

Norfolk Boreas Offshore Wind Farm

Chapter 33

Onshore Cumulative Impact Assessment

Environmental Statement

Volume 1

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Author: Royal HaskoningDHV

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Table of Contents

33	Onshore cumulative impacts.....	1
33.1	Introduction	1
33.2	Legislation, Guidance and Policy	2
33.3	Consultation.....	5
33.4	Assessment Methodology.....	7
33.5	References	42

Tables

Table 33.1 NPS assessment requirements for CIA	4
Table 33.2 Consultation Responses	5
Table 33.3 Projects and plans included in the CIA for each onshore technical assessment	10
Table 33.4 Potential cumulative impacts identified for ground conditions and contamination	24
Table 33.5 Potential cumulative impacts identified for water resources and flood risk	26
Table 33.6 Potential cumulative impacts identified for land use and agriculture	27
Table 33.7 Potential cumulative impacts identified for onshore ecology	28
Table 33.8 Potential cumulative impacts identified for onshore ornithology	30
Table 33.9 Potential cumulative impacts identified for traffic and transport	31
Table 33.10 Potential cumulative impacts identified for noise and vibration	32
Table 33.11 Potential cumulative impacts identified for air quality	33
Table 33.12 Potential cumulative human health influences	34
Table 33.13 Potential cumulative impacts identified for onshore archaeology and cultural heritage	35
Table 33.14 Potential cumulative impacts identified for landscape and visual impacts	36
Table 33.15 Potential cumulative impacts identified for tourism and recreation	38
Table 33.16 Potential cumulative impacts identified for socio-economics	40

Appendices (Volume 3)

Appendix 33.1 Projects considered in onshore CIA	
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Glossary of Acronyms

CIA	Cumulative Impact Assessment
DCO	Development Consent Order
EIA	Environmental Impact Assessment
EPP	Evidence Plan Process
ES	Environmental Statement
ESS	Environmental Stewardship Scheme
ETG	Expert Topic Group
EU	European Union
HDD	Horizontal Directional Drilling
HE	Highways England
HGV	Heavy Goods Vehicle
LEP	Local Enterprise Partnership
NCC	Norfolk County Council
NE	Natural England
NPS	National Policy Statement
NSIP	Nationally Significant Infrastructure Project
OTMP	Outline Traffic Management Plan
O&M	Operation and Maintenance
PEIR	Preliminary Environmental Information Report
PRoW	Public Rights of Way
SoS	Secretary of State
SPZ	Source Protection Zone
VWPL	Vattenfall Wind Power Limited
ZEA	Zonal Environmental Appraisal

Glossary of Terminology

Landfall	Where the offshore cables come ashore at Happisburgh South
National Grid overhead line modifications	The works to be undertaken to complete the necessary modification to the existing 400kV overhead lines
National Grid substation extension	The permanent footprint of the National Grid substation extension
National Grid substation extension	The final location for the National Grid substation extension
Necton National Grid substation	The grid connection location for Norfolk Boreas and Norfolk Vanguard
Onshore 400kV cable route	Buried high-voltage cables linking the onshore project substation to the Necton National Grid substation
Onshore cable route	The up to 35m working width within a 45m wide corridor which will contain the buried export cables as well as the temporary running track, topsoil storage and excavated material during construction.
Onshore cables	The cables which take power and communications from landfall to the onshore project substation

Onshore project area	The area of the onshore infrastructure (landfall, onshore cable route, accesses, trenchless crossing zones and mobilisation areas; onshore project substation and extension to the Necton National Grid substation and overhead line modifications)
Onshore project substation	A compound containing electrical equipment to enable connection to the National Grid. The substation will convert the exported power from HVDC to HVAC, to 400kV (grid voltage). This also contains equipment to help maintain stable grid voltage
The project	Norfolk Boreas Offshore Wind Farm, including the onshore and offshore infrastructure

33 ONSHORE CUMULATIVE IMPACTS

33.1 Introduction

1. This chapter of the Environmental Statement (ES) provides a summary of the Cumulative Impact Assessment (CIA) for the onshore topics of the proposed Norfolk Boreas Offshore Wind Farm (herein 'the project'). Whilst each technical assessment chapter within the ES provides its own CIA section in relation to that topic, the purpose of this chapter is to present an overview of all potential onshore cumulative impacts of the project. Chapter 32 Offshore Cumulative and Transboundary Impacts summarises the CIA for the offshore topics and is also provided to meet the requirement to consider transboundary impacts required by The Espoo Convention as implemented by the Environmental Impact Assessment (EIA) Directive and transposed into UK law by way of the EIA Regulations.
2. This chapter also describes the requirement for CIA, and the guidance for completing CIA in relation to Nationally Significant Infrastructure Projects (NSIP), and the consultation undertaken to inform the approach that Norfolk Boreas Limited has adopted.
3. This chapter draws information from, and should be read in conjunction with:
 - Chapter 19 Ground Conditions and Contamination;
 - Chapter 20 Water Resource and Flood Risk;
 - Chapter 21 Land Use and Agriculture;
 - Chapter 22 Onshore Ecology;
 - Chapter 23 Onshore Ornithology;
 - Chapter 24 Traffic and Transport;
 - Chapter 25 Noise and Vibration;
 - Chapter 26 Air Quality;
 - Chapter 27 Human Health;
 - Chapter 28 Onshore Archaeology and Cultural Heritage;
 - Chapter 29 Landscape and Visual Impact Assessment;
 - Chapter 30 Tourism and Recreation; and
 - Chapter 31 Socio-economics.
4. Vattenfall Wind Power Limited (VWPL) (the parent company of Norfolk Boreas Limited) is also developing Norfolk Vanguard, a 'sister project' to Norfolk Boreas. In order to minimise impacts associated with onshore construction works for the two projects, Norfolk Vanguard are seeking to obtain consent to undertake enabling works for both projects at the same time. However, Norfolk Boreas needs to consider the possibility that Norfolk Vanguard may not proceed to construction.

5. Therefore, the assessment is undertaken using the following two alternative scenarios (further details can be found in Chapter 5 Project Description) and an assessment of potential impacts has been undertaken for each scenario:
 - **Scenario 1** – Norfolk Vanguard proceeds to construction and installs ducts and other shared enabling works for Norfolk Boreas.
 - **Scenario 2** – Norfolk Vanguard does not proceed to construction and Norfolk Boreas proceeds alone. Norfolk Boreas undertakes all works required as an independent project.

33.2 Legislation, Guidance and Policy

6. There are numerous pieces of legislation, guidance and policy applicable to CIA. The following sections provide detail on key pieces of international and UK legislation, policy and guidance which are relevant to this chapter.

33.2.1 Legislation

7. Norfolk Boreas is subject to EIA under European Union (EU) EIA Directive 85/337/EEC (as amended). The EIA Directive is transposed into English law for NSIPs by the Infrastructure Planning (Environmental Impact Assessment) Regulations 2009 (the EIA Regulations). In 2011, the original EIA Directive and amendments were translated into EIA Directive 2011/92/EU.
8. Directive 2014/52/EU amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment was published in the European Union's Official Journal in April 2014. The requirements of Directive 2014/52/EU have been formally implemented in England insofar as relevant to NSIPs in the form of a revised set of regulations entitled 'The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017' (the EIA Regulations 2017).
9. Schedule 4 paragraph 5 of the EIA Regulations (abridged below) states the need for:

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

(e) the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources.

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

10. In line with this requirement a description of likely significant cumulative effects is provided in the ES and summarised in this chapter.
11. Despite the UK's decision to leave the EU following the EU Referendum in June 2016 (Brexit), the understanding is that most EU law is expected to continue to be in place following Brexit. Further information is detailed in Chapter 3 Policy and Legislation.

33.2.2 Guidance

12. Guidance that is applicable to a specific assessment is identified in the relevant chapter (Chapters 19 – 31).
13. Of relevance to CIA in general, and which has been used to guide the approach taken, are the Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions (European Commission, 1999) and (RenewableUK, 2013) CIA guidelines, guiding principles for cumulative impacts assessments in offshore wind farms.
14. Also of relevance to the general approach taken is Advice Note Nine, published by the Planning Inspectorate (2018). This Advice Note addresses the use of the 'Rochdale Envelope' approach under the Planning Act 2008 (as amended by the Localism Act 2011). Advice Note 17 also provides guidance on plans and projects that should be considered in the CIA (the Planning Inspectorate, 2015).

