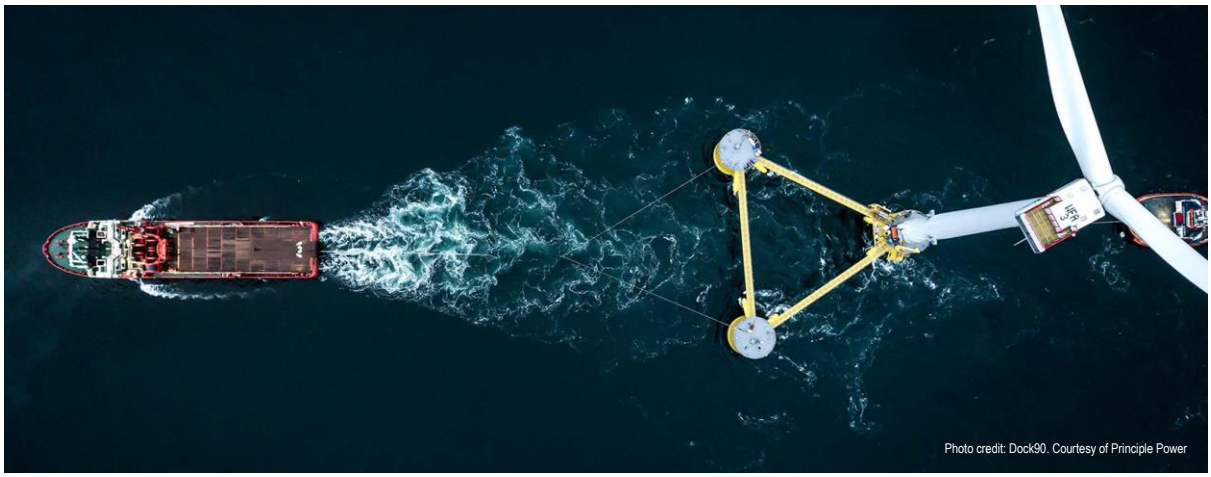

Project Erebus Environmental Statement
Chapter 30: Cumulative Effects Assessment

Table of Contents

Acronyms

Term	Definition
CEA	Cumulative Effects Assessment
DCO	Development Consent Order
EIA	Environmental Impact Assessment
EEA	European Economic Area
ES	Environmental Statement
FAD	Fish Aggregating Device
GVA	Gross Value Added
HRA	Habitats Regulations Assessment
INNC	Invasive Non-Native Species
JNCC	Joint Nature Conservation Committee
MCAA	Marine and Coastal Access Act
MU	Management Unit
NPS	National Policy Statement
NRW	Natural Resources Wales
NSIP	Nationally Significant Infrastructure Project
O&M	Operation and Maintenance
SLVIA	Seascape, Landscape and Visual Impact Assessment
SSC	Suspended Sediment Concentration
UNECE	United Nations Economic Commission for Europe
WNMP	Welsh National Marine Plan
WTF	Wind Turbine Generator
ZOI	Zone of Influence

Chapter 30 Cumulative Effects Assessment

30.1 Introduction

30.1.1.1 This chapter summarises the Cumulative Effects Assessment (CEA) and transboundary impact assessment for the proposed Erebus floating offshore wind development (herein 'the Project'). A detailed technical assessment of cumulative effects relevant to each topic is provided in the respective chapter within this Environmental Statement (ES) (Chapters 6 to 27), including transboundary impacts where applicable; this chapter is intended to provide a comprehensive overview of the potential for cumulative effects from the Project overall.

30.1.1.2 This chapter outlines the legislative requirements for a CEA and for assessment of transboundary impacts, signposts to guidance that has been used to direct the CEA and summarises the consultation that was undertaken during development of the methodology for CEA applied within the ES.

30.1.1.3 It should be noted that the CEA is a distinct assessment from the in-combination assessment required as part of the Habitats Regulations Assessment (HRA) process. However, the in-combination assessment involves similar aspects to the CEA, notably the methodology for identification of other plans, projects and activities that should be considered within assessment. The in-combination assessment is provided separately within Volume 3, Technical Appendix 8.3: Report to Inform Appropriate Assessment.

30.1.1.4 This chapter has drawn upon information provided in:

- Chapter 6: Marine and Coastal Processes
- Chapter 7: Marine Seabed and Water Quality
- Chapter 9: Marine and Coastal Ecology
- Chapter 10: Fish and Shellfish Ecology
- Chapter 11: Offshore Ornithology
- Chapter 12: Marine Mammals
- Chapter 13: Seascape and Visual Impacts
- Chapter 14: Offshore Archaeology and Cultural Heritage
- Chapter 15: Commercial Fisheries
- Chapter 16: Shipping and Navigation
- Chapter 17: Aviation and Radar
- Chapter 18: Coastal and Marine Infrastructure and Other Users
- Chapter 19: Onshore Geology, Hydrogeology and Hydrology
- Chapter 20: Terrestrial and Coastal Ecology and Onshore Ornithology
- Chapter 21: Landscape and Visual Impacts
- Chapter 22: Onshore Noise and Vibration
- Chapter 23: Onshore Archaeology and Cultural Heritage
- Chapter 24: Land Use
- Chapter 25: Traffic and Transport

- Chapter 26: Air Quality
- Chapter 27: Socio-economics, Tourism and Recreation.

30.2 Legislation, Policy and Guidelines

30.2.1 Legislation

30.2.1.1 The Proposed Development is subject to EIA under European Union (EU) EIA Directive 85/337/EEC (as amended by Directives 97/11/EC, 2003/35/EC and 2009/31/EC). In 2011, the original EIA Directive and amendments were codified by EIA Directive 2011/92/EU (as amended by Directive 2014/52/EU) (the EIA Directive). The EIA Directive ensures that projects likely to have significant effects on the environment are subject to an EIA prior to their approval or authorisation. The requirement to comply with them is transposed into UK law by regulations and/or amendment legislation such as The Marine Works (Environmental Impact Assessment) Regulations 2010 (as amended) which were amended in 2017.

30.2.1.2 Following the UK's exit from the EU and end of transition period on 31 December 2020, various pieces of legislation have been passed to remove the domestic constitutional basis for EU law in the UK and ensure continuity. This includes EIA, for which the Environmental Assessments and Miscellaneous Planning (Amendment) (EU Exit) Regulations 2018 were introduced. The regulations ensure that environmental considerations continue to be taken into account at the development consent stage.

30.2.1.3 Schedule 4 paragraph 5 of the 2017 EIA Regulations (abridged below) states the need for:

"*A description of the likely significant effects of the development on the environment resulting from, inter alia:*

(e) 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

The description of the likely significant effects on the factors specified in regulation 4(2) should cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development."

30.2.1.4 This requirement has been met through assessment of potential for significant cumulative and transboundary effects within each technical chapter presented in the Project ES. The present chapter provides an overall summary of these outcomes.

30.2.1.5 The requirement for assessment of transboundary effects is also laid out in the United Nations Economic Commission for Europe (UNECE) Convention on Environmental Impact Assessment in a Transboundary Context (referred to as the Espoo Convention). This Convention obliges its Parties to conduct an EIA of any planned activities if these can have a significant transboundary impact.

30.2.1.6 Where it is identified that a development may result in significant impacts on the environment of a European Member State, Regulation 32 of the EIA Regulations requires that corresponding information is provided to the respective Member State. Consultation must then be initiated with that State regarding appropriate mitigation measures.

30.2.2 Policy

30.2.2.1 Although this Project is seeking Section 36 consent under the Electricity Act 1989 and a Marine Licence under the Marine and Coastal Access Act (MCAA) 2009, as opposed to a Development Consent Order (DCO), its generating capacity (up to 100 MW) is similar to the minimum threshold (100 MW) for Nationally Significant Infrastructure Projects (NSIPs). In the absence of S.36 consent guidance, NSIP guidance is considered relevant to use for this Project. National Policy Statements (NPSs) were developed to provide guidance in the determination of NSIPs. Those relevant for CEA include:

- Overarching NPS for Energy (EN-1) (DECC, 2011a); and
- NPS for Renewable Energy Infrastructure (EN-3), July 2011 (DECC, 2011b).

30.2.2.2 Table 30.1 identifies sections of EN-1 and EN-3 most relevant to this assessment and detail where these have been addressed as part of this assessment.

