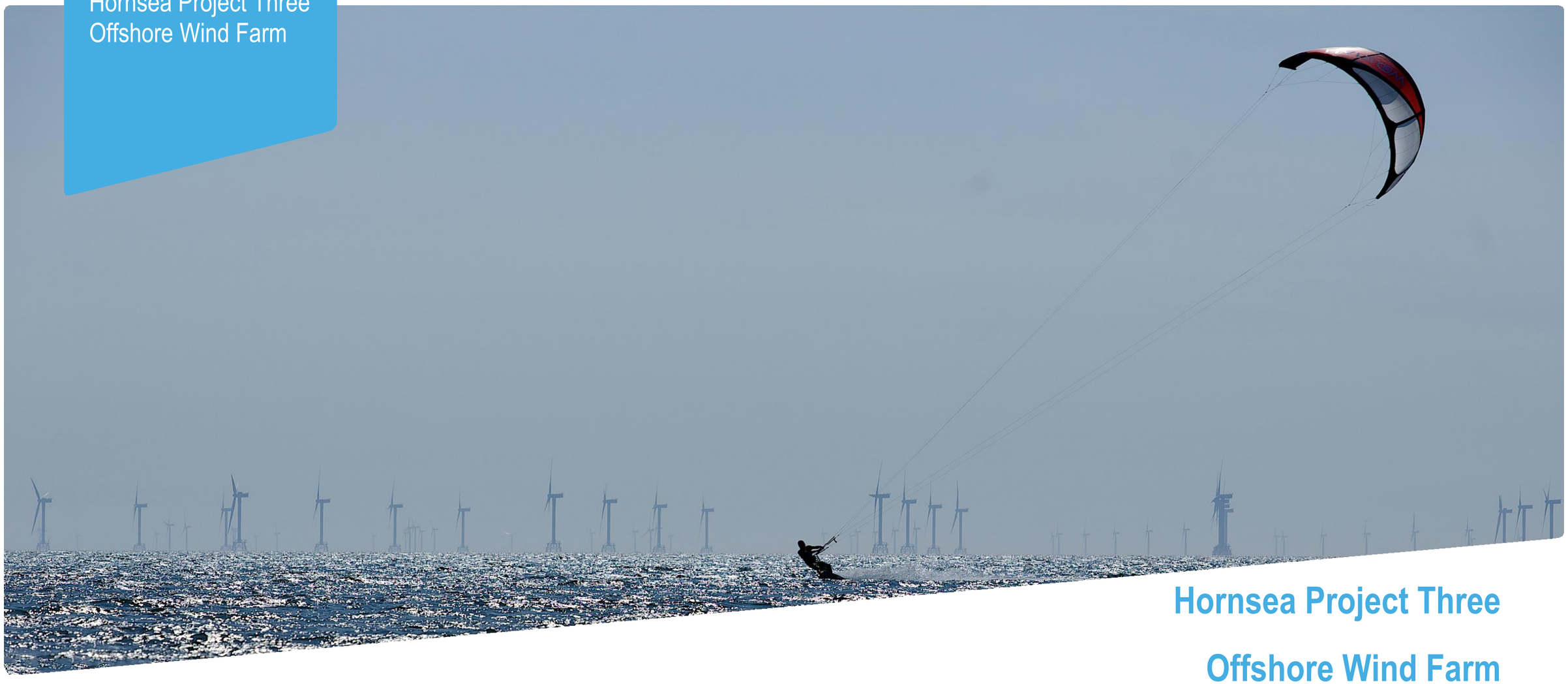
Hornsea Project Three
Offshore Wind Farm



Hornsea Project Three

Offshore Wind Farm

Environmental Statement:
Volume 3, Chapter 11: Inter-related Effects (Onshore)

PINS Document Reference: A6.3.11
APFP Regulation 5(2)(a)

Date: May 2018

Hornsea 3
Offshore Wind Farm

Ørsted

Environmental Impact Assessment

Environmental Statement

Volume 3

Chapter 11: Inter-related Effects (Onshore)

Liability
This report has been prepared by RPS, with all reasonable skill, care and diligence within the terms of their contracts with Orsted Power (UK) Ltd.

Report Number: A6.3.11

Version: Final

Date: May 2018

This report is also downloadable from the Hornsea Project Three offshore wind farm website at:
www.hornseaproject3.co.uk

Ørsted,

5 Howick Place,

London, SW1P 1WG

Front cover picture: Kite surfer near a UK offshore wind farm © Orsted Hornsea Project Three (UK) Ltd., 2018.

Prepared by: RPS

Checked by: Sarah Drljaca

Accepted by: Sophie Banham

Approved by: Stuart Livesey

Table of Contents

List of Tables

Glossary

Term	Definition
Hornsea Three onshore elements	Hornsea Three landfall area, onshore cable corridor, the onshore HVAC booster station, the onshore HVDC converter/HVAC substation and the interconnection with the Norwich Main National Grid substation.
Inter-related effects	Those that arise from the combined action of a number of different environmental topic-specific effects from a single scheme upon a single receptor/resource. Multiple effects on the same receptor arising from Hornsea Three. These occur either where a single effect acts on a receptor over time to produce a potential additive effect or where a number of separate effects, such as noise and visual effects, affect a single receptor (for example, people living nearby).

Acronyms

Acronym	Description
AONB	Area of Outstanding Natural Beauty
CoCP	Code of Construction Practice
DCO	Development Consent Order
EIA	Environmental Impact Assessment
HDD	Horizontal Directional Drilling
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
IPC	Infrastructure Planning Commission
MHWS	Mean High Water Springs
NPS	National Policy Statement
PINS	Planning Inspectorate
PRoW	Public Right of Way
Sops	Secretary of State

Units

Unit	Description
km	Kilometre (distance)
m	Metre (distance)

11. Inter-related Effects (Onshore)

11.1 Introduction

11.1.1.1 This chapter of the Environmental Statement presents the findings of the Environmental Impact Assessment (EIA) of the onshore elements of the Hornsea Project Three offshore wind farm (hereafter referred to as 'Hornsea Three') on inter-related effects (onshore). Specifically, this chapter considers the potential effect of Hornsea Three landward of Mean High Water Springs (MHWS) during its construction, operation and maintenance, and decommissioning.

11.1.1.2 Those effects of Hornsea Three seaward of MHWS are assessed in volume 2, chapter 12 Inter-related Effects (Offshore).

11.2 Purpose of this chapter

11.2.1.1 The primary purpose of the Environmental Statement is to support the Development Consent Order (DCO) application for Hornsea Three under the Planning Act 2008 (the 2008 Act), as amended. It accompanies the application to the Secretary of State for development consent.

11.2.1.2 The Infrastructure Planning (Environmental Impact Assessment) Regulations 2009, as amended, require '*A description of the aspects of the environment likely to be significantly affected by the development, including, in particular, population, fauna, flora, soil, water, air, climatic factors, material assets, including the architectural and archaeological heritage, landscape and the interrelationship between the above factors'* (Schedule 4). As set out in volume 1, chapter 5: Environmental Impact Assessment Methodology, the 2009 Regulations are the relevant consideration for the EIA for Hornsea Three. However, as a matter of good practice, the measures required by the Infrastructure Planning (Environmental Impact Assessment) 2017 Regulations have also been considered where appropriate in this Environmental Statement. The 2017 Regulations include a similar requirement to identify, describe and assess the 'interaction' between environmental topics (Regulation 5).

11.2.1.3 Chapters 1 to 10 of volume 3 of this Environmental Statement assess the effects of the onshore elements of Hornsea Three on topic-specific receptors. The assessments are impact-led (i.e. the impacts on receptors are identified by impact type for the construction, operation and maintenance, and decommissioning phases). This inter-related effects chapter adopts a different approach by focusing on the receptor and then identifying the impacts which may arise from more than one environmental topic or impacts that may arise during more than one project phase (i.e. impacts which are not explicitly addressed elsewhere in the Environmental Statement).

11.2.1.4 In particular, this Environmental Statement chapter:

- Presents the receptor groups considered within the EIA process;
- Summarises the potential for effects on these receptor groups, based on the findings of the topic-specific chapters (volume 3, chapters 1 to 10), across the three key project phases (construction, operation and maintenance, and decommissioning); and
- Presents the potential for multiple effects on any of the identified receptor groups to interact and create 'inter-related' effects.

11.2.1.5 The impact assessment presented within this chapter draws upon the information, assessment and conclusions presented in volume 3, chapters 1 to 10.

11.2.1.6 This chapter only assesses inter-related effects between topic chapters on onshore receptors. Cumulative effects (i.e. effects arising from other developments acting together with Hornsea Three) are addressed in the individual topic chapters of the Environmental Statement.

11.3 Study area

11.3.1.1 The study area for the assessment of inter-related effects has been informed by the study areas used in the topic-specific assessments. As a general rule, there is a greater potential for inter-related effects in close proximity to the onshore elements of Hornsea Three as, for many topic areas, the number and significance of likely effects decreases with distance.

