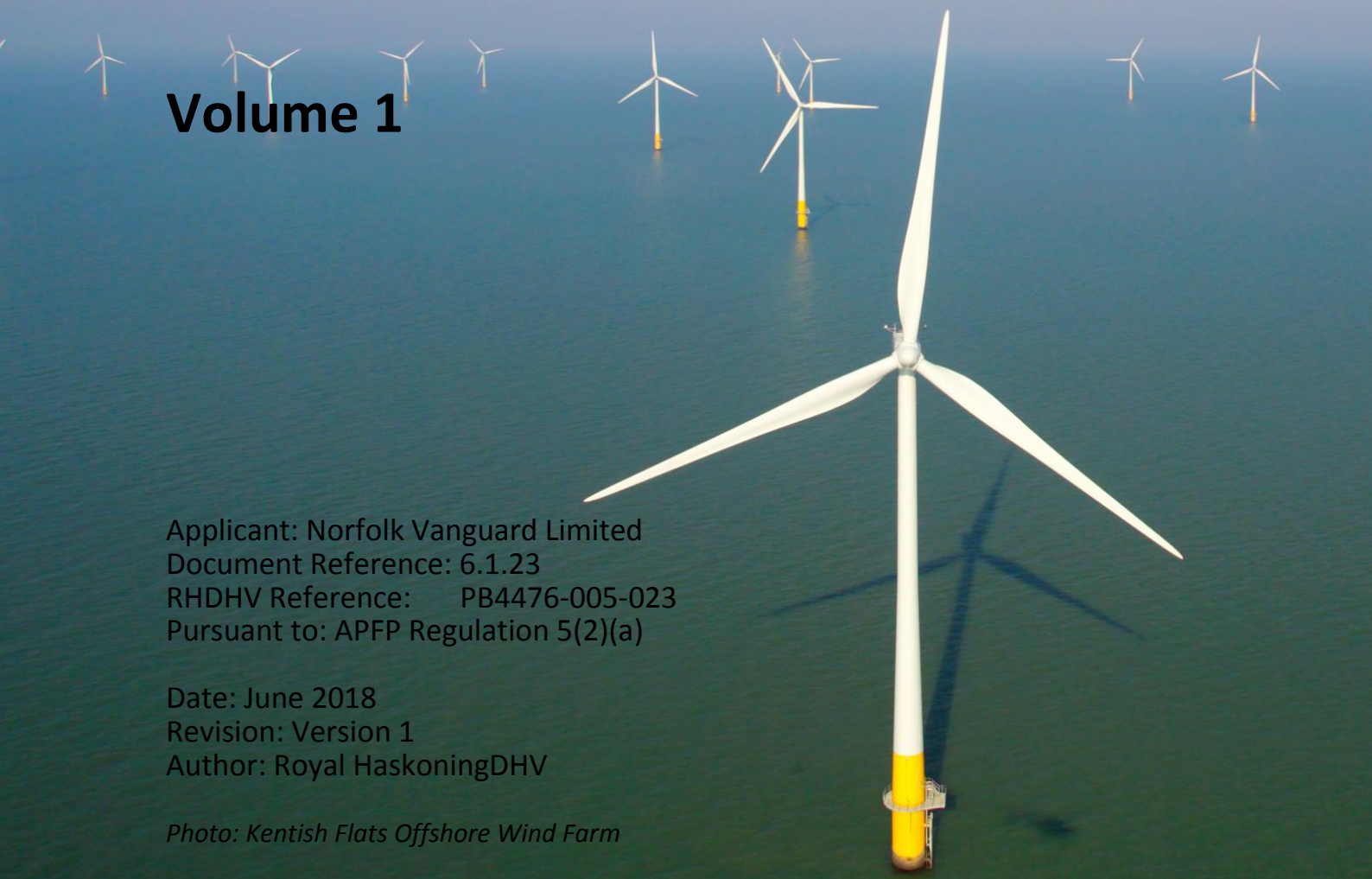
Norfolk Vanguard Offshore Wind Farm

Chapter 23

Onshore Ornithology

Environmental Statement

Volume 1



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Environmental Impact Assessment
Environmental Statement

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For and on behalf of Norfolk Vanguard Limited

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Date: 8th June 2018

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Table of Contents

Tables

Figures (Volume 2)

Appendices (Volume 3)

