MORGAN AND MORECAMBE OFFSHORE WIND FARMS: TRANSMISSION ASSETS

Environmental Statement

Volume 4, Chapter 3: Inter-relationships

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Glossary

Term	Meaning
Applicants	Morgan Offshore Wind Limited (Morgan OWL) and Morecambe Offshore Windfarm Ltd (Morecambe OWL).
Archaeological Exclusion Zone	An area surrounding any features or geophysical anomalies of known or potential archaeological interest within which no activity may occur.
Bathymetry	A measurement of the depth of water in the ocean.
Climate change	A change in global or regional climate patterns, in particular a change apparent from the mid to late 20th century onwards and attributed largely to the increased levels of atmospheric carbon dioxide produced by the use of fossil fuels.
Commitment	This term is used interchangeably with mitigation and enhancement measures. The purpose of commitments is to avoid, prevent, reduce or, if possible, offset significant adverse environmental effects. Primary and tertiary commitments are taken into account and embedded within the assessment set out in the ES.
Dust	Solid particles suspended in air or settled out onto a surface after having been suspended in air, as defined by the Institute of Air Quality Management.
Earthworks	Covers the processes of soil-stripping, ground-levelling, excavation, and landscaping, as defined by the Institute of Air Quality Management.
Effect	The term used to express the consequence of an impact. The significance of effect is determined by correlating magnitude of the impact with the importance, or sensitivity, of the receptor or resource in accordance with defined significance criteria.
EIA Scoping Report	A report setting out the proposed scope of the Environmental Impact Assessment process. The Transmission Assets Scoping Report was submitted to The Planning Inspectorate (on behalf of the Secretary of State) for the Morgan and Morecambe Offshore Windfarms Transmission Assets in October 2022.
Environmental Impact Assessment	The process of identifying and assessing the significant effects likely to arise from a project. This requires consideration of the likely changes to the environment, where these arise as a consequence of a project, through comparison with the existing and projected future baseline conditions.
Environmental Statement	The document presenting the results of the Environmental Impact Assessment process.
Fishery	A group of vessel voyages which target the same species or use the same gear.
Generation Assets	The generation assets associated with the Morgan Offshore Wind Project and the Morecambe Offshore Windfarm include the offshore wind turbines, inter-array cables, offshore substation platforms and platform link (interconnector) cables to connect offshore substations.
Impact	Change that is caused by an action/proposed development, e.g., land clearing (action) during construction which results in habitat loss (impact).
Inter-related effects	Inter-related effects arise where an impact acts on a receptor repeatedly over time to produce a potential additive effect or where a number of separate impacts, such as noise and habitat loss, affect a single receptor.

Term	Meaning
Landfall	The area in which the offshore export cables make landfall (come on shore) and the transitional area between the offshore cabling and the onshore cabling. This term applies to the entire landfall area at Lytham St. Annes between Mean Low Water Springs and the transition joint bays inclusive of all construction works, including the offshore and onshore cable routes, intertidal working area and landfall compound(s).
Mitigation measures	This term is used interchangeably with Commitments. The purpose of such measures is to avoid, prevent, reduce or, if possible, offset significant adverse environmental effects.
Morecambe OWL	Morecambe Offshore Windfarm Limited is a joint venture between Zero-E Offshore Wind S.L.U. (Spain) (a Cobra group company) (Cobra) and Flotation Energy Ltd.
Morgan and Morecambe Offshore Wind Farms: Transmission Assets	The offshore and onshore infrastructure connecting the Morgan Offshore Wind Project and the Morecambe Offshore Windfarm to the national grid. This includes the offshore export cables, landfall site, onshore export cables, onshore substations, 400 kV grid connection cables and associated grid connection infrastructure such as circuit breaker compounds. Also referred to in this report as the Transmission Assets, for ease of reading.
Morgan Offshore Wind Project: Generation Assets	The offshore generation assets and associated activities for the Morgan Offshore Wind Project.
Morgan OWL	Morgan Offshore Wind Limited is a joint venture between bp Alternative Energy investments Ltd. and Energie Baden-Württemberg AG (EnBW).
National Policy Statement(s)	The current national policy statements published by the Department for Energy Security and Net Zero in 2023 and adopted in 2024.
Onshore substations	The onshore substations will include a substation for the Morgan Offshore Wind Project: Transmission Assets and a substation for the Morecambe Offshore Windfarm: Transmission Assets. These will each comprise a compound containing the electrical components for transforming the power supplied from the generation assets to 400 kV and to adjust the power quality and power factor, as required to meet the UK Grid Code for supply to the National Grid.
Particulate matter	Microscopic solid or liquid airborne particles that are categorised as having either an aerodynamic diameter less than 10 microns (PM_{10}) or less than 2.5 microns ($PM_{2.5}$).
Planning Inspectorate	The agency responsible for operating the planning process for applications for development consent under the Planning Act 2008.
Project lifetime effects	Assessment of the scope for effects that occur throughout more than one phase of the Morgan and Morecambe Offshore Wind Farms: Transmission Assets (construction, operation and maintenance, and decommissioning) to interact to potentially create a more significant effect on a receptor than if assessed in isolation.
Receptor-led effects	Assessment of the scope for multiple effects to interact to create inter-related effects on a receptor. Receptor-led effects might be short term, temporary or transient effects, or incorporate longer term effects.
Renewable energy	Energy from a source that is not depleted when used, such as wind or solar power.
Runoff	Runoff occurs when there is more water than land can absorb. The excess liquid flows across the surface of the land.

Term	Meaning
Safety zones	An area around a structure or vessel which should be avoided.
Scoping Opinion	Sets out the Planning Inspectorate's response (on behalf of the Secretary of State) to the Scoping Report prepared by the Applicants. The Scoping Opinion contains the range of issues that the Planning Inspectorate, in consultation with statutory stakeholders, has identified should be considered within the Environmental Impact Assessment process.
Scour protection	Protective materials to avoid sediment being eroded away from the base of the foundations due to the flow of water.
Spatial extent	Geographical area over which the impact may occur.
Study area	This is an area which is defined for each environmental topic which includes the Transmission Assets Order Limits as well as potential spatial and temporal considerations of the impacts on relevant receptors. The study area for each topic is intended to cover the area within which an impact can be reasonably expected.
Substation	Part of an electrical transmission and distribution system. Substations transform voltage from high to low, or the reverse by means of electrical transformers.
Transmission Assets	See Morgan and Morecambe Offshore Wind Farms: Transmission Assets (above).
Transmission Assets Order Limits	The area within which all components of the Transmission Assets will be located, including areas required on a temporary basis during construction and/or decommissioning.

Acronyms

Acronym	Meaning
BEIS	Department for Business, Energy and Industrial Strategy
CCS	Carbon Capture and Storage
CoT	Commitment
EIA	Environmental Impact Assessment
EMF	Electromagnetic Field
EMP	Environmental Management Plan
ES	Environmental Statement
GVA	Gross Value Added
IEF	Important Ecological Features
INNS	Invasive and Non-native Species
LCA	Landscape Character Area
MCZ	Marine Conservation Zone
NPS	National Policy Statement
NRA	Navigational Risk Assessment

Acronym	Meaning
PAD	Protocol of Archaeological Discoveries
PRoW	Public Rights of Way
SAC	Special Area of Conservation
SSC	Suspended sediment concentrations
UK	United Kingdom
UXO	Unexploded Ordnance
WSI	Written Scheme of Investigation

Units

Unit	Description
nm	Nautical mile

3 Inter-relationships

3.1 Introduction

3.1.1 Overview

3.1.1.1 This chapter of the Environmental Statement (ES) presents the preliminary findings of the Environmental Impact Assessment (EIA) work undertaken to date for the Morgan and Morecambe Offshore Wind Farms: Transmission Assets. For ease of reference the Morgan and Morecambe Offshore Wind Farms: Transmission Assets are referred to in this chapter as the 'Transmission Assets'.

3.1.1.2 This chapter considers the potential offshore and onshore inter-related effects associated with potential impacts of the Transmission Assets during the construction, operation and maintenance, and decommissioning phases. Inter-related effects refer to the interactions between aspect assessments and are considered for 'project lifetime effects' and 'receptor-led effects'. Further detail is provided in section **3.3.5.**

3.1.1.3 The assessment presented in this chapter has taken into account relevant impact assessments provided in the ES as set out in **Table 3.1**.

Table 3.1: Topic chapters of the ES used to inform the inter-relationships assessment

ES Chapters
Volume 2 – Effects on the offshore environment
Chapter 1: Physical processes
Chapter 2: Benthic subtidal and intertidal ecology
Chapter 3: Fish and shellfish ecology
Chapter 4: Marine mammals
Chapter 5: Offshore ornithology
Chapter 6: Commercial fisheries
Chapter 7: Shipping and navigation
Chapter 8: Marine archaeology
Chapter 9: Other sea users
Volume 3 – Effects on the onshore environment
Chapter 1: Geology, hydrogeology and ground conditions
Chapter 2: Hydrology and flood risk
Chapter 3: Onshore ecology and nature conservation
Chapter 4: Onshore and intertidal ornithology
Chapter 5: Historic environment
Chapter 6: Land use and recreation

ES Chapters
Chapter 7: Traffic and transport
Chapter 8: Noise and vibration
Chapter 9: Air quality
Chapter 10: Landscape and visual resources
Chapter 11: Aviation and radar
Volume 4 – Effects on the onshore and offshore environment
Chapter 1: Climate change
Chapter 2: Socio-economics

3.2 Policy context

3.2.1 Planning policy context

3.2.1.1 The Transmission Assets is located in English offshore waters (beyond 12 nautical miles (nm) from the English coast) and inshore waters (within 12 nm from the English coast), with the onshore infrastructure located wholly within England. As set out in Volume 1, Chapter 1: Introduction of the ES, the Secretary of State for the Department for Business, Energy and Industrial Strategy (BEIS) (the department which preceded the Department for Energy Security and Net Zero) has directed that the Transmission Assets are to be treated as development for which development consent is required under section 35 of the Planning Act 2008, as amended.

3.2.2 National Policy Statements

3.2.2.1 There are currently six energy National Policy Statements (NPSs), three of which contain policy relevant to offshore wind development and the Transmission Assets, specifically:

- overarching NPS for Energy (NPS EN-1) which sets out the UK Government's policy for the delivery of major energy infrastructure (Department for Energy Security & Net Zero 2023a);
- NPS for Renewable Energy Infrastructure (NPS EN-3) (Department for Energy Security & Net Zero 2023b); and
- NPS for Electricity Networks Infrastructure (NPS EN-5) (Department for Energy Security & Net Zero 2023c). Planning policy on renewable energy infrastructure is presented in Volume 1, Chapter 2: Policy and legislative context of the ES.

3.2.2.2 Of the three NPSs identified, one of these, NPS EN-1 addresses the consideration of interrelationships between effects, and this is summarised in **Table 3.2** below.

Table 3.2: Summary of the NPS EN-1 requirements relevant to inter-related effects

Summary of NPS requirement	How and where considered in the ES
The Secretary of State should consider how the accumulation of, and interrelationship between, effects might affect the environment, economy or community as a whole, even though they may be acceptable when considered on an individual basis with mitigation measures in place. (EN-1, paragraph 4.3.19).	Project lifetime effects and receptor-led effects are assessed throughout this chapter of the ES. **Section 3.4** provides the inter-relationships assessment.

3.3 Consultation, study area and methodology

3.3.1 Scoping

3.3.1.1 On 28 October 2022, the Applicants submitted a Scoping Report to the Planning Inspectorate, which described the scope and methodology for the technical studies being undertaken to provide an assessment of any likely significant effects for the construction, operation and maintenance and decommissioning phases of the Transmission Assets.