11.3.1.2 Due to the differing spatial extent of effects experienced by different onshore receptors, the study area for potential inter-related effects varies according to topic and receptor. The potential inter-related effects considered in this chapter are, therefore, limited to the study areas defined in each of the topic specific chapters outlined in paragraph 11.6.1.1.

11.4 Planning policy context

11.4.1 National policy statements

11.4.1.1 Planning policy on offshore renewable energy Nationally Significant Infrastructure Projects (NSIPs) is contained in the Overarching National Policy Statement (NPS) for Energy (EN-1) (Department of Energy and Climate Change (DECC), 2011a).

11.4.1.2 NPS EN-1 includes guidance on the matters to be included in the assessment. This is summarised in Table 11.1.

Table 11.1: Summary of NPS EN-1 provisions relevant to inter-related effects (onshore).

Summary of NPS EN-1 policy relevant to the assessment of inter-related effects (onshore)	How and where considered in the Environmental Statement
The Infrastructure Planning Commission (IPC) should consider how the accumulation of, and interrelationship between, effects might affect the environment, economy and community as a whole, even though they may be acceptable when considered on an individual basis with mitigation measures in place (paragraph 4.2.6, NPS EN-1).	Topic-specific chapters have been prepared for the onshore elements of Hornsea Three in volume 3, chapters 1 to 10. The assessment of inter-related effects is presented in section 11.7 of this chapter

11.4.1.3 There is no policy relevant to inter-related effects in the NPS for Renewable Energy Infrastructure (NPS EN-3, DECC, 2011b) or the NPS for Electricity Networks Infrastructure (NPS EN-5, DECC, 2011c).

11.5 Consultation

11.5.1.1 Table 11.2 below summarises the issues raised relevant to onshore inter-related effects, which have been identified during consultation activities to date. Table 11.2 also indicates either how these issues have been addressed within this Environmental Statement or how the Applicant has had regard to them. Further information on the consultation activities undertaken for Hornsea Three can be found in the Consultation Report (document reference number A5.1) that accompanies the application for development consent.

11.5.1.2 Consultation relating to topic-specific issues is reported in the relevant onshore chapters (volume 3, chapters 1 to 10).

Table 11.2: Summary of key consultation issues raised during consultation activities undertaken for Hornsea Three relevant to inter-related effects (onshore).

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
December 2016	PINS – Scoping Opinion	The Secretary of State recommends that in order to assist the decision making process, the Applicant may wish to consider the use of tables to identify and collate the residual impacts after mitigation on the basis of specialist topics, inter-relationships and cumulative impacts and to demonstrate how the assessment has taken account of this Opinion and other responses to consultation.	The significance of effects for the individual assessments (taking into account mitigation) has been summarised in a table at the end of each chapter. The inter-related assessments for the defined receptor groups are presented in Table 11.7 and Table 11.8.
		The EIA Regulations state that information submitted within the Environmental Statement includes a description of the development, including a description of the aspects of the environment likely to be significantly affected by the development, including, in particular, population, fauna, flora, soil, water, air, climatic factors, material assets, including the architectural and archaeological heritage, landscape and the interrelationship between the above factors.	An assessment of these environmental aspects has been provided in volume 3, chapters 1 to 10 of the Environmental Statement. The assessments include inter-related effects which may occur on topic-specific receptors (e.g. land take and noise disturbance effects on a protected species). Section 11.8 of this chapter considers inter-related effects which are not covered within the topic chapters and has been prepared to meet the requirement of the EIA Regulations. The inter-related assessments for the defined receptor groups are presented in Table 11.7 and Table 11.8.
		The Secretary of State considers it is imperative for the Environmental Statement to define the meaning of 'significant' in the context of each of the specialist topics and for significant impacts to be clearly identified. The Secretary of State recommends that the criteria should be set out fully and that the Environmental Statement should set out clearly the interpretation of 'significant' in terms of each of the EIA topics. Quantitative criteria should be used where available. The Secretary of State considers that this should also apply to the consideration of cumulative impacts and impact inter-relationships.	Individual topic chapters identify the methodology for the topic-specific assessments. Several topic-specific chapters use quantitative criteria to identify significant effects according to their appropriate guidance. The EIA methodology is set out in volume 1, chapter 5: Environmental Impact Assessment Methodology, which describes the assessment process and criteria used to define significant effects. Section 11.8 of this chapter has identified whether there are likely to be any inter-related effects where the significance of the combined effect may be greater than the reported effects within the topic chapters.
		The inter-relationship between aspects of the environments likely to be significantly affected is a requirement of the EIA Regulations (see Schedule 4 Part 1 of the EIA Regulations). These occur where a number of separate impacts, e.g. noise and air quality, affect a single receptor such as fauna.	Potential inter-related effects on topic-specific receptors are inherent in the assessment and are described in the relevant topic chapter by phase. Effects on fauna from noise (i.e. disturbance) are addressed in volume 3, chapter 3: Ecology and Nature Conservation, and effects from air quality are addressed in volume 3, chapter 9: Air Quality. Other inter-related effects (where the receptor is common to several topic chapters or where effects may occur during more than one phase) are presented in section 11.8 of this chapter. The assessments for the defined receptor groups are presented in Table 11.7 and Table 11.8.
		The Secretary of State considers that the inter-relationships between factors must be assessed in order to address the environmental impacts of the proposal as a whole. This will help to ensure that the Environmental Statement is not a series of separate reports collated into one document, but rather a comprehensive assessment drawing together the environmental impacts of the proposed development. This is particularly important when considering impacts in terms of any permutations or parameters to the proposed development.	Potential inter-related effects on topic-specific receptors are inherent in the assessment and are described in the relevant topic chapter by phase. Other inter-related effects (where the receptor is common to several topic chapters or where effects may occur during more than one phase) are presented in section 11.8 of this chapter. The inter-related assessments for the defined receptor groups are presented in Table 11.7 and Table 11.8.
		The Secretary of State considers that the Environmental Statement should not be a series of disparate reports and stresses the importance of considering inter- relationships between factors and cumulative impacts.	Onshore inter-related effects are presented within section 11.8 of this chapter. Cumulative effects from Hornsea Three in combination with multiple other schemes are considered within the topic chapters.
November 2016	Natural England – Scoping Opinion	We note that EIA should consider the environment as a whole, and not as a discrete set of individually sensitive receptors. Within the scoping report there is a section (5.6) on inter-related effects where the Applicant has outlined suggestions regarding the assessment of linkages between receptors, and how impacts on one receptor may influence others e.g. such as impacts to fish which may be important as prey species for birds and marine mammals. We consider that such inter-relationships are likely to be key in interpreting the environmental impacts of the development and welcome the applicant's intention to integrate these aspects as part of the EIA process.	Linkages between topic-specific receptors are acknowledged and where such linked relationships arise these have been assessed within the individual topic chapters and are not repeated here. This inter-related chapter considers inter-related effects which are not covered within the topic chapters (where the receptor is common to several topic chapters or where effects may occur during more than one phase).

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
September 2017	Natural England	Geology, hydrology and ecology and nature conservation topics have been included in the inter-related effects assessment. The only two receptor groups brought forward for inter-related impacts assessment are: • 'closest long-term receptors – people living at dwellings within 350 m of construction activities'; and • 'closest intermittent receptors – people using public rights of way'. We challenge this approach in the light of insufficient data that has been presented in the relevant geology, hydrology and ecology chapters. We advise that onshore inter-related effects are re-assessed for the final application once fit for purpose evidence is available.	The methodology for the assessment is set out in section 11.7. This explains that effects on topic-specific receptors are assessed within the relevant topic chapter. For example, the ecology chapter considers the effects of changes in water quality on ecological receptors. In addition, volume 6, annex 2.4: Hydrological Characterisation Report sets out links between geology, hydrology and ecology in relation to the onshore elements of Hornsea Three. This chapter provides information on inter-related effects that are not covered in topic-specific chapters (where the receptor is common to several topic chapters or where effects may occur during more than one phase).

11.6 Methodology to inform the baseline

11.6.1 Data sources

11.6.1.1 Details of the baseline environments for the receptor groups considered in this inter-related effects chapter are specific to each receptor group and are, therefore, set out in the relevant topic-specific chapters. This chapter draws on the baseline information within the individual chapters. The relevant chapters drawn upon in this inter-related effects (onshore) assessment are as follows:

- Chapter 1: Geology and Ground Conditions;
- Chapter 2: Hydrology and Flood Risk;
- Chapter 3: Ecology and Nature Conservation;
- Chapter 4: Landscape and Visual Resources;
- Chapter 5: Historic Environment;
- Chapter 6: Land Use and Recreation;
- Chapter 7: Traffic and Transport;
- Chapter 8: Noise and Vibration;
- Chapter 9: Air Quality; and
- Chapter 10: Socio-economics.