Glossary

AONB	Area of Outstanding Natural Beauty
BCT	Bat Conservation Trust
BoCC4	Birds of Conservation Concern 4
CIA	Cumulative Impact Assessment
CIEEM	Chartered Institute for Ecology and Environmental Management
CIRIA	Construction Industry Research and Information Association
CMS	Construction Method Statement
CRoW	Countryside and Rights of Way Act
CRS	Cable Relay Station
CWS	County Wildlife Site
dB	Decibels
DCO	Development Consent Order
DECC	Department for Energy and Climate Change
Defra	Department for Environment, Food and Rural Affairs
EcIA	Ecological impact Assessment
EEC	European Economic Community
EIA	Environmental Impact Assessment
ES	Environmental Statement
ETG	Expert Topic Group
ha	hectares
HDD	Horizontal Directional Drilling
HRA	Habitats Regulations Assessment
HSI	Habitat Suitability Index
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
ICZM	Integrated Coastal Zone Management
IPC	Infrastructure Planning Committee
JNCC	Joint Nature Conservation Committee
LBAP	Local Biodiversity Action Plan
LNR	Local Nature Reserve
m	metres
NBIS	Norfolk Biodiversity Information Service
NERC	Natural Environment and Rural Communities Act
NGR	National Grid Reference
NNR	National Nature Reserve
NPPF	National Planning Policy Framework
NPS	National Policy Statement
NVC	National Vegetation Classification
NWS	Norfolk Wildlife Services
NWT	Norfolk Wildlife Trust
OLEMS	Outline Landscape Environmental Management Strategy
PEIR	Preliminary Environmental Information Report
pSPA	Potential Special Protection Area
RNR	Roadside Nature Reserve
SAC	Special Area of Conservation

SINC	Site of Importance for Nature Conservation
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
TN	Target Note
UK BAP	UK Biodiversity Action Plan
UKSPI	UK Species of Principal Importance

Terminology

Attenuation pond zone	Zone within which the attenuation pond at the onshore project substation or Necton National Grid substation will be located.
Cable Relay Station	Primarily comprised of an outdoor compound containing reactors (also called inductors, or coils) and switchgear to increase the power transfer capability of the cables under the HVAC technology scenario as considered in the PEIR. This is no longer required for the project as the HVDC technology has been selected.
Indicative mitigation planting	Areas identified for mitigation planting at the onshore project substation and Necton National Grid substation.
Jointing pit	Underground structures constructed at regular intervals along the cable route to join sections of cable and facilitate installation of the cables into the buried ducts
Landfall	Where the offshore cables come ashore at Happisburgh South
Landfall compound	Compound at landfall within which HDD drilling would take place
Link boxes	Underground chambers or above ground cabinets next to the cable trench housing low voltage electrical earthing links.
Mobilisation area	Areas approx. 100 x 100m used as access points to the running track for duct installation. Required to store equipment and provide welfare facilities. Located adjacent to the onshore cable route, accessible from local highways network suitable for the delivery of heavy and oversized materials and equipment.
Mobilisation zone	Area within which the mobilisation area will be located.
National Grid new / replacement overhead line tower	New overhead line towers to be installed at the National Grid substation.
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 temporary works area	Land adjacent to the Necton National Grid substation which would be temporarily required during construction of the National Grid substation extension.
Necton National Grid substation	The existing 400kV substation at Necton, which will be the grid connection location for Norfolk Vanguard
Onshore 400kV cable route	Buried high-voltage cables linking the onshore project substation to the Necton National Grid substation
Onshore cables	The cables which take the electricity from landfall to the onshore project substation
Onshore cable corridor	200m wide onshore corridor within which the onshore cable route would be located as submitted for PEIR.
Onshore cable route	The 45m easement which will contain the buried export cables as well as the temporary running track, topsoil storage and excavated material during construction.

Onshore project area	All onshore electrical infrastructure (landfall; onshore cable route, accesses, trenchless crossing technique (e.g. Horizontal Directional Drilling (HDD)) zones and mobilisation areas; onshore project substation and extension to the Necton National Grid substation and overhead line modification)
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.
Running track	The track within the onshore cable route which the construction traffic would use to access workfronts
The Applicant	Norfolk Vanguard Limited
The project	Norfolk Vanguard Offshore Wind Farm, including the onshore and offshore infrastructure
Transition pit	Underground structures that house the joints between the offshore export cables and the onshore cables within the landfall zone
Trenchless crossing zone (e.g. HDD)	Temporary areas required for trenchless crossing works.
Workfront	The 150m length of onshore cable route within which duct installation would occur

23 ONSHORE ORNITHOLOGY

23.1 Introduction

1. This chapter of the Environmental Statement (ES) considers the potential impacts of the proposed Norfolk Vanguard project (herein 'the project') on onshore ornithology. This chapter is concerned with onshore birds and their terrestrial habitats; potential impacts upon offshore birds are considered in Chapter 13 Offshore Ornithology.