3.3.1.2 Following consultation with the appropriate statutory bodies, the Planning Inspectorate (on behalf of the Secretary of State) provided a Scoping Opinion on 8 December 2022.

3.3.2 Statutory consultation responses

3.3.2.1 The preliminary findings of the EIA process were published in the PEIR in October 2023. The PEIR was prepared to provide the basis for formal consultation under the Planning Act 2008. This included consultation with statutory and non-statutory bodies under section 42 and section 47 of the Planning Act 2008, as summarised in **Table 3.3**

3.3.3 Summary of consultation responses received

3.3.3.1 A summary of the key items raised specific to inter-related effects is presented in **Table 3.3** together with how these have been considered in the production of this chapter. It should however be noted that formal responses are provided for **all** consultation responses received and can be accessed in the Consultation Report (document reference E1).

Table 3.3: Summary of key consultation comments raised during consultation activities undertaken for the Transmission Assets relevant to inter-related effects

Date	Consultee and type of response	Comment raised	Response to comment raised and/or where considered in this chapter
28 October 2022	Planning Inspectorate – response to scoping	The Inspectorate considers that the list of inter-related effects should also include human health, land use and recreation and landscape and visual impacts (related to tranquillity).	Project lifetime effects and receptor-led effects are identified within this chapter of the ES, including the inter-related effects for human health (**Table 3.28**), land use and recreation (**Table 3.20**), and landscape and visual impacts (**Table 3.24**). **Section 3.4** provides the assessment of inter-related effects.
23 November 2023	Orsted Burbo Extension Ltd – statutory consultation response	With regard to in-combination effects, the Burbo Back Extension, Barrow and the Transmission Assets are an area of concern due to the nature of the increased development in a congested area of sea, particularly in relation to shipping and navigation, ornithology, and marine mammals, as well as seabed morphology.	Inter-related effects are discussed in relation to shipping and navigation (**Table 3.12**), ornithology (**Table 3.18**), and marine mammals (**Table 3.9**), as well as seabed morphology (**Table 3.6**).
23 November 2023	Northwest Wildlife Trust - statutory consultation response	Current Defra policy 3 is to ensure that all existing and potential fishing operations are managed in line with Article 6 of the Habitats Directive. The current, risk-based, 'revised approach' to fisheries management in UK national site network is a compromise agreed by all to prevent the closure of fisheries during assessment. This approach further supports the view that fishing is considered a plan or a project and therefore, must be included in the in-combination assessment in line with Article 6(3) of the Habitats Directive.	A description of the likely interactive effects arising from the Transmission Assets on commercial fisheries is provided in (**Table 3.11**). There is no change in the significance of effects resulting from the inter-related assessment for commercial fisheries. Fishing is not considered a plan or project, but a baseline activity that encompasses various receptors including commercial fish species and vessels which are adequately considered in Volume 2, Chapter 3:

Date	Consultee and type of response	Comment raised	Response to comment raised and/or where considered in this chapter
			Fish and shellfish ecology of the ES, Volume 2, Chapter 6: Commercial fisheries of the ES, and Volume 2, Chapter 7: Shipping and navigation of the ES. Fishing has not been considered as an activity with impacts to be included in the in-combination effects assessment of the ISAA (document reference E2.1 – Information to Support Appropriate Assessment part 1, E2.2 – Information to Support Appropriate Assessment part 2 and E2.3 – Information to Support Appropriate Assessment part 3).
23 November 2023	Annex 4 Marine Mammals - Natural England - statutory consultation response	The outcomes of the inter-related effects assessment should be presented [in the ES]. Natural England noted the 'light touch' approach of the assessment [in the PEIR] (Volume 4, Chapter 5, Table 5.9) especially disturbance and disagreed with the outcome of the assessment for receptor led effects. Include the outcomes of the inter-related effects assessment in this report. In particular, the inter-related effects from various disturbance sources should be assessed adequately in the submitted ES.	The assessment in Volume 2, Chapter 4: Marine mammals of the ES has been revisited since the PEIR for all impacts and amendments made on the basis of project refinements and the best available evidence. Further justification has been provided throughout to support the conclusions of the assessment. The inter-related effects assessment is presented in **Table 3.9**

3.3.4 Study area and data sources

3.3.4.1 Due to the differing spatial extent of effects experienced by different receptors, the study area and baseline environments for potential inter-related effects varies according to individual topics and receptor(s). The potential inter-related effects considered in this chapter are, therefore, also limited to the study areas defined in each of the topic chapters.

3.3.5 Impact assessment methodology

3.3.5.1 Specific to the inter-related effects impact assessment, the Planning Inspectorate Advice Note 9 (Planning Inspectorate, 2018) has been considered while writing this chapter, with specific regard to the following text (paragraph 4.13*):*

- *'ensure that interactions (interactions between aspect assessments includes where a number of separate impacts, e.g. noise and air quality, affect a single receptor such as fauna) between aspect (the Planning Inspectorate refers to 'aspects' as meaning the relevant descriptions of the environment identified in accordance with the EIA Regulations) assessments are taken into account relevant to the worst case scenario(s) established and that careful consideration is given to how these are assessed.*
- *ensure that the assessment of the worst case scenario(s) addresses impacts which may not be significant on their own but could become significant when they inter-relate with other impacts alone or cumulatively with impacts from other development (including those identified in other aspect assessments).'*

3.3.5.2 The approach to assessing inter-related effects has followed a four stage process, as summarised in **Table 3.4** below and discussed in following paragraphs.

Table 3.4: Summary of staged approach to the inter-related effects assessment

Stage	Description
1	Assessments undertaken for individual EIA topic areas within Volumes 2, 3 and 4.
2	Review of the likely receptor(s)/resource(s) affected by more than one impact through analysis of the assessment of effect sections undertaken for individual EIA topic areas.
3	Identification of potential combination effects on these receptor groups through review of the topic assessments in the ES chapters.
4	Assessment undertaken on how individual effects may combine to create inter-related effects on each receptor group for: • 'project lifetime effects', i.e., during construction, operation and maintenance and decommissioning phases; and • 'receptor-led effects', i.e., multiple simultaneous effects on a single receptor/resource.

Stage 1: Topic-specific assessments

3.3.5.3 The first stage of the environmental assessment of effects is presented in each of the individual ES topic chapters and comprises the individual assessments of effects on receptors across the construction, operation and maintenance, and decommissioning phases of the Transmission Assets.

Stage 2: Identification of receptor groups

3.3.5.4 Stage 2 involved a review of the assessments undertaken in the topic chapters to identify 'receptor groups' requiring assessment within the inter-related effects assessment. i.e. those which may be effected by more than one impact or project phase. The term 'receptor group' is used to highlight that the approach taken for the inter-related effects assessment will not consider each individual receptor, but rather potentially sensitive groups of receptors.

3.3.5.5 The potential receptor groups have been identified from the topic assessments (see **paragraph 3.1.1.3**) and these have been considered in further detail at Stage 3 and 4.

Stage 3: Identification of potential inter-related effect on receptor groups

3.3.5.6 Following the identification of receptor groups the potential inter-related effects on the receptor groups were identified. This was informed by the topic assessments together with expert judgement.

Stage 4: Assessment of inter-related effects on each receptor group

3.3.5.7 A qualitative assessment has been undertaken to identify project lifetime effects and receptor led effects as defined in **Table 3.5**.

Table 3.5: Definitions of project lifetime and receptor-led inter-related effects

Effect type	Description
Project lifetime effects	Assessment of the scope for effects that occur throughout more than one phase of the Transmission Assets (construction, operation and maintenance, and decommissioning) to interact to potentially create a more significant effect on a receptor than if assessed in isolation in these three phases.
Receptor-led effects	Assessment of the scope for all effects (including inter-relationships between environmental topics) to interact, spatially and temporally, to create inter-related effects on a receptor. Receptor-led effects might be short term, temporary or transient effects, or incorporate longer term effects.

3.3.5.8 The assessment has considered the potential for individual effects to interact to create a different or greater effect. Where potential project lifetime effects on receptor groups have already been considered within the topic chapters of the ES, these receptor groups have not been considered further in this assessment of inter-related effects.

3.3.5.9 The assignment of significance of effect to any such inter-related effect is not undertaken, rather, any inter-related effects that may be of greater

significance than the individual effects in isolation on a given receptor are identified.

3.4 Assessment of inter-related effects

3.4.1.1 The assessment of inter-related effects is presented within tables in this section as follows.

- **Table 3.6:** Physical processes.
- **Table 3.7:** Benthic subtidal and intertidal ecology.
- **Table 3.8:** Fish and shellfish.
- **Table 3.9:** Marine mammals.
- **Table 3.10:** Offshore ornithology
- **Table 3.11:** Commercial fisheries.
- **Table 3.12:** Shipping and navigation.
- **Table 3.13:** Marine archaeology.
- **Table 3.14:** Other sea users.
- **Table 3.15:** Geology, hydrogeology and ground conditions.
- **Table 3.16:** Hydrology and flood risk.
- **Table 3.17:** Onshore ecology and nature conservation.
- **Table 3.18:** Onshore and intertidal ornithology.
- **Table 3.19:** Historic environment.
- **Table 3.20:** Land use and recreation.
- **Table 3.21:** Traffic and transport.
- **Table 3.22:** Noise and vibration.
- **Table 3.23:** Air Quality.
- **Table 3.24:** Landscape and visual resources.
- **Table 3.25:** Aviation and radar.
- **Table 3.26:** Climate change.
- **Table 3.27:** Socio-economics.
- **Table 3.28**: Human health.

Table 3.6: Physical processes – summary of likely significant inter-related effects

Potential impacts	Phase[a]			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Project lifetime effects					
Increase in suspended sediments due to construction, operation and maintenance and/or decommissioning related activities, and the potential impact to physical features.	✓	✓	✓	Increases in suspended sediment concentrations (SSCs) during construction phase would not extend into the operational phase. Similarly, those increases which occur in the operational phase due to maintenance activities would not extend to decommissioning.	No change resulting from inter-related assessment.
Impacts to physical processes, seabed morphology and the associated potential impacts to physical features and adjacent shorelines.	✓	✓	✓	Changes to physical processes and seabed morphology due to infrastructure related to the same structures within the construction, operation and decommissioning phases. The decommissioning phase structures are those remaining bed structures such as cable protection, thus resulting in a lesser magnitude of the same impact.	No change resulting from inter-related assessment.
Receptor-led effects					
Fylde Marine Conservation Zone (MCZ), West of Walney MCZ, West of Copeland MCZ, Shell Flat Special Area of Conservation (SAC) and the Ribble Estuary: during the construction, and operation and maintenance, and decommissioning phases, increased suspended sediment concentrations and associated deposition on physical features may occur; this would coincide with changes to tidal currents, wave climate, littoral currents and sediment transport due to the presence of the cable protection. Maintenance activities are sporadic, with the impacts predicted to be of local spatial extent, short term duration and intermittent. Within the West of Walney MCZ, West of Copeland MCZ and Shell Flat feature of the Shell Flat and Lune Deep SAC, these impacts would be indistinguishable from background variations due to distance from the Transmission Assets (*c*. 6 km). The Fylde MCZ and Ribble Estuary are affected directly, however, the recoverable nature of the sites paired with the intermittent nature of effect means it is not significant in terms of EIA. The additive effects on physical processes receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the ES					

[a] C=construction, O=operation and maintenance, D=decommissioning

Table 3.7: Benthic subtidal and intertidal ecology – summary of likely significant inter-related effects

Potential impacts	Phase[a]			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Project lifetime effects					
Temporary habitat loss/disturbance.	✓	✓	✓	The total area of habitat potentially affected, when disturbance and loss are considered additively across all phases is greater than for each individual phase (e.g., just the construction phase). However, temporary habitat loss/disturbance arising during each phase of the Transmission Assets will be highly localised to the vicinity of the activities being undertaken (i.e., limited to the immediate footprints) during each phase (i.e., construction, operation and maintenance, and decommissioning). Individual activities (e.g., cable installation and repairs, and sandwave clearance) will each cause temporary habitat loss/disturbance intermittently with only a small proportion of the total area of habitat being impacted at any one time. The predominantly muddy sand sediment and sand sediment habitats present within the Transmission Assets are typical of, and widespread throughout, the UK and in the east Irish Sea. All sediments and associated benthic communities are predicted to recover. Whilst there is the potential for repeat disturbance to occur during the operation and maintenance phase to habitats previously disturbed during the construction phase (e.g. during cable repair and reburial events), it is predicted that the benthic communities will have fully recovered from construction impacts by this time. Across the project lifetime, the effects on benthic ecology receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the ES.	No change resulting from inter-related assessment.
Increased SSCs and associated sediment deposition.	✓	✓	✓	Activities with the potential to result in the greatest level of seabed disturbance and, therefore, highest increases in SSC/deposition, will occur during the construction and decommissioning phases. Any effects on benthic communities during this time will be intermittent, temporary and short term. The benthic subtidal Important Ecological Features (IEFs) potentially affected by increased SSC and deposition are predicted to have recovered in the intervening period between phases (i.e., prior to any localised increases in SSC during maintenance activities in the operation and maintenance phase). Across the project lifetime, the effects on benthic ecology receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the ES.	No change resulting from inter-related assessment.