11.7 Impact assessment methodology

11.7.1 Overview

11.7.1.1 The approach to the assessment of effects in this inter-related effects chapter has broadly followed the methodology set out in volume 1, chapter 5: Environmental Impact Assessment Methodology. Specific to the inter-related effects assessment, the following guidance documents have also been considered:

- Design Manual for Roads and Bridges HA205/08 (Highways Agency *et al*., 2008); and
- Advice Note 9: Rochdale Envelope (Planning Inspectorate (PINS), 2012).

11.7.1.2 In addition, the inter-related effects assessment has considered the legislative framework as defined by the EIA Regulations (see paragraph 11.2.1.2).

11.7.2 Approach to assessment

11.7.2.1 The approach to assessing inter-related effects within this chapter has followed a four stage process, as summarised in Table 11.3 and outlined in the following paragraphs. Further details of the approach summarised above and used to develop this chapter are presented in volume 1, chapter 5: Environmental Impact Assessment Methodology.

Table 11.3: Summary of staged approach to the inter-related effects assessment for Hornsea Three.

Stage	Description
1	Assessments undertaken for individual EIA topic areas within volume 3, chapters 1 to 10.
2	Review of the assessments set out within volume 3, chapters 1 to 10 to identify any receptor groups that may be affected by more than one topic area.
3	Identification of potential inter-related (onshore) effects on these receptor groups, including consideration of the extent to which potential inter-related effects are already considered within the Environmental Statement.
4	Assessment of 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 effects on a single receptor).

Stage 1: Topic-specific assessments

11.7.2.2 The first stage of the assessment of inter-related (onshore) effects is presented in each of the individual onshore topic chapters and comprises the individual assessments of effects on receptors across the construction, operation and maintenance, and decommissioning phases of the onshore elements of Hornsea Three.

11.7.2.3 The findings of these assessments are presented in volume 3, chapters 1 to 10 of the Environmental Statement.

Stage 2: Identification of receptor groups

11.7.2.4 Stage 2 involved a review of the assessments undertaken in the topic-specific chapters to identify 'receptor groups' requiring assessment within the inter-related effects assessment. The term 'receptor group' is used to highlight that the approach taken for the inter-related effects assessment does not assess every individual receptor assessed at the EIA stage, but rather potentially sensitive groups of receptors. The receptor groups assessed can be broadly categorised as follows:

- Geology and ground conditions: geologically designated sites; land/soils; groundwater (including aquifers and Source Protection Zones);
- Hydrology and flood risk: surface water bodies; flood risk (residents; other land uses);
- Ecology and nature conservation: ecologically designated sites; important habitat features; protected species;
- Landscape and visual resources: designated sites; landscape character; visual receptors (residents; users of public rights of way; other visual receptors);
- Historic environment: buried archaeology; designated heritage assets; settings of heritage assets;
- Land use and recreation: agricultural land; farm businesses; users of public rights of way;
- Traffic and transport: road users, residents; pedestrians/cyclists; sensitive local uses (e.g. schools, hospitals, local facilities);

- Noise and vibration: residents, users of public rights of way; users of other land uses (e.g. places of work);
- Air quality: residents; places of public amenity/public attractions; places of work; schools/hospitals; species/habitats; and
- Socio-economics: employment levels, housing and other local services; tourism; renewable energy sector.

11.7.2.5 The potential for inter-related effects was considered in further detail at Stage 3.

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

11.7.2.6 Consideration was given to the potential for inter-related effects to arise for each of the identified receptor groups across the three project phases (i.e. project lifetime effects) as well as the interaction of multiple effects on a receptor (i.e. receptor-led effects), as defined in Table 11.4.

Table 11.4: Definitions of project lifetime and receptor led inter-related effects.

Effect Type	Definition
Project lifetime effects	Assessment of the scope for effects that occur throughout more than one phase of the project, (construction, operation and maintenance, and decommissioning) to interact to potentially create a more significant effect on a receptor than if just assessed in isolation in these three key project stages (e.g. construction phase noise, operational noise and noise during decommissioning and dismantling at the onshore HVAC booster station and HVDC converter/HVAC substation).
Receptor-led effects	Assessment of the scope for all effects to interact, spatially and temporally, to create inter-related effects on a receptor or receptor group. As an example, all effects on a given receptor such as local residents – construction dust and noise, increased traffic and visual change etc. may interact to produce a greater effect on this receptor than when the effects are considered in isolation. Receptor-led effects might be short term, temporary or transient effects, or incorporate longer term effects.

Project lifetime effects

11.7.2.7 With respect to the potential for effects to occur in more than one phase of the project (project lifetime effects), Table 11.5 identifies the potential for inter-relationships to occur and considers whether any potential effects are already considered within the Environmental Statement.

Table 11.5: Potential for project lifetime effects.

Receptor group	Potential for project lifetime effect
Geologically designated sites	Volume 3, chapter 1: Geology and Ground Conditions identifies that no designated geological sites would be directly affected by the onshore elements of Hornsea Three. As there would be no impact on these sites arising from any phase of Hornsea Three, there is not considered to be any potential for project lifetime effects for this receptor group.
Land/soil (contamination)	Volume 3, chapter 1: Geology and Ground Conditions considers the potential for effects arising from contamination. No existing contaminated land sites have been identified within the study area for the onshore elements of Hornsea Three. The assessment does not identify the potential for any contamination of land/soils arising from the construction, operation or decommissioning of the onshore elements of Hornsea Three. Therefore, there is not considered to be any potential for project lifetime effects for this receptor group.
Groundwater (including aquifers and Source Protection Zones)	Volume 3, chapter 1: Geology and Ground Conditions considers the effects on groundwater. Some limited effects on secondary aquifers, groundwater quality and flow are identified during all phases, although these are not significant. Project lifetime effects on groundwater receptors are considered within section 11.8 of this chapter.
Surface water bodies (quality, flow)	Volume 3, chapter 2: Hydrology and Flood Risk considers the effects on surface water receptors. Some limited effects on surface watercourses are identified during all phases, although these are not significant. Project lifetime effects on surface water receptors are considered within section 11.8 of this chapter.
Ecologically designated sites	Volume 3, chapter 3: Ecology and Nature Conservation considers effects on ecologically designated sites. Such effects would be very limited during the construction phase, as the design of the onshore elements of Hornsea Three has sought to avoid direct effects as far as practicable. Some limited effects may also occur during decommissioning but these would be no greater than (and are likely to be less than) those arising during construction. No effects on designated sites would occur during the operation and maintenance phase. Therefore, there is no potential for effects to occur throughout the whole project lifetime. The combined effect of the construction and decommissioning effects would not be likely to exceed the magnitude of impact and significance of effect described for the construction phase (up to minor adverse significance, which is not significant). Therefore, no significant project lifetime effects are considered likely.
Habitats and species	The majority of effects on habitats and species would occur during the construction phase, including any permanent habitat loss, which is assessed in volume 3, chapter 3: Ecology and Nature Conservation. There is some potential for some effects on habitats and species to also occur during the decommissioning phase. Only effects relating to the permanent infrastructure (relating to disturbance and water quality) have some potential to continue through to the operation and maintenance phase. These effects on habitats and species are considered within section 11.8 of this chapter.
Landscape designated sites	Volume 3, chapter 4: Landscape and Visual Resources identifies that The Broads Area of Outstanding Natural Beauty (AONB) is located almost entirely outside of the study area, largely outside of the Zone of Theoretical Visibility and entirely outside of the Zone of Visual Influence for the onshore elements of Hornsea Three. Given the limited extent of the onshore elements of Hornsea Three within the Norfolk Coast AONB and the nature of potential effects (i.e. short term construction activity followed by landscape reinstatement) it is unlikely that construction would undermine the special qualities or reasons for designation of these landscapes. Significant effects on designated sites are not therefore anticipated. The only effect on the North Norfolk AONB identified in volume 3, chapter 4: Landscape and Visual Resources relates to construction phase effects on landscape character arising from construction of the cable corridor. No further effects are identified in later phases. Therefore, no project lifetime effects are anticipated.
Landscape character	Volume 3, chapter 4: Landscape and Visual Resources considers effects on landscape character. Effects relating to the cable route would occur during the construction phase. However, some effects on landscape character arising from the permanent onshore infrastructure are identified during all phases of the project. Therefore, project lifetime effects on landscape character are considered within section 11.8 of this chapter.
Buried archaeology	Volume 3, chapter 5: Historic Environment sets out the effects on buried archaeology. Effects on buried archaeology would occur during the construction phase of the project and would be permanent. No further effects would occur during other phases of the project and, therefore, no project lifetime effects would occur.
Heritage assets and their settings	Volume 3, chapter 5: Historic Environment considers the effects on heritage assets and the historic landscape. A number of effects would occur during the construction phase only. However, there is some potential for effects (including beneficial effects) on the settings of heritage assets and on the historic landscape to occur through all phases of the project. Project lifetime effects on these assets are considered within section 11.8 of this chapter.
Agricultural land and farm businesses	Volume 3, chapter 6: Land Use and Recreation considers the effects on agricultural land quality and farm holdings. The permanent loss of agricultural land and effects on farm holdings associated with the onshore elements of Hornsea Three would occur during the construction phase. No additional effects would occur during the operation and maintenance phase. Decommissioning effects have been scoped out of the assessment of effects on land use. Therefore, there is not considered to be any potential for project lifetime effects for this receptor group.
Socio-economic factors (tourism, renewable energy sector).	Volume 3, chapter 10: Socio-economics considers effects on these receptor groups. Some effects are identified across all of the phases of the project. Therefore, project lifetime effects are considered within section 11.8 of this chapter.
Humans (residents, users of schools/hospitals, community facilities, places of work)	Volume 3, chapters 4: Landscape and Visual Resources, 7: Traffic and Transport, 8: Noise and Vibration and 9: Air Quality consider effects on local residents and those using community facilities/employed in the local area. Some effects are identified across all of the phases of the project. Therefore, project lifetime effects are considered within section 11.8 of this chapter.
Humans (travellers, pedestrians/cyclists, users of public rights of way)	Volume 3, chapters 4: Landscape and Visual Resources, 6: Land Use and Recreation, 7: Traffic and Transport, 8: Noise and Vibration and 9: Air Quality consider effects on users of public rights of way and the road network, where relevant. Some effects are identified across all of the phases of the project. Therefore, project lifetime effects are considered within section 11.8 of this chapter.