2. This chapter provides an overview of the existing baseline environment in respect to onshore ornithology within a study area around the onshore project area. This chapter details the results of the Ecological Impact Assessment (EcIA) for onshore ornithology only, which has been undertaken of the potential impacts and any associated mitigation for the construction, operation and decommissioning of the project based on this baseline environment. This EcIA also considers transboundary impacts, and cumulative impacts of other proposed projects in respect of onshore ornithology. The proposed methodology adhered to for the EcIA and Cumulative Impact Assessment (CIA) is discussed in section 23.4.

3. This chapter makes reference to other chapters within this ES which present baseline data or impact assessments which are relevant to the assessment of potential impacts upon onshore ornithology. The relevant chapters are:

- Chapter 13 Offshore Ornithology;
- Chapter 20 Water Resources and Flood Risk;
- Chapter 26 Air Quality;
- Chapter 22 Onshore Ecology;
- Chapter 25 Noise and Vibration; and
- Chapter 29 Landscape and Visual Impact Assessment.

23.2 Legislation, Guidance and Policy

23.2.1 Legislation

4. There are a number of pieces of legislation applicable to onshore ornithology. A summary of the key pieces of International and UK legislation relevant to this chapter are provided in the following sections.

23.2.1.1 Habitats Directive - Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora

5. The Directive provides protection for specific habitats listed in Annex I and species listed in Annex II of the Directive. The Directive sets out decision making procedures for the protection of Special Areas of Conservation (SAC) and Special Protection

Areas (SPA) and these are implemented in the UK through The Conservation of Habitats and Species Regulations 2017.

23.2.1.2 Birds Directive - Council Directive 79/409/EEC on the Conservation of Wild Birds

6. This Directive provides a framework for the conservation and management of wild birds in Europe. The most relevant provisions of the Directive are the identification and classification of SPAs for rare or vulnerable species listed in Annex I of the Directive and for all regularly occurring migratory species (required by Article 4). It also establishes a general scheme of protection for all wild birds (required by Article 5). The Directive requires national Governments to establish SPAs and to have in place mechanisms to protect and manage them. The SPA protection procedures originally set out in Article 4 of the Birds Directive have been replaced by the Article 6 provisions of the Habitats Directive.

23.2.1.3 Wildlife and Countryside Act 1981 (as amended)

7. The Act makes it an offence (with exception to species listed in Schedule 2 and with additional penalties for species listed in Schedule 1) to intentionally: kill, injure, or take any wild bird; take, damage or destroy the nest of any wild bird while that nest is in use or being built; and take or destroy an egg of any wild bird.

8. The Act makes provision for the notification and confirmation of Sites of Special Scientific Interest (SSSI).

23.2.1.4 The Conservation of Habitats and Species Regulations 2017

9. The Regulations transpose the Council Directive 92 / 43 / EEC the 'Habitats Directive' in to national law (in respect of England and Wales) and requires the state to designate SACs.

10. The Regulations require competent authorities to consider or review planning permission, applied for or granted, affecting a European site, and, subject to certain exceptions, restrict or revoke permission where the integrity of the site would be adversely affected.

23.2.1.5 Natural Environment and Rural Communities (NERC) Act 2006

11. Section 41 of the Act requires the Secretary of State (SoS) to compile a list of habitats and species of principal importance for the conservation of biodiversity in England (herein 'S41 species').

12. Decision makers of public bodies, in the execution of their duties, must have regard to the conservation of biodiversity in England, and the list is intended to guide them.

23.2.1.6 Marine and Coastal Access Act 2009

13. The act includes provisions for the coastal environment including improving access to the coast and undertaking Integrated Coastal Zone Management (ICZM), which

brings policy makers, decision makers and stakeholders together to manage coastal and estuarine areas.

23.2.1.7 Countryside and Rights of Way Act 2000 (CRoW)

14. The Act amends the law relating to public rights of way including making provision for public access on foot to certain types of land. Amendments are made in relation to SSSIs to improve their management and protection, as well as to the Wildlife and Countryside Act 1981, to strengthen the legal protection for threatened species. Provision is also made for Areas of Outstanding Natural Beauty (AONB) to improve their management.