Table 30.1 EN-1 and EN-3 Assessment Provisions Relevant to Cumulative Effects Assessment and Assessment of Transboundary Impacts

NPS Requirement	NPS Reference	ES Reference
The ES should provide information on how the effects of the applicant's proposal would combine and interact with the effects of other development (including projects for which consent has been sought or granted, as well as those already in existence).	EN-1 4.2.5	This information is provided in all chapters.
Any assessment of aviation or other defence interests should include potential impacts of the project upon the operation of CNS infrastructure, flight patterns (both civil and military), other defence assets and aerodrome operational procedures. It should also assess the cumulative effects of the project with other relevant projects in relation to aviation and defence	EN-1 5.4.12	This assessment is undertaken in Chapter 17: Aviation and Radar
Where cumulative effects on intertidal habitats are predicted as a result of the cumulative effects of multiple cable routes, it may be appropriate for applicants of various schemes to work together to ensure that the number of cables crossing the intertidal zone are minimised and installation and decommissioning phases are coordinated to ensure that disturbance is also reasonably minimised	EN-3 2.6.89	No other cable routes reach land at the same location as the Proposed Development.
Where necessary, assessment of the effects on marine mammals should include details of: • duration of the potentially disturbing activity including cumulative/in-combination effects with other plans or projects	EN-3 2.6.92	This assessment is undertaken in Chapter 12: Marine Mammals

NPS Requirement	NPS Reference	ES Reference
Where cumulative effects on subtidal habitats are predicted as a result of the cumulative effects of multiple cable routes, it may be appropriate for applicants for various schemes to work together to ensure that the number of cables crossing the subtidal zone is minimised and installation/decommissioning phases are coordinated to ensure that disturbance is reasonably minimised.	EN-3 2.6.120	Interaction between multiple cable routes occurs in a single instance along the export cable, where the cable route for the Proposed Development intersects the Greenlink Interconnector. This single event was unavoidable given the location of these projects and all efforts have been made to avoid interaction between cable routes. The Project team has been in regular contact with the developers of the Greenlink Interconnector and will continue to do so throughout the duration of Project development, construction, operation and maintenance (O&M) and decommissioning.
In some circumstances, transboundary issues may be a consideration as fishermen from other countries may fish in waters within which offshore wind farms are sited.	EN-3 2.6.124	This assessment is undertaken in Chapter 15: Commercial Fisheries.
The navigation risk assessment will for example necessitate: • cumulative and in-combination risks associated with the development and other developments (including other wind farms) in the same area of sea.	EN-3 2.6.157	This assessment is undertaken in Chapter 16: Shipping and Navigation and Volume 3, Technical Appendix 16.1: Navigational Risk Assessment.
The applicant should have regard to the likely overall effect of the development in question and to any cumulative effects of other relevant proposed, consented and operational offshore wind farms.	EN-3 2.6.169	This information is provided in all chapters.

Welsh National Marine Plan (WNMP)

30.2.2.3 The Welsh Government has developed the first marine plan for Welsh inshore and offshore waters, the Welsh National Marine Plan (WNMP). The Plan was developed in accordance with the MCAA 2009, the UK Marine Policy Statement and the Maritime Spatial Planning Directive (discussed further in Chapter 5: Policy and Legislation).

30.2.2.4 Throughout the WNMP, it is clarified that environmental impacts should be assessed both individually and cumulatively (Plan Policy D1, D5, D6, D9, D11). Table 30.2 sets out WNMP policies which are particularly relevant to assessment of cumulative effects.

Table 30.2: WNMP Policies Relevant to Assessment of Cumulative Effects

WNMP Policy Descriptions	Reference	ES Reference
Support the sustainable development of the Welsh marine area by contributing across Wales' well-being goals, supporting the Sustainable Management of Natural Resources (SMNR) through decision making and by taking account of the cumulative effects of all uses of the marine environment.	Overarching Plan Objective 1	All chapters
Proposals should demonstrate that they have assessed potential cumulative effects and should, in order of preference: • avoid adverse effects; and/or • minimise effects where they cannot be avoided; and/or • mitigate effects where they cannot be minimised. If significant adverse effects cannot be avoided, minimised or mitigated, proposals must present a clear and convincing case for proceeding. Proposals that contribute to positive cumulative effects are encouraged	GOV_01: Promoting Good Governance	All chapters

30.2.3 Guidance

30.2.3.1 The proposed approach to CEA takes account of the following documents:

- PINS guidance (Advice Note 17, Cumulative Effect Assessment, PINS 2019); and
- Cumulative Impact Assessment Guidelines: Guiding Principles for Cumulative Impacts Assessment in Offshore Wind Farms (Renewable UK, 2013).

30.2.3.2 PINS guidance (Advice Note 17, PINS 2019) is considered the best and most appropriate guidance for marine renewable developments of this nature and provides clear justification for each decision within the process. PINS Advice Note 17 identifies that the following types of major developments in the wider study area should be taken into consideration in any CEA:

- Projects under construction;
- Consented / permitted development(s) - but not yet implemented;
- Submitted application(s) - but not yet determined;
- Projects on the National Infrastructure Planning Portal's Programme of Projects;
- Projects identified in the relevant development plan (and emerging development plans - with appropriate weight given as they move closer to adoption) recognising that much information on any relevant proposals will be limited; and
- Projects identified in other plans and programmes (as appropriate) which set the framework for future development consents / approvals, where such development is reasonably likely to come forward.

30.2.3.3 As such, projects that were built and operational at the time that survey data were collected have been classified as part of the baseline conditions i.e. are largely excluded from the CEA. However, operational projects have been included within the CEA where these are associated with ongoing risk of additional impacts, i.e. offshore wind developments. For those projects that were only partially constructed, or have only recently been completed, the full extent of the impacts arising from the development(s) may not be known and have therefore been included within the CEA.

30.2.3.4 A four staged approach was undertaken for the CEA:

- **Stage 1** – Establish the project's Zone of Influence (ZOI) and identify a long-list of 'other development'.
- **Stage 2** – Identify short-list of 'other development' for the CEA. Once the CEA long-list was created (Stage 1 above), all projects and plans were screened, based on the potential for interaction with the Project. Interaction may be either temporal, spatial or conceptual.
- **Stage 3** – Information gathering on the short-listed 'other developments'.
- **Stage 4** – Assessment of cumulative effects.

30.2.3.5 The Planning Inspectorate Advice Note 12: Transboundary Impacts and Process (PINS, 2018) lays out the process for consultation where it is deemed there is risk that a project may have significant transboundary impacts. This Advice Note stipulates that developers should identify potential significant transboundary effects where possible or provide justification in instances where it is considered that there would not be any significant effects on European Member States.

30.3 Consultation and Scoping

30.3.1.1 Volume 3, Technical Appendix 2.3: Consultation Report provides details of consultation responses received and actions taken by the Applicant to address any concerns that were raised.

30.3.1.2 Specific consultation was undertaken with statutory consultees Natural Resources Wales (NRW) and the Joint Nature Conservation Committee (JNCC), and key stakeholders, Pembrokeshire Coast National Park Authority (PCNPA) and Pembrokeshire County Council (PCC) to agree the CEA methodology. The stages of consultation and the agreed methodology are discussed and presented below in Section 30.4

30.4 Assessment Methodology and Significance Criteria

30.4.1 Cumulative Effects Assessment

30.4.1.1 The approach for CEA has been developed through consultation of standard guidance and consultation with statutory consultees, primarily NRW and the JNCC.

30.4.1.2 An initial long list of projects with the Proposed Development was identified, based on a zone of influence (ZOI) approach (in accordance with PINS, 2019). These ZOIs were shared during consultation, together with the corresponding justification or evidence base. The use of ZOIs is intended to provide a transparent and justifiable area of search within which other developments may be located. Full details of the ZOIs applied within this CEA together with the resultant long-list are provided in Volume 3, Technical Appendix 30.1: Project Identification in Support of Cumulative Effect Assessment.

30.4.1.3 The availability of information necessary to conduct the CEA will depend on the current status of the other developments. Only projects which are reasonably well described and sufficiently advanced to provide information on which to base a meaningful and robust assessment have been included in the CEA. In certain instances, particularly within assessment of cumulative impacts from older operational OWFs on marine ornithological receptors (see Chapter 11: Offshore Ornithology), suitable data is not available to allow a quantitative assessment of cumulative impacts. In such cases, a qualitative assessment is provided (in accordance with advice provided in the RenewableUK Guiding Principles for Cumulative Impacts Assessment In Offshore Wind Farms (RenewableUK, 2013)). Where appropriate a level of certainty is attributed to each development, reflecting the availability of detail and information necessary for the assessment. This approach is based on the three-tier system proposed in the Planning Inspectorate's Advice Note 17. However, where additional detail is required, e.g. for assessment of marine mammals, a more refined tiering system based on the guidance issued by JNCC and Natural England in September 2013 is employed and involves six tiers.