33.2.2.1 The Planning Inspectorate Advice Note Nine

15. The Planning Inspectorate Advice Note Nine (the Planning Inspectorate, 2018) recognises that, at the time of submitting an application, offshore wind developers may not know the precise nature and arrangement of infrastructure that make up the proposed development. This is due to a number of factors such as the evolution of technology, the need for flexibility in key commercial project decisions and the need for further detailed surveys (especially geotechnical surveys) which are required before a final design and layout can be determined. It is therefore important that a design envelope is used to provide flexibility. Where necessary, a range of parameters for each aspect of the project has been defined and subsequently, the worst case associated with each parameter and dependent on the receptor has been used in each impact assessment. This provides confidence that the EIA process is robustly considering the likely impact of the project, whilst also allowing the project to be optimised and refined at the time of construction, noting that this may be several years after the Development Consent Order (DCO) application is made. The project design envelope therefore provides the maximum extent of the consent sought. The detailed design of the project can then be developed, refined and procured within this consented envelope prior to construction.

16. The advice note highlights the importance of identifying and assessing the potential for cumulative impacts against the baseline position (which would include built and operational development) in order to ensure a robust application of the Rochdale Envelope.
17. In line with the advice note, this ES considers the potential for cumulative impacts to arise in the context of the flexibility being sought as part of the project description. This chapter provides a summary of the assessment that has been undertaken.

33.2.3 Policy

18. CIA has been undertaken with specific reference to the relevant National Policy Statements (NPS). These are the principal decision making documents for NSIP, and those relevant to Norfolk Boreas are:
 - Overarching NPS for Energy (EN-1) (Department of Energy and Climate Change (DECC) 2011a);
 - NPS for Renewable Energy Infrastructure (EN-3) (DECC, 2011b); and
 - NPS for Electricity Networks Infrastructure (EN-5) (DECC, 2011c).
19. The specific requirements of the NPS in relation to CIA, relevant to the project, are summarised in Table 33.1 and includes where in this ES they are addressed.

Table 33.1 NPS assessment requirements for CIA

NPS Requirement	NPS reference	ES reference
EN-1 – Overarching NPS for Energy		
Information should be provided on how the effects of the applicant’s proposal would combine and interact with the effects of other development (including projects for which consent has been sought or granted, as well as those already in existence).	EN-1, section 4.2.5	This is assessed in all chapters as applicable.
As described in the relevant sections of this NPS and in the technology- specific NPSs, where the proposed project has an effect on human beings, the ES should assess these effects for each element of the project, identifying any adverse health impacts, and identifying measures to avoid, reduce or compensate for these impacts as appropriate. The impacts of more than one development may affect people simultaneously, so the applicant and the IPC should consider the cumulative impact on health.	EN-1, section 4.13	Chapter 27 Human Health Chapter 30 Tourism and Recreation Chapter 31 Socio-economics
Consider and quantify the different types of flooding (whether from natural and human sources and include joint and cumulative effects) and identify flood risk reduction measures, so that assessments are fit for the purpose of the decisions being made.	EN-1, section 5.7.5	Chapter 20 Water Resources and Flood Risk
The ES should identify existing and proposed land uses near the project, any effects of replacing an existing development or use of the site with the proposed project or preventing a development or use on a neighbouring site from continuing.	EN-1, section 5.10.5	Chapter 21 Land Use and Agriculture

NPS Requirement	NPS reference	ES reference
Applicants should also assess any effects of precluding a new development or use proposed in the development plan.		
If development consent were to be granted for a number of projects within a region and these were developed in a similar timeframe, there could be some short-term negative effects, for example a potential shortage of construction workers to meet the needs of other industries and major projects in within the region.	EN-1, paragraph 5.12.3	Chapter 20 Water Resources and Flood Risk
EN-3 – NPS for Renewable Energy Infrastructure		
Cumulative effects of the development with other relevant proposed, consented and operational wind farms will be considered.	EN-3, paragraph 2.6.169	All Chapters
EN-5 – NPS for Electricity Infrastructure		
Cumulative landscape and visual impacts can arise where new overhead lines are required along with other related developments such as substations, wind farms and/or other new sources of power generation.	EN-5, paragraph 2.8.2	Chapter 29 Landscape and Visual Impact Assessment

33.3 Consultation

20. Consultation is an important aspect of the EIA and is an ongoing process throughout the lifecycle of the project, from the initial stages through to consent and post-consent. To date, consultation regarding the approach to CIA and transboundary impacts has been conducted through a number of Expert Topic Groups (ETG) through an overarching Norfolk Boreas Evidence Plan Process (EPP), the Scoping Report (Royal HaskoningDHV, 2017) and the Norfolk Boreas Preliminary Environmental Information Report (PEIR) (Norfolk Boreas Limited, 2018). Full details of the project consultation process are presented within Chapter 7 Technical Consultation and have been included within the Consultation Report (document reference 5.1), which has been submitted as part of the DCO application.
21. A summary of the consultation carried out at key stages throughout the project is detailed within relevant chapter assessments and focusses on key issues defined in each assessment, consultation specifically on the CIA are outlined in Table 33.2.

Table 33.2 Consultation Responses

Consultee	Date /Document	Comment	Response / where addressed in the ES
Chapter 21 Land Use and Agriculture			
Secretary of State (SoS)	Scoping Opinion (June 2017)	The potential for sterilisation of land along the cable route should be assessed within the ES, including interrelated socioeconomic effects. The SoS does not agree that the effects of diversions of PRoW during construction can be scoped out of the assessment given the nature and	Potential cumulative impacts are considered in section 21.8 of Chapter 21 Land Use and Agriculture. Socioeconomic impacts are considered in Chapter 31.

Consultee	Date /Document	Comment	Response / where addressed in the ES
		duration of the proposed works as well as the potential cumulative effect with Norfolk Vanguard.	
Chapter 22 Onshore Ecology			
SoS	Scoping Opinion (June 2017)	The Applicant's attention is drawn to the comments from NE about the potential cumulative effects from the Norfolk Boreas, Norfolk Vanguard and Hornsea Three wind farms onshore cables and coastal defence works. The Applicant is advised to specifically discuss the potential for these cumulative effects through the EPP so as to inform the EIA cumulative assessment.	Cumulative impacts arising from these three projects are considered in section 22.8 of Chapter 22 Onshore Ecology.
Chapter 24 Traffic and Transport			
Highways England (HE) and Norfolk County Council (NCC)	Norfolk Vanguard ETG Meeting (July 2017)	NCC / HE raised concerns over potential cumulative effects resultant from Norfolk Vanguard construction traffic and proposed A47 Corridor Improvement Programme schemes.	The scope of the cumulative assessment has been agreed with HE and NCC and is set out in section 24.8 of Chapter 24 Traffic and Transport.
NCC	Norfolk Boreas PEIR (October 2018)	Norfolk County Council requested that the developer confirms any cumulative impacts associated with all three wind farm projects utilising the same access route to the compound at Oulton airfield. Norfolk County Council have stated that they are holding an objection until this issue has been suitably addressed.	This is contained within the CIA in section 24.8 of Chapter 24 Traffic and Transport which details the traffic management plan associated with Oulton.
Oulton Parish Council	Norfolk Boreas PEIR (October 2018)	Oulton Parish Council questioned whether the pilot scheme for routing traffic to and from the mobilisation and cable route 'The Street' is for all vehicles and how this can be achieved safely as the route is already used by agricultural vehicles.	A full CIA is contained within section 24.8 of Chapter 24 Traffic and Transport. A number of mitigation measures have been proposed for 'The Street' and agreed with NCC. Further details are provided in the Outline Traffic Management Plan (OTMP) (document reference 8.8) which has been submitted with the DCO application.

Consultee	Date /Document	Comment	Response / where addressed in the ES
Chapter 25 Noise and Vibration			
Breckland Council	Scoping Opinion June 2017	Further consideration should be given to the potential impacts of low frequency noise and vibration associated with the operation of the substation and associated apparatus. This should also be considered as part of the potential cumulative impacts associated with the existing substation at Necton and any other proposals. It is stated this has been scoped out of the ES during the operational phase of the development.	As detailed the onshore project substation will be designed to achieve negligible levels of ground-borne vibration. Therefore, operational vibration can be scoped out of the EIA requirements for the operational phase of the project.
Chapter 29 Landscape and Visual Impact			
SoS	Scoping Opinion June 2017	The Applicant proposes to scope out cumulative landscape and visual impacts of the landfall for all phases of the Proposed Development and of the onshore cable route for operation and decommissioning. The SoS agrees with this approach for operation and decommissioning; however, as the projects to be considered in the CIA have not yet been determined, the SoS Scoping Opinion for Norfolk Boreas Offshore Wind Farm does not agree that construction phase cumulative impacts can be scoped out at the landfall at this stage. It cannot be certain that other large developments may not be constructed concurrently in proximity to these elements (including the Norfolk Vanguard project).	A list of projects to be assessed in the Norfolk Vanguard ES has been agreed with NCC. This list is considered relevant also to Norfolk Boreas and has been used as the basis of the CIA in section 29.8 of Chapter 29 Landscape and Visual Impact.