11.7.2.8 Based on the above, the following receptor groups may experience effects across a number of project phases:

- Groundwater receptors;
- Surface water bodies;
- Habitats and species;
- Landscape character;
- Heritage assets (setting and the historic landscape);
- Socio-economic factors (tourism, renewable energy sector);
- Humans (residents, users of schools/hospitals, community facilities, places of work). These include the closest long-term receptors - people living at dwellings closest to the onshore elements of Hornsea Three; and
- Humans (travellers, pedestrians/cyclists, users of public rights of way). These include the closest intermittent receptors - people using Public Rights of Way (PRoWs) (and other linear routes) closest to the onshore elements of Hornsea Three.

11.7.2.9 The potential for project lifetime effects on the above receptor groups is considered within this inter-related effects chapter.

Receptor-led effects

11.7.2.10 With respect to the potential for interaction of multiple effects on a receptor (receptor-led effects), Table 11.6 identifies potential for inter-relationships to occur for each receptor group and considers whether any potential effects are already considered within the Environmental Statement.

Table 11.6: Potential for interaction between topic areas to result in inter-related effects on receptor groups.

Receptor group	Potential for inter-related effect on receptor group?										Potential inter-related effect considered in the Environmental Statement?
	Geology and ground conditions	Hydrology and flood risk	Ecology and nature conservation	Landscape and visual resources	Historic environment	Land use and recreation	Traffic and transport	Noise and vibration	Air quality	Socio-economics	
Geologically designated sites	N/A	No	No	No	No	No	No	No	No	No	Effects on designated sites are considered in volume 3, chapter 1: Geology and Ground Conditions. There is no potential for inter-related effects (with other topic areas) on this receptor group.
Land/soil (contamination)	N/A	No	No	No	No	No	No	No	No	No	Interaction between land quality and groundwater is considered in volume 3, chapter 1: Geology and Ground Conditions and in volume 6, annex 2.4: Hydrological Characterisation Report.
Groundwater (including aquifers and Source Protection Zones)	N/A	Yes (interaction between ground/surface water)	No	No	No	No	No	No	No	No	Potential contamination of groundwater-fed surface watercourses is considered in volume 3, chapter 1: Geology and Ground Conditions. Interaction between ground and surface water considered in volume 6, annex 2.4: Hydrological Characterisation Report.
Surface water bodies (quality, flow)	Yes	N/A	Yes	No	No	No	No	No	No	No	As above, interaction between ground and surface water considered in volume 3, chapter 1: Geology and Ground Conditions and chapter 2: Hydrology and Flood Risk. Interaction between ground and surface water considered in volume 6, annex 2.4: Hydrological Characterisation Report. Effects on ecological receptors in relation to changes in surface water quality are considered in volume 3, chapter 3: Ecology and Nature Conservation.
Ecologically designated sites	No	Yes (water quality)	N/A	No	No	No	No	Yes	Yes	No	Effects on ecological receptors affected by changes in surface water quality are considered in volume 3, chapter 3: Ecology and Nature Conservation. There are theoretical interactions between atmospheric emissions from traffic and ecological receptors. However, no such effects have been identified for the onshore elements of Hornsea Three. Effects of noise (disturbance) and dust on ecological receptors are considered in volume 3, chapter 3: Ecology and Nature Conservation. Consideration of dust effects on ecological receptors (where relevant) is provided in volume 3, chapter 9: Air Quality.
Habitats and species	No	Yes (water quality)	N/A	No	No	No	No	Yes	Yes	No	

Receptor group	Potential for inter-related effect on receptor group?										Potential inter-related effect considered in the Environmental Statement?
	Geology and ground conditions	Hydrology and flood risk	Ecology and nature conservation	Landscape and visual resources	Historic environment	Land use and recreation	Traffic and transport	Noise and vibration	Air quality	Socio-economics	
Landscape designated sites	No	No	No	N/A	Yes	No	No	Yes	No	No	Effects on designated sites and landscape character are considered in volume 3, chapter 4: Landscape and Visual Resources. Some receptors may be of both landscape and heritage value. Effects on heritage assets are considered in volume 3, chapter 5: Historic Environment. Theoretically, noise may affect tranquillity within designated sites. However, volume 3, chapter 4: Landscape and Visual Resources identifies that The Broads Area of Outstanding Natural Beauty (AONB) is located almost entirely outside of the study area, largely outside of the Zone of Theoretical Visibility and entirely outside of the Zone of Visual Influence for the onshore elements of Hornsea Three. Given the limited extent of the onshore elements of Hornsea Three within the Norfolk Coast AONB and the nature of potential effects (i.e. short term construction activity followed by landscape reinstatement) it is unlikely that construction would undermine the special qualities or reasons for designation of these landscapes. Significant effects on designated sites are not therefore anticipated.
Landscape character	No	No	No	N/A	Yes	No	No	No	No	No	
Buried archaeology	No	No	No	No	N/A	No	No	No	No	No	Effects on all heritage assets (including buried archaeology and designated sites) are considered in volume 3, chapter 5: Historic Environment. Changes in views, traffic flow or noise levels can affect the setting of heritage assets. Where relevant, this is considered within volume 3, chapter 5: Historic Environment.
Heritage assets and their settings	No	No	No	Yes (visual)	N/A	No	No	No	No	No	
Agricultural land and farm businesses	No	No	No	No	No	N/A	No	No	No	No	Effects on agricultural land and farm businesses are considered in volume 3, chapter 6: Land Use and Recreation. There is no potential for any additional effects on this receptor group.
Tourism	No	No	No	Yes (views)	No	Yes	No	Yes	No	N/A	There are potential links with noise, landscape and recreation in terms of tourism– these are considered within volume 3, chapter 10: Socio-economics.
Renewable energy sector	No	No	No	No	No	No	No	No	No	N/A	Effects are considered in volume 3, chapter 10: Socio-economics. There is no potential for inter-related effects on this receptor group.
Humans (residents, users of schools/hospitals, community facilities, places of work)	No	No	No	Yes (views)	Yes (views)	No	Yes	Yes	Yes (dust)	No	Potential effects on water quality are assessed in full within volume 3, chapter 1: Geology and Ground Conditions and chapter 2: Hydrology and Flood Risk. However, the assessment identifies that residents may be subject to visual effects, together with effects arising as a result of noise, dust and traffic-related effects. In addition, users of the local transport and rights of way networks may be affected by visual effects, together with effects arising as a result of noise, dust and traffic-related effects. Therefore, these effects are considered within this inter-related effects assessment.
Humans (travellers, pedestrians/cyclists, users of public rights of way)	No	No	No	Yes (views)	Yes (views)	Yes	Yes	Yes	Yes (dust)	No	

11.7.2.11 Based on the above, it is clear that most receptor-led inter-related effects are considered within the relevant chapters of the Environmental Statement. However, two receptor groups may experience effects across a number of environmental topic areas:

- Humans (residents, users of schools/hospitals, community facilities, places of work). These include the closest long-term receptors - people living at dwellings closest to the onshore elements of Hornsea Three; and
- Humans (travellers, pedestrians/cyclists, users of public rights of way). These include the closest intermittent receptors - people using PRoWs (and other linear routes) closest to the onshore elements of Hornsea Three.

11.7.2.12 Some inter-related effects on these receptor groups have been considered elsewhere in the Environmental Statement. For example, noise effects from traffic are considered in chapter 8: Noise and Vibration, while dust from traffic is considered in chapter 9: Air Quality. Nevertheless, due to the number of potential interactions between topic areas, the potential for effects to combine to result in receptor-led effects over and above those identified within the topic chapters are considered within this inter-related effects chapter. The key considerations in the assessment of inter-related effects on these receptors are:

- Noise;
- Dust;
- Views;
- Traffic and transport;
- Land use and recreation; and
- Socio-economics (housing, employment).