23.2.2 Guidance

15. This EcIA has been undertaken in accordance with the following industry accepted guidance and standards:

- Chartered Institute of Ecology and Environmental Management (CIEEM) (2016a) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal, 2nd Ed.;
- British Standard 42020:2013 – Biodiversity. Code of Practice for planning and development; and
- Construction Industry Research and Information Association CIRIA Guidance note C692 Environmental Good Practice on Site Guide (3rd edition).

16. The following species-specific guidance and standards have been used during the assessment process:

- Natural England (2015) Standing advice on wild birds.

23.2.3 Policy

23.2.3.1 National Planning Policy Framework (NPPF)

17. The NPPF, published in 2012, replaces the former series of Planning Policy Statements (PPS). From its outset the document is clearly concerned with Sustainable Development, and paragraph 6 states that there are three dimensions to sustainable development: economic, social and environmental, and that all three are mutually dependent and gains for all should be sought jointly and simultaneously through the planning system. The environmental dimension is defined (as per the framework document) as:

- *"an environmental role – contributing to protecting and enhancing our natural, built and historic environment; and, as part of this, helping to improve biodiversity, use natural resources prudently, minimise waste and pollution, and mitigate and adapt to climate change including moving to a low carbon economy".*

23.2.3.2 Natural Environment White Paper 2011

18. The paper was the first White Paper produced by the government in 20 years. The paper contains plans to reconnect nature, connect people and nature for better quality of life and capture and improve the value of nature.

23.2.3.3 A Green Future: Our 25 Year Plan to Improve the Environment 2018

19. The plan sets out 10 goals and a range of high-level policies aimed at helping "the natural world regain and retain good health". The key policies within this plan relevant for this chapter are:

- Embedding an 'environmental net gain' principle for development, including housing and infrastructure;
- Focusing on woodland to maximise its many benefits; and
- Protecting and recovering nature (including improving biosecurity to protect and conserve nature).

23.2.3.4 Biodiversity 2020: A Strategy for England's wildlife and ecosystem services

20. The Strategy sets out how England will implement the 2010 Aichi Biodiversity Targets, European Commission's 2011 EU Biodiversity Strategy and the recommendations of the 2011 Natural Environment White Paper. It contains the following relevant targets:

- Better wildlife habitats with 90% of priority habitats in favourable or recovering condition and at least 50% of SSSIs in favourable condition, while maintaining at least 95% in favourable or recovering condition;
- More, bigger and less fragmented areas for wildlife, with no net loss of priority habitat and an increase in the overall extent of priority habitats by at least 200,000 hectares (ha);
- By 2020, at least 17% of land and inland water, especially areas of particular importance for biodiversity and ecosystem services, conserved through effective, integrated and joined up approaches to safeguard biodiversity and ecosystem services including through management of our existing systems of protected areas and the establishment of nature improvement areas;
- Restoring at least 15% of degraded ecosystems as a contribution to climate change mitigation and adaptation.
- By 2020, we will see an overall improvement in the status of our wildlife and will have prevented further human-induced extinctions of known threatened species; and
- By 2020, significantly more people will be engaged in biodiversity issues, aware of its value and taking positive action.

23.2.3.5 National Policy Statements

21. The assessment of potential impacts upon onshore ornithology has been made with specific reference to the relevant National Policy Statements (NPS). These are the principal decision making documents for NSIPs. Those relevant to the project 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)

22. The specific assessment requirements for onshore ornithology, as detailed in the NPSs, are summarised in Table 23.1, together with an indication of the paragraph numbers of the ES chapter where each is addressed.

Table 23.1 NPS assessment requirements

NPS requirement	NPS reference	ES reference
EN-1 Overarching NPS for Energy		
'Where the development is subject to EIA the applicant should ensure that the ES clearly sets out any effects on internationally, nationally and locally designated sites of ecological or geological conservation importance, on protected species and on habitats and other species identified as being of principal importance for the conservation of biodiversity. The applicant should provide environmental information proportionate to the infrastructure where EIA is not required to help the Infrastructure Planning Commission (IPC) consider thoroughly the potential effects of a proposed project.'	Section 5.3.3.	Existing environment (in relation to onshore ornithology) is discussed in section 23.6. Assessment is set out in sections 23.7 and 23.8.
'The applicant should show how the project has taken advantage of opportunities to conserve and enhance biodiversity and geological conservation interests.'	Section 5.3.4.	Embedded mitigation measures with respect to onshore ornithology are presented in section 23.7.1 and further mitigation measures are set out in sections 23.7 and 23.8.
'When considering the application, the IPC will have regard to the Government's biodiversity strategy is set out in 'Working with the grain of nature', which aims to halt or reverse declines in priority habitats and species; accept the importance of biodiversity to quality of life. The IPC will consider this in relation to the context of climate change. As a general principle, and subject to the specific policies below, development should aim to avoid significant harm to biodiversity and geological conservation interests, including through mitigation and consideration of reasonable alternatives (as set out in section 4.4 above); where significant harm cannot be avoided, then appropriate compensation measures should be sought. In taking decisions, the IPC should ensure that appropriate	Sections 5.3.5 – 5.3.8.	Embedded mitigation measures with respect to onshore ornithology are presented in section 23.7.1 and further mitigation measures are set out in sections 23.7 and 23.8.