30.4.1.4 During consultation with NRW/JNCC it was agreed that CEA should consider the following:

- Projects started but not finished;
- Projects with consent but not started;
- Applications lodged and not determined;
- Refusals subject to appeal;
- Known projects not needing consent;
- Proposals in adopted plans (potentially); and
- Firm proposals in published final draft plans (potentially).

30.4.1.5 It was clarified that the reason for the inclusion of the word 'potentially' was because there has to be sufficient information for their effects to be reasonably understood, as well as good reasons for thinking they will be taken forward.

30.4.1.6 On this basis, it was established that certain known, but early stage, developments could not be assessed within CEA due to an absence of sufficient detail so as to allow effects to be reasonably understood.

30.4.1.7 In accordance with PINS Guidance Note 17: Cumulative Effects Assessment, the Applicant proposed to and agreed a cut-off date (1 October 2021) with NRW for inclusion of other developments within the CEA. Any developments for which there is insufficient information available to allow cumulative effects to be reasonably understood by this date would be omitted from the CEA. However, where projects come forward following the cut-off date it is understood that additional information may be requested during the determination period.

30.4.1.8 Projects which are built and operational during baseline site characterisation are considered to be part of the baseline for the CEA. However, where it is identified that there are ongoing impacts from built and operational projects, these have been considered within the CEA. For those projects that were only partially constructed, or have only recently been completed, the full extent of the impacts arising from the development(s) may not be known and have therefore been included within the CEA.

30.4.1.9 In addition to the methodology presented above, specific consultation was undertaken with statutory consultees to agree the CEA for Landscape and Visual Impact Assessment (LVIA) and Seascape and Visual Impact Assessment (SLVIA).

30.4.1.10 A technical note summarising the proposed approach to Cumulative Effect Assessment for the SLVIA and LVIA was shared with NRW, PCC and PCNPA in September 2021. Comments were received from NRW (October 2021) where it was agreed projects to be scoped out and where concerns were raised about the omission of some projects, the approach was adapted to include these in the CEA. Further details are provided in Chapter 13: Seascape and Visual Impact and Chapter 21: Landscape and Visual Impact and summarised in this chapter in Section 30.5.7 and Section 30.5.15.

30.4.1.11 Table 30.3 details the short-list of projects identified for each receptor topic assessed within the EIA, based on the Project ZOI extent, which has been developed as part of continued consultation with technical consultees.

Table 30.3: Short-list of projects included in cumulate effects assessment.

Project	Distance from array (km)	Distance from ECC (km)	Sector	Marine Coastal Processes	Marine Sediment and Water Quality	Marine and Coastal Ecology	Fish and Shellfish Ecology	Marine Ornithology	Marine Mammals	Seascape and Visual Impact	Marine Archaeology and Cultural Heritage	Commercial Fisheries	Shipping and Navigation	Aviation and Radar	Coastal and Marine Infrastructure	LVIA	Socio Economics, Tourism & Recreation
Erebus			Offshore Renewables														
Rhoscrowther Wind Farm	43.7	NA	Onshore Renewables							x						x	
Milford Haven Dredging	35.6	0.5	Maintenance Dredging	x	x												
Maintenance Dredge Disposal: Milford Haven Two Disposal Site	24.1	4.1	Dredge Disposal	x	x												
Greenlink Interconnector	17.8	0.0	Interconnector	x	x	x	x		x		x	x	x		x	x	x
META Warrior Way	49.0	10.5	Offshore Renewables		x	x	x					x	x		x		x
META Dale Road	39.7	1.9	Offshore Renewables	x	x	x	x			x		x	x		x		x

Project	Distance from array (km)	Distance from ECC (km)	Sector	Marine Coastal Processes	Marine Sediment and Water Quality	Marine and Coastal Ecology	Fish and Shellfish Ecology	Marine Ornithology	Marine Mammals	Seascape and Visual Impact	Marine Archaeology and Cultural Heritage	Commercial Fisheries	Shipping and Navigation	Aviation and Radar	Coastal and Marine Infrastructure	LVIA	Socio Economics, Tourism & Recreation
META East Pickard Bay (Bombora)	37.3	1.6	Offshore Renewables	x	x	x	x		x	x		x	x		x		x
Project Valorous	3.6	10.9	Offshore Renewables	x	x	x	x	x		x		x	x	x	x		x
Dieppe - Le Tréport	491.2	472.6	Offshore Renewables						x								
Fécamp	442.5	427.0	Offshore Renewables						x								
Calvados (Courseulles-sur-mer)	418.0	407.1	Offshore Renewables						x								
TwinHub (WaveHub)	115.7	119.4	Offshore Renewables						x								
Atlantic Marine Energy Test Site (AMETS)	429.7	441.8	Offshore Renewables						x								
Rampion 2	374.1	354.5	Offshore Renewables						x								

Project	Distance from array (km)	Distance from ECC (km)	Sector	Marine Coastal Processes	Marine Sediment and Water Quality	Marine and Coastal Ecology	Fish and Shellfish Ecology	Marine Ornithology	Marine Mammals	Seascape and Visual Impact	Marine Archaeology and Cultural Heritage	Commercial Fisheries	Shipping and Navigation	Aviation and Radar	Coastal and Marine Infrastructure	LVIA	Socio Economics, Tourism & Recreation
Holyhead Deep (Minesto)	206.3	178.4	Offshore Renewables						x								
Codling	175.6	159.5	Offshore Renewables						x								
Oriel	271.5	255.7	Offshore Renewables						x								
Dublin Array	194.1	179.3	Offshore Renewables						x								
Arklow Bank – Phase 1	146.0	134.5	Offshore Renewables					x									
Burbo Bank	275.1	239.0	Offshore Renewables					x									
Burbo Bank Extension	271.3	235.2	Offshore Renewables					x									
Gwynt y Môr	257.3	222.4	Offshore Renewables					x									
North Hoyle	258.5	222.8	Offshore Renewables					x									

Project	Distance from array (km)	Distance from ECC (km)	Sector	Marine Coastal Processes	Marine Sediment and Water Quality	Marine and Coastal Ecology	Fish and Shellfish Ecology	Marine Ornithology	Marine Mammals	Seascape and Visual Impact	Marine Archaeology and Cultural Heritage	Commercial Fisheries	Shipping and Navigation	Aviation and Radar	Coastal and Marine Infrastructure	LVIA	Socio Economics, Tourism & Recreation
Ormonde	322.9	289.9	Offshore Renewables					x									
Rhyl Flats	247.6	212.6	Offshore Renewables					x									
Robin Rigg	384.0	354.1	Offshore Renewables					x									
Walney – Phase 1 and 2	315.9	282.8	Offshore Renewables					x									
Walney Extension	314.3	282.2	Offshore Renewables					x									
West of Duddon Sands	311.8	278.2	Offshore Renewables					x									

30.4.1 Transboundary Assessment

30.4.1.1 Potential transboundary impacts have been assessed in a similar manner to other Project impacts (see Chapter 2: Overview of EIA Methodology for details). The transboundary impacts assessment has two stages, screening and assessment. This assessment methodology will follow that of the EIA methodology as detailed in Section 2.6 of Chapter 2: Overview of EIA Methodology. Where any deviations are required on a topic-by-topic basis, these will be detailed within the relevant EIA part of Section 30.6.

30.5 Cumulative Effects Assessment Summary

30.5.1.1 The following provides a summary of cumulative effects assessed within each topic-specific chapter of the ES. The table specifies the impact pathway, outlines the basis for determination and states the CEA level of significance that has been determined. Details of the basis for the outcomes provided in Table 30.4 together with details of any mitigation measures that have been proposed, have been detailed within the relevant technical chapter.

30.5.1 Marine and Coastal Processes

30.5.1.1 Table 30.4 provides a summary of the CEA for Marine and Coastal Processes. Details of the other developments considered for Marine and Coastal Processes are provided in Table 30.3.

Table 30.4 Summary of Cumulative Effects Assessment for Marine and Coastal Processes

Impact Pathway	Basis for Determination	Significance
Construction Phase		
Potential cumulative increases in Suspended Sediment Concentration (SSC) and associated changes in bed level during construction.	Any project within one tidal excursion distance has the potential to cause localised temporary increases in SSC due to the installation or removal of structures on the bed and / or through the dredging and disposal of material. If these activities were to occur at the same time as construction (or decommissioning) works for the Proposed Development, there may be potential for cumulative increases in SSC and associated changes in bed levels.	It is not expected that marine and coastal processes receptors can be affected by elevated levels of SSC. However, the potential for these changes to impact other EIA receptor groups are considered within the following other ES Chapters: Chapter 7: Marine Seabed and Water Quality; Chapter 9: Marine and Coastal Ecology; Chapter 10: Fish and Shellfish Ecology; Chapter 12: Marine Mammals; Chapter 14: Marine Archaeology and Cultural Heritage.