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

11.7.2.13 Individual effects on each of the receptor groups identified above have been considered. It is important to note that the inter-related effects assessment considers only effects produced by the onshore elements of Hornsea Three (together with Hornsea Three onshore compounds, storage areas and accesses) and not from other projects, which are considered within the cumulative impact assessment sections of each topic chapter.

11.7.2.14 The significance of the individual effects, as defined in the topic-specific chapters, is presented in the assessment tables for each receptor group (all conclusions for significance of effect assume successful implementation of mitigation measures where appropriate, i.e. the residual effect has been used). A descriptive assessment of the scope for these individual effects to interact to create a different or greater effect has then been undertaken. This assessment incorporates qualitative and, where reasonably possible, quantitative assessments. The assignment of significance of effect for any such inter-related effect is not undertaken, rather, any inter-related effects that may be of greater significance than the individual effects acting in isolation on a given receptor are identified and discussed within this inter-related effects chapter.

11.8 Assessment of inter-related effects

11.8.1.1 For each of the receptor groups listed above, the scope for effects on these receptors to create project lifetime effects over all the project phases and/or receptor-led effects through interacting together on the receptor group in question has been explored and is discussed in the following sections.

11.8.1.2 Table 11.7 considers the project lifetime effects and the potential for significant inter-related effects to occur. Table 11.8 considers the receptor-led effects and the potential for significant inter-related effects to occur.

Table 11.7: Summary of the potential project lifetime inter-related effects

Topic area	Impact type	Significance of effect (from topic assessment)			Inter-related assessment
		Construction	Operation and maintenance	Decommissioning	
Groundwater receptors					
Groundwater quality/flow	Impacts on quality of secondary and principal aquifers and groundwater quality.	Minor adverse	Negligible to minor adverse	Negligible to minor adverse	No significant effects are predicted within volume 3, chapter 1: Geology and Ground Conditions, which considers the effects on a phase-by-phase basis. The magnitude of impact in all phases would be controlled through good practice measures, for example, in handling and storing of materials. Contamination is therefore relatively unlikely and, if it were to occur, would be intermittent/occasional rather than a continuous effect throughout the project. Taking into account the low risk of such an event occurring and the measures proposed to control such effects, it is not considered that the significance of effect across the project lifetime would be any greater than that recorded during construction (minor adverse and not significant). Therefore, no significant inter-related effects are likely.
Surface water bodies					
Surface watercourses	Impacts on water quality.	Minor adverse	Minor adverse	Minor adverse	The greatest number of potential effects on surface watercourses would arise during the construction phase as a result of open cut trenching across minor watercourses and HDD activities. During operation and decommissioning, effects would be limited to potential effects on water quality arising from maintenance or decommissioning activities. For the operation and decommissioning phases, the predicted impact magnitude would be negligible (leading to a minor adverse effect due to the high sensitivity of the receptors). Although consideration of all phases would increase the duration of the potential effect, the risk of effects on water quality is relatively low with the proposed pollution prevention measures in place. Overall, therefore, it is not considered that the significance of effect across the project lifetime would be any greater than that recorded during construction (minor adverse and not significant). Therefore, no significant inter-related effects are likely.
Habitats and species					
Habitats/species	Disturbance and contamination (e.g. runoff of pollutants).	Generally negligible to minor adverse. Moderate adverse for disturbance to pink-footed geese.	Negligible to minor adverse	Negligible to minor adverse	The greatest number of potential effects on species and habitats would arise during the construction phase as a result of habitat loss, disturbance and impacts associated with open cut trenching across minor watercourses and HDD activities. During operation and decommissioning, effects would be limited to potential effects arising from disturbance/contamination. Therefore, project lifetime effects would be limited to these aspects. These effects are identified within volume 3, chapter 3: Ecology and Nature Conservation as being of up to minor adverse significance. The exception to this is disturbance of pink-footed geese during construction, which may be up to moderate adverse (although reduced with effective mitigation in place). The latter effect relates to an area of known habitat close to the coast that could be affected (depending on whether fields are planting with sugar beet at the time) during cable installation. This effect would not therefore re-occur during operation or decommissioning and therefore no project lifetime effects on pink-footed geese are anticipated. For other species, project lifetime disturbance effects are not considered likely to exceed that recorded for each individual phase (minor adverse and not significant). Therefore, no significant inter-related effects are likely. With respect to potential runoff of pollutants on habitats, it is not considered that the significance of effect across the project lifetime would be any greater than that recorded during construction (minor adverse and not significant). Therefore, no significant inter-related effects are likely.

Topic area	Impact type	Significance of effect (from topic assessment)			Inter-related assessment
		Construction	Operation and maintenance	Decommissioning	
Landscape character					
Local landscape character areas	Change in landscape character.	Negligible to minor adverse (onshore cable corridor) No significance level assigned (onshore HVAC booster station and HVDC converter/HVAC substation)	Up to major adverse within the site itself. Up to minor adverse across affected landscape character areas.	No significance level assigned	Effects along the onshore cable route would arise during the construction phase and would be temporary. During operation and decommissioning, effects would be limited to those associated with the onshore HVAC booster station and onshore HVDC converter/HVAC substation. Volume 3, chapter 4: Landscape and Visual Resources explains that the primary landscape effects arising from the onshore elements of Hornsea Three would be from the permanent onshore HVAC booster station and onshore HVDC converter/HVAC substation and therefore greater focus is placed on landscape and visual effects during the operation and maintenance phase. It is not considered that the project lifetime effects would exceed those reported for the operation and maintenance phase, i.e. significant change in landscape character within the site itself and up to minor adverse (not significant) effects across each landscape character area overall. Therefore, no significant inter-related effects are likely. There is some potential for the adverse effects to be reversed during decommissioning if all above ground permanent structures are removed.
Heritage assets (setting and the historic landscape)					
Heritage assets (scheduled monuments, listed buildings, Conservation Areas and Registered Parks and Gardens) Historic environment	Effects on the settings of heritage assets and effects on overall historic landscape pattern/character.	Negligible to moderate adverse (setting of heritage assets) Negligible to minor adverse (historic landscape)	Moderate adverse (setting of heritage assets) Minor adverse (historic landscape)	Negligible to minor adverse (setting of heritage assets) Negligible (historic landscape)	Effects along the onshore cable route would arise during the construction phase and would be temporary. During operation and decommissioning, effects would be limited to those associated with the onshore HVAC booster station and onshore HVDC converter/HVAC substation. Volume 3, chapter 5: Historic Environment identifies effects on the settings of heritage assets and effects on the historic landscape as effects that could occur during more than one phase of the project. Effects on the settings of heritage assets would be up to moderate adverse during construction and operation. During decommissioning, negligible to minor adverse effects are anticipated. Overall, the effects identified during the operation and maintenance phase would be moderate adverse (significant). These have been assessed as long term/permanent effects and, as such, the inter-related effect with the construction and decommissioning phases (during which effects would occur for a shorter period prior to the operational effects) would not be of any greater significance than that assessed for the operation and maintenance phase (moderate adverse and significant). With respect to the historic landscape, up to minor adverse effects are identified during the construction and operation and maintenance phases. The operation and maintenance phase effects have been assessed as long term/permanent effects and, as such, the inter-related effect (with the construction and decommissioning phases) would not result in any greater effect than that assessed for the operation and maintenance phase (minor adverse and not significant).
Socio-economic factors					
Tourism	Effect on local tourism and recreational resources. Effect on offshore and coastal tourism and recreation activity.	Minor adverse	Minor adverse	Minor adverse	Volume 3, chapter 10: Socio-economics identifies minor effects during each of the phases in relation to tourism activity. These are not considered to be significant. Overall, the significance of the project lifetime effect is not likely to be any greater than the operational (long term/permanent) effect of the project (i.e. minor adverse and not significant).
Renewable energy sector	Effect on the performance of the renewable energy sector	Minor beneficial (moderate beneficial in high impact scenario)	Minor beneficial	N/A	Volume 3, chapter 10: Socio-economics identifies minor effects during the operation and maintenance phase, with minor or moderate beneficial effects during construction (depending on the scenario considered). No new effects are identified during the decommissioning phase. Overall, the significance of the project lifetime effect is not likely to be greater than those reported above (i.e. minor beneficial, with possible shorter term moderate beneficial effects during the construction phase). No effects greater than those identified during construction are considered likely.