Potential impacts	Phase[a]			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Disturbance/remobilisation of sediment-bound contaminants.	✓	✓	✓	This impact is expected to occur in the construction, operation and maintenance, and decommissioning phases of the Transmission Assets during activities that disturb seabed sediments. However, additive effects across the lifetime of the Transmission Assets are considered highly unlikely on the basis of the physical processes modelling outputs which have shown that increases in SSC (and therefore associated contaminants) will be temporary and will return to baseline within a few tidal cycles, as well as the low levels of contamination which were detected in the site-specific survey. This is not predicted to result in any significant combined impact across phases greater than what has been assessed for each individual phase. For example, remobilisation as a result of sandwave clearance or cable burial construction activities will only result in low concentrations of sediment bound contaminants which as noted above will have been dispersed over a large area therefore they will not interact with potential contaminants released from operation and maintenance activities. Across the project lifetime, the effects on benthic ecology receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the ES.	No change resulting from inter-related assessment.
Long term habitat loss.	✓	✓	✓	This impact will occur throughout the construction, operation and maintenance and decommissioning phases of the Transmission Assets. The communities that develop on the introduced artificial structures will likely differ from the surrounding sedimentary biotopes but may be typical of areas of coarse and stony substrate in the area. Also, the amount of the hard infrastructure is expected to be consistent between the construction and operations and maintenance phases, and this will provide long-term stability to any communities which form. Across the Transmission Assets lifetime, the effects on benthic ecology receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the ES.	No change resulting from inter-related assessment.
Introduction of artificial structures.	✓	✓	✓	This impact will occur throughout the construction and operation and maintenance, and decommissioning phases of the Transmission Assets. The communities that develop on the introduced artificial structures will likely differ from the surrounding sedimentary biotopes but may be typical of areas of coarse and stony substrate in the area and is likely to result in an increase in biodiversity. Also, the amount of the hard infrastructure is expected to be consistent between the construction, operation and maintenance, and decommissioning phases, and this will provide long-term stability to any communities which form.	No change resulting from inter-related assessment.

Potential impacts	Phase[a]			Likely significant inter-related effects	Inter-related significance
	C	O	D		
				Across the Transmission Assets lifetime, the effects on benthic ecology receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the ES.	
Increased risk of introduction and spread of invasive and non-native species.	✓	✓	✓	Although the presence and movement of construction/decommissioning vessels in the area may facilitate the introduction and spread of Invasive Non-native Species (INNS) across all phases of the Transmission Assets, this effect will predominantly arise during the operation and maintenance phase, if it does occur. This is because, the presence of the hard substrate associated with cable protection will be present in the operation and maintenance phase which may provide INNS with the necessary substrate on which to settle. However, the measures adopted as part of the Transmission Assets include a commitment to produce an Offshore Environmental Management Plan (EMP) (Commitment (CoT) 65 as detailed in Volume 1, Annex 5.3: Commitments Register) with provisions for management of INNS. This will ensure that the risk of potential introduction and spread of INNS will be minimised across all phases. As a result, any additional inter-related effect is judged to be of minor significance in all phases of the Transmission Assets. Across the Transmission Assets lifetime, the effects on benthic ecology receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the ES.	No change resulting from inter-related assessment.
Changes in physical processes	✖	✓	✓	This impact will arise throughout the operation and maintenance and decommissioning phases of the Transmission Assets from the installation of infrastructure into the water column, including scour effects and changes in the sediment transport and wave regimes resulting in potential effects on benthic subtidal and intertidal receptors. Across the Transmission Assets lifetime, the effects on benthic ecology receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the ES.	No change resulting from inter-related assessment.
Receptor-led effects					
There is the potential for spatial and temporal interactions between the effects arising from habitat loss/disturbance/alteration and increased SSC and associated sediment deposition and resuspension of contaminants, Electromagnetic Field (EMF) and heat on benthic habitats during the lifetime of the Transmission Assets.					

Potential impacts	Phase[a]			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Based on current understanding, and expert knowledge, the greatest potential for inter-related impacts is predicted to arise through the interaction of direct (both temporary and permanent) habitat loss/disturbance from sandwave clearance and cable installation, indirect habitat disturbance due to sediment deposition and indirect effects of changes in physical processes due to the Transmission Assets infrastructure. These individual impacts were assigned a significance of negligible to minor as individual impacts and although potential combined impacts may arise (i.e., spatial and temporal overlap of habitat disturbance), it is not predicted that this will result in effects of more significance than the individual impacts in isolation. This is because the combined extent of habitat potentially affected would be typically restricted to the Transmission Assets Order Limits, the habitats affected are widespread across the UK and east Irish Sea and, where temporary disturbance occurs, full recovery of the benthos is predicted. In addition, any effects due to changes in the physical processes are likely to be limited, both in extent and also in magnitude, with many benthic ecology receptors having low sensitivity or high recoverability to the scale of the changes predicted. Across the Transmission Assets lifetime, the additive effects on benthic ecology receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the ES.					

[a] C=construction, O=operation and maintenance, D=decommissioning

Table 3.8: Fish and shellfish ecology – summary of likely significant inter-related effects

Potential impacts	Phase[a]			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Project lifetime effects					
Temporary and long term habitat loss/disturbance.	✓	✓	✓	When subtidal habitat loss (temporary and long term) is considered together across all phases of the Transmission Assets, the total area of habitat affected is larger than for the individual project stages. However, similar habitats are widespread across the fish and shellfish ecology study area and the wider Irish Sea and the impact will therefore be proportionally small in this context. During the operation and maintenance phase, most of the disturbance will be highly localised and the habitats affected are predicted to recover quickly following completion of maintenance activities with fish and shellfish IEFs recovering into the affected areas. Also, many operation and maintenance activities will be located in the same areas affected during construction (e.g., reburial of exposed cables). Decommissioning will also be impacting the same locations, to a lesser degree than during construction. Therefore, across the project lifetime, the potential effects on fish and shellfish IEFs are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase.	No change resulting from inter-related assessment.
Underwater sound from all other activities during all phases.	✓	✓	✓	This impact is unlikely to have any additive effect across the three phases of the Transmission Assets, due to the implementation of provisions for vessels and vessel movements within the offshore EMP (CoT65, Volume 1, Annex 5.3: Commitments Register) to be followed by every vessel engaged in the project, including speed restrictions which will support management of sound generation. For all phases, vessel movements will primarily be located within the Offshore Order Limits and travelling at a speed slower than 14 knots is anticipated to reduce the potential for disturbance effects. With the exception of CTVs, most vessels involved in the construction phase are likely to be travelling considerably slower than this, and all vessels will be required to follow an Offshore EMP (CoT65, Volume 1, Annex 5.3: Commitments Register) (which includes measures to minimise disturbance to marine mammals and rafting birds from vessels (document reference: J16). Across the project lifetime, the effects on fish and shellfish ecology receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the ES.	No change resulting from inter-related assessment.

Potential impacts	Phase[a]			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Increased suspended SSCs and associated sediment deposition.	✓	✓	✓	Most of the seabed disturbance (resulting in highest SSC/deposition) will occur during each of the construction and decommissioning phases, with minor increases in SSC/deposition occurring during the operation and maintenance phase. IEFs and associated spawning/nursery habitats potentially affected by increased SSCs and deposition will recover quickly following impact exposure such that there will be no inter-related effects across the construction, operation and maintenance and decommissioning phases. Across the project lifetime, the effects on fish and shellfish ecology receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the ES.	No change resulting from inter-related assessment.
Introduction and colonisation of hard substrata.	✓	✓	✓	This impact will occur throughout all phases of the Transmission Assets, with the expected development of hard substrate communities throughout the lifetime of the infrastructure. These communities will differ from the surrounding sedimentary biotopes but are unlikely to represent a significant decrease in biodiversity. Also, much of the hard infrastructure is expected to be left in place following decommissioning and this will provide long-term stability to any communities which form. Therefore, across the project lifetime, the effects on fish and shellfish IEFs are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase.	No change resulting from inter-related assessment.
Injury to basking shark due to increased risk of collision with vessels.	✓	✓	✓	This impact is unlikely to have any additive effect across the three phases of the Transmission Assets, due to the implementation of provisions for vessels and vessel movements within the Outline offshore EMP (CoT65, Volume 1, Annex 5.3: Commitments Register) to be followed by every vessel engaged in the project to avoid collisions where possible. Should any collisions occur, the impact will be limited to that phase of activity, and evidence exists to suggest long-term survivability of basking shark in the event of collisions, depending upon the severity (see Volume 2, Chapter 3: Fish and shellfish ecology of the ES).	No change resulting from inter-related assessment.

Potential impacts	Phase[a]			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Disturbance/remobilisation of sediment-bound contaminants.	✓	✓	✓	This impact is expected to occur in the construction, operation and maintenance, and decommissioning phases of the Transmission Assets during activities that disturb seabed sediments. However, additive effects across the lifetime of the Transmission Assets are considered highly unlikely on the basis of the physical processes assessment which suggests that increases in SSC (and therefore associated contaminants) will be temporary, dispersed and diluted over a large area and will return to baseline within a few tidal cycles, as well as the low levels of contamination which were detected in the site-specific surveys. This is not predicted to result in any significant combined impact across phases greater than what has been assessed for each individual phase. For example, remobilisation as a result of construction activities will only result in low concentrations of sediment bound contaminants which, as noted above, will have been dispersed over a large area and therefore, they will not interact with potential contaminants released from operation and maintenance activities. It is predicted that IEFs and associated spawning/nursery habitats potentially affected by remobilisation of sediment bound contaminants will recover quickly following impact exposure such that there will be no inter-related effects across the construction, operation and maintenance and decommissioning phases. Therefore, across the project lifetime, the effects on fish and shellfish ecology receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase.	No change resulting from inter-related assessment.
Receptor-led effects					
Potential exists for spatial and temporal interactions between habitat loss or disturbance, underwater sound, increased SSC/deposition, introduction and colonisation of hard structures, EMF effects, disturbance and remobilisation of sediment-bound contaminants and injury to basking shark from vessel collisions during the lifetime of the Transmission Assets. Based on current understanding and expert knowledge, the greatest scope for potential interaction impacts is predicted to arise through the interaction of habitat loss (temporary and long term), increased SSC, underwater sound from UXO clearance during the construction phase, and EMF effects during the operation and maintenance phase. These individual impacts were assigned a significance of negligible to minor adverse as standalone impacts and although potential combined impacts may arise (e.g., through increases in SSCs and associated deposition and the disturbance and remobilisation of sediment bound contaminants which are likely to co-occur, although the potential for effects associated with remobilising sediment bound contaminants is negligible based upon the in situ contaminants data collected), it is important to recognise that some of the activities potentially resulting in combined effects are mutually exclusive.					