Impact Pathway	Basis for Determination	Significance
Operation and Maintenance		
Changes in sediment transport.	Levelling of sandwaves within the export cable corridor has potential to result in cumulative impacts with construction or O&M activities for the Valorous offshore wind development. However, it is not predicted that Project activities would lead to removal of any material from the local sediment transport system. As such, there will be very little potential for cumulative interaction.	Minor Adverse
Decommissioning		
No potential cumulative effects were identified in relation to marine and coastal processes during the decommissioning phase.		

30.5.2 Marine Sediment and Water Quality

30.5.2.1 Table 30.5 provides a summary of the CEA for Marine Sediment and Water Quality. Details of the other developments considered for Marine Sediment and Water Quality are provided in Table 30.3.

Table 30.5 Summary of Cumulative Effects Assessment for Marine Sediment and Water Quality.

Impact Pathway	Basis for Determination	Significance
Construction Phase		
Accidental release of fluids into the environment.	The worst-case scenario for accidental pollution events is that effects envelope will overlap, causing an increased magnitude of effect on environmental receptors. As such, any project within one tidal excursion distance is screened into assessment.	Negligible
Cable installation works may cause changes to water quality through sediment re suspension.	The worst-case scenario for effects of elevated SSC is that effects envelope will overlap, causing an increased magnitude of effect on environmental receptors. As such, any project within one tidal excursion distance is screened into assessment. It is determined that any cumulative increases in SSC will be small and given the geographic separation between projects these are expected to remain within the parameters assessed for the Project alone.	Minor Adverse
Water quality may be altered through the mobilisation of contaminated sediments	The worst-case scenario for effects of elevated levels of contaminants in surrounding waters is that effects envelope will overlap, causing an increased magnitude of effect on environmental receptors. As such, any project within one tidal excursion distance is screened into assessment.	Minor Adverse

Impact Pathway	Basis for Determination	Significance
	It is expected that any cumulative increases in contaminant levels will be negligible and given the geographic separation between projects these are expected to remain within the parameters assessed for the Project alone.	
Operation and Maintenance		
Accidental release of fluids into the environment.	As described above.	Negligible
Benthic sediments may be mobilised through scouring effects caused by installation of turbine foundations, anchor points and cable protection. Sediment re-suspension could lead to deterioration in water quality.	As described above.	Negligible
The introduction of transmission assets may heat surrounding sediments and cause increase bacterial growth.	Although all other renewable energy and energy transmission developments have potential to cause similar effects, this pathway was not assessed for any other development screened into cumulative assessment. As such, CEA was carried out qualitatively, based on assumed similarity with the Proposed Development.	Minor Adverse
Decommissioning		
Due to level of uncertainty over the likely schedule for decommissioning the Proposed Development and lack of certainty over long-term timelines for other projects considered, it is considered that cumulative effects assessment cannot be realistically completed for this Project phase.		

30.5.3 Marine and Coastal Ecology

30.5.3.1 Table 30.6 provides a summary of the CEA for Marine and Coastal Ecology. Details of the other developments considered for Marine and Coastal Ecology are provided in Table 30.3.

Table 30.6 Summary of Cumulative Effects Assessment for Marine and Coastal Ecology.

Impact Pathway	Basis for Determination	Significance
Construction Phase		
Temporary habitat disturbance.	Additive habitat loss/disturbance across the region. However, it is considered unlikely that activities will be completed concurrently and there is extensive similar habitat available regionally.	Minor Adverse
Temporary increases in suspended solids/smothering and changes to physical processes.	The worst-case scenario for effects of elevated SSC is that effects envelope will overlap, causing an increased magnitude of effect on environmental receptors. As such, any project within one tidal excursion distance is screened into assessment. It is determined that any cumulative increases in SSC will be small and given the geographic separation between projects these are expected to remain within the parameters assessed for the Project alone.	Minor Adverse
Risk of introduction of Invasive Non-Native Species (INNS).	As noted in consultation with NRW and JNCC, the ZOI approach is not appropriate for INNS. Worst-case assessment based on volume of additional hard substrate material that is introduced from each other development, together with expected elevation in vessel transport (see Volume 3, Technical Appendix 9.5: INNS Plan).	Minor Adverse
Accidental release of pollutants from vessels.	The worst-case scenario for accidental pollution events is that effects envelope will overlap, causing an increased magnitude of effect on environmental receptors. As such, any project within one tidal excursion distance is screened into assessment (see Chapter 16: Shipping and Navigation for more details).	Minor Adverse
Accidental release of contaminants from disturbance of sediments.	Although contamination levels in regional sediments is low, the worst-case scenario for effects of contaminated sediment disturbance/mobilisation is based on overlap of effects envelope causing an increased magnitude of effect on environmental receptors. As such, any project within one tidal excursion distance is screened into assessment. It is expected that any cumulative increases in contaminant levels will be negligible and given the geographic separation between projects these are expected to remain within the parameters assessed for the Project alone.	Minor Adverse
Operation and Maintenance		
Long-term loss of habitat from project infrastructure.	Additive habitat loss across the region.	Minor Adverse

Impact Pathway	Basis for Determination	Significance
Temporary disturbance of habitat from cable repairs and remediation.	Additive habitat loss/disturbance across the region.	Minor Adverse
Temporary increases in suspended solids/smothering and changes in physical processes.	As described above.	Minor Adverse
Colonisation of infrastructure from INNS.	As noted in consultation with NRW and JNCC, the ZOI approach is not appropriate for INNS. Worst-case assessment based on volume of additional hard substrate material that is introduced from each other development, together with expected elevation in vessel transport.	Minor Adverse
Accidental release of pollutant from vessels and Wind Turbine Generator (WTG).	As described above.	Minor Adverse
Accidental release of contaminants from disturbance of sediments.	As described above.	Minor Adverse
EMF emissions from power cables.	Although all other renewable energy and energy transmission developments have potential to cause similar effects, this pathway was not assessed for any other development screened into cumulative assessment. As such, CEA was carried out qualitatively, based on assumed similarity with the Proposed Development (see Volume 3, Technical Appendix 7.2: EMF Compliance).	Minor Adverse
Decommissioning		
The same type and level of significance is predicted for decommissioning cumulative impacts as those described for the construction phase. As such, a minor adverse significance is assessed.		

30.5.4 Fish and Shellfish Ecology

30.5.4.1 Table 30.7 provides a summary of the CEA for Fish and Shellfish Ecology. Details of the other developments considered for Fish and Shellfish Ecology are provided in Table 30.3.

Table 30.7 Summary of Cumulative Effects Assessment for Fish and Shellfish Ecology.

Impact Pathway	Basis for Determination	Significance
Construction Phase		
Temporary habitat disturbance/damage	Additive habitat loss/disturbance across the region. However, it is considered unlikely that activities will be completed concurrently and there is extensive similar habitat available regionally.	Minor Adverse
Increased suspended sediment and sediment deposition.	The worst-case scenario for effects of elevated SSC is that effects envelope will overlap, causing an increased magnitude of effect on environmental receptors. As such, any project within one tidal excursion distance is screened into assessment. It is determined that any cumulative increases in SSC will be small and given the geographic separation between projects these are expected to remain within the parameters assessed for the Project alone.	Minor Adverse
Disturbance, injury and mortality from subsea noise.	Worst-case spatial extent for cumulative assessment of acoustic emissions is based on modelling outputs presented in Volume 3, Technical Appendix 12.2: Underwater Noise and Vibration.	Minor Adverse
Operation and Maintenance		
Long-term loss of habitat via project infrastructure.	Additive habitat loss/disturbance across the region. However, it is considered unlikely that activities will be completed concurrently and there is extensive similar habitat available regionally.	Minor Adverse
Temporary habitat disturbance via repair and remediation works.	Additive habitat loss/disturbance across the region. However, it is considered unlikely that activities will be completed concurrently and there is extensive similar habitat available regionally.	Minor Adverse
Increased suspended sediment and sediment deposition via repair and remediation works.	As described above.	Minor Adverse
Fish aggregating device (FAD) and collision effects.	The effects of FAD are determined to be low for the Project alone. Given the small footprint of the Proposed Development and other projects it is considered unlikely that the cumulative FAD effects between projects will increase impact significance.	Minor Adverse
Reduced fishing pressures within the Project area.	A reduction in fishing pressure is expected within the array area during the O&M phase. This is only likely to impact >12 m offshore mobile gear vessels given the offshore location of the Project array area.	Negligible

Impact Pathway	Basis for Determination	Significance
Electromagnetic field effects from cables	Although all other renewable energy and energy transmission developments have potential to cause similar effects, this pathway was not assessed for any other development screened into cumulative assessment. As such, CEA was carried out qualitatively, based on assumed similarity with the Proposed Development (see Volume 3, Technical Appendix 7.2: EMF Compliance for details of Project assessment).	Minor Adverse
Disturbance, injury and mortality from subsea noise produced via operational activities.	Worst-case spatial extent for cumulative assessment of acoustic emissions is based on modelling outputs presented in Volume 3, Technical Appendix 12.2: Underwater Noise and Vibration.	Minor Adverse
Decommissioning		
The same type and level of significance is predicted for decommissioning cumulative impacts as those described for the construction phase. As such, a minor adverse significance is assessed.		