33.4 Assessment Methodology

22. The key aim of the onshore CIA for Norfolk Boreas is to assess whether impacts on a receptor may occur on a cumulative basis between Norfolk Boreas and other projects, activities and plans (either consented or forthcoming) in the onshore study area.
23. The scope of the CIA (in terms of relevant issues and projects) has been established with consultees (including other developers) as the EIA has progressed, this is also detailed in Chapter 6 EIA Methodology and in each onshore technical chapter (Chapters 19 to 32). Norfolk Boreas Limited has taken advice and guidance from various sources to inform the CIA (sections 33.2 and 33.3). The CIA draws from

findings of earlier studies undertaken to inform the East Anglia Zonal Environmental Appraisal (ZEA) (EAOW, 2012a) which considered cumulative impacts arising from the development of the whole zone and work undertaken for the EIA for East Anglia ONE (EAOW, 2012b), East Anglia THREE (EATL, 2015) and Norfolk Vanguard (Norfolk Vanguard Limited, 2018).

24. The Planning Inspectorate Advice Note Nine and its complementary guidance in Advice Note 17, provide guidance on plans and projects that should be considered in the CIA based on a tiered approach with decreasing levels of likely available detail:
 - Projects that are under construction;
 - Permitted applications, not yet implemented;
 - Submitted applications not yet determined;
 - Projects on the Planning Inspectorate's Programme of Projects;
 - Development identified in relevant Development Plans, with weight being given as they move closer to adoption and recognising that much information on any relevant proposals will be limited; and
 - Sites identified in other policy documents as development reasonably likely to come forward.
25. Where it is helpful to do so 'Tiers' of the development status of other projects' have been defined, as well as the availability of information to be used within the CIA. This approach is based on the three tier system proposed in Planning Inspectorate Advice Note 17.
26. The CIA is a two part process in which an initial list of projects with the potential to interact with Norfolk Boreas is identified, based on the potential mechanism of interaction. Where it is helpful to do so, the tiered approach may be adopted, based on the availability of information for each project to enable further assessment.
27. Only projects which are reasonably well described and sufficiently advanced to provide information on which to base a meaningful and robust assessment have been included in the CIA.
28. Projects which are sufficiently implemented during the site characterisation for the project are considered as part of the baseline for the EIA.
29. Onshore plans or projects to be taken into consideration include (but not limited to):
 - Other offshore wind farm infrastructure;
 - Other energy generation infrastructure;
 - Building/housing developments;
 - Installation or upgrade of roads;
 - Installation or upgrade of cables and pipelines;

- Coastal protection works; and
 - National Grid works.
30. In line with the RenewableUK CIA Guidelines for offshore wind farms (RenewableUK, 2013), the approach to CIA attempts to incorporate an appropriate level of pragmatism. This is demonstrated in the confidence levels applied to various developments, particularly those that are known but currently lack detailed project application documentation, such as those projects at the scoping stage only. These projects have been considered for CIA only in those chapters where it is considered that the Scoping Reports contain sufficient detail with which to undertake a meaningful assessment. Where there is a lack of specific information in the public domain, such as how and when (or if) projects will be built, it is not always possible to undertake a meaningful CIA.
31. Projects identified for potential cumulative impacts that were agreed as part of the Norfolk Vanguard consultation have also been considered relevant to Norfolk Boreas. These projects, as well as all relevant development applications submitted since this consultation have been considered as part of the Norfolk Boreas CIA. The list of all projects that were scoped in for the consideration of each onshore technical assessment can be found in Appendix 33.1.
32. Table 33.3 lists the projects from Appendix 33.1 which were included in the CIA for each onshore technical assessment.
33. Scenario 2 assumes that the Norfolk Vanguard project would not be constructed. There is therefore no potential for cumulative impacts to occur with Norfolk Vanguard under this scenario.

Table 33.3 Projects and plans included in the CIA for each onshore technical assessment

Status	Development period	¹ Distance from Norfolk Boreas (km)	Project definition	Project data status	Included in CIA	Rationale	
Chapter 19 Ground Conditions and Contamination							
National Infrastructure Planning							
Norfolk Vanguard Offshore Wind Farm	Application submitted	Expected construction 2020 to 2025	0 – projects are co-located	Full ES available: https://infrastructure.planninginspectorate.gov.uk/projects	High	Yes	Overlapping proposed project boundaries may result in impacts of a direct and / or indirect nature on groundwater quality and resources during construction, as well as impacts on human health. The projects are located in the same bedrock principal aquifer. No cumulative impacts on surface water are anticipated.
Hornsea Project Three Offshore Wind Farm	Application submitted	Expected construction start date 2021. Duration 6 to 10 years dependent on phasing.	0 – cable intersects project 32km between substation locations	Full ES available: https://infrastructure.planninginspectorate.gov.uk/projects	High	Yes	The onshore export cable route will overlap the Norfolk Boreas onshore route around Reepham. The application was submitted to the Planning Inspectorate May 2018. Overlapping proposed project boundaries may result in impacts of a direct and / or indirect nature on groundwater quality and resources during construction, as well as impacts on human health. The projects are located in the same bedrock principal aquifer. No cumulative impacts on surface water are anticipated.

¹ Shortest distance between the considered project and Norfolk Boreas – unless specified otherwise.

Status	Development period	¹ Distance from Norfolk Boreas (km)	Project definition	Project data status	Included in CIA	Rationale	
Chapter 20 Water Resources and Flood Risk							
National Infrastructure Planning							
Norfolk Vanguard Offshore Wind Farm	Application submitted	Expected construction 2020 to 2025	0 – projects are co-located	Full ES available: https://infrastructure.planninginspectorate.gov.uk/projects/eastern/norfolk-vanguard/?ipcsection=docs	High	Yes	<p>Under Scenario 1, the overlap between the proposed project boundaries for Norfolk Boreas and Norfolk Vanguard may result in direct and / or indirect impacts during construction and operation. Construction activities for Norfolk Vanguard along the cable route will be complete prior to commencement of cable-pulling activities for Norfolk Boreas. However, construction of the onshore project substation and Necton National Grid extension sites will overlap.</p> <p>Scenario 2 assumes that Norfolk Vanguard would not be constructed. There is therefore no potential for cumulative impacts to occur under this scenario.</p>
Hornsea Project Three Offshore Wind Farm	Application submitted	Expected construction start date 2021. Duration 6 to 10 years dependent on phasing.	0 – cable intersects project 32 between substation locations	Full ES available: https://infrastructure.planninginspectorate.gov.uk/projects/eastern/hornsea-project-three-offshore-wind-farm/?ipcsection=docs	High	Yes	<p>The cable corridor for the Hornsea Project Three Offshore Wind Farm makes landfall at Weybourne with grid connection at Norwich Main. The Hornsea Project Three cable corridor crosses the Norfolk Boreas onshore cable route within the Blackwater Drain water body catchment. The Hornsea Project Three Offshore Wind Farm would also cross watercourses in the River Wensum and the River Bure catchments, both of which will also be crossed by Norfolk Boreas. Overlapping proposed project boundaries may result in impacts</p>

Status	Development period	¹ Distance from Norfolk Boreas (km)	Project definition	Project data status	Included in CIA	Rationale	
						of a direct and / or indirect nature during construction and operation.	
Chapter 21 Land Use and Agriculture							
National Infrastructure Planning							
Norfolk Vanguard Offshore Wind Farm	Application submitted	Expected construction 2020 to 2025	0 – projects are co-located	Full ES available: https://infrastructure.planninginspectorate.gov.uk/projects/eastern/norfolk-vanguard/?ipcsection=docs	High	Yes	Overlapping proposed project boundaries may result in impacts of a direct and / or indirect nature during construction and operation.
Hornsea Project Three Offshore Wind Farm	Application submitted	Expected construction start date 2021. Duration 6 to 10 years dependent on phasing.	0 – cable intersects project 32 - between substation locations	Full ES available: https://infrastructure.planninginspectorate.gov.uk/projects/eastern/hornsea-project-three-offshore-wind-farm/	High	Yes	Overlapping proposed project boundaries at Reepham may result in impacts of a direct and / or indirect nature during construction and operation.
Chapter 22 Onshore Ecology							
National Infrastructure Planning							
Norfolk Vanguard Offshore Wind Farm	Application submitted	Expected construction 2020 to 2025	0 – projects are co-located	Full ES available: https://infrastructure.planninginspectorate.gov.uk/projects/eastern/norfolk-vanguard/?ipcsection=docs	High	Yes	Overlapping proposed project boundaries may result in impacts of a direct and / or indirect nature during construction and operation.