Potential impacts	Phase[a]			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Further, where activities may co-occur, the impacts of each activity are typically specific to particular species or species groups and their behaviour or lifecycle stage (e.g., spawning of herring, sandeel habitation and spawning, migration of diadromous fish). For example, most potential effects associated with an increase in SSC/deposition will arise from seabed preparation and sandwave clearance works and the installation of the Transmission Assets cables, whereas most effects will arise from UXO clearance undertaken at a different time. In addition, these impacts will be temporary and reversable following cessation of construction or decommissioning, with fish and shellfish communities expected to recover. Furthermore, it should also be noted that there will be no temporal overlap of elevated sound production between UXO clearance or geophysical survey acquisition, therefore these activities are considered exclusive to one another and are not expected to generate any interactive effects. Any potential behavioural effects as a result of EMF would be likely to occur over the same area as habitat loss/change effects (i.e., within metres of the cable) and therefore habitat loss effects would not be additive to EMF effects. There may be localised changes in fish and shellfish communities in the areas affected by long term habitat loss, due to potential changes in substrate type and foraging opportunities and potential behavioural effects associated with EMFs. Any shifts in baseline assemblage will be limited to these areas and, therefore, effects of greater significance than the individual impacts in isolation (i.e., negligible to moderate) are not predicted. Overall, the evidence presented in Volume 2, Chapter 3: Fish and shellfish ecology of the ES indicates that impacts on fish and shellfish receptors from construction are temporary and reversible and that fish and shellfish communities are not significantly adversely affected by the presence of export cables and therefore additive effects across impacts and phases are not expected to occur.					

[a] C=construction, O=operation and maintenance, D=decommissioning

Table 3.9: Marine mammals – summary of likely significant inter-related effects

Potential impacts	Phase[a]			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Project lifetime effects					
Injury and disturbance to marine mammals from elevated underwater sound due to vessel use and other sound-producing activities.	✓	✓	✓	Vessels will be used throughout all phases of the Transmission Assets and therefore the impact of injury and disturbance to marine mammals from elevated underwater sound due to vessel use and other sound producing activities throughout all phases could cause additional disturbance to marine mammals compared to considering each stage separately. However, for all phases, vessel movements will primarily be located within the Offshore Order Limits and travelling at a speed slower than 14 knots, which is anticipated to reduce disturbance effects (evidenced by slowdown trial undertaken by Joy *et al*. (2019) which achieved 22% reduction in 'potential lost foraging time' for	No change resulting from inter-related assessment.

Potential impacts	Phase[a]			Likely significant inter-related effects	Inter-related significance
	C	O	D		
				killer whales (with 40% reductions when 100% of vessels were under the 11 knot speed limit)). Vessels will also follow the Outline measures to minimise disturbance to marine mammals and rafting birds from vessels (document reference J16), also stated within the Offshore EMP (CoT65, Volume 1, Annex 5.3: Commitments Register) (Volume 2, Chapter 4, Section 4.8, Table 4.12).	
Increased likelihood of injury due to collision with vessels.	✓	✓	✓	Over the lifetime of the Transmission Assets there will be an ongoing risk of collision associated with vessel activity throughout all phases. If injury to marine mammals from collisions did occur this could lead to loss of individuals and potentially have an effect at the population-level, particularly for species with smaller populations, such as bottlenose dolphin and harbour seal. However, there is a high likelihood that marine mammals will avoid vessels, as they will likely be disturbed by underwater sound from the vessel, thereby reducing collision risk. In addition, the risk of collisions will be further reduced through the implementation of Offshore EMPs (CoT65, Volume 1, Annex 5.3: Commitments Register) (Volume 2, Chapter 4, Section 4.8, Table 4.12) with provisions for vessels and vessel movements, including vessel transit corridors to minimise the potential for collision risk.	No change resulting from inter-related assessment
Changes in fish and shellfish communities affecting prey availability.	✓	✓	✓	Fish and shellfish communities may be impacted through all phases of the Transmission Assets and therefore could present a long-term effect on marine mammals through changes to prey availability. Potential effects on fish and shellfish receptors are described in detail in Volume 2, Chapter 3: Fish and shellfish of the ES. For all potential impacts and at all phases of the Transmission Assets the effects were, however, predicted to be very localised (within the close vicinity of the project), and unlikely to lead to significant effects on marine mammals. Even in the context of longer-term impacts there is unlikely to be an additive effect as marine mammals can exploit a suite of prey species and only a small area will be affected when compared to available foraging habitat in the east Irish Sea.	No change resulting from inter-related assessment
Receptor-led effects					
There is the potential for spatial and temporal interactions between the effects arising from elevated underwater sound (due to UXO clearance, site investigation surveys, and vessel use and other sound producing activities), collision risk with vessels and changes in prey availability during the lifetime of the Transmission Assets. Based on current understanding and expert knowledge, the greatest potential for inter-related effects is predicted to arise through the interaction of injury and disturbance from elevated underwater sound during UXO clearance, elevated underwater sound due to vessel use and other sound producing activities and elevated underwater sound generated from site investigation survey sources, due to the Transmission Assets. Except for the impact of UXO clearance for harbour porpoise only (which was given a moderate adverse significance, for auditory injury only), these impacts were assigned a significance of minor as individual impacts. Whilst potential overlap of effects may arise (e.g. spatial and temporal overlap of sound impacts from					

Potential impacts	Phase[a]			Likely significant inter-related effects	Inter-related significance
	C	O	D		
elevated underwater sound due to vessel use and other sound producing activities with other sound impacts) it is not predicted that these will result in effects of greater significance than the individual impacts in isolation. Firstly, there will be no temporal overlap between the impacts of injury and disturbance from elevated underwater sound during UXO clearance and elevated underwater sound generated during site investigation survey sources; UXO clearance will not temporally overlap with site investigation surveys due to safety and operational reasons. Whilst the impact of injury and disturbance from elevated underwater sound due to vessel use and other sound producing activities will overlap temporally with other sound producing activities across all phases of the Transmission Assets, and there may be some overlap of ensonification, all individuals are assumed to be disturbed if within range and excluded from the greatest disturbance footprint. Similarly, there is unlikely to be any inter-related effect of vessel collision and sound impacts, as those animals excluded from disturbance footprints will also be excluded from potential collision risk zones. As such, there will unlikely be a pathway to inter-related effects. Additionally, sound impacts have the potential to temporally overlap with the impact of changes in fish and shellfish communities affecting prey availability across all phases of the Transmission Assets. However, as above, all individuals are assumed to be disturbed by sound impacts if within range and excluded from the greatest disturbance footprint. Therefore, if an animal is excluded from the area, no inter-related effect is likely. In addition, any effects on prey species will likely be offset, on the basis that, as marine mammals are temporarily displaced from areas around sound impacts, many prey species that form part of their diet will also be temporarily displaced. Furthermore, once sound impacts have ceased any changes to prey availability will be highly localised (within the close vicinity of the project), and therefore there will unlikely be a pathway to inter-related effects.					

[a] C=construction, O=operation and maintenance, D=decommissioning

Table 3.10: Offshore ornithology – summary of likely significant inter-related effects

Potential impacts	Phase[a]			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Project lifetime effects					
Disturbance and/or displacement from airborne sound, underwater sound,	✓	✓	✓	The impact of disturbance and/or displacement caused by construction activities and associated vessel movements is predicted to be negligible or minor adverse for all species, which is not significant in EIA terms. In addition, with implementation of the measures adopted as part of the Transmission Assets, the risk of disturbance will be further reduced through a best practice vessel	No change resulting from inter-related assessment.

Potential impacts	Phase[a]			Likely significant inter-related effects	Inter-related significance
	C	O	D		
and presence of vessels and infrastructure.				handling protocols to minimise the potential for disturbance (CoT69, CoT110 and CoT111, Volume 1, Annex 5.3: Commitments Register). The birds disturbed during the construction phase are expected to return as soon as the specific and locally active works are completed. During the operations and maintenance phase, the impact is expected to of lower magnitude when compared to the construction phase, involving fewer vessel movements albeit occurring over a longer time period. This effect was predicted to be of negligible or minor significance for all species. Whilst the operations and maintenance phase will feature a much-reduced level of boat activity in comparison to the construction phase, the decommissioning phase will require similar number of vessels to the construction phase. The effects of decommissioning activities are expected to be similar in magnitude to those arising from construction. Across the project lifetime, the effects on offshore ornithology receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the Environmental Statement.	
Indirect impacts from underwater sound, habitat loss and increased suspended sediment concentrations affecting prey species.	✓	✓	✓	Indirect impacts caused by a change in prey species (e.g. cod, sprat, herring and sandeel) during the construction, operation and maintenance, and decommissioning phases are predicted to be minor adverse for relevant receptor species, which is not significant in EIA terms. There will be no inter-related effects between the construction and decommissioning phases which do not overlap. Across the project lifetime, the effects on offshore ornithology receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the Environmental Statement.	No change resulting from inter-related assessment.
Temporary habitat loss/disturbance and increased SSCs.	✓	✓	✓	During the construction and decommissioning phases, seabirds may be indirectly disturbed and displaced as a result of direct impacts on habitat and increased SSCs, which may result in the loss of a food resource to birds in the Offshore Order Limits. Due to the localised nature of the impact, these minor adverse effects on prey species will be extremely localised and will be of negligible magnitude when considered against the wide areas over which seabirds forage. This will lead to temporary habitat disturbance at a local scale. During the operations and maintenance phase, activities within the Offshore Order Limits may lead to increases in SSCs and associated sediment deposition. The magnitude of the impacts would be a small fraction of those quantified for the construction and decommissioning phases. The prey species	No change resulting from inter-related assessment.

Potential impacts	Phase[a]			Likely significant inter-related effects	Inter-related significance
	C	O	D		
				and habitats potentially affected by construction and decommissioning activities are likely to recover during the operations and maintenance phase. Across the project lifetime, the effects on offshore ornithology receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the Environmental Statement.	
Receptor-led effects					
Potential exists for spatial and temporal interactions between disturbance and indirect impacts and temporary habitat loss/disturbance during the lifetime of the Transmission Assets. Based on current understanding and expert knowledge, the greatest scope for potential interaction impacts is predicted to arise through the following: Combined disturbance, displacement, and changes in prey species during the construction phase. Individual impacts were assigned a significance of negligible to minor adverse as standalone impacts. Although potential combined impacts may arise, it is essential to acknowledge that some of the activities potentially resulting in combined effects would not be additive. For instance, the displacement effect on seabirds is expected to be very localised, intermittent and of short duration during the construction phase. Prey availability and habitats may also be altered during the construction phase, leading to the redistribution of birds. In this scenario, the inter-related effects are expected to cancel each other out to a degree: a redistribution of prey due to indirect disturbance/displacement will reduce the direct displacement effect of seabirds caused by construction activities. Compounding inter-related effects will only occur if seabirds continue to use the site where prey have been displaced from. The conclusion can also be made, therefore, that any inter-related effects will not be of greater significance than those effects in isolation, as already assessed.					