30.5.5 Marine Ornithology

30.5.5.1 Table 30.8 provides a summary of the CEA for Marine Ornithology. Details of the other developments considered for Marine Ornithology are provided in Table 30.3.

Table 30.8 Summary of Cumulative Effects Assessment for Marine Ornithology.

Impact Pathway	Basis for Determination	Significance
Operation and Maintenance		
Collision risk: northern gannet	CEA predicts a mortality rate representing 0.04% of the BDMPS population (September to November) and 0.03% of the BDMPS (December to March). This small proportion of the population is not expected to result in significant population level adverse effects.	Minor adverse
Collision risk: herring gull	CEA predicts a mortality rate representing 0.13% of the BDMPS population (September to February). This small proportion of the population is not expected to result in significant population level adverse effects.	Minor adverse
Collision risk: great black-backed gull	CEA predicts a mortality rate representing 0.38% of the BDMPS population (September to March). This small proportion of the population is not expected to result in significant population level adverse effects.	Minor adverse
Collision risk: Lesser black-backed gull	CEA predicts a mortality rate corresponding with 0.18% of the BDMPS population (August to October and March to April) and 0.70% of the BDMPS (November to February).	Minor adverse

Impact Pathway	Basis for Determination	Significance
	This small proportion of the population is not expected to result in significant population level adverse effects.	
Collision risk: black legged kittiwake	CEA predicts a mortality rate corresponding with 0.03% of the BDMPS population (August to December) and 0.04% of the BDMPS (January to April). This small proportion of the population is not expected to result in significant population level adverse effects.	Minor adverse
Collision risk: common guillemot	CEA predicts a mortality rate corresponding with 0.03% of the BDMPS population (August to February). This small proportion of the population is not expected to result in significant population level adverse effects.	Minor adverse
Displacement effects: Manx shearwater	CEA predicts a mortality rate corresponding with 0.02% of the BDMPS population (August to October and March to May). This small proportion of the population is not expected to result in significant population level adverse effects.	Minor adverse
Displacement effects: northern gannet	No quantitative data for other projects scoped in for CEA are available, only a qualitative assessment could be made for cumulative effects. The other projects scoped in for CEA assess impacts to northern gannet from displacement effects as minor or negligible, and monitoring reports for these projects show no impacts outside those predicted in the corresponding ES. Cumulatively, with the Project, mortality to the regional northern gannet population is not likely to be significant	Minor adverse
Displacement effects: black-legged kittiwake	No quantitative data for other projects scoped in for CEA are available, only a qualitative assessment could be made for cumulative effects. The other projects scoped in for CEA assess impacts to black-legged kittiwake from displacement effects as minor or negligible, and monitoring reports for these projects show no impacts outside those predicted in the corresponding ES. Cumulatively, with the Project, mortality to the regional black-legged kittiwake population is not likely to be significant	Negligible
Displacement effects: Atlantic puffin	No quantitative data for other projects scoped in for CEA are available, only a qualitative assessment could be made for cumulative effects. The other projects scoped in for CEA assess impacts to Atlantic puffin from displacement effects as minor or negligible, and monitoring reports for these projects show no impacts outside those predicted in the corresponding ES. Cumulatively, with the Project, mortality to the regional Atlantic puffin population is not likely to be significant	Minor adverse

Impact Pathway	Basis for Determination	Significance
Displacement effects: common guillemot	Predicted levels of mortalities, when proportioned by season represent 0.45% of the BDMPS (March to June and August to February). In addition, the common guillemot colonies identified in Project apportioning are outside the species-specific mean maximum foraging range and therefore there is very limited potential for cumulative effects.	Minor adverse
Displacement effects: razorbill	CEA predicts a mortality rate corresponding with 0.12% of the BDMPS population (August to October and January to March). Furthermore, it should be noted that this is a highly precautionary assessment, assuming that all mortalities occur in a single season. Should mortalities be divided across the seasons proportionately with populations, the mortality rate would be approximately 0.04% in all seasons. This small proportion of the population is not expected to result in significant population level adverse effects.	Minor adverse

30.5.6 Marine Mammals

30.5.6.1 Table 30.9 provides a summary of the CEA for Marine Mammals. Details of the other developments considered for Marine Mammals are provided in Table 30.3.

Table 30.9 Summary of Cumulative Effects Assessment for Marine Mammals.

Impact Pathway	Basis for Determination	Significance
All Project Phases		
Disturbance to bottlenose dolphin from underwater noise.	Of the seven offshore projects screened into the cumulative effects assessment for bottlenose dolphins, the Proposed Development has the highest level of predicted disturbance impact. Given the limited contribution of other projects to overall disturbance, cumulative levels of significance are not expected to increase above those assessed alone.	Negligible to Minor Adverse
Disturbance to common dolphin from underwater noise.	The majority of projects within the common dolphin MU were omitted from the CEA due to their location in the North Sea, where common dolphins are not expected to be present in sufficient numbers. Construction activities for the remaining projects that were screened into assessment have no temporal overlap with construction of the Proposed Development. Therefore, cumulative levels of significance are not expected to increase above those assessed alone.	Negligible
Disturbance to harbour porpoise from underwater noise.	Many of the offshore projects screened into the assessment for harbour porpoise are planned to conduct offshore construction work prior to the Project offshore construction window and, thus, the predicted impacts do not overlap. Prior to the offshore construction activities commence at the Project, the	Minor Adverse

Impact Pathway	Basis for Determination	Significance
	construction of the other developments is expected to have a Negligible to Medium magnitude; harbour porpoise have been assessed as having a low sensitivity to disturbance from piling and therefore the significance is assessed as Minor.	
Disturbance from vessels.	Cumulative assessment was based on the increased potential for disturbance to marine mammals due to the potential increase in vessel movements from the construction of the Project offshore wind farm with other planned or existing projects, plans and activities. Vessel routes to and from project sites will use existing vessel routes, where marine mammals will be accustomed to, and potentially habituated to, regular vessel movements. Additional risk is confined mainly to construction sites. Any disturbance is predicted to be small scale, long-term duration but intermittent. It is expected that any marine mammals that are disturbed as a result of vessel presence will return to the area once the vessel disturbance has ended.	Negligible to Minor Adverse

30.5.7 Seascape and Visual Impacts

30.5.7.1 Table 30.10 provides a summary of the CEA for Seascape and Visual Impacts. The cumulative effects assessment methodology for seascape varied from that applied to other topics and as such only the outcomes are summarised below. The full assessment is provided in Chapter 13: Seascape and Visual Impacts. Details of the other developments considered for Seascape and Visual Impacts are provided in Table 30.3.

Table 30.10 Summary of Cumulative Effects Assessment for Seascape and Visual Impacts.

Impact Pathway	Basis for Determination	Significance
Operational Phase (consented scenario)		
Potential cumulative visual and seascape effects on visual amenity (META East Pickard Bay and META Dale Roads)	Effects on all other seascape character receptors and PCNP special qualities considered in the consented scenario cumulative assessment were found to be not significant and scoped out of detailed assessment	Minor Adverse
Operational Phase (application scenario)		
Potential cumulative visual and seascape effects on visual amenity (Rhoscrowther Wind Farm, META East Pickard Bay	Effects on all other seascape character receptors and PCNP special qualities considered in the application stage scenario cumulative assessment were found to be not significant and scoped out of detailed assessment.	Minor Adverse

Impact Pathway	Basis for Determination	Significance
and META Dale Roads)		
Operational Phase (scoping scenario)		
Potential cumulative visual and seascape effects on visual amenity (Valorous)	Effects on all other seascape character receptors and PCNP special qualities considered in the application stage scenario cumulative assessment were found to be not significant and scoped out of detailed assessment.	Minor Adverse

30.5.8 Marine Archaeology and Cultural Heritage

30.5.8.1 Table 30.11 provides a summary of the CEA for Marine Archaeology and Cultural Heritage. Details of the other developments considered for Marine Archaeology and Cultural Heritage are provided in Table 30.3.