Status	Development period	¹ Distance from Norfolk Boreas (km)	Project definition	Project data status	Included in CIA	Rationale	
Hornsea Project Three Offshore Wind Farm	Application submitted	Expected construction start date 2021. Duration 6 to 10 years dependent on phasing.	0 – cable intersects project 32km between substation locations	Full ES available: https://infrastructure.planninginspectorate.gov.uk/projects/eastern/hornsea-project-three-offshore-wind-farm/?ipcsection=docs	High	Yes	Overlapping proposed project boundaries at Salle Park may result in impacts of a direct and / or indirect nature during construction and operation
Dudgeon Offshore Wind Farm	Commissioned	Constructed	0	http://dudgeonoffshorewind.co.uk/	High	Yes	Already constructed
Chapter 23 Onshore Ornithology							
National Infrastructure Planning							
Norfolk Vanguard Offshore Wind Farm	Application submitted	Expected construction 2020 to 2025	0 – projects are co-located	Full ES available: https://infrastructure.planninginspectorate.gov.uk/projects/eastern/norfolk-vanguard/?ipcsection=docs	High	Yes	Overlapping proposed project boundaries may result in impacts of a direct and / or indirect nature during construction and operation.
Hornsea Project Three Offshore Wind Farm	Application submitted	Expected construction start date 2021. Duration 6 to 10 years dependent on phasing.	0 – cable intersects project 32km between substation locations	Full ES available: https://infrastructure.planninginspectorate.gov.uk/projects/eastern/hornsea-project-three-offshore-	High	Yes	Overlapping proposed project boundaries at Salle Park may result in impacts of a direct and / or indirect nature during construction and operation

Status	Development period	¹ Distance from Norfolk Boreas (km)	Project definition	Project data status	Included in CIA	Rationale	
			wind-farm/?ipcsection=docs				
Dudgeon Offshore Wind Farm	Commissioned	Constructed	0	http://dudgeonoffshorewind.co.uk/	High	Yes	Overlapping proposed project boundaries at Necton may result in impacts of a direct and / or indirect nature during operation
North Norfolk District Council							
Coastal defence/protection works, Happisburgh PF/18/0751	Approved	Coastal protection over 10 year duration from August 2018	0.12	https://idoxpa.norfolk.gov.uk/online-applications/applicationDetails.do?activeTab=summary&keyVal=_NNORF_DCAPR_93543	Medium	Yes	Coastal protection scheme is located 0.1km from the project boundary. This has the potential act cumulatively upon bird species which utilise coastal environments at the landfill.
Chapter 24 Traffic and Transport							
National Infrastructure Planning							
Norfolk Vanguard Offshore Wind Farm	Application submitted	Expected construction 2020 to 2025	0 – projects are co-located	Full ES available: https://infrastructure.planninginspectorate.gov.uk/projects/eastern/norfolk-vanguard/	High	Yes	Overlapping proposed project boundaries may result in impacts of a direct and / or indirect nature during construction.
Hornsea Project Three Offshore Wind Farm	Application submitted	Expected construction start date 2021. Duration 6 to 10 years dependent on phasing.	0 - cable intersects project	Full ES available: https://infrastructure.planninginspectorate.gov.uk/projects/eastern/hornsea-project-three-offshore-wind-farm/	High	Yes	Overlapping proposed project boundaries may result in impacts of a direct and / or indirect nature during construction.

	Status	Development period	¹ Distance from Norfolk Boreas (km)	Project definition	Project data status	Included in CIA	Rationale
A47 corridor improvement programme – A47 North Tuddenham to Easton Dualling	Pre-application (application due 2020)	Start works April 2021 Open May 2023	26.7	https://infrastructure.planninginspectorate.gov.uk/projects/eastern/a47-north-tuddenham-to-easton/	Medium	Yes	Scenario 1 does not generate significant impacts through sensitive junctions. Scenario 2 - Insufficient information in the public domain with regards to final scheme proposal. However, Norfolk Boreas Limited has liaised with HE to establish a suitable 'reference case' for highway capacity assessments, therefore it is taken forward into the CIA.
A47 corridor improvement programme – A47 Blofield to North Burlingham	Pre-application (application due 2019)	Start works 2021 Open 2022	25	https://infrastructure.planninginspectorate.gov.uk/projects/eastern/a47-blofield-to-north-burlingham/	Medium	Yes	
A47 corridor improvement programme – A47 / A11 Thickthorn Junction	Pre-application (application due 2019)	Start works 2021 Open 2023	18	https://infrastructure.planninginspectorate.gov.uk/projects/eastern/a47a11-thickthorn-junction/	Medium	Yes	
A47/A12 Junction enhancements to the following junctions and roundabout; Vauxhall, Gapton Hall, Harfreys, Bridge Road and James Pagat Hospital	Pre-application (application due 2019)	Starts 2019/2020 with projected finish year of 2022	26.7km	https://highwaysengland.co.uk/projects/a47-great-yarmouth-junction-improvements/	Medium	Yes	

Status	Development period	¹ Distance from Norfolk Boreas (km)	Project definition	Project data status	Included in CIA	Rationale	
Norwich Western Link	Pre-application	Expected construction start late 2022	2.8	https://www.norfolk.gov.uk/roads-and-transport/major-projects-and-improvement-plans/norwich/norwich-western-link/timeline	Medium	Yes	If consent is granted, Norfolk Boreas Limited and its contractors would engage with stakeholders to establish opportunities to co-ordinate activities and avoid peak traffic impacts. This commitment would be contained in the OTMP which will be contained in the final DCO submission.
Chapter 25 Noise and Vibration							
National Infrastructure Planning							
Norfolk Vanguard Offshore Wind Farm	Application submitted	Expected construction 2020 to 2025	0 – projects are co-located	Full ES available: https://infrastructure.planninginspectorate.gov.uk/projects/eastern/norfolk-vanguard/?ipcsection=docs	Norfolk Vanguard Offshore Wind Farm	Yes	Overlapping proposed project boundaries may result in impacts of a direct and / or indirect nature during construction and operation. However, due to the strategic nature of developing the projects together, cumulative impacts are minimised.
Hornsea Project Three Offshore Wind Farm	Application submitted	Expected construction start date 2021. Duration 6 to 10 years dependent on phasing.	0 – cable intersects project 32km between substation locations	Full ES available: https://infrastructure.planninginspectorate.gov.uk/projects/eastern/hornsea-project-three-offshore-wind-farm/?ipcsection=docs	Hornsea Project Three Offshore Wind Farm	Yes	Overlapping proposed project boundaries may result in impacts of a direct and / or indirect nature during construction where geographical footprints overlap and due to noise emissions from construction traffic

Status	Development period	¹ Distance from Norfolk Boreas (km)	Project definition	Project data status	Included in CIA	Rationale	
Dudgeon Offshore Wind Farm	Commissioned	Constructed	0	http://dudgeonoffshorewind.co.uk/	Dudgeon Offshore Wind Farm	Yes	Overlapping proposed project boundaries may result in impacts of a direct and / or indirect nature during operation.
Chapter 26 Air Quality							
National Infrastructure Planning							
Norfolk Vanguard Offshore Wind Farm	Application submitted	Expected construction 2020 to 2025	0 – projects are co-located	Full ES available: https://infrastructure.planninginspectorate.gov.uk/projects/eastern/hornsea-project-three-offshore-wind-farm/	High	Yes	Under Scenario 1, the overlap between the proposed project boundaries for Norfolk Boreas and Norfolk Vanguard may result in direct and / or indirect impacts during construction and operation. Construction activities for Norfolk Vanguard along the cable route will be complete prior to commencement of cable-pulling activities for Norfolk Boreas. However, construction of the onshore project substation and National Grid extension sites will overlap. Scenario 2 assumes that the Norfolk Vanguard project would not be constructed. There is therefore no potential for cumulative impacts to occur under this scenario.
Hornsea Project Three Offshore Wind Farm	Application submitted	Expected construction start date 2021. Duration 6 to 10 years dependent on phasing.	0 – cable intersects project 32km between substation locations	Full ES available: https://infrastructure.planninginspectorate.gov.uk/projects/eastern/hornsea-project-three-offshore-wind-farm/	High	Yes	There is potential for the construction phases of Norfolk Boreas and Hornsea Project Three to overlap. This project has therefore been considered in the air quality CIA for both scenarios.