[a] C=construction, O=operation and maintenance, D=decommissioning

Table 3.11: Commercial fisheries – summary of likely significant inter-related effects

Potential impacts	Phase[a]			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Project lifetime effects					
Loss or restricted access to fishing grounds.	✓	✓	✓	During the construction and decommissioning phases of the Transmission Assets, advisory exclusion zones, and therefore the areas from which commercial fishing will be excluded, will be highly localised. During construction, for example, fishing activity will only be excluded from 500 m advisory exclusion zones around major installation vessels installing subtidal export cables. Temporary restrictions to fishing activity and/or anchoring, will also be required in areas where full cable burial to target depth has not yet been achieved and/or surface-laid cable exists (e.g. prior to cover by external cable protection). In such areas of temporarily shallow-buried/surface-laid cable, the restricted areas may be monitored by guard vessels as required (as outlined within the outline Fisheries Liaison and Co-existence Plan provided with the application, document reference J13). During operation and maintenance phase, all commercial fisheries receptor groups will be able to continue fishing within the Transmission Assets Order Limits: Offshore. The commercial fisheries assessment presented in Volume 2, Chapter 6: Commercial fisheries of the ES concluded a negligible effect for all receptor groups, with the exception of Scottish west coast scallop vessels and Isle of Man scallop vessels where a minor adverse effect is predicted, which is not significant in EIA terms. While there will be a small incremental increase in the area in which fishing may be disrupted as the Transmission Assets is built out, as fishing activity is likely to be able to continue elsewhere during all project phases, effects on commercial fisheries across the phases are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase. Across the project lifetime, the effects on commercial fisheries receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the ES.	No change resulting from inter-related assessment.
Displacement of fishing activity into other areas.	✓	✓	✓	During all phases of the Transmission Assets, the commercial fisheries assessment presented in Volume 2, Chapter 6: Commercial fisheries of the ES concluded a negligible effect for all receptor groups. The Applicants have made a number of commitments to mitigate the potential for the Transmission Assets to severely restrict fishing and displace fishing activity into other areas and to promote co-	No change resulting from inter-related assessment.

Potential impacts	Phase[a]			Likely significant inter-related effects	Inter-related significance
	C	O	D		
				existence. All commitments are outlined within the outline Fisheries Liaison and Co-existence Plan provided with the application, document reference J13). Across the project lifetime, the effects on commercial fisheries receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the ES.	
Loss or damage to fishing gear due to snagging.	✓	✓	✓	During all phases of the Transmission Assets, the commercial fisheries assessment presented in Volume 2, Chapter 6: Commercial fisheries of the ES concluded a negligible effect for all receptor groups, with the exception of the Scottish west coast scallop vessels and Isle of Man scallop vessels, where a minor adverse effect is predicted. This is not significant in EIA terms. The construction, operation and maintenance, and decommissioning of the Transmission Assets may lead to loss or damage to fishing gear due to snagging. Snagging risks may occur as a result of infrastructure on the seabed, such as subtidal export cables and associated cable protection. Across the project lifetime, the effects on commercial fisheries receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the ES.	No change resulting from inter-related assessment.
Supply chain opportunities for local fishing vessels.	✓	✓	✓	During the construction, operation and maintenance, and decommissioning phases, there may be the opportunity for commercial fisheries operators to provide support to the Transmission Assets, such as guard vessels and scouting surveys. Across the project lifetime, the effects on commercial fisheries receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the ES.	No change resulting from inter-related assessment.
Receptor-led effects					
There is potential for an inter-related effect from the combination of supply chain benefits for local fishing vessels and reduction in loss or restricted access to fishing grounds; this is because fishing vessels are likely to be providing marine operational support during periods of construction or major maintenance works which would have resulted in a loss or restricted access to fishing grounds if the vessel had not been providing support to the Transmission Assets. This means that the benefit to the local fishing vessels, as a result of the supply chain opportunities, is acting more as an alleviation of potential losses than an additional					

Potential impacts	Phase[a]			Likely significant inter-related effects	Inter-related significance
	C	O	D		
benefit. It is therefore predicted that any potential inter-related effect will reduce the beneficial significance of supply chain opportunities, which would result in a negligible beneficial significance. There is potential for an inter-related effect from the combination of the loss or restricted access to fishing grounds and the consequent displacement of fishing activity into other areas. This could result in increased gear conflict and pressure on other fishing grounds. During construction, static gear vessels may be required to relocate pots from areas of activity, which could increase intensity of activity in other areas or cause conflict with mobile gear species (e.g., scallop vessels). However, with successful implementation of the measures outlined in Volume 2, Chapter 6: Commercial fisheries of the ES, and the temporary nature of the works, it is not predicted that there will be any inter-related effect of greater significance than those already assessed in isolation.					

[a] C=construction, O=operation and maintenance, D=decommissioning

Table 3.12: Shipping and navigation – summary of likely significant inter-related effects

Potential impacts	Phase[a]			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Project lifetime effects					
Displacement/interference of fishing activity.	✓	✓	✓	Displacement of fishing activity due to the presence of the Transmission Assets and avoidance of other vessels. These impacts are assessed in Volume 2, Chapter 6: Commercial fisheries of the ES. During all phases of the Transmission Assets, the commercial fisheries assessment presented in Volume 2, Chapter 6: Commercial fisheries of the ES concluded a negligible effect for all receptor groups. The Applicants have made a number of commitments to mitigate the potential for the Transmission Assets to severely restrict fishing and displace fishing activity into other areas and to promote co- existence. All commitments are outlined within the outline Fisheries Liaison and Co-existence Plan provided with the application, document reference J13. The Navigation Risk Assessment (NRA) conducted in Volume 2, Annex 7.1: Navigational Risk Assessment of the ES was of sufficient detail that interactions between effects were considered, both from different phases and different receptors, and therefore the results would be the same. Across the Transmission Assets lifetime, the effects on shipping and navigation receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the	No change resulting from inter-related assessment.

Potential impacts	Phase[a]			Likely significant inter-related effects	Inter-related significance
	C	O	D		
				assessments presented for each individual phase or when considered in conjunction with other topics addressed in the ES.	
Collision and allision risk of fishing vessels.	✓	✓	✓	Displacement of fishing activity due to the presence of the Transmission Assets increases the risk of collision or allision of fishing vessels. These impacts are assessed within Volume 2, Chapter 7: Shipping and navigation of the ES but further details on fishing activity are provided in Volume 2, Chapter 6: Commercial fisheries of the ES. Volume 2, Annex 7.1: Navigational Risk Assessment of the ES was of sufficient detail that interactions between effects were considered, both from different phases and different receptors, and therefore the results would be the same. Across the Transmission Assets lifetime, the effects on shipping and navigation receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the ES.	No change resulting from inter-related assessment.
Interference with oil and gas activities.	✓	✓	✓	The proximity of oil and gas assets and the movements of supply ships would be impacted by the presence of the Transmission Assets. These impacts are assessed in Volume 2, Chapter 9: Other sea users of the ES. Volume 2, Annex 7.1: Navigational Risk Assessment of the ES was of sufficient detail that interactions between effects were considered, both from different phases and different receptors. Across the Transmission Assets lifetime, the effects on shipping and navigation receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the ES.	No change resulting from inter-related assessment.
Impact on emergency response capability.	✓	✓	✓	The need for SAR assets to operate around the Transmission Assets has impacts upon aviation receptors. These impacts are assessed in Volume 3, Chapter 11: Aviation and radar of the ES. Volume 2, Annex 7.1: Navigational Risk Assessment of the ES was of sufficient detail that interactions between effects were considered, both from different phases and different receptors, and therefore the results would be the same. Across the Transmission Assets lifetime, the effects on shipping and navigation receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the	No change resulting from inter-related assessment.

Potential impacts	Phase[a]			Likely significant inter-related effects	Inter-related significance
	C	O	D		
				assessments presented for each individual phase or when considered in conjunction with other topics addressed in the ES.	
Impact on marine navigation, communications position fixing equipment.	✓	✓	✓	Impacts to shore-based radar may occur in addition to marine radar. These impacts are assessed in Volume 3, Chapter 11: Aviation and radar of the ES. Volume 2, Annex 7.1: Navigational Risk Assessment of the ES was of sufficient detail that interactions between effects were considered, both from different phases and different receptors, and therefore the results would be the same. Across the Transmission Assets lifetime, the effects on shipping and navigation receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the ES.	No change resulting from inter-related assessment.
Receptor-led effects					
The presence of advisory 500 m exclusion zones around vessels during the construction, operation and maintenance and decommissioning phases, respectively, may result in the displacement from fishing grounds of commercial fishing vessels. This displacement and the associated reduction in available sea room will increase the vessel to vessel collision risk between third-party vessels. However, it is unlikely that effects will act together and that any interactions between effects will be of any greater significance than those already assessed for the Transmission Assets alone. Across the Transmission Assets lifetime, the additive effects on shipping and navigation receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the ES.					

[a] C=construction, O=operation and maintenance, D=decommissioning

Table 3.13: Marine archaeology – summary of likely significant inter-related effects

Potential impacts	Phase[a]			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Project lifetime effects					
Sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors.	✓	✓	✓	The construction, operation and maintenance, and decommissioning phases of the Transmission Assets may lead to sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors. This impact has the potential to combine across all three phases of the Transmission Assets to further expose or bury marine archaeology receptors. The measures adopted as part of the project, described in Section 8.8 of Volume 2, Chapter 8: Marine archaeology of the ES, to include the implementation of and adherence to offshore Written Scheme Investigations (WSIs) for archaeology (Outline Offshore WSI is provided with the application, document reference J17) in order to record and protect any marine archaeology uncovered during the lifetime of the project. The measures adopted also include for the ongoing monitoring of known archaeological receptors of medium and high potential through the review of the Archaeological Exclusion Zones included within the Offshore Order Limits (presented in the outline offshore WSI for archaeology (document reference J17), as per CoT63, Volume 1, Annex 5.3: Commitments Register) to continue to understand the impacts of changing sediments on those receptors.	No change resulting from inter-related assessment.
Receptor-led effects					
Potential exists for interactions between indirect impacts to marine archaeological receptors. Based on current understanding and expert knowledge, the greatest scope for potential inter-related impacts is predicted to arise through the following: • Combined effects of sediment disturbance and deposition and the alteration of sediment transport regimes during the operation and maintenance phase. The combination of sediment disturbance and deposition through activities such as repair and reburial and alteration of transport regimes during the operations and maintenance phase has the potential to further expose or bury marine archaeology receptors. The measures adopted as part of the Transmission Assets will ensure procedures for the investigation, protection and recording of any as yet unknown marine archaeology through the outline offshore Written Scheme of Investigation and Protocol of Archaeological Discoveries (PAD) (document reference J17) and the ongoing monitoring of known archaeological receptors of significance. It is therefore predicted that any inter-related effect will not be of any greater significance than those impacts already assessed in isolation (i.e., minor adverse and not significant).					