Topic area	Impact type	Significance of effect (from topic assessment)			Inter-related assessment
		Construction	Operation and maintenance	Decommissioning	
People living at dwellings					
Traffic and transport	Driver delay	Negligible to minor adverse	Traffic movements associated with maintenance visits would be minimal and under the thresholds for assessment. Therefore, the assessment of traffic movements during the operation and maintenance phase has been scoped out of the assessment.	Vehicle movements generated during the decommissioning phase would be lower than those during the construction phase. Therefore, the significance would not exceed negligible to minor, at worst.	Potential effects on local drivers as a result of slow moving traffic, severance of routes, pedestrian delay, pedestrian amenity and road safety associated with the onshore elements of Hornsea Three may occur across the local road network during the construction phase as the Hornsea Three onshore cable route is constructed. During operation, any effects are likely to be limited and localised (with minimal traffic movements associated with the operation and maintenance phase). Therefore, there would be no significant effects on receptors across the construction and operation phases. Effects during decommissioning are uncertain at this stage but would occur after completion of the operation and maintenance phase and, therefore, would not be continuous with construction effects. Such effects would be no greater than (and are likely to be less than) those occurring during construction. No inter-related effects across the project phases are anticipated.
	Severance				
	Pedestrian delay				
	Pedestrian amenity				
	Accidents and road safety				
	Abnormal loads				
Dust	Dust soiling surfaces as a result of movement of plant and vehicles, excavation and associated earthworks.	Not significant	The operation of the HVAC booster station and the HVDC converter/HVAC substation is not expected to generate any air emissions. Therefore, operational effects have been scoped out of the assessment.	Not significant	Whilst there is potential for effects during construction, on the basis of the assessment undertaken there is no potential for project lifetime dust effects as such effects are not likely to occur during the operation and maintenance phase. Any effects during decommissioning would occur as a discrete event with any potential effects concentrated at the onshore HVAC booster station and HVDC converter/HVAC substation. Overall, no inter-related effects across the project phases are anticipated.
Noise	Noise and vibration associated with the HVDC converter/HVAC substation.	Negligible	Negligible to minor adverse	Negligible to minor adverse	The potential exists for project lifetime inter-related effects in that there would be noise sources at the onshore HVDC converter/HVAC substation and HVAC booster substation during all phases. However, the levels of effects, with the benefit of designed in mitigation through noise attenuation, are expected to be low and controlled within acceptable limits for this type of project. The project lifetime effect is not considered to be any greater than the effects identified for each phase (up to minor adverse and not significant).
	Noise and vibration associated with construction activities at the HVAC booster station	Negligible	Negligible to minor adverse	Negligible to minor adverse	
Views (settlements: Swardeston, Swainsthorpe and Stoke Holy Cross, Edgefield)	Impact of the onshore HVAC booster station and removal of vegetation resulting in views of construction activities, plant and machinery.	No significance level assigned	Up to minor adverse	No significance level assigned	Scope exists for inter-related project lifetime effects on visual receptors living close to the onshore HVAC booster station as there are visual effects throughout the phases (initially as construction activity and then with the built structures in place, followed by potential decommissioning activity). Operational effects would occur for the longest period of time and would be up to minor adverse. The proposed planting would, in time, lessen the long term effects. It is not likely that the project lifetime effects would be significant.
	Impact of the onshore HVDC converter/HVAC substation and removal of vegetation resulting in views of construction activities, plant and machinery.	No significance level assigned	Minor neutral	No significance level assigned	Scope exists for inter-related project lifetime effects on visual receptors living close to the onshore HVDC converter/HVAC substation as there would be visual effects throughout the phases (initially as construction activity and then with the built structures in place, followed by potential decommissioning activity). Volume 3, chapter 4: Landscape and Visual Resources explains that the primary visual effects arising from the onshore elements of Hornsea Three would be from the permanent onshore HVAC booster station and onshore HVDC converter/HVAC substation and therefore greater focus is placed on visual effects in the operation and maintenance phase. It is not considered that the project lifetime effects would exceed those reported for the operation and maintenance phase (i.e. minor neutral and not significant for local settlements).

Topic area	Impact type	Significance of effect (from topic assessment)			Inter-related assessment
		Construction	Operation and maintenance	Decommissioning	
People using public rights of way (PRoW) and other linear routes					
Land use and recreation	Disruption due to temporary closures on the PRoW network and other linear routes.	Moderate (Peddars Way and Norfolk Coast Path) Minor (other linear routes) Minor (other PRoWs)	Effects on PRoWs during the operation and maintenance phase have been scoped out of the assessment (no further impact).	There would be no change to PRoWs as a result to the decommissioning phase and therefore effects have been scoped out of the assessment.	The temporary closures or diversions of PRoWs (where required) would only occur during the construction phase, therefore no inter-related effects across the project phases are anticipated.
Traffic and transport	Severance - Increases in total traffic and in HGV movements, making it more difficult to cross roads and access facilities or other sections of the local community. Pedestrian delay - An increase in total flows on links where pedestrians are required to cross without signal controlled crossings. Pedestrian amenity - An increase in HGV movements, particularly in areas where there are significant pedestrian movements and where footway provision is poor.	Negligible to minor adverse	Traffic movements associated with maintenance visits would be minimal and under the thresholds for assessment. Therefore, the assessment of traffic movements during the operation and maintenance phase have been scoped out of the assessment.	Vehicle movements generated during the decommissioning phase would be lower than those during the construction phase. Therefore, the significance would not exceed negligible to minor, at worst.	Potential effects on pedestrians/cyclists as a result of severance of routes, pedestrian delay, pedestrian amenity associated with the onshore elements of Hornsea Three may occur across the local road network during the construction phase as the Hornsea Three onshore cable route is constructed. During operation, any effects are likely to be limited and localised (with minimal traffic movements associated with the operation and maintenance phase). Therefore, there would be no significant effects on receptors across the construction and operation phases. Effects during decommissioning are uncertain at this stage but would occur after completion of the operation and maintenance phase and, therefore, would not be continuous with construction effects. Such effects would be no greater than (and are likely to be less than) those occurring during construction. No inter-related effects across the project phases are anticipated.
Dust	Dust soiling surfaces as a result of movement of plant and vehicles, excavation and associated earthworks both on and around the Hornsea Three landfall area, the other trenchless installation crossing points, the onshore cable corridor and the onshore HVAC booster station and HVDC converter/HVAC substation.	Not significant	The operation of the HVAC booster station and the HVDC converter/HVAC substation is not expected to generate any air emissions. Therefore, operational effects have been scoped out of the assessment.	Not significant	Whilst there is potential for effects during construction, on the basis of the assessment undertaken there is no potential for project lifetime dust effects as such effects are not likely to occur during the operation and maintenance phase. Any effects during decommissioning would occur as a discrete event with any potential effects concentrated at the onshore HVAC booster station and HVDC converter/HVAC substation. Overall, no inter-related effects across the project phases are anticipated.
Noise	Noise associated with the onshore HVAC booster station and HVDC converter/HVAC substation.	Negligible	Negligible to minor adverse	Negligible to minor adverse	There is potential for project lifetime inter-related effects to occur as there would be noise sources at the onshore HVAC booster station and HVDC converter/HVAC substation during all phases. However, the levels of effects, with the benefit of designed-in mitigation through noise attenuation, are expected to be low and controlled within acceptable limits for this type of project. The project lifetime effect is not considered to be any greater than the effects identified for each phase (i.e. negligible to minor adverse) and is not likely to be significant.

Topic area	Impact type	Significance of effect (from topic assessment)			Inter-related assessment
		Construction	Operation and maintenance	Decommissioning	
Views	Impact of the onshore HVAC booster station and removal of vegetation resulting in views of construction activities, plant and machinery.	No significance level assigned	Up to minor adverse	No significance level assigned	Scope exists for inter-related project lifetime effects on visual receptors using routes close to the onshore HVAC booster station as there are visual effects throughout the phases (initially as construction activity and then with the built structures in place, followed by potential decommissioning activity). Operational effects would occur for the longest period of time and would be up to minor adverse. The proposed planting would, in time, lessen the long term effects such that the project lifetime effects would not be significant.
	Impact of the onshore HVDC converter/HVAC substation and removal of vegetation resulting in views of construction activities, plant and machinery.	No significance level assigned	Up to major-moderate adverse (reducing over time)	No significance level assigned	Scope exists for inter-related project lifetime effects on visual receptors living close to the onshore HVDC converter/HVAC substation as there would be visual effects throughout the phases (initially as construction activity and then with the built structures in place, followed by potential decommissioning activity). Volume 3, chapter 4: Landscape and Visual Resources explains that the primary visual effects arising from the onshore elements of Hornsea Three would be from the permanent onshore HVAC booster station and onshore HVDC converter/HVAC substation and therefore greater focus is placed on landscape and visual effects the operation and maintenance phase. It is not considered that the project lifetime effects would exceed those reported for the operation and maintenance phase i.e. significant effect on users of some local routes between the B113 and A140 north of Swainsthorpe, reducing to not significant in the longer term.