Status	Development period	¹ Distance from Norfolk Boreas (km)	Project definition	Project data status	Included in CIA	Rationale	
Chapter 27 Human Health							
National Infrastructure Planning							
Norfolk Vanguard Offshore Wind Farm	Application submitted	Expected construction 2020 to 2025	0 – projects are co-located	Full ES available: https://infrastructure.planninginspectorate.gov.uk/projects/eastern/norfolk-vanguard/?ipcsection=docs	High	Yes	Overlapping proposed project boundaries may result in impacts of a direct and / or indirect nature during construction and operation.
Hornsea Project Three Offshore Wind Farm	Application submitted	Expected construction start date 2021. Duration 6 to 10 years dependent on phasing.	0 – cable intersects project 32km between substation locations	Full ES available: https://infrastructure.planninginspectorate.gov.uk/projects/eastern/hornsea-project-three-offshore-wind-farm/?ipcsection=docs	High	Yes	Overlapping proposed project boundaries at Reepham may result in impacts of a direct and / or indirect nature during construction and operation. There is also the potential for cumulative traffic impacts during construction.
Dudgeon Offshore Wind Farm	Commissioned	Constructed	0	http://dudgeonoffshorewind.co.uk/	High	Yes	The Dudgeon onshore cable route is to the north of Norfolk Boreas, connecting to the grid at Necton, on the same site as the connection for Norfolk Boreas. Community comments received during consultation express frustration due to impacts from this project. Therefore, the cumulative impact will probably be felt more through a negative perception relating to communities.

Status	Development period	¹ Distance from Norfolk Boreas (km)	Project definition	Project data status	Included in CIA	Rationale	
North Norfolk District Council							
Bacton and Walcott Coastal Management Scheme	Submitted	Construction start date 2019	1.0	Public information leaflets available: https://www.norfolk.gov.uk/media/3371/bacton-to-walcott-public-information-booklet-july-2017.pdf	Medium	Yes	Coastal management schemes have a potential to increase suspended sediment level during construction which has a small chance of leading to health effects. On the other hand, coastal management and protection has a long term beneficial effect that would outweigh the short term construction effect by protecting communities from increased risk due to climate change.
Coastal defence/ protection works, Happisburgh PF/18/0751	Approved	Coastal protection over 10 year duration from August 2018.	0.12	https://idoxpa.norfolk.gov.uk/online-applications/applicationDetails.do?activeTab=summary&keyVal=_NNO RF_DCAPR_93543	Medium	Yes	
Chapter 28 Onshore Archaeology and Cultural Heritage							
National Infrastructure Planning							
Norfolk Vanguard Offshore Wind Farm	Application submitted	Expected construction 2020 to 2025	0 – projects are co-located	Full ES available: https://infrastructure.planninginspectorate.gov.uk/projects/eastern/norfolk-vanguard/?ipcsection=docs	High	Yes	Overlapping project boundaries may result in impacts of a direct and / or indirect nature.

Status	Development period	¹ Distance from Norfolk Boreas (km)	Project definition	Project data status	Included in CIA	Rationale	
Hornsea Project Three Offshore Wind Farm	Application submitted	Expected construction start date 2021. Duration 6 to 10 years dependent on phasing.	0 – cable intersects project 32 - between substation locations	https://infrastructure.planninginspectorate.gov.uk/projects/eastern/hornsea-project-three-offshore-wind-farm/	High	Yes	Overlapping project boundaries may result in impacts of a direct and / or indirect nature.
North Norfolk District Council							
Bacton and Walcott Coastal Management Scheme	Approved	Expected construction start date Spring 2019	1.0	Public information leaflets available: https://www.norfolk.gov.uk/media/3371/bacton-to-walcott-public-information-booklet-july-2017.pdf	Medium	Yes	Although there is no geographical overlap between the project boundaries, cumulative impacts of a direct or indirect nature may occur to deposits of geoarchaeological interest that are present and intersect both the onshore project area and the proposed Bacton and Walcott Coastal Management Scheme.
Coastal defence/ protection works, Happisburgh PF/18/0751	Approved	Coastal protection over 10-year duration from August 2018	0.12	https://idoxpa.norfolk.gov.uk/online-applications/applicationDetails.do?activeTab=summary&keyVal=_NNO RF_DCAPR_93543	Medium	Yes	Although there is no geographical overlap between the project boundaries, cumulative impacts of a direct or indirect nature may occur to deposits of geoarchaeological interest that are present and intersect both the onshore project area and the proposed Happisburgh coastal defence and protection works.

Status	Development period	¹ Distance from Norfolk Boreas (km)	Project definition	Project data status	Included in CIA	Rationale	
Chapter 29 Landscape and Visual							
National Infrastructure Planning							
Norfolk Vanguard Offshore Wind Farm	Application submitted	Expected construction 2020 to 2025	0 – projects are co-located	Full ES available: https://infrastructure.planninginspectorate.gov.uk/projects/eastern/norfolk-vanguard/?ipcsection=docs	High	Yes	Norfolk Boreas onshore project substation and National Grid substation extension would be sited adjacent to the respective onshore infrastructure of the Norfolk Vanguard project. There is the potential significant cumulative effects may arise in conjunction with this project and therefore it is included in the CIA.
Hornsea Project Three Offshore Wind Farm	Application submitted	Expected construction start date 2021. Duration 6 to 10 years dependent on phasing.	0 – cable intersects project 32km between substation locations	Full ES available: https://infrastructure.planninginspectorate.gov.uk/projects/eastern/hornsea-project-three-offshore-wind-farm/?ipcsection=docs	High	Yes	Hornsea Project Three Offshore Wind Farm onshore cable route would cross the Norfolk Boreas onshore cable route to the north-east of Reepham and construction compounds would be located near disused Oulton Airfield.
Chapter 30 Tourism and Recreation							
National Infrastructure Planning							
Norfolk Vanguard Offshore Wind Farm	Application submitted	Expected construction 2020 to 2025	0 – projects are co-located	Full ES available: https://infrastructure.planninginspectorate.gov.uk/projects/eastern/norfolk-vanguard/?ipcsection=docs	High	Yes	Impacts would relate to visual and noise impacts to onshore tourism and recreation assets, primarily concentrating around mobilisation areas and works at the project substation and National Grid extension.

Status	Development period	¹ Distance from Norfolk Boreas (km)	Project definition	Project data status	Included in CIA	Rationale	
Hornsea Project Three Offshore Wind Farm	Application submitted	Expected construction start date 2021. Duration 6 to 10 years dependent on phasing.	0 – cable intersects project 32km between substation locations	Full ES available: https://infrastructure.planninginspectorate.gov.uk/projects/eastern/hornsea-project-three-offshore-wind-farm/?ipcsection=docs	High	Yes	The Hornsea Project Three onshore cable route will cross the Norfolk Boreas cable route. The exact location and manner of this crossing will determine the magnitude of cumulative impacts on local tourism and recreation assets.
North Norfolk District Council							
Bacton and Walcott Coastal Management Scheme	Approved	Expected construction start date Spring 2019	1.0	Public information leaflets available: https://www.norfolk.gov.uk/media/3371/bacton-to-walcott-public-information-booklet-july-2017.pdf	Medium	Yes	Potential for nourishment scheme to influence coastal process in vicinity of project.
Chapter 31 Socio-economics							
National Infrastructure Planning							
Norfolk Vanguard Offshore Wind Farm	Application submitted	Expected construction 2020 to 2025	0 – projects are co-located	Full ES available: https://infrastructure.planninginspectorate.gov.uk/projects/eastern/norfolk-	High	Yes	Impacts will relate to job creation and community infrastructure.

Status	Development period	¹ Distance from Norfolk Boreas (km)	Project definition	Project data status	Included in CIA	Rationale	
			vanguard/?ipcsection=docs				
Hornsea Project Three Offshore Wind Farm	Application submitted	Expected construction start date 2021. Duration 6 to 10 years dependent on phasing.	0 – cable intersects project 32km between substation locations	Full ES available: https://infrastructure.planninginspectorate.gov.uk/projects/eastern/hornsea-project-three-offshore-wind-farm/?ipcsection=docs	High	Yes	Hornsea’s onshore cable route will cross the Norfolk Boreas cable route. How this interaction of construction is managed will determine the magnitude of impacts on community infrastructure. However, in general the socio-economic impacts of due to construction and operation parallel those described in this chapter.
Dudgeon Offshore Wind Farm	Commissioned	Constructed	0	http://dudgeonoffshorewind.co.uk/	High	Yes	The Dudgeon onshore cable route is to the north of Norfolk Boreas, connecting to the grid at Necton.
North Norfolk District Council							
Bacton and Walcott Coastal Management Scheme	Application	Construction start date 2019	1	Public information leaflets available: https://www.north-norfolk.gov.uk/media/3371/bacton-to-walcott-public-information-booklet-july-2017.pdf	Medium	Yes	

33.4.1 Ground Conditions and Contamination

34. The following projects were assessed for potential cumulative impacts related to ground conditions and contamination:

- Norfolk Vanguard Offshore Wind Farm (Scenario 1 only); and
- Hornsea Project Three Offshore Wind Farm (Scenario 1 and Scenario 2).

35. Table 33.4 provides a summary of the CIA outcomes for ground conditions and contamination. All plans and projects with the potential for cumulative impacts identified for ground conditions and contamination are presented in Table 33.3.