[a] C=construction, O=operation and maintenance, D=decommissioning

Table 3.14: Other sea users – summary of likely significant inter-related effects

Potential impacts	Phase[a]			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Project lifetime effects					
Displacement of recreational activities.	✓	✓	✓	During the construction, operation and maintenance, and decommissioning phases, the presence of infrastructure, safety zones and advisory clearance distances, may lead to the displacement of recreational activities such as recreational sailing, water sports and fishing from the Offshore Order Limits. The level of recreational activity within the Offshore Order Limits is low. There is low to medium recreational vessel activity in nearshore areas of Offshore Order Limits, with boating and water sports taking place closer to shore. There is the potential for loss of recreational resource during nearshore/inshore cable installation activities in the construction phase, however any displacement nearshore will be temporary and is not likely to result in inter-related effects. Across the project lifetime, the effects on other sea users receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the ES.	No change resulting from inter-related assessment.
Increased SSC and associated deposition affecting recreational diving and designated bathing water sites.	✓	✓	✓	During the construction, operation and maintenance, and decommissioning phases the installation, maintenance and removal of infrastructure has the potential to increase SSC within the water column. There is potential that sediment plumes from resuspended sediment could impact recreational areas through changes to water quality. The impact will be of regional spatial extent and medium term duration. Across the project lifetime, the effects on other sea users receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the ES.	No change resulting from inter-related assessment.
Impacts to existing cables or pipelines or restrictions on access.	✓	✓	✓	During the construction, operation and maintenance, and decommissioning phases existing cables and pipelines may be affected where they are crossed by Transmission Assets cables. In addition, access to existing cables and pipelines may be restricted during construction, maintenance and decommissioning activities due to the presence of Transmission Assets infrastructure, safety zones and advisory clearance distances.	No change resulting from inter-related assessment.

Potential impacts	Phase[a]			Likely significant inter-related effects	Inter-related significance
	C	O	D		
				Across the project lifetime, the effects on other sea users receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the ES.	
Reduction or restriction of other offshore energy activities.	✓	✓	✓	Installation of the export cables may lead to the reduction or restriction of other offshore energy activities in the local study area. Such activities may include surveys, drilling or vessel access to infrastructure for maintenance or decommissioning. During the installation of the cables, the area available for seismic surveys and drilling will be restricted, and the presence of safety zones and advisory clearance distances around vessels may also restrict the ability to use certain alternative survey methods. Across the project lifetime, the effects on other sea users' receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the ES.	No change resulting from inter-related assessment.
Receptor-led effects:					
Potential exists for spatial and temporal interactions between direct and indirect impacts to infrastructure and other user receptors. Based on current understanding and expert knowledge, the greatest scope for potential inter-related impacts is predicted to arise from the following: The interaction of the increased SSC and associated deposition, and the potential for displacement, on recreational divers and bathers. There is one designated bathing water site which overlaps with the Intertidal Infrastructure Area (St. Annes North). At St Annes North, there is the potential for the displacement of recreational activities due to safety zones around construction, maintenance, and decommissioning works to interact with increased SSC and associated deposition and create an interactive effect on St Annes North. However, both impacts were assessed as being of negligible adverse significance throughout all phases of the Transmission Assets, and it is not anticipated that the potential interactive effect would be of greater significance.					

Table 3.15: Geology, hydrogeology and ground conditions – summary of likely significant inter-related effects

Potential impacts	Phase[a]			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Project lifetime effects					
Impacts to groundwater, including aquifers.	✓	✓	✓	Potential effects on aquifers, groundwater quality and flow during the construction, operation and maintenance and decommissioning phases. However, it is not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase.	No change resulting from inter-related assessment.
Receptor-led effects					
There is potential for receptor led effects between possible groundwater contamination and surface water hydrology, especially in relation to the trenchless techniques proposed in proximity to the River Ribble and the known contamination adjacent. There is also the potential for receptor led effects between groundwater dependent habitats or sites designated for conservation and possible groundwater contamination. Where areas of potentially significant contamination (e.g. landfills and historical landfills) cannot be avoided, ground investigation or other appropriate measures (e.g. use Personal Protective Equipment and/or hazard signage) will be implemented to mitigate potential impacts to, or effects on sensitive receptors. Where ground investigation identifies potential risks to sensitive receptors from contamination, a remediation strategy would be prepared in consultation with the Environment Agency. This is addressed in Volume 3, Chapter 1: Geology, hydrogeology and ground conditions of the ES and Volume 3, Chapter 2: Hydrology and flood risk of the ES. Contamination impacts upon ecological receptors are assessed in Volume 3, Chapter 3: Onshore ecology and nature conservation. There is potential for receptor led effects between disturbance of any previously unidentified historical contamination and new accidental contamination i.e., leaks and spills, especially in relation to construction workers and public health receptors. However, tertiary mitigation proposed, including statutory health and safety requirements, and measures to secure construction areas, ensure that contamination will not affect occupational or public health. This is assessed in Volume 1, Annex 5.1: Human health of the ES. For the receptor led effects, overall, it is unlikely that receptors would experience increased significance of inter-related effects than that which has already been reported in the individual chapters for the identified receptors. Therefore, there is no change resulting from the inter-related assessment.					

[a] C=construction, O=operation and maintenance, D=decommissioning

Table 3.16: Hydrology and flood risk – summary of likely significant inter-related effects

Potential impacts	Phase[a]			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Project lifetime effects					
Contamination of groundwater from polluted surface waters	✓	✗	✓	There is a potential for receptor led effects between surface water and groundwater. Contaminated surface water associated with construction and decommissioning activities has the potential to enter and contaminate groundwater receptors. Due to embedded measures (CoT02, CoT10, CoT90, CoT04, CoT11, CoT09, CoT35, CoT36, CoT77, CoT82, CoT41, CoT39, Volume 1, Annex 5.3: Commitments Register) included as part of the project design required to meet legislative requirements, it is unlikely that receptors would experience increase significance of inter-related effects beyond that which has already been reported in the individual chapters for the identified receptors. Therefore there is no change result from the inter-related assessment.	No change resulting from inter-related assessment.
Contamination of surface waters from polluted groundwater	✓	✗	✓	There is a potential for receptor led effects between surface water and groundwater. Contaminated groundwater associated with construction and decommissioning activities has the potential to enter and contaminate surface water receptors. Due to embedded measures included as part of the project design required to meet legislative requirements, it is unlikely that receptors would experience increase significance of inter-related effects that which has already been reported in the individual chapters for the identified receptors. Therefore there is no change result from the inter-related assessment.	No change resulting from inter-related assessment.
contamination of habitats and detrimental effects to ecology from polluted surface waters	✓	✗	✓	There is a potential for receptor led effects between surface water and habitat and species. Contaminated runoff associated with construction and decommissioning activities has the potential to enter and contaminate surface water receptors which can serve as a habitat for species. Due to embedded measures included as part of the project design required to meet legislative requirements, it is unlikely that receptors would experience increase significance of inter-related effects that which has already been reported in the individual chapters for the identified receptors. Therefore there is no change result from the inter-related assessment.	No change resulting from inter-related assessment.
Receptor-led effects					
There are not expected to be any receptor-led effects.					

[a] C=construction, O=operation and maintenance, D=decommissioning

Table 3.17: Onshore ecology and nature conservation – summary of likely significant inter-related effects

Potential impacts	Phase[a]			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Project lifetime effects					
The effect of changes in groundwater associated with offshore export cables where they are present beneath groundwater dependent sand dune habitats at landfall.	✓	✓	✓	The assessment of changes in groundwater is set out in: • Lytham St Annes Dunes SSSI and Lytham St Annes LNR (section 3.11.3 of Volume 3, Chapter 3 of the ES); • Biological Heritage Sites (section 3.11.4 of Volume 3, Chapter 3 of the ES); and • Terrestrial invertebrates and plants as part of SSSI and BHS designations (section 3.11.15 of Volume 3, Chapter 3 of the ES). The assessment shows that, without secondary mitigation, the changes in groundwater conditions caused by the presence of the cables could cause changes in the composition and distribution of vegetation communities in the SSSI. However, with the implementation of appropriate secondary mitigation which includes a ground investigation and hydrogeological risk assessment (where required) for the Lytham St Annes sand dunes post consent as part of detailed design for the project, the effect would be minor adverse. Additional details are provided in Volume 3, Chapter 3: Onshore ecology and nature conservation.	No change resulting from inter-related assessment.
Receptor-led effects					
The impacts on the groundwater-dependent plant communities forming the reasons for designation of the sites discussed in section 3.11.3 and section 3.11.3 of Volume 3, Chapter 3 of the ES could result in the loss of characteristic wetland plant species. This would be exacerbated if emissions of pollutants from construction vehicles led to an increase in eutrophication and acidification. The two impacts would interact to shift plant communities from those characteristic of high and fluctuating groundwater levels and low nutrient status, which are distinctive and are a reason for designation of the sites in question, to common and generalist plant communities of no ecological significance.					

[a] C=construction, O=operation and maintenance, D=decommissioning

Table 3.18: Onshore and intertidal ornithology – summary of likely significant inter-related effects

Potential impacts	Phase[a]			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Project lifetime effects					
Potential impacts of disturbance, fragmentation and isolation.	✓	✓	✓	Across the project lifetime, the effects of disturbance, fragmentation and species isolation are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase. Furthermore, the effects during operation and maintenance phase will be limited to the onshore substation areas and will be less than those experienced during construction. Following the implementation of measures adopted as part of the Transmission Assets and further mitigation, project lifetime effects would be no greater than those experienced during the construction phase for the operation and maintenance phase or the decommissioning phase. Therefore, increased significance of inter-related effects is unlikely to occur.	No change resulting from inter-related assessment.
Potential impacts of habitat loss, contamination (e.g., site runoff) and INNS.	✓	×	✓	Following the implementation of measures adopted as part of the Transmission Assets, project lifetime effects would be no greater than those experienced during the construction phase for the decommissioning phase and will not continue in the operation and maintenance phase. Therefore, increased significance of inter-related effects is unlikely to occur.	No change resulting from inter-related assessment.
Receptor-led effects					
There are potential receptor led effects associated with potential for loss of habitat, disturbance and pollution caused by accidental spills/contamination; changes to agricultural land affecting habitats; construction dust and air emissions affecting habitats; and noise causing disturbance. These are assessed within Volume 3, Chapter 4: Onshore and intertidal ornithology of the ES. There is potential for receptor led effects between dust and/or noise disturbance and designated sites, both during construction, these are addressed in Volume 3, Chapter 9: Air quality of the ES and Volume 3: Chapter 8: Noise and vibration of the ES, respectively. Embedded mitigation is proposed to ensure suitable management of dust (CoT33) and noise emissions (CoT80, CoT88), during construction, such that the impacts to the designated sites do not occur. Furthermore, consideration of offshore ornithology is addressed in Volume 2 of the ES. Overall, it is unlikely that receptors would experience increased significance of inter-related effects than that which has already been reported in the individual chapters for the identified receptors. Therefore, there is no change resulting from the inter-related assessment.					

[a] C=construction, O=operation and maintenance, D=decommissioning

Table 3.19: Historic environment – summary of likely significant inter-related effects

Potential impacts	Phase[a]			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Project lifetime effects					
Change within the settings of above ground heritage assets.	✓	✓	✓	Potential effects on designated built heritage assets resulting from change within their settings could occur during all three phases. However, this only applies to built heritage assets that have some level of intervisibility with one or both of the onshore substations. This is a small number of assets, and it is considered that there is no potential for project lifetime effects to occur on this receptor group that are larger than the effects assessment within any individual phase.	No change resulting from inter-related assessment.
Receptor-led effects					
There are potential receptor led effects associated with the potential visual impacts and changes in setting of designated built heritage assets. These are assessed within Volume 3, Chapter 5: Historic environment of the ES, including the use of the Zone of Theoretical Visibility determined as part of Volume 3, Chapter 10: Landscape and visual impact assessment to inform the historic environment study area. There are also potential receptor led effects associated with noise emissions that occur within the settings of designated built heritage assets. Embedded mitigation is proposed to ensure suitable management of noise emissions, during construction and operation, such that the significant impacts to the built heritage assets do not occur (CoT35 and CoT79). For the receptor led effects, overall, it is unlikely that receptors would experience increased significance of inter-related effects than that which has already been reported in the individual chapters for the identified receptors. Therefore, there is no change resulting from inter-related assessment.					