Table 11.8: Summary of the potential receptor-led effects

People living at dwellings
The closest settlements to the onshore elements of Hornsea Three include Weybourne, Kelling, High Kelling, Hempstead, Baconsthorpe, Edgefield Street, Saxthorpe and Corpustry, Norton Corner, Heydon, Wood Dalling, Reepham, Booton, Hengrave and Swannington, Alderford, Attlebridge, Morton, Weston Longville, Ringland, Easton, Marlingford, Bawburgh, Little Melton, Hethersett, Lower East Carleton, Swardeston, Dunston and Swainsthorpe. In addition to these settlements, there are other areas of dispersed settlement, such as isolated farms, manor houses and small hamlets present within the topic study areas. **Construction** The greatest scope for potential inter-related effects is predicted to arise through the interaction of effects during the construction phase due to the number of receptors potentially affected by cable works and due to the number of topics with the potential to interact. **Noise**: The noise assessment has considered receptors within 1 km of the onshore elements of Hornsea Three together with storage areas, compounds and accesses. The assessment identified that properties within approximately 29 m of the onshore cable route, within approximately 50 m of the access route works, within approximately 97 metres of the Horizontal Directional Drilling (HDD) locations and within approximately 211 m of the landfall activities would be most vulnerable to construction effects. Within the above distances, noisy works would be unlikely to occur for a total number of days exceeding 40 in any six consecutive months. Works would be undertaken in accordance with the Code of Construction Practice (CoCP), which would include measures such as alternate working methodologies, working hours etc. for these properties. With such measures in place, the construction effect would be up to minor adverse (not significant). **Dust**: The study area for the dust assessment was 350 m from the onshore elements of Hornsea Three, as well as the compounds, storage areas and access routes. No significant dust effects were identified within this area. **Visual**: The closest settlements to the onshore cable route would be Kelling, Weston Longville and Little Melton. Impacts would arise from the introduction of construction activities (excavations, temporary work lighting, individual tree felling, limited hedgerow removal, etc.) into views that presently, in the most part, look out across open fields adjacent to the settlements. Views would tend to be limited to the periphery of nearby settlements. Beyond this, in settlements more distant from the cable corridor, the potential for views and therefore the magnitude of impact would rapidly diminish as the layering of vegetation within the flat or gently undulating landscape interrupts views of construction activities. The significance of effect at these locations would be up to moderate adverse significance at the most affected settlements (not significant). Long term effects on views affected by the permanent infrastructure are considered in the operational assessment below. **Traffic and Transport**: Five road links are identified as having some potential for effects arising from the construction phase. No significant effects on any of these links are identified in terms of driver delay, severance or effects on pedestrians. **Socio-economics**: The socio-economic assessment identified a negligible effect in relation to demand for housing, accommodation and local services during construction. A beneficial local employment effect is identified, which may be significant depending on the impact scenario considered. Taking into account the above, there is some potential for residents of the closest properties to the onshore cable route to experience noise and visual effects during construction. As set out above, noise effects would be short term in any given location and would not be continuous throughout the construction phase. Visual effects for the closest settlements to the cable route may be up to moderate adverse (not significant). At the onshore HVAC booster station/ onshore HVDC converter/HVAC substation, no properties have been identified that would experience a construction noise effect and, therefore, receptors would not experience both noise and visual effects at this location. Effects arising from traffic and beneficial effects of employment would occur over a wider local area. Potential effects on properties would be reduced through the use of quieter alternative methods, plant and/or equipment, where reasonably practicable; the use of site hoardings, enclosures, portable screens and/or screening noisier items of plant, where reasonably practicable; and maintaining and operating all vehicles, plant and equipment in an appropriate manner, to ensure that extraneous noise from mechanical vibration, creaking and squeaking is kept to a minimum. Effective dust control measures are proposed. These principles will be secured through the CoCP. An Outline CoCP (document reference A8.5) accompanies the application for development consent. Construction effects would be temporary, with effects occurring at any one location for a limited period of time (albeit that this may be repeated in the event of a second phase of construction). Overall, whilst adverse inter-related effects may arise at some locations on a temporary basis, they are unlikely to be significant. It is noted that employment effects are predicted to be beneficial and may be significant. **Operation/maintenance and Decommissioning** Fewer effects are predicted to occur after completion of the construction phase. During operation, only visual and noise effects are likely to adversely affect the closest residents as no traffic or dust effects are predicted during this phase. Seven properties have been predicted to experience a minor magnitude of noise impact during the night time, leading to a negligible to minor adverse effect (not significant). The visual assessment identifies minor effects at Edgefield, Swardeston, Swainsthorpe and Stoke Holy Cross. The overall inter-related effect for the closest properties is not likely to exceed minor adverse (not significant). No significant decommissioning effects are anticipated.

People using public rights of way (PRoW) and other linear routes

Potential exists for spatial and temporal interactions of effects on people using PRoWs and other linear routes within the topic-specific study areas. Volume 3, chapter 6: Land Use and Recreation identifies the key PRoWs and other linear routes that may be affected by the onshore elements of Hornsea Three.

Construction: Promoted routes

At the coast, the Hornsea Three landfall area construction works would result in the temporary disruption to a section of the Peddars Way and Norfolk Coast Path. The method of cable installation has not yet been confirmed but open cutting a trench through the route has been assessed (the maximum design scenario). Under this scenario a temporary diversion would be put in place along existing tracks to the immediate south for an indicative period of three months on up to two occasions. The route would remain open but the temporary diversion would be further away from the coast and approximately 600 m in length). Walkers using this temporary diversion would therefore be exposed to the construction activities but for a relatively short period of time. Volume 3, chapter 6: Land Use and Recreation reports a temporary moderate adverse (significant) effect for users of the PRoW. Volume 3, chapter 4: Landscape and Visual Resources and chapter 8: Noise and Vibration also consider the effects on users of PRoW. Users of these routes would experience changed views as a result of the proposed diversion, including close views of construction activities over a short extent of the route. Overall, for users of the Coast Path, moderate adverse effects on views have been identified. For users of other long distance paths, moderate-minor adverse effects are predicted. Volume 3, chapter 8: Noise and Vibration identifies negligible to minor adverse effects (not significant) on PRoWs during the construction phase. Volume 3, chapter 9: Air Quality does not identify any significant effects associated with dust within the study area. As set out above, effective dust control measures are proposed to be implemented through the CoCP. Overall, effects on users of this route would be temporary and would affect a relatively short length of the promoted path. The diversion would allow continued use of the path but there would be changes in the experience for users. Overall, it is considered that the significance of effects would not exceed that reported in volume 3, chapter 6: Land Use and Recreation (moderate adverse and significant).

A number of other promoted/long distance PRoWs crossed by the onshore cable route, including the Holt-Mannington Walk and the Tas Valley Way. Volume 3, chapter 6: Land Use and Recreation identifies a temporary minor adverse (not significant) effect. Volume 3, chapter 4: Landscape and Visual Resources considers the visual effects on users of these routes. Effects would primarily arise from the introduction of construction activity, and sometimes temporary construction or HDD compounds, into views at close proximity to each of the routes. These would be seen over short sections, up to several hundred meters, of these long distance routes. In order for construction activities to cross the Holt-Mannington Walk and the Tas Valley Way would require temporary closure or diversion of routes. Users of these routes would experience changed views as a result of diversions. Effects on diverted sections are likely to include close views of construction activities over a short extent of the route. Overall, for users these long distance paths, moderate-minor adverse visual effects are predicted (not significant). Volume 3, chapter 8: Noise and Vibration identifies negligible to minor adverse effects (not significant) on PRoWs during the construction phase. No significant dust effects are predicted. Overall, taking into account the limited contribution from dust and noise at these locations, the greatest contributing factor to any effect on users of these routes would be the visual effect and it is considered that the inter-related effect would not exceed that reported for views (moderate-minor adverse and not significant).

Construction: Local PRoWs and other linear routes

The Hornsea Three onshore cable construction works would have a temporary impact on a number of other PRoWs. Some of these PRoW crossings within the onshore cable corridor would be via HDD where the route would remain open during the construction period along its existing alignment. Where open cut trenching may be required, the PRoWs would be subject to temporary diversions to maintain public access and the connectivity of the network. These diversions would remain in place for an indicative three month period during the construction phase. Volume 3, chapter 6: Land Use and Recreation reports that this would lead to a temporary minor adverse (not significant) effect for users of the PRoWs. Users of these PRoWs and other linear routes may also experience other effects, such as noise, dust and visual effects. Volume 3, chapter 8: Noise and Vibration identifies negligible to minor adverse effects (not significant) on PRoWs during the construction phase. Volume 3, chapter 4: Landscape and Visual Resources predicts moderate-minor adverse effects on local PRoWs affected by the onshore cable works (not significant). Long term effects on views from local routes affected by the permanent infrastructure are considered in the operational assessment below.