Table 33.4 Potential cumulative impacts identified for ground conditions and contamination

Potential Impact	Rationale for potential cumulative impact	Cumulative Impact Significance	
		Scenario 1	Scenario 2
Construction			
Impacts to coastline, including designated geological sites.	Impacts to interest features of designated sites may be exacerbated by other projects.	No impact	No impact
Contamination of secondary aquifers as a result of construction activities.	Impacts to secondary aquifers may be exacerbated by other projects.	No impact	No impact
Impacts on groundwater quality in the principal aquifer (including Source Protection Zone (SPZ) areas) as a result of shallow excavation construction activities.	Impacts to principal aquifer including SPZ areas may be exacerbated by other projects.	No impact	No impact
Impacts on groundwater quality in the principal aquifer (including SPZ areas) resulting from trenchless crossing techniques and piling.	Impacts to principal aquifer including SPZ areas may be exacerbated by other projects.	No impact	No impact
Impacts of construction may affect the quality of surface waters fed by groundwater.	Impacts to the quality of surface waters fed by groundwater may be exacerbated by other projects.	No impact	No impact
Impacts to human health, including construction workers and general public during any excavations associated with construction.	Impacts to surface water may be exacerbated by other projects.	No impact	No impact

Potential Impact	Rationale for potential cumulative impact	Cumulative Impact Significance	
		Scenario 1	Scenario 2
Sterilisation of mineral resources.	Impacts to Mineral Safeguard Areas may be exacerbated by other projects.	No impact	No impact
Impacts on shallow groundwater due to changes to the hydraulic regime as a result of changes to soil compaction along the cable route.	Impacts to groundwater may be exacerbated by other projects.	No impact	No impact
Operation			
Impacts during Operation and Maintenance (O&M) are scoped out of the EIA as agreed during the scoping stage (see section 19.7.5 in Chapter 19 Ground Conditions and Contamination).			
Decommissioning			
The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator. A decommissioning plan will be provided. As such, cumulative impacts during the decommissioning stage are assumed to be the same as those identified during the construction stage.			

33.4.2 Water Resource and Flood Risk

36. The following projects were assessed for potential water resource and flood risk cumulative impacts:

- Norfolk Vanguard Offshore Wind Farm (Scenario 1 only); and
- Hornsea Project Three Offshore Wind Farm (Scenario 1 and Scenario 2).

37. Table 33.5 provides a summary of the CIA outcomes for water resources and flood risk. All plans and projects with the potential for cumulative impacts identified for water resources and flood risk are presented in Table 33.3.

Table 33.5 Potential cumulative impacts identified for water resources and flood risk

Potential Impact	Rationale for potential cumulative impact	Cumulative Impact Significance	
		Scenario 1	Scenario 2
Construction			
Direct disturbance of surface water bodies	Impacts to water bodies may be exacerbated by other projects	Minor adverse	Minor to moderate adverse
Increased sediment supply		Minor adverse	Minor to moderate adverse
Accidental release of fuels, oils, lubricants, foul waters and construction materials		Minor adverse	Minor adverse
Increased surface runoff and flood risk		Minor adverse	Minor adverse
Operation			
Increased surface water runoff, altered groundwater flows and changes to flood risk	Impacts to water bodies may be exacerbated by other projects	Negligible – Minor adverse	Negligible – Minor adverse
Supply of fine sediment and other contaminants		Minor adverse	Minor adverse
Decommissioning			
The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator. A decommissioning plan will be provided. As such, cumulative impacts during the decommissioning stage are assumed to be the same as those identified during the construction stage.			

38. Whilst some cumulative impacts associated with Scenario 2 are assessed as **moderate adverse** significance, these are no greater than those identified for the Norfolk Boreas alone under Scenario 2. Mitigation measures have been identified including a commitment to trenchless crossing techniques for sensitive watercourses, sediment management, construction surface water drainage, and implementation of best practice measures. With the implementation of these measures the magnitude of potential impacts is reduced to low to negligible in all cases. However, due to the high value of these receptors this would still represent an impact of **moderate adverse** significance.
39. Potential impacts relate to direct disturbance of watercourses and increased sediment input, both at a sub-catchment level. The identified moderate adverse impacts relate to the high value sub-catchments, which will be subject to multiple

watercourse crossings during construction. When assessed alone, potential impacts on the individual watercourses which make up each sub-catchment are not considered to give rise to significant effects.

33.4.3 Land Use and Agriculture

The following projects were assessed for potential cumulative impacts related to land use and agriculture:

- Norfolk Vanguard Offshore Wind Farm (Scenario 1 only); and
- Hornsea Project Three Offshore Wind Farm (Scenario 1 and Scenario 2).

40. Table 33.6 provides a summary of the CIA outcomes for land use and agriculture. All plans and projects with the potential for cumulative impacts identified for land use and agriculture are presented in Table 33.3.

Table 33.6 Potential cumulative impacts identified for land use and agriculture

Potential Impact	Rationale for potential cumulative impact	Cumulative Impact Significance	
		Scenario 1	Scenario 2
Construction			
Drainage	Impacts may occur where project boundaries overlap spatially or temporally on the same landowner/occupier's land.	Minor adverse	Minor adverse
Land taken out of existing use/disruption to agricultural activities		Minor adverse	Negligible
Degradation of natural resources - soil		Minor adverse	Negligible
Loss of soil resource – soil erosion		Minor adverse	Negligible
Environmental Stewardship Scheme (ESSs)		Minor adverse	Negligible
Operation			
Permanent change to land use	Impacts may occur where project boundaries overlap spatially or temporally on the same landowner/occupier's land.	Minor adverse	Minor adverse
ESS		Minor adverse	Minor adverse

Potential Impact	Rationale for potential cumulative impact	Cumulative Impact Significance	
		Scenario 1	Scenario 2
Decommissioning			
The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator. A decommissioning plan will be provided. As such, cumulative impacts during the decommissioning stage are assumed to be the same as those identified during the construction stage.			

33.4.4 Onshore Ecology

41. The following projects have been assessed for potential onshore ecology cumulative impacts:
- Norfolk Vanguard Offshore Wind Farm (Scenario 1 only);
 - Hornsea Project Three Offshore Wind Farm (Scenario 1 and Scenario 2); and
 - Dudgeon Offshore Wind Farm (Scenario 1 and Scenario 2).
42. Table 33.7 provides a summary of the CIA outcomes for onshore ecology. All plans and projects with the potential for cumulative impacts identified for onshore ecology are presented in Table 33.3.

Table 33.7 Potential cumulative impacts identified for onshore ecology

Potential Impact	Rationale for potential cumulative impact	Cumulative Impact Significance	
		Scenario 1	Scenario 2
Construction			
Statutory designated sites	Impacts to interest features of designated sites may be exacerbated by other projects	Minor adverse	Minor adverse
Non-statutory designated sites		Minor adverse	Minor adverse
Arable land	Loss of habitat / species due to other projects may increase the cumulative loss within the county	Minor adverse	Minor adverse
Woodland, trees and scrub		No impact	Negligible
Hedgerows		Minor adverse	Moderate adverse
Grassland		No impact	Minor adverse
Coastal habitats		No impact	No impact
Watercourses and ponds		Minor adverse	Minor adverse
Badgers		Negligible	Minor adverse
Bats		Minor adverse	Moderate adverse

Potential Impact	Rationale for potential cumulative impact	Cumulative Impact Significance	
		Scenario 1	Scenario 2
Water vole		Minor adverse	Minor adverse
Otter		Minor adverse	Minor adverse
Great crested newts		Minor adverse	Minor adverse
Reptiles		Minor adverse	Minor adverse
White-clawed crayfish		No impact	No impact
Other invertebrates		No impact	No impact
Fish		Minor adverse	Minor adverse
Protected flora		No impact	No impact
Invasive non-native species		Minor adverse	Minor adverse
Operation			
Habitat and species during maintenance	Impact to species due to other projects may increase the cumulative impacts to species within the county	Minor adverse	Minor adverse
Fauna during operational lighting and noise		Minor adverse	Minor adverse
Decommissioning			
The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator. A decommissioning plan will be provided. As such, cumulative impacts during the decommissioning stage are assumed to be the same as those identified during the construction stage.			

43. The cumulative impacts on ecology were identified as being no greater than those identified for the Norfolk Boreas alone. It is considered that moderate adverse cumulative impacts will remain after mitigation for bats under Scenario 2 (loss of connective hedgerow habitat) and hedgerows (Scenario 2), but these impacts will reduce to non-significant over time as replacement hedgerows mature.

33.4.5 Onshore Ornithology

44. The following projects have been assessed for potential onshore ornithology cumulative impacts:
- Norfolk Vanguard Offshore Wind Farm (Scenario 1 only);
 - Hornsea Project Three Offshore Wind Farm (Scenario 1 and Scenario 2);

- Dudgeon Offshore Wind Farm (Scenario 1 and Scenario 2); and
- Coastal defence/protection works, Happisburgh (Scenario 1 and Scenario 2).