Table 30.11 Summary of Cumulative Effects Assessment for Marine Archaeology and Cultural Heritage.

Impact Pathway	Basis for Determination	Significance
Construction Phase		
Potential effects on areas of palaeolandscape.	Cumulative assessment considers developments with direct spatial overlap, where there is potential for concurrent impacts on sites within the footprint of the proposed Project; assessment also accounts for indirect impact associated with changes to marine and coastal processes.	Minor Adverse
O&M and Decommissioning Phases		
No potential cumulative effects were identified in relation to marine archaeology and cultural heritage during the O&M and decommissioning phases.		

30.5.9 Commercial Fisheries

30.5.9.1 Table 30.12 provides a summary of the CEA for Commercial Fisheries. Details of the other developments considered for Commercial Fisheries are provided in Table 30.3.

Table 30.12 Summary of Cumulative Effects Assessment for Commercial Fisheries.

Impact Pathway	Basis for Determination	Significance
Construction Phase		
Temporary loss of access to fishing grounds) (and associated reduction in revenue) due to presence of installation vessels and (temporary) construction-phase safety zones.	The potential cumulative impact of Project activities with other developments is assessed by individual fleet. It has been assumed, when considering other offshore wind developments, that resumption of fishing will be permitted once the developments are operational.	Minor Adverse
Temporary displacement of fishing activity into other areas (and associated reduction in revenue) due to presence of installation vessels and construction-phase safety zones.	Displacement of fishing vessels may result in increased levels of competition between local vessels.	Minor Adverse
Temporary increased steaming times due to the presence of installation vessels and (temporary) construction-phase safety zones during construction.	The presence of works vessels and implementation of advisory safety zones at the Proposed Development and other projects may cause some short term increases in steaming distances and times. This would have cause increases in operational costs for fishing vessels.	Negligible
Change in distribution of commercially exploited fish and shellfish populations due to construction activities.	There is potential for Project activities to have adverse impacts on distribution of commercially exploited fish and shellfish as a result of cumulative impacts with other projects. This could in turn indirectly affect the productivity of the fisheries that target them.	Minor Adverse
Snagging resulting from seabed obstructions	The placement of Project structures in the marine environment, together with the development of other projects regionally will result in an increased overall level of disruption to fishing activities.	Minor Adverse
Increased supply chain opportunities for local fishing vessels.	If construction or operation and maintenance of any of the other projects listed is undertaken at the same time as the Project construction activities, potential cumulative beneficial impacts for supply chain opportunities will exist.	Moderate Beneficial

Impact Pathway	Basis for Determination	Significance
Operation and Maintenance		
Loss of access to fishing grounds (and associated reduction in revenue) due to long-term presence of Project infrastructure.	As described above.	Minor Adverse
Temporary displacement of fishing activity into other areas (and associated reduction in revenue) due to presence of installation vessels and construction-phase safety zones.	As described above.	Negligible to Minor Adverse
Temporary loss of access to fishing grounds) (and associated reduction in revenue) and/or displacement due to presence of export cable repair/remediation vessels and (temporary) advisory exclusion zones.	As described above.	Minor Adverse
Increased steaming times due to the presence of the Proposed Development.	As described above.	Negligible
Snagging resulting from seabed obstructions.	As described above.	Minor Adverse
Supply chain opportunities for local fishing vessels.	If construction or operation and maintenance of any of the other projects listed is undertaken at the same time as the Project construction activities, potential cumulative beneficial impacts for supply chain opportunities will exist.	Moderate Beneficial

Impact Pathway	Basis for Determination	Significance
Decommissioning		
The same type and level of significance is predicted for decommissioning cumulative impacts as those described for the construction phase. As such, a minor adverse significance is assessed.		

30.5.10 Shipping and Navigation

30.5.10.1 Assessment of potential cumulative effects from Project construction together with the construction, operation and maintenance, and decommissioning associated with other projects including META, Greenlink, and Project Valorous is considered within Chapter 16: Shipping and Navigation. In all cases it is determined that the cumulative effects are not considered to be significantly worse than the Project in isolation.

30.5.11 Aviation and Radar

30.5.11.1 Table 30.13 provides a summary of the CEA for Aviation and Radar. Details of the other developments considered for Aviation and Radar are provided in Table 30.3.

Table 30.13 Summary of Cumulative Effects Assessment for Aviation and Radar.

Impact Pathway	Basis for Determination	Significance
Construction		
No potential cumulative effects were identified in relation to aviation and radar during the construction phase.		
Operation and Maintenance		
Creation of Aviation Obstacle to Fixed Wing and Rotary Aircraft Operating Offshore.	The range within which cumulative effects may occur is dependent on various complex variables, related to specific aviation receptors. The north-east Celtic Sea range is used as precautionary extent.	Minor Adverse
WTG causing Interference on Civil and Military Radar Systems.	The range within which cumulative effects may occur is dependent on various complex variables, related to specific aviation receptors. The northeast Celtic Sea range is used as precautionary extent.	Minor Adverse
Decommissioning		
No potential cumulative effects were identified in relation to aviation and radar during the decommissioning phase.		

30.5.12 Coastal and Marine Infrastructure and Other Users

30.5.12.1 Table 30.14 provides a summary of the CEA for Coastal and Marine Infrastructure and Other Users. Details of the other developments considered for Coastal and Marine Infrastructure and Other Users are provided in Table 30.3.

Table 30.14 Summary of Cumulative Effects Assessment for Coastal and Marine Infrastructure and Other Users.

Impact Pathway	Basis for Determination	Significance
Construction Phase		
Disturbance and obstruction to other marine renewable project activities arising from the use of the Port of Milford Haven, O&M vessels and associated safety zones during O&M activities.	The construction phase for Project Valorous and the Project may overlap and, due to the proximity of the sites, there is potential for disturbance and obstruction from installation vessels. Although there is potential for a cumulative increase in vessel traffic if construction phases for both projects were to overlap, this is considered unlikely and if it were to occur it would be limited to a very short period. Therefore, the magnitude of impact would not be expected to increase above that assessed for the Project alone.	Minor Adverse
Disruption to firing exercises and other military activities due to the presence of construction vessels.		Minor Adverse
Damage or disturbance to existing subsea cables during construction.	The location of array cables or route for the export cable for Project Valorous is not yet known, so it is not possible to assess the potential impact of damage or disturbance to existing subsea cables. However, Project Valorous would implement project specific Crossing and Proximity Agreements with cable owners where necessary. Therefore, the magnitude of impact would not be expected to increase above that assessed for the Project alone.	Minor Adverse
Operation and Maintenance		
Disturbance and obstruction to other marine renewable project activities arising from the use of the Port of Milford Haven, O&M vessels and associated safety zones during O&M activities.	Potential for cumulative effects arise due to the potential for various renewable energy and energy transmission developments to be operational concurrently. This may result in multiple temporary safety zones being implemented at the same time around different O&M works.	Minor Adverse
Disruption to firing exercises and other military activities due to the presence of O&M vessels.	The operational phase of the Project will initially overlap with construction of Project Valorous and, subsequently, the operational phase. This will result in increased numbers of installation and O&M vessels, and associated safety zones, within Castlemartin military practice area/sea danger area.	Minor Adverse
Damage or disturbance to	As described above.	Minor Adverse

Impact Pathway	Basis for Determination	Significance
existing cables during O&M activities.		
Decommissioning		
The same type and level of significance is predicted for decommissioning cumulative impacts as those described for the construction phase. As such, a minor adverse significance is assessed.		

30.5.13 Onshore Geology, Hydrogeology and Hydrology

30.5.13.1 There is no observed construction, operation, maintenance or decommissioning cumulative effects for Onshore Geology, Hydrogeology and Hydrology. Details of the other developments considered for Onshore Geology, Hydrogeology and Hydrology are provided in Volume 3, Technical Appendix 30.1: Project Identification in Support of Cumulative Effect Assessment.