Other linear routes used for recreational purposes are also identified in volume 3, chapter 6: Land Use and Recreation. All of the linear routes identified for recreational use or promoted for use by non-motorised users would remain open during the construction period because the Hornsea Three onshore cable corridor would be installed by HDD under these facilities. Therefore, all of the local roads crossed by the onshore cable corridor, which are available for non-motorised users as well as motorised vehicles, would remain open during the construction period. Where there would be an interface between users of these routes and construction traffic, management measures would be put in place in accordance with the Outline Construction Traffic Management Plan (document reference A8.2) and the Outline CoCP (document reference A8.5). This would lead to a temporary minor adverse (not significant) effect.

Overall, taking into account the temporary nature of the effects and the effective measures in place to control dust and noise effects, visual effects would make the greatest contribution to any inter-related effect. No significant visual effects have been identified and it is considered likely that inter-related effects would not be significant during the temporary construction works.

Operation and maintenance

During operation, there would be no effects on Peddars Way or the Coast Path. However, routes close to the onshore HVAC booster station and the onshore HVDC converter/HVAC substation may be affected and are considered below.

Onshore HVAC booster station: The closest route within the group to the onshore HVAC booster station is the bridleway to the east that runs through Barningham Green Plantation and New Covert. Views would not be possible for the majority of this route although where it briefly runs between the two blocks of woodland there would be relatively open views of one edge of the booster station seen at close proximity. Proposed woodland planting would soften the built form seen here, although it would not result in a notable change to the scale of impacts as it matures over time. The effects on visual receptors using PRoW are predicted to be small scale, of limited spatial extent, permanent duration and reversible. The effects on views would be minor adverse (not significant). Noise effects on the nearest PRoW to the booster substation are assessed as being of negligible to minor adverse significance. Taking this into account, it is considered likely that these effects would combine to create significant inter-related effect.

Onshore HVDC converter/HVAC substation: The Tas Valley Way extends broadly south from Norwich, passing to the east of the onshore HVDC converter/HVAC substation, as it heads towards Bracon Ash and out of the onshore HVDC converter/HVAC substation study area. The Zone of Theoretical Visibility indicates potential visibility, albeit intermittently, along much of its length. In reality this would be considerably reduced as a result of passing alongside hedgerows and tree belts along its route and other intervening vegetation in the wider landscape. Where views of the onshore HVDC converter/HVAC substation are possible these would be seen relatively distantly and in the context of the pylons passing the site and other infrastructure such as the distant but often prominent masts at Poringland. The visual effects would be minor adverse (not significant). Boudicca Way lies outside the Zone of Visual Influence. This route follows a broadly north-south route in the eastern part of the onshore HVDC converter/HVAC substation study area. It extends from Norwich southwards following a relatively elevated route past Arminghall and Stoke Holy Cross with a spur forking west to Venta Icenorum. Views would potentially be possible from a relatively wide extent of the route due to its elevated position. The onshore HVDC converter/HVAC substation would generally be seen appearing above dense woodland and below existing power lines. The visual effects would be minor-moderate adverse (not significant). Local PRoWs may also experience visual effects up to major-moderate adverse (significant), although this would reduce over time as mitigation planting matures to moderate adverse (not significant). Noise effects on the nearest PRoW to the onshore HVDC converter/HVAC substation are assessed as being of negligible significance. The greatest contributor to any inter-related effect on these routes would therefore be visual effects. As a result, inter-related effects are not likely to exceed the level reported for visual effects (major-moderate adverse and significant in some locations, reducing over time as mitigation planting matures to moderate adverse and not significant).

Decommissioning

During decommissioning, effects associated with decommissioning activity would be similar to (although often less than) those during the construction phase. No significant inter-related effects are predicted.

11.9 Summary

11.9.1.1 The tables presented within this chapter consider the potential for inter-related effects arising from the onshore elements of Hornsea Three on a range of onshore receptor groups. Much of the content of these tables has been based upon the assessments of individual effects presented in the topic-specific Environmental Statement chapters. The identification of potential inter-related effects has been based on a largely qualitative assessment using expert judgement, and noting that inter-related effects have already been accounted for, in many instances, within the assessments in the topic chapters. The following conclusions arise in the context of physical and human environments.

11.10 Conclusion

11.10.1.1 This chapter has defined the potential inter-related effects considered to arise from the onshore elements of Hornsea Three. Project lifetime and receptor-led effects have been considered.

11.10.1.2 The potential for long term inter-related effects is expected to be greatest for people living in dwellings closest to the onshore HVDC converter/HVAC substation. However, the potential for project lifetime effects is limited, given that many effects would occur only during construction and, potentially, to a lesser extent during decommissioning.

11.10.1.3 Scope exists for inter-related project lifetime effects on visual receptors closest to the onshore HVAC booster station or the onshore HVDC converter/HVAC substation as there are visual effects throughout the phases (initially as construction activity and then with the built structures in place, followed by potential decommissioning activity). However, the proposed planting would, in time, lessen these effects as it matures. Significant effects would therefore be restricted to particular views for a period of time during operation prior to the planting becoming fully mature. During the remainder of the project lifetime, effects would be less than this and not significant.

11.10.1.4 Due to concurrent multiple activities, the construction phase presents the most likely opportunity for receptor-led effects. It is anticipated that PRoWs and other linear routes such as the Norfolk Coastal Path could be diverted temporarily during the construction phase. During construction, these short term effects could combine with visual effects, dust and noise effects. For all PRoW users and users of other linear routes, inter-related effects would be intermittent as users move through the area.

11.10.1.5 A range of effective onshore construction phase mitigation is proposed as part of Hornsea Three, which would be implemented through the CoCP. An Outline CoCP (document reference A8.5) is provided as part of the application for development consent. Given the effectiveness of the mitigation proposed, many effects during construction would be negligible to minor adverse and not significant.

11.10.1.6 With respect to users of public rights of way, moderate adverse effects are identified for some visual receptors, although these are not considered to be significant. One significant (**moderate adverse**) effect is identified in the topic-specific chapters for the construction phase, which relates to the effect of potential route closures or diversions on the Peddars Way/Norfolk Coast Path. These receptors would therefore experience disruption to the route itself and a change in user experience, of which visual effects would form a part. Taking into account the measures proposed (management measures on the beach at either side of the construction working areas to guide walkers along the diverted coastal path) and the temporary nature of the effect, it is not considered likely that any inter-related effect arising from dust, noise and visual effects would result in any greater level of effect than that reported in volume 3, chapter 6: Land Use and Recreation (moderate adverse and significant).

11.10.1.7 With respect to residents, construction effects would be temporary, with effects occurring at any one location along the cable route for a limited period of time (albeit that this may be repeated in the event of a second phase of construction). Effects in relation to construction views, noise, traffic and dust are not predicted to be significant. The proposed measures would control construction effects as far as reasonably practicable. The highest level of significance has been assigned to visual effects during construction, which may be up to moderate adverse. The assessment provided in volume 3, chapter 4: Landscape and Visual Resources does not consider the visual effects on settlements during construction to be significant. Overall, whilst inter-related effects on residents may arise from some locations on a temporary basis, they are unlikely to exceed the level reported for visual effects (moderate adverse and not significant).

11.10.1.8 Fewer effects are predicted to occur after completion of the construction phase. During operation, only visual and noise effects are likely to adversely affect the closest residents as no traffic or dust effects are predicted during this phase. Seven properties have been predicted to experience a minor magnitude of impact during the night time, leading to a negligible to minor adverse effect (not significant). The visual assessment identifies minor effects at Edgefield, Swardeston, Swainsthorpe and Stoke Holy Cross. The overall inter-related effect for the closest properties is not likely to be significant.

11.10.1.9 The operation of the onshore HVDC converter/HVAC substation has the potential to result in significant visual effects for users of local PRoWs, which would reduce to not significant once proposed planting matures. However, other effects on these users during this phase would be limited, such that the visual effects would make the greatest contribution to any inter-related effects. It is not therefore anticipated that the inter-related effects would exceed the effects reported in the visual assessment.

11.11 References

Department for Energy and Climate Change (DECC) (2011a). Overarching National Policy Statement for Energy (EN-1). July 2011. London: The Stationery Office.

Department for Energy and Climate Change (DECC) (2011b). National Policy Statement for Renewable Energy Infrastructure (EN-3). July 2011. London: The Stationery Office.

Department of Energy and Climate Change (DECC) (2011c). National Policy Statement for Electricity Networks Infrastructure (EN-5). July 2011. London: The Stationery Office.

Highways Agency, Scottish Government, Welsh Assembly Government and the Department for Regional Development Northern Ireland (2008) Design Manual for Roads and Bridges, Volume 11, Section 2, Part 5 HA205/08: Assessment and Management of Environmental Effects.

The Infrastructure Planning (Environmental Impact Assessment) Regulations 2009 SI 2009 No. 2263.

The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 SI 2017 No. 572

PINS (2012). Advice Note nine: Using the “Rochdale Envelope”. Bristol, PINS

PINS (2016). Scoping Opinion Proposed Hornsea Three Offshore Wind Farm. PINS Reference EN010080 [online] Available at: < https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010080/EN010080-000069-Scoping%20Opinion.pdf>