45. Table 33.8 provides a summary of the CIA outcomes for onshore ornithology. All plans and projects with the potential for cumulative impacts identified for onshore ornithology are presented in Table 33.3.

Table 33.8 Potential cumulative impacts identified for onshore ornithology

Potential Impact	Rationale for potential cumulative impact	Cumulative Impact Significance	
		Scenario 1	Scenario 2
Construction			
Designated sites	Impacts to interest features of designated sites may be exacerbated by other projects	Minor adverse	Minor adverse
Wintering / on passage bird species		Minor adverse	Minor adverse
Breeding bird species		Minor adverse	Minor adverse
Operation			
Disturbance to habitats and species from maintenance activities	Impacts to interest features of designated sites may be exacerbated by other projects	Minor adverse	Minor adverse
Disturbance to onshore ornithology from operational lighting and noise		Minor adverse	Minor adverse
Decommissioning			
The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator. A decommissioning plan will be provided. As such, cumulative impacts during the decommissioning stage are assumed to be the same as those identified during the construction stage.			

33.4.6 Traffic and Transport

46. The following projects have been considered for potential traffic and transport cumulative impacts:

- Norfolk Vanguard Offshore Wind Farm (Scenario 1 only);
- Hornsea Project Three Offshore Wind Farm (Scenario 2 only);
- A47 corridor improvement schemes (Scenario 2):
 - A47 North Tuddenham to Easton;
 - A47 Blofield to North Burlingham;

- A47 / A11 Thickthorn;
- A47 Yarmouth Junctions;
- A47 Third River Crossing (Great Yarmouth).
- Norwich Western Link (Scenario 2).

47. Table 33.9 provides a summary of the CIA outcomes for traffic and transport. All plans and projects with the potential for cumulative impacts identified for traffic and transport are presented in Table 33.3.

Table 33.9 Potential cumulative impacts identified for traffic and transport

Potential Impact	Rationale for potential cumulative impact	Cumulative Impact Significance	
		Scenario 1	Scenario 2
Construction			
Pedestrian severance	Cumulative impacts arising from two or more projects are possible due to the increase in traffic from the projects.	The cumulative traffic demand of Norfolk Boreas and Norfolk Vanguard would not result in a greater impact than that of the assessed Norfolk Boreas Scenario 2 worst case.	Negligible to Minor adverse
Pedestrian amenity			Minor adverse
Road safety			Minor adverse
Operation			
No cumulative impacts are anticipated as there are no operational impacts associated with Norfolk Boreas.			
Decommissioning			
The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator. A decommissioning plan will be provided. As such, cumulative impacts during the decommissioning stage are assumed to be the same as those identified during the construction stage.			

33.4.7 Noise and Vibration

48. The following projects have been assessed for potential noise and vibration cumulative impacts:
- Norfolk Vanguard Offshore Wind Farm (Scenario 1 only);
 - Hornsea Project Three Offshore Wind Farm (Scenario 1 and Scenario 2); and
 - Dudgeon Offshore Wind Farm (Scenario 1 and Scenario 2).

49. Table 33.10 provides a summary of the CIA outcomes for noise and vibration. All plans and projects with the potential for cumulative impacts identified for noise and vibration are presented in Table 33.3.

Table 33.10 Potential cumulative impacts identified for noise and vibration

Potential Impact	Rationale for potential cumulative impact	Cumulative Impact Significance	
		Scenario 1	Scenario 2
Construction			
Construction noise.	There is potential for impacts associated with noise and vibration generated during the construction phase site works to lead to a cumulative impact with other proposed developments.	Negligible	Negligible
Operation			
Operational noise.	There is potential for a cumulative impact to occur during the operational phase in conjunction with other operational noise sources.	Negligible	Negligible
Decommissioning			
The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator. A decommissioning plan will be provided. As such, cumulative impacts during the decommissioning stage are assumed to be the same as those identified during the construction stage.			

33.4.8 Air Quality

50. The following projects were assessed for potential air quality cumulative impacts:
- Norfolk Vanguard Offshore Wind Farm (Scenario 1 only); and
 - Hornsea Project Three Offshore Wind Farm (Scenario 1 and Scenario 2).
51. Table 33.11 provides a summary of the CIA outcomes for air quality. All plans and projects with the potential for cumulative impacts identified for air quality are presented in Table 33.3.

Table 33.11 Potential cumulative impacts identified for air quality

Potential Impact	Rationale for potential cumulative impact	Cumulative Impact Significance	
		Scenario 1	Scenario 2
Construction			
Construction dust and fine particulate matter	There is potential for cumulative construction dust impacts where projects occur within 700m of each other.	Not significant	Not significant
Construction vehicle exhaust emissions	Where the construction phase of the project overlaps with other projects, there is the potential for cumulative impacts associated with project-generated traffic emissions on the local road network.	Not significant	Not significant
Operational			
Impacts during O&M are scoped out of the EIA as agreed during the scoping stage (see section 26.3 in Chapter 26 Air Quality).			
Decommissioning			
The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator. A decommissioning plan will be provided. As such, cumulative impacts during the decommissioning stage are assumed to be the same as those identified during the construction stage.			

33.4.9 Human Health

52. The following projects have been assessed for potential cumulative impacts related to human health:

- Norfolk Vanguard Offshore Wind Farm (Scenario 1 only);
- Hornsea Project Three Offshore Wind Farm (Scenario 1 and Scenario 2);
- Dudgeon Offshore Wind Farm (Scenario 1 and Scenario 2);
- Bacton and Walcott Coastal Management Scheme (Scenario 1 and Scenario 2);
and
- Happisburgh coastal defence and protection works.

53. Table 33.12 provides a summary of the CIA outcomes for human health. All plans and projects with the potential for cumulative impacts identified for human health are presented in Table 33.3.

Table 33.12 Potential cumulative human health influences

Potentially effected population	Potential cumulative health influences	Cumulative impact significance	
		Scenario 1	Scenario 2
Inter-project cumulative effect			
Population near landfall	<ul style="list-style-type: none"> Norfolk Vanguard (Scenario 1 only); and Bacton and Walcott Coastal Management; and Happisburgh coastal protection works. 	Negligible to minor adverse	Negligible to minor adverse
Population along the cable route	<ul style="list-style-type: none"> Norfolk Vanguard (Scenario 1 only); Dudgeon; and Hornsea Project Three. 	Negligible to minor adverse	Negligible to minor adverse
Population near the onshore project substation	<ul style="list-style-type: none"> Norfolk Vanguard (Scenario 1 only); and Dudgeon. 	Negligible to minor adverse	Negligible to minor adverse
Local – Population of North Norfolk, Broadland and Breckland Districts Regional – Population of Norfolk County	<ul style="list-style-type: none"> Norfolk Vanguard (Scenario 1 only); Dudgeon; Hornsea Project Three; Bacton Coastal Management; and Happisburgh coastal protection works. 	Negligible to minor adverse	Negligible to minor adverse
National and International – Population of England and beyond the borders of England	<ul style="list-style-type: none"> Norfolk Vanguard (Scenario 1 only); Dudgeon; and Hornsea Project Three. 	Moderate beneficial	Moderate beneficial

33.4.10 Onshore Archaeology and Cultural Heritage

54. The following projects have been assessed for potential cumulative impacts related to archaeology and cultural heritage:

- Norfolk Vanguard Offshore Wind Farm (Scenario 1 only);
- Hornsea Project Three Offshore Wind Farm (Scenario 1 and Scenario 2);

- Bacton and Walcott Coastal Management Scheme (Scenario 1 and Scenario 2); and
- Happisburgh coastal defence and protection works (Scenario 1 and Scenario 2).

55. Table 33.13 provides a summary of the CIA outcomes for onshore archaeology and cultural heritage. All plans and projects with the potential for cumulative impacts identified for onshore archaeology and cultural heritage are presented in Table 33.3.