[a] C=construction, O=operation and maintenance, D=decommissioning

Table 3.20: Land use and recreation – summary of likely significant inter-related effects

Potential impacts	Phase[a]			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Project lifetime effects					
The temporary and permanent loss of agricultural land including BMV.	✓	×	✓	The temporary loss of agricultural land, including BMV land would only occur during construction and decommissioning of the Transmission Assets. The permanent loss of agricultural land, including BMV land would only occur during construction of the Transmission Assets. There would be no additional effects during operation and maintenance of the Transmission Assets. The period of time between the construction and decommissioning phase of the Transmission Assets is 35 years. As such, it is unlikely that these impacts would interact to produce a project lifetime effect of greater significance than those identified during each individual phase. Therefore, it is considered that there is no potential this impact to result in significant project lifetime effects.	No change resulting from inter-related assessment.
Temporary and permanent disruption to agricultural land holdings.	✓	×	✓	The temporary disruption to agricultural land holdings would only occur during construction and decommissioning of the Transmission Assets. The permanent disruption to agricultural land holdings would only occur during construction of the Transmission Assets. There would be no additional effects during operation and maintenance of the Transmission Assets. The period of time between the construction and decommissioning phase of the Transmission Assets is substantial. As such, it is unlikely that these impacts would interact to produce a project lifetime effect of greater significance than those identified during each individual phase. Therefore, it is considered that there is no potential this impact to result in significant project lifetime effects.	No change resulting from inter-related assessment.
Temporary and permanent disruption to the recreational use of recreational resources (coastal areas, Access Land, open greenspace, NCRs/Coastal Path/Long distance routes, other Public Rights of Way (PRoW), recreational resources).	✓	×	✓	The temporary disruption to the recreational use of recreational resources would only occur during construction and decommissioning of the Transmission Assets. The temporary disruption to the recreational use of recreational resources would only occur during construction and decommissioning of the Transmission Assets. There would be no additional effects during operation and maintenance of the Transmission Assets. The period of time between the construction and decommissioning phase of the Transmission Assets is 35 years. As such, it is unlikely that these impacts would interact to produce a project lifetime effect of greater significance than those identified during each individual phase. Therefore, it is considered that there is no potential for this impact to result in significant project lifetime effects.	No change resulting from inter-related assessment.

Potential impacts	Phase[a]			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Receptor-led effects					
Potential receptor led effects include those affecting the amenity of recreational resources because of changes to the visual and acoustic environments. These are assessed, where relevant, in Volume 3: Chapter 10: Landscape and Visual Resources and Volume 3: Chapter 8: Terrestrial noise and vibration of the ES. In addition, effects on rivers, waterways and agricultural drainage within the area of Onshore Order Limits are considered in Volume 3, Chapter 2: Hydrology and flood risk of the ES, including potential impacts due to contamination of surface water and groundwater. The potential effects arising from construction, operation and maintenance and decommissioning of the Transmission Assets on recreational operations at Blackpool Airport are considered in Volume 3: Chapter 11: Aviation and radar and Volume 4, Chapter 2: Socio-economics of the ES. Overall, it is unlikely that receptors would experience increased significance of inter-related effects than that which has already been reported in the individual chapters for the identified receptors. Therefore, it is considered that there is no potential for identified impacts to result in significant receptor led effects.					

[a] C=construction, O=operation and maintenance, D=decommissioning

Table 3.21: Traffic and transport – summary of likely significant inter-related effects

Potential impacts	Phase[a]			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Project lifetime effects					
No project lifetime effects likely				N/A	N/A
Receptor-led effects					
Receptors include people that are living in and using facilities, and using transport networks. There is potential for inter-related effects from transport with noise and vibration, air quality, and human health. The construction phase has the highest likelihood of receptor-led effects. However, these effects would be managed through measures set out in the Outline CoCP (document reference J1).					

[a] C=construction, O=operation and maintenance, D=decommissioning

Table 3.22: Noise and vibration – summary of likely significant inter-related effects

Potential impacts	Phase[a]			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Project lifetime effects					
The impact of noise and vibration due to construction and decommissioning activities on human receptors.	✓	×	✓	Effects on human receptors from noise associated with the construction activities would be temporally separate to the decommissioning activities. Therefore, it is considered that there is no potential for project lifetime effects to occur on this receptor group.	No change resulting from inter-related assessment.
The impact of noise generated by additional vehicle movements on the local highway network during the construction and decommissioning phase for the Transmission Assets on human receptors.	✓	×	✓	Effects on human receptors from noise generated by additional vehicle movements would be temporally separate to the decommissioning activities. Therefore, it is considered that there is no potential for project lifetime effects to occur on this receptor group.	No change resulting from inter-related assessment.
Receptor-led effects					
There are potential inter-related effects on ecological habitats and species (e.g. sand lizards) due to disturbance from noise and vibration associated with construction activities. There are also potential inter-related effects on the setting of heritage features due to disturbance from noise and vibration associated with construction activities. The inter-related effects of noise and vibration with historic environment are considered in Volume 3, Chapter 5: Historic environment of the ES. The inter-related effects noise and vibration with ecology, particularly in relation to disturbance, are considered in Volume 3, Chapter 3: Onshore ecology and nature conservation of the ES and Volume 3, Chapter 4: Onshore and intertidal ornithology of the ES. There may be effects on human health such as in areas where Horizontal Directional Drilling is required since loud equipment may be required to operate at night-time. Receptors exposed to unmitigated high noise levels may be subjected to sleep disturbance and increased stress. However, embedded mitigation is proposed to ensure suitable management of noise emissions during construction (see outline construction noise and vibration management plan (document reference J1.6)). This is assessed in Volume 1: Annex 5.1: Human health of the ES. It should be noted that the assessment of noise disturbance and amenity of PRoW will be included in Volume 3, Chapter 8: Noise and vibration for ES, but the mitigation proposed is anticipated to ensure no change resulting from inter-related assessment.					

Potential impacts	Phase[a]			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Overall, it is unlikely that receptors would experience increased significance of inter-related effects than that which has already been reported in the individual chapters for the identified receptors. Therefore, there is no change resulting from inter-related assessment.					

[a] C=construction, O=operation and maintenance, D=decommissioning

Table 3.23: Air quality – summary of likely significant inter-related effects

Potential impacts	Phase[a]			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Project lifetime effects					
The impact of dust soiling (nuisance) on property arising from dust emissions generated by onsite construction and decommissioning activities.	✓	✗	✓	There may be inter-related effects from dust during earthworks and construction; however, these are taken into account in the assessment presented in Volume 3, Chapter 9: Air quality of the ES.	No change resulting from inter-related assessment.
The impact of an increase in suspended particulate matter on people arising from dust emissions generated by onsite construction and decommissioning activities.	✓	✗	✓	There may be inter-related effects from dust during earthworks and construction; however, these are taken into account in the assessment presented in Volume 3, Chapter 9: Air quality of the ES.	No change resulting from inter-related assessment.
The impact of an increase in suspended particulate matter on ecological receptors arising from dust emissions generated by	✓	✗	✓	There may be inter-related effects from dust during earthworks and construction; however, these are taken into account in the assessment presented in Volume 3, Chapter 9: Air quality of the ES.	No change resulting from inter-related assessment.

Potential impacts	Phase[a]			Likely significant inter-related effects	Inter-related significance
	C	O	D		
onsite construction and decommissioning activities.					
The impact of emissions from traffic on human-health and ecological receptors.	✓	✗	✓	Potential for emissions from vehicles have been assessed in Volume 3, Chapter 9: Air quality and are based on traffic data from Volume 3, Chapter 7: Traffic and transport of the ES.	No change resulting from inter-related assessment.
Receptor-led effects					
The potential impacts associated with construction and decommissioning of the Transmission Assets include an increase in suspended particulate matter and deposited dust that has fallen out of the air onto surfaces, which do not interact. Therefore, it is considered that there are no receptor-led effects with respect to air quality.					

[a] C=construction, O=operation and maintenance, D=decommissioning

Table 3.24: Landscape and visual resources – summary of likely significant inter-related effects

Potential impacts	Phase[a]			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Project lifetime effects					
Landscape impacts - potential change to landscape character.	✓	✓	✓	The potential effect is directly in relation to the scale and size of development proposed, the geographic extent of impact, and the distance and context factors in relation to the receptor. The scale of potential effects on landscape character is likely to be high in relation to the onshore substations themselves and diminishing with distance from the substations. The scale of effects will also increase through the construction phase due to the nature of the impact and the increased land required for temporary construction compounds, reduced during operation and maintenance, decreasing further through the decommissioning phase. Although this indicates that there is a potential lengthening of the temporal effect, across the project lifetime, the effects on landscape character resources are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase.	No change resulting from inter-related assessment.
Visual impacts	✓	✓	✓	The potential effect is directly in relation to the nature, scale and size of development proposed, and the proximity and visual context in relation to the receptor. The scale of potential effects on visual amenity and views is likely to be high in close proximity to the onshore substations themselves, diminishing with distance from the substations. The scale of effects will also potentially increase through the construction phase due to the nature of the impact and the increased extent of activities required for temporary construction compounds, reduced during operation and maintenance, decreasing further following establishment of landscape planting proposals and through the decommissioning phase. Although this indicates that there is a potential lengthening of the temporal effect, across the project lifetime, the effects on visual receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for receptors in specific locations during each individual phase.	No change resulting from inter-related assessment.
Receptor-led effects					
There is the potential for spatial and temporal interactions between the potential impacts identified on landscape and visual resources receptors. The greatest potential for inter-related effects is through the interaction of impacts on the known visual receptors within the landscape and visual resources study area.					

Potential impacts	Phase[a]			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Combined effects on visual receptors will vary temporally and spatially across the study area according to the project activities that are being undertaken. The mobile nature of many of the visual receptors (e.g., walkers, equestrians and cyclists) means that impacts will only occur when those receptors are in the vicinity of the Transmission Assets. The significance therefore varies depending on the receptor's distance to the Transmission Assets, with those closest to the onshore substations experiencing high impacts which then diminish with distance. The likely effects of construction activities will be temporary and will give way to operation and maintenance phase effects which will be fully reversible when the Transmission Assets are decommissioned. Therefore, the significance of these combined effects on visual receptors will not be of any greater significance than the effects when assessed in isolation. There are also inter-relationships with receptors for the historic environment, ecology and recreation. Whilst the assessment of effects on character includes land that contains heritage assets, effects on heritage assets and their context and settings are considered within Volume 3, Chapter 5: Historic environment of the ES. The landfall and onshore cable laying activities will be located within the Landscape Character Area (LCA) 19a Fylde Coast Dunes and the Suburban Urban LCA and the onshore substations and cable laying activities will be located within LCA 15d: Coastal Plain – Fylde, which are associated with listed buildings or conservation areas, resulting in temporary or long term significant adverse effects on landscape character. The assessment of effects on character includes land that contains ecological assets effects on flora and fauna within habitats and is considered within Volume 3, Chapter 4: Onshore ecology and nature conservation of the ES. The construction and operation of the onshore substations will change the existing farmland of LCA 15d: The Fylde Coastal Plain resulting in some temporary and some long term loss of features such as hedgerows, ditches, trees and ponds which have ecological value. The impacts will result in some localised major adverse effects on landscape character, which is significant. Therefore, the significance of these combined effects on visual receptors will not be of any greater significance than the effects when assessed in isolation. Whilst the assessment of effects on visual receptors includes people using recreational assets, effects on public open space and public rights of way are considered within Volume 3, Chapter 6: Agricultural land use and recreation of the ES. Equestrians using bridleways and walkers using PRoW in close proximity to onshore substations, people using the beach and PRoW coinciding with or in close proximity to onshore cable/landfall will gain open views of the construction activities and operational substations resulting in temporary or long term significant adverse sequential effects. Therefore, the significance of these combined effects on visual receptors will not be of any greater significance than the effects when assessed in isolation.					