30.5.14 Terrestrial & Coastal Ecology and Onshore Ornithology

30.5.14.1 There is no observed construction, operation, maintenance or decommissioning cumulative effects for Terrestrial & Coastal Ecology and Onshore Ornithology. Details of the other developments considered for Terrestrial & Coastal Ecology and Onshore Ornithology are provided in Volume 3, Technical Appendix 30.1: Project Identification in Support of Cumulative Effect Assessment.

30.5.15 Landscape and Visual Impact

30.5.15.1 Of the cumulative developments noted in the long list that lie within the cumulative Study Area, only the consented Greenlink project has been considered in detail in the cumulative assessment. The other cumulative developments in the Study Area are not considered to have the potential to contribute to significant cumulative landscape or visual effects. This is largely due to distance or separation between the Proposed Development and the cumulative development or due to landscape elements / built structures that limit the level of intervisibility and therefore cumulative effect.

30.5.15.2 The more significant cumulative effects are limited to the construction phase of the onshore substation and would reduce to a lower and not significant levels following completion of construction activities.

30.5.15.3 Table 30.15 provides a summary of the CEA for Landscape and Visual Impact. The cumulative effects assessment methodology for landscape varied from that applied to other topics and as such only the outcomes are summarised below. The full assessment is provided in Chapter 21: Landscape and Visual Impacts. Details of the other developments considered for Landscape and Visual Impact are provided in Volume 3, Technical Appendix 30.1: Project Identification in Support of Cumulative Effect Assessment.

Table 30.15 Summary of Cumulative Effects Assessment for Landscape and Visual Impact

Impact Pathway	Cumulative Effect (construction)	Cumulative Effect (year 1)	Cumulative Effect (year 15)
Landscape Character Effects (onshore substation)			
cLCA 25 – Hundelton and Lamphey	Moderate-minor and not significant	Moderate-minor and not significant	Minor and not significant
SCA 32 – Inner Milfor Haven	Minor and not significant	Minor and not significant	Minor and not significant
Visual Effects (onshore substation)			
Viewpoint 1: Goldborough Road, east of Wallaston Cross	No effect	No effect	No effect
Viewpoint 2: Wales Coast Path, Lambeeth Farm	Moderate and not significant	Moderate and not significant	Moderate-minor and not significant
Viewpoint 3: Goldborough Road, near Moreston	Moderate and significant	Moderate and not significant	Moderate-minor and not significant
Viewpoint 4: B4320, near Wogaston	No effect	No effect	No effect
Viewpoint 5: Pennar	Moderate-minor and not significant	Moderate-minor and not significant	Minor and not significant

30.5.16 Onshore Noise and Vibration

30.5.16.1 There is no observed construction, operation, maintenance or decommissioning cumulative effects for Onshore Noise and Vibration. Details of the other developments considered for Onshore Noise and Vibration are provided in Volume 3, Technical Appendix 30.1: Project Identification in Support of Cumulative Effect Assessment.

30.5.17 Onshore Archaeology and Cultural Heritage

30.5.17.1 There is no observed construction, operation, maintenance or decommissioning cumulative effects for Onshore Archaeology and Cultural Heritage. Details of the other developments considered for Onshore Archaeology and Cultural Heritage are provided in Volume 3, Technical Appendix 30.1: Project Identification in Support of Cumulative Effect Assessment.

30.5.18 Land Use

30.5.18.1 There is not expected to be any potential pathways for cumulative effects in relation to land use.

30.5.18.2 The assessment considers any present or reasonably foreseeable project, programme or plan that could result in an additive impact with the Project. Details of the other developments considered for Land Use are provided in Volume 3, Technical Appendix 30.1: Project Identification in Support of Cumulative Effect Assessment.

30.5.19 Traffic and Transport

30.5.19.1 There is potential for additional construction activities to be occurring simultaneously with the construction of the Proposed Development in 2026. The Contractor will work with others operating in the area and Pembrokeshire County Council Highways, to coordinate activities and minimise the impact on the adjacent highway network and local receptors as far as possible. The Proposed Development is forecast to have a negligeable impact on the operation of the local highway network and it is expected that the final Construction Transport Management Plan will be able to be more specific closer to the time when construction activities commence. Details of the other developments considered for Traffic and Transport are provided in Volume 3, Technical Appendix 30.1: Project Identification in Support of Cumulative Effect Assessment.

30.5.20 Air Quality

30.5.20.1 There is no observed construction, operation, maintenance or decommissioning cumulative effects for Air Quality. Details of the other developments considered for Air Quality are provided in Volume 3, Technical Appendix 30.1: Project Identification in Support of Cumulative Effect Assessment.

30.5.21 Socio-economics, Tourism and Recreation

30.5.21.1 Table 30.16 Summary of Cumulative Effects Assessment for Socio-economics, Tourism and Recreation. provides a summary of the CEA for Socio-economics, Tourism and Recreation. Details of the other developments considered for Socio-economics, Tourism and Recreation are provided in Table 30.3.

Table 30.16 Summary of Cumulative Effects Assessment for Socio-economics, Tourism and Recreation.

Impact Pathway	Basis for Determination	Significance
Construction Phase		
Direct employment, increase in professional roles and training.	During the construction phase of the Project, there will be a requirement for a significant number of workers across a range of different skills and trades. Some of this work force will be sourced from the local labour market whilst other more specialist staff will be sourced from further afield. The Project will provide training opportunities to help meet this demand for skilled workers.	Minor Beneficial
Operation and Maintenance		
Disruption / reduced access to local businesses.	Cumulative impacts may arise from visual inspection and maintenance repairs to infrastructure of multiple projects. However, these are not anticipated to be significant due to the low expected frequency and short duration.	Minor Adverse

Impact Pathway	Basis for Determination	Significance
Disruption to Recreational Vessel Activities and Chartered Boat Tours.	Cumulative impacts during the operation of the Projects are anticipated to include loss of grounds and access; disruption and displacement due to an increase in vessel traffic; collision risks; and increase in steering times to avoid the array area for recreational vessels. The cumulative impacts relating to recreational vessel users would remain minor adverse. In addition, multiple marine projects situated within the Celtic Deep are all likely to contribute towards the loss of 'Wilderness' and impact the seascape.	Minor Adverse
Direct and indirect employment benefits, including inward migration of economically active people, safeguarding the existing supply chain, new supply chain opportunities.	There will be direct and indirect cumulative employment benefits in the area from development of various projects. These include the inward migration of economically active people, the safeguarding of the existing supply chain and provision of new supply chain opportunities.	Minor Beneficial
Increase in professional roles and training opportunities.	There will be increases in the availability of professional roles for local workers as well as training opportunities from development of various projects.	Minor Beneficial
Gross Value Added (GVA) impacts including increased productivity, increased revenue opportunities and economic benefit, reducing Welsh Index of Multiple Deprivation.	Economic impacts will include those associated with the additional GVA generated by the different stages of the Project, increased productivity due to the higher value nature of the employment opportunities associated with the development of multiple projects locally.	Minor Beneficial
Use of green energy, creation of cluster effects and energy security.	There will be a series of beneficial socio-economic benefits as various businesses related to activities at the Project are located in close proximity to each other. Clustering generates a range of positive impacts, including enhanced productivity and the benefits associated with knowledge exchange and joint working.	Minor Beneficial
Electromagnetic field impacts.	Adverse health impacts upon the local population could occur as a consequence of the fear of perceived harm to health as a consequence of EMF exposure brought about by onshore export cables and substations for multiple projects.	Negligible
Well-being of Future Generations Goals associated with green energy.	The establishment of multiple renewable energy developments locally will combine to help progress towards Well-being of Future Generations Goals associated with green energy.	Minor Beneficial

Impact Pathway	Basis for Determination	Significance
Decommissioning		
No potential cumulative effects were identified in relation to socio-economics, tourism and recreation during the decommissioning phase.		

30.6 Transboundary Assessment Summary

30.6.1.1 The following provides a summary of transboundary assessment outcomes for each topic-specific chapter of the ES.

30.6.1 Marine and Coastal Processes

30.6.1.1 No transboundary effects have been identified. This is because the predicted changes to the key marine and coastal process pathways (i.e. tides, waves, and sediment transport) are not anticipated to be sufficient to influence identified receptors at this distance from the Proposed Development.

30.6.2 Marine Seabed and Water Quality

30.6.2.1 In view of the limited spatial extent of potential impacts on marine sediment and water quality from the Proposed Development, i.e. 19 km and the distance to national waters of nearest neighbour state (>60 km) it is considered that there is no potential for transboundary effects.