Table 33.13 Potential cumulative impacts identified for onshore archaeology and cultural heritage

Potential Impact	Rationale for potential cumulative impact	Cumulative Impact Significance	
		Scenario 1	Scenario 2
Construction			
Cumulative direct impact on (permanent change to) above ground and / or buried archaeological remains	Impacts may occur to individual archaeological features in an area of over-lap or those with an extent which intersects two or more project boundaries. The nature of the buried archaeological resource on a wider scale may also be affected.	Non-significant	Non-significant
Cumulative indirect impact on the setting of heritage assets (designated and non-designated)	Impacts arising from two or more projects are possible, particularly in the event that the construction of two or more projects is concurrent and within sight of an individual heritage asset or group of heritage assets.	Negligible to Minor adverse	Negligible to minor adverse
Cumulative impact on potential geoarchaeological / paleoenvironmental remains, potentially indicative of former land surfaces	Impacts may occur to geo-archaeological / paleoenvironmental remains where deposits of geoarchaeological importance present within two or more project boundaries are directly impacted as the result of groundworks.	Negligible	Negligible
Operation			
Cumulative indirect Impact on the Setting of Heritage Assets (designated and non-designated)	Impacts arising from two or more projects are possible, particularly in the event that the infrastructure of two or	Minor adverse	No impact

Potential Impact	Rationale for potential cumulative impact	Cumulative Impact Significance	
		Scenario 1	Scenario 2
	more projects occurs within sight of an individual heritage asset or group of heritage assets.		
Decommissioning			
The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator. A decommissioning plan will be provided. As such, cumulative impacts during the decommissioning stage are assumed to be the same as those identified during the construction stage.			

33.4.11 Landscape and Visual Impact Assessment

56. The following projects have been assessed for potential cumulative impacts related to landscape and visual assessment:

- Norfolk Vanguard Offshore Wind Farm (Scenario 1 only); and
- Hornsea Project Three Offshore Wind Farm (Scenario 2 only).

57. Table 33.14 provides a summary of the CIA outcomes for landscape and visual impact assessment. All plans and projects with the potential for cumulative impacts identified for landscape and visual impact assessment are presented in Table 33.3.

Table 33.14 Potential cumulative impacts identified for landscape and visual impacts

Potential Impact	Rationale for potential cumulative impact	Cumulative Impact Significance	
		Scenario 1	Scenario 2
Construction			
Potential cumulative impact on visual amenity of walkers relating to Norfolk Vanguard and Norfolk Boreas	Construction of the Norfolk Boreas in addition to the Hornsea Project Three onshore cable route would have potential cumulative effect on the views of walkers on an approximate 200m section of Marriott's Way	n/a	None. Effect short term and reversible.
Operation			
Potential cumulative impact on landscape character relating to Norfolk Vanguard and Norfolk Boreas	Presence of two or more projects within a landscape character type, or visible from same viewpoint.	None after 20 years. Significant effect long term (20 years) and	n/a

Potential Impact	Rationale for potential cumulative impact	Cumulative Impact Significance	
		Scenario 1	Scenario 2
		reversible in localised area.	
Potential cumulative impact on landscape character relating to Norfolk Vanguard and Norfolk Boreas		None after 20 years. Significant effect long term (20 years) and reversible in localised area.	n/a
Potential cumulative impact on landscape character relating to Norfolk Vanguard and Norfolk Boreas		None after 20 years. Significant effect long term (20 years) and reversible in localised area.	n/a
Potential cumulative impact on visual amenity of road-users relating to Norfolk Vanguard and Norfolk Boreas		None after 25 years. Significant effect long term (25 years) and reversible over 10m section.	n/a
Potential cumulative impact on visual amenity of walkers relating to Norfolk Vanguard and Norfolk Boreas		None after 20 years. Significant effect long term (20 years) and reversible over 550m section. Beneficial effect for remaining 10 years.	n/a
Decommissioning			
The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator. A decommissioning plan will be provided. As such, cumulative impacts during the decommissioning stage are assumed to be the same as those identified during the construction stage.			

33.4.12 Tourism and Recreation

58. The following projects have been assessed for potential tourism and recreation cumulative impacts:

- Norfolk Vanguard Offshore Wind Farm (Scenario 1 only);
- Hornsea Project Three Offshore Wind Farm (Scenario 1 and Scenario 2); and
- Bacton and Walcott Coastal Protection (Scenario 1 and Scenario 2).

Table 33.15 provides a summary of the CIA outcomes for tourism and recreation. All plans and projects with the potential for cumulative impacts identified for tourism and recreation are presented in Table 33.3.

Table 33.15 Potential cumulative impacts identified for tourism and recreation

Potential Impact	Rationale for potential cumulative impact	Cumulative Impact Significance	
		Scenario 1	Scenario 2
Construction			
Increased marine construction traffic affecting attractiveness of the coastline for tourism and recreation.	There is the potential for vessels associated with other offshore wind farms in the southern North Sea to be visible along with vessels associated with Norfolk Boreas	Negligible	Negligible
Disruption of marine recreational activities including sailing and other water sports	There is potential for cumulative impacts with other offshore wind farms in the southern North Sea with regards to vessel routing / displacement.	No impact	No Impact
Deterioration to Bathing Water / Blue Flag beaches and resulting effect on Tourism and Recreation	Although the project will not have a direct impact on Blue Flag beaches, the perception of tourists due to other developments (such as the Norfolk Vanguard offshore wind farm) may create the perception that the area is becoming over developed.	Negligible	Negligible
Disruption to onshore coastal tourism and recreation assets	Depending on the timing of the works with regards the Bacton to Walcott Shoreline Management scheme and landfall works associated with Norfolk Boreas and Norfolk Vanguard there may be cumulative disruption to recreational coastal users.	Minor adverse	n/a
Visual impacts of construction activity to tourism and recreation assets	Depending on the timings of the works for Hornsea Project Three, there may be cumulative impacts during construction works.	Minor adverse	Minor adverse

Potential Impact	Rationale for potential cumulative impact	Cumulative Impact Significance	
		Scenario 1	Scenario 2
Reduction of tourist accommodation availability due to non-resident work force	Depending on timing of works with respect other large infrastructure projects there may be an accumulation of non-resident workers residing within Norfolk during high season months.	Negligible	Negligible
Obstruction or disturbance to inland tourism and recreation assets	This will depend on the phasing of works with respect other projects with the potential for interaction.	Minor adverse	Minor adverse
Obstruction or disturbance to users of Public Rights of Way (PRoW) and other non-motorised routes	This will depend on the phasing of works with respect to Hornsea Project Three.	n/a	Negligible
Increased traffic affecting tourism and recreation	This will depend on the phasing of works with respect to Hornsea Project Three and shoreline protection works at Bacton.	n/a	Negligible to Minor Adverse
Operation			
Obstruction or disturbance to marine recreation	Once constructed, it is assumed that impacts will be negligible so ongoing obstruction of marine recreation is unlikely for recreation vessels.	No impact	No Impact
Visual and noise impacts on land-based tourism and recreation assets	Once constructed, it is assumed that these impacts will be negligible so ongoing obstruction of recreation is unlikely. However, if not managed properly, the perception of the value visitors have for rural Norfolk tourism may reduce which may lead to a reduction in tourist numbers.	Negligible	Negligible

Potential Impact	Rationale for potential cumulative impact	Cumulative Impact Significance	
		Scenario 1	Scenario 2
Decommissioning			
The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator. A decommissioning plan will be provided. As such, cumulative impacts during the decommissioning stage are assumed to be the same as those identified during the construction stage.			

33.4.13 Socio-economics

59. The following projects have been assessed for potential socio-economic cumulative impacts:

- Norfolk Vanguard Offshore Wind Farm (Scenario 1 only);
- Hornsea Project Three Offshore Wind Farm (Scenario 1 and Scenario 2); and
- Dudgeon Offshore Wind Farm (Scenario 1 and Scenario 2).

Other major offshore wind projects will also be included in the cumulative assessment. These include East Anglia ONE, East Anglia THREE, East Anglia ONE North and East Anglia TWO will be included when considering construction employment. All offshore wind farms that have the potential to operate in the New Anglia Local Enterprise Partnership (LEP) will be considered for operational employment.

Table 33.16 provides a summary of the CIA outcomes for socio-economics. All plans and projects with the potential for cumulative impacts identified for socio-economics are presented in Table 33.3.

Table 33.16 Potential cumulative impacts identified for socio-economics

Potential Impact	Rationale for potential cumulative impact	Cumulative Impact Significance	
		Scenario 1	Scenario 2
Construction			
Job creation during construction	An ongoing succession of onshore construction exercises could provide confidence to the construction market and drive investment.	Major beneficial	Major beneficial
Supply chain job creation during operation	A strategically developed supply chain of Tier 2 and 3 businesses could provide confidence to the fabrication market and drive investment.	Major beneficial	Major beneficial

Potential Impact	Rationale for potential cumulative impact	Cumulative Impact Significance	
		Scenario 1	Scenario 2
Effects on community infrastructure	Potential for effects on community infrastructure with other projects	Minor adverse	Minor adverse
Operation			
Onshore direct employment and supply chain job creation	Potential for significant investment in the supply chain and human resource development for O&M services to the offshore wind farm sector.	Major beneficial	Major beneficial
Decommissioning			
<p>The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator. A decommissioning plan will be provided. As such, cumulative impacts during the decommissioning stage are assumed to be the same as those identified during the construction stage.</p>			

33.5 References

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