[a] C=construction, O=operation and maintenance, D=decommissioning

Table 3.25: Aviation and radar – summary of likely significant inter-related effects

Potential impacts	Phase[a]			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Project lifetime effects					
Aviation obstacle near Blackpool Airport (impacts to airfield)	✓	✓	✓	None. There are no inter-related effects that are of greater significance than those assessed in isolation.	No change resulting from inter-related assessment.
Receptor-led effects					
• None					

[a] C=construction, O=operation and maintenance, D=decommissioning

Table 3.26: Climate change – summary of likely significant inter-related effects

Potential impacts	Phase[a]			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Project lifetime effects					
The impact of lifetime GHG emissions arising from the consumption of materials and activities required to facilitate the consumption, operation and maintenance, and decommissioning of the Transmission Assets.	✓	✓	✓	The assessment of climate change considers net whole life greenhouse gas emissions (project lifetime effects) arising from the consumption of materials and activities required to facilitate the consumption, operation and maintenance, and decommissioning of the Transmission Assets. However, these are taken into account in the assessment presented in Volume 4, Chapter 1: Climate change of the ES.	No change resulting from inter-related assessment.

Potential impacts	Phase[a]			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Receptor-led (in-combination) effects					
There are potential inter-related effects with receptors for physical processes, hydrology and flood risk, onshore ecology and nature conservation, onshore and intertidal ornithology, noise and vibration, land use and landscape and visual resources. • Projected future changes to sea level and storminess may result in altered interaction between sediment transport processes and the presence of infrastructure during the operation and maintenance phase of the Transmission Assets. The assessment of physical processes (Volume 2, Chapter 1 of the ES) considers future changes in sea level and storminess as a result of climate change within the future baseline. It is identified that such changes are unlikely to have the effect of significantly altering tidal patterns and sediment transport regimes offshore. In the near-shore or inter-tidal areas increased storminess may have the potential to alter existing sediment transport regimes, however the presence of buried export cables would not influence these changes. As such, there is no change in the reported significance of effect when assessed in-combination with climate impacts. • The projected future increase in precipitation may result in heightened flood risk with regards to additional surface water runoff during the operation of the onshore substations. The assessment of flood risk, taking into account increases in rainfall rates due to climate change, has been addressed in Volume 3, Chapter 2: Hydrology and flood risk of the ES, ensuring the drainage design is able to accommodate increasing volumes of surface water runoff associated with the effects of climate change during the operation and maintenance phase. As such, there will be no change in the reported significance of effect when assessed in-combination with climate impacts. • Where onshore elements of the Transmission Assets are within existing flood defences, activities required to facilitate the decommissioning of onshore export cables and 400 kV grid connection cables would not impact the integrity (or efficacy) of flood defence infrastructure, and increase the risk of flooding within the site and the surrounding area and an Onshore Decommissioning Plan will be developed prior to decommissioning and include provisions for the removal of all onshore above ground infrastructure and the decommissioning of below ground infrastructure. There is not anticipated to be any in-combination impact with climate change, as onshore and offshore cables will either remain in-situ or be removed via joint bays without further excavation, and as such flood defence infrastructure will not be impacted. As such, there will be no change in the reported significance of effect when assessed in-combination with climate impacts. • Projected future climate change may exacerbate habitat loss, in addition to the success of the ecological mitigation strategy as selected species may not be suitable for future climate conditions. This is in addition to impacts on the success of the Landscape Management Plan and Outline Ecological Management Plan, developed primarily in relation to the landscape proposals at the onshore substation sites, but also to reinstate hedgerows through which the cable corridor passes. The assessments of landscape and visual resources (Volume 3, Chapter 10 of the ES), onshore ecology and nature conservation (Volume 3, Chapter 3 of the ES) and onshore and intertidal ornithology (Volume 3, Chapter 4 of the ES) consider future climate projections when determining appropriate mitigation measures to be implemented to manage the visual and ecological effects of the Transmission Assets. When developing detailed mitigation, climate resilient plant species will be specified in order to ensure the success of the planned mitigation over the Transmission Assets' lifetime. This approach is detailed within the Outline Landscape Management Plan (document reference J2) and Ecological Management Plan (document reference J6). As such, there will be no change in the reported significance of effect when assessed in-combination with climate impacts. • Projected temperature increases may result in increased cooling demand within substation buildings, leading to increased noise generated by cooling plant during the operation and maintenance phase of the Transmission Assets, impacting human receptors. The assessment of noise and vibration (Volume 3, Chapter 8 of the ES) has been undertaken based on the assumption that the onshore substation plant items will operate at their maximum duty. As such, the					

Potential impacts	Phase[a]			Likely significant inter-related effects	Inter-related significance
	C	O	D		
assessment yields the maximum noise effects resultant from the cooling plant to be installed at the proposed onshore substation buildings. Given it is not anticipated that the cooling plant will operate consistently at maximum capacity under current climate conditions, the installed capacity will be able to manage future temperature rise to some extent, with any associated increase in use or duty already captured within the assessment assumptions. Additionally, noise generated by the cooling plant will not be the dominant source of noise associated with the operation and maintenance of the onshore substations. As such, any increase in noise levels from increased operation or capacity of cooling plant during the Transmission Assets' lifetime as a result of projected climatic changes is not anticipated to result in a change in significance associated with operation and maintenance noise effects.					

[a] C=construction, O=operation and maintenance, D=decommissioning

Table 3.27: Socio-economics – summary of likely significant inter-related effects

Potential impacts	Phase[a]			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Project lifetime effects					
The potential impact on economic receptors including employment and Gross Value Added (GVA).	✓	✓	✓	There will be beneficial effects on employment and GVA throughout the construction and installation; operation and maintenance; and decommissioning phases. Employment and GVA effects will occur within different locations and sectors of the economy, and at different times and intensities. In combination the Transmission Assets will provide a long term employment and GVA stimulus. These inter-related effects are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phases. Therefore, these inter-related effects would not be significant in EIA terms.	No change resulting from inter-related assessment.
The potential impact of increased employment opportunities.	✓	✓	✓	There will be beneficial effects on the potential for local workers to access employment throughout the construction and installation; operation and maintenance; and decommissioning phases. Access to employment effects will occur within different locations, sectors of the economy and labour market – and at different times and intensities. In combination, the Transmission Assets will provide a long term employment stimulus.	No change resulting from inter-related assessment.

Potential impacts	Phase[a]			Likely significant inter-related effects	Inter-related significance
	C	O	D		
				These inter-related effects are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phases. Therefore, these inter-related effects would not be significant in EIA terms.	
The potential impact on population, housing, and accommodation.	✓	✓	✓	Direct and indirect employment generated during the construction phase could increase population, and demand for housing and accommodation during this phase. Direct and indirect employment generated during the operation and maintenance phase could increase demand for housing, accommodation and local services during the construction phase. Direct and indirect employment generated during the operation and maintenance phase could increase demand for housing, accommodation and local services. It is anticipated that due to the long term nature of the operation and maintenance requirements the workforce will live locally. Some of those may relocate to the area requiring long term/permanent housing within the vicinity of the operation and maintenance port. Direct and indirect employment generated during the decommissioning phase could increase demand for housing and local services during the decommissioning phase. The housing and accommodation needs of employment during each phase differs. These inter-related effects are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phases. Therefore, these inter-related effects would not be significant in EIA terms.	No change resulting from inter-related assessment.
The potential impact on tourism.	✓	✓	✓	Potential impacts of the construction, operation and maintenance, and decommissioning of the Transmission Assets on tourism are indirect in nature. These inter-related effects are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phases. Therefore, these inter-related effects would not be significant in EIA terms.	No change resulting from inter-related assessment.
Receptor-led effects					
By definition, the economic and social impacts outlined above will interact. The tourism receptor is an exception, which is primarily determined on the basis of visual impact.					

Potential impacts	Phase[a]			Likely significant inter-related effects	Inter-related significance
	C	O	D		
Expenditure associated with the Transmission Assets will result in potential employment and GVA impacts – these potential impacts are the basis for assessing potential socio-economic effects. Therefore, the interactions between socio-economic receptors are inherent in the assessments of these impacts. It is not possible for socio-economic impacts to act together in a manner that multiplies effects. Employment-related receptors are likely to interact with the demand for housing, accommodation and local services receptor. In the event that potential employment and GVA impacts were to increase or decrease, effects related to the demand for housing, accommodation and local services would similarly increase or decrease. However, these impacts would not act together in a manner that multiplies effects.					

[a] C=construction, O=operation and maintenance, D=decommissioning

Table 3.28: Human health – summary of likely significant inter-related effects

Description of impact	Phase[a]			Likely significant inter-related effects	Significance
	C	O	D		
Project lifetime effects					
Water Quality	✓	✓	✓	Effects relating to water quality across construction, operations and maintenance and decommissioning are already taken into account by the health assessment, including where effects are characterised as 'long-term'. The greatest potential for impacts will be during the construction phase and during any routine occasional maintenance shipping activities. Operational effects will be long term however they will also be occasional resulting in a minor change in quality of life for very few people in the local population. These will be appropriately mitigated through adherence with the 'International Convention for the Prevention of Pollution from Ships' (1973) and the use of standard good practice mitigation to avoid and contain any spills. The combined effect during all phases of the project is not anticipated to be greater than the individual effect on the identified receptors.	No change resulting from inter-related assessment.
Noise and Vibration	✓	✓	✓	Effects relating to ongoing noise disturbance across construction, operations and maintenance and decommissioning are already taken into account by the health assessment, including where effects are characterised as 'long-term'. The different phases of the Transmission Assets predominantly affect different populations, and noise characteristics are also different between phases. The area of overlap between the different phases of the Project is therefore limited.	No change resulting from inter-related assessment.

Description of impact	Phase[a]			Likely significant inter-related effects	Significance
	C	O	D		
Receptor-led effects					
There will be a potential reduction in use of open spaces for recreation, leisure and play due to a combination of reduced access to such spaces or connecting active travel routes (including PRoW) and additional noise disturbance and concern about EMF. This has been assessed in Volume 1, Annex 5.1: Human health of the ES. However, changes in access to open space (e.g., at landfall) are not expected to overlap with matters of any active travel disruption (e.g., along the onshore export cable corridor) or with matters of noise and EMF concern (e.g., close to the onshore substations). Construction noise and any disruption to active travel routes or open space are all transitory and short-term at any given location. This limits the potential for effects for significant public health effects, even in combination.					

a C=construction, O=operation and maintenance, D=decommissioning

3.5 Conclusion

3.5.1.1 The tables presented within this chapter provide the assessment of potential inter-related effects (both project lifetime and receptor-led effects) arising from the Transmission Assets on a range of receptor groups.

3.5.1.2 Following the implementation of mitigation measures adopted as part of the project and further mitigation (if required), project lifetime effects arising during the construction, operation and maintenance, and decommissioning phases of the Transmission Assets are unlikely to result in effects of greater significance than those reported individually in the ES.

3.5.1.3 For receptor led effects, overall, it is unlikely that receptors would experience increased significance of inter-related effects than that which has already been reported in the individual chapters for the identified receptors. Therefore, there is no change resulting from inter-related assessment.

3.6 References

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