30.6.3 Offshore Designated Sites

30.6.3.1 In some circumstances, transboundary issues may be a consideration, as qualifying features of international sites may interact with the Project. Transboundary impacts are summarised in this chapter, and considered in detail in the associated biological chapter for each receptor, and are included in further detail with specific reference to Natura 2000 and Ramsar Sites in Volume 3, Technical Appendix 8.2: HRA Screening Report and Volume 3, Technical Appendix 8.3: Report to Inform Appropriate Assessment.

30.6.4 Marine and Coastal Ecology

30.6.4.1 In view of the limited spatial extent of potential impacts on benthic ecological receptors from the Project, and the distance to national waters of nearest neighbour state (>60 km), it is considered that there is no potential for transboundary effects.

30.6.5 Fish and Shellfish Ecology

30.6.5.1 No transboundary impacts are predicted to result from the construction, O&M and decommissioning of the proposed Project on fish and shellfish receptors.

30.6.6 Marine Ornithology

30.6.6.1 Although displacement and collision risk effects associated with the Project are expected to be highly localised (i.e. within 4 km of the Project), impacts to regional populations may be detectable at greater distances (e.g. within foraging range or migratory routes). Therefore, there is potential for transboundary effects to occur where far ranging or migratory populations interact with the Project.

30.6.6.2 A very small proportion of individual birds present at the Project site were apportioned to SPA colonies outside of UK waters. The Project apportioning analysis results show that ≤0.5% of individual seabirds of any species recorded were attributable to SPA colonies outside of UK waters, with the following exceptions:

- Black legged kittiwake:
  - Saltee Island SPA (4.6%);
  - Howth Head Coast SPA (3.3%);
  - Lambay Island SPA (3.1%);
  - Ireland's Eye SPA (1.6%);
- Common guillemot:
  - Saltee Islands SPA (4.9%); and
- Razorbill:
  - Saltee Islands SPA (3.9%).

30.6.6.3 Potential impacts to seabird populations as qualifying features of SPAs are considered and assessed in Volume 3, Technical Appendix 8.2: Habitats Regulations Assessment Screening and Volume 3, Technical Appendix 8.3: Report to Inform Appropriate Assessment.

30.6.6.4 Mortality due to displacement and collision risk is very low, and as such, a negligible proportion of the seabirds attributed the above SPAs may experience mortality due to collision risk or displacement effects (refer to Volume 3, Technical Appendix 11.3: Collision Risk Modelling and Volume 3, Technical Appendix 11.4: Displacement Analysis). Therefore, the impact of a collision risk and displacement effects is expected to lead to a negligible adverse effect, which is considered not significant in EIA terms.

30.6.7 Marine Mammals

30.6.7.1 There may be behavioural disturbance or displacement of marine mammals from the Project site as a result of underwater noise. Behavioural disturbance resulting from underwater noise during construction and decommissioning could occur over large ranges (tens of kilometres) and, therefore, there is the potential for transboundary effects to occur where subsea noise arising from the Project could extend into waters of other European Economic Area (EEA) states. The Project is located in close proximity to other states (e.g. Irish waters, UK waters) and, therefore, there is the potential for transit of certain species between areas. Any transboundary impacts that do occur as a result of underwater noise at the Project are predicted to be short-term and intermittent, with the return of disturbed marine mammals to affected areas following the completion of construction activities.

30.6.7.2 Disturbance to prey species from loss of fish spawning and nursery habitat and suspended sediments and deposition may also occur. The effects of reduction in prey availability are predicted to be limited in extent to a number of kilometres from the Project and are therefore not predicted to extend into the waters of other EEA states. Therefore, the impact of a reduction in prey ability will not lead to a significant effect.

30.6.7.3 It should be noted that the mobile nature of marine mammals results in the potential for transboundary effects to occur. Whilst each species has been assessed within the relevant Management Unit (MU) for the Project, the MUs under which each species has been assessed varies greatly in the area covered, with the MUs for harbour porpoise, bottlenose dolphin and grey seals being relatively localised and the MUs for common dolphin and minke whale covering the Celtic and Greater North Sea area. Furthermore, the respective MUs do not represent closed populations. This means that impacts, whilst localised, could potentially affect other MUs if mixing between the assessed populations occurs. For example, bottlenose dolphins are known to have a large home range (Duckett, 2018) and therefore mixing with the Irish Sea MU population is considered possible.

30.6.7.4 The magnitude of the impact has been assessed as low to negligible and the sensitivity of receptors as low to negligible. Therefore, the significance of behavioural disturbance leading to transboundary effects is concluded to be of negligible to minor adverse significance, which is not significant in terms of the EIA regulations.

30.6.1 Seascape and Visual Impact

30.6.1.1 The array area is located approximately 89.6 km from the coastline of the nearest EU member state (Republic of Ireland). The Zone of Theoretical Visibility in Volume 2, Figure 13.11a shows that there is no theoretical visibility of the offshore elements of the Proposed Development beyond approximately 70 km due to the effects of earth curvature, which would effectively 'hide' the WTGs behind the horizon at this distance.

30.6.1.2 Transboundary effects have therefore been scoped out of the SLVIA, since there is no potential for significant effects at such long distance; the coastlines of other EU member states are outside the SLVIA Study Area and would have no visibility of the construction and operation of the Proposed Development.

30.6.2 Offshore Archaeology and Cultural Heritage

30.6.2.1 No transboundary impacts to historic assets have been identified by this assessment.

30.6.1 Commercial Fisheries

30.6.1.1 In some circumstances, transboundary issues may be a consideration as fishermen from other countries may fish in waters within which offshore windfarms are sited. Transboundary impacts are integrated within Chapter 15: Commercial Fisheries, as the impact assessment takes into account the potential impacts of the Project on international fleets which are known to operate in the area.

30.6.2 Shipping and Navigation

30.6.2.1 Any potential for significant transboundary effects, with regard to shipping and navigation from the Project upon the interests of other EEA States and the UK has been assessed as part of the holistic shipping and navigation EIA. Due to the international nature of shipping and navigation activity, transboundary effects are an integral part of the Navigational Risk Assessment and EIA and so are considered as part of the assessments presented in Chapter 16: Shipping and Navigation.

30.6.3 Aviation and Radar

30.6.3.1 There is the potential for transboundary impacts to arise from the presence of the Wind Turbine Generators (WTGs) during the O&M phase disrupting civil radar coverage from the Republic of Ireland. The probability of effect (due to radar detectability of the WTG) is low due to the range of applicable Irish radar systems from the array area.

30.6.3.2 The Project is located in the UK Flight Information Region (FIR) with no delegation of airspace to the Irish authorities. The sensitivity of the receptor is considered to be low and the magnitude of the impact is deemed to be negligible. Therefore, the potential transboundary impact of disruption of civil aviation radar coverage interference on aviation and radar is concluded to be of negligible significance which is not significant in EIA terms.

30.6.4 Coastal and Marine Infrastructure and Other Users

30.6.4.1 The Greenlink Interconnector is a subsea and underground electricity interconnector cable linking the existing electricity grids in Ireland and Great Britain. This receptor has been identified and assessed, specifically in respect of damage or disturbance to existing cables during all phases of the Project. The impacts resulted in no greater than Minor Adverse effect. Given the low likelihood of damage, no transboundary effects have been identified arising for this receptor.

30.6.5 Socio-Economics, Tourism and Recreation

30.6.5.1 No transboundary effects were identified.

30.7 References

DECC (Department of Energy and Climate Change), 2011a. Overarching National Policy Statement for Energy (EN-1). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/47854/1938-overarching-nps-for-energy-en1.pdf [Accessed November 2021].

DECC (Department of Energy and Climate Change), 2011b. Overarching National Policy Statement for Renewable Energy Infrastructure (EN-3). https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/47856/1940-nps-renewable-energy-en3.pdf [Accessed November 2021].

PINS (The Planning Inspectorate), 2019. Advice Note 17: Cumulative Effects Assessment (v2). Available at: https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/advice-note-17/ [Accessed October 2021].

PINS (The Planning Inspectorate), 2019. Advice Note Seventeen: Cumulative effects assessment relevant to nationally significant infrastructure projects. Available at: https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/advice-note-17/ [Accessed November 2021].

PINS (The Planning Inspectorate), 2018. Advice Note Twelve: Transboundary Impacts and Process. Available at: https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/advice-note-twelve-transboundary-impacts-and-process/ [Accessed October 2021].

RenewableUK (2013). Cumulative Impact Assessment Guidelines: Guiding Principles for Cumulative Impacts Assessment in Offshore Wind Farms. Available at: https://nerc.ukri.org/innovation/activities/energy/offshore/cumulative-impact-assessment-guidelines/ [Accessed October 2021].