NPS requirement	NPS reference	ES reference
weight is attached to designated sites of international, national and local importance; protected species; habitats and other species of principal importance for the conservation of biodiversity; and to biodiversity and geological interests within the wider environment.'		
'The IPC will have the same regard to potential Special Protection Areas (pSPAs) and Ramsar sites as those sites identified through international conventions and European Directives.'	Section 5.3.9.	Designated sites in relation to onshore ornithology are discussed in section 23.6. Assessment is set out in sections 23.7 and 23.8. Site selection decisions have been made to avoid interest features at designated sites.
'Many SSSIs are also designated as sites of international importance and will be protected accordingly. Those that are not, or those features of SSSIs not covered by an international designation, should be given a high degree of protection.'	Section 5.3.11.	Designated sites in relation to onshore ornithology are discussed in section 23.6. Assessment is set out in sections 23.7 and 23.8. Site selection decisions have been made to avoid interest features at designated sites.
'Where a proposed development on land within or outside an SSSI is likely to have an adverse effect on an SSSI (either individually or in combination with other developments), development consent should not normally be granted. Where an adverse effect, after mitigation, on the site's notified special interest features is likely, an exception should only be made where the benefits (including need) of the development at this site, clearly outweigh both the impacts that it is likely to have on the features of the site that make it of special scientific interest and any broader impacts on the national network of SSSIs.'	Section 5.3.11.	Designated sites in relation to onshore ornithology are discussed in section 23.6. Assessment is set out in sections 23.7 and 23.8. Site selection decisions have been made to avoid interest features at designated sites.
'The IPC will have regard to sites of regional and local biodiversity and geological interest, which include Regionally Important Geological Sites, Local Nature Reserves and Local Sites when considering applications since they are recognised to have a fundamental role in meeting overall national biodiversity targets.'	Section 5.3.13.	Designated sites in relation to onshore ornithology are discussed in section 23.6. Assessment is set out in sections 23.7 and 23.8. Site selection decisions have been made to avoid interest features at designated sites.
The IPC will aim to maximise opportunities to build in beneficial biodiversity features when considering proposals as part of good design.	Section 5.3.15.	Embedded mitigation measures in relation to onshore ornithology are presented in section 23.7.1 and further mitigation measures are set out in

NPS requirement	NPS reference	ES reference
		sections 23.7 and 23.8. This includes replanting and reinstatement of habitat where considered necessary.
The IPC shall have regard to the protection of legally protected species and habitats and species of principal importance for nature conservation. 'The IPC shall refuse consent where harm to the habitats or species and their habitats would result, unless the benefits (including need) of the development outweigh that harm. In this context the IPC should give substantial weight to any such harm to the detriment of biodiversity features of national or regional importance which it considers may result from a proposed development.'	Sections 5.3.16 – 5.3.17.	The existing environment in relation to onshore ornithology for protected and important species and habitats is discussed in section 23.6. Assessment is set out in sections 23.7 and 23.8.
The applicant should include appropriate mitigation measures as an integral part of the proposed development and demonstrate that: • During construction, they will seek to ensure that activities will be confined to the minimum areas required for the works; • During construction and operation best practice will be followed to ensure that risk of disturbance or damage to species or habitats is minimised, including as a consequence of transport access arrangements; • Habitats will, where practicable, be restored after construction works have finished; and • Opportunities will be taken to enhance existing habitats and, where practicable, to create new habitats of value within the site landscaping proposals.	Section 5.3.18.	Embedded mitigation measures in relation to onshore ornithology are presented in section 23.7.1 and further mitigation measures are set out in sections 23.7 and 23.8. This includes replanting and reinstatement of habitat where considered necessary.
'The IPC will need to take account of what mitigation measures may have been agreed between the applicant and Natural England has granted or refused or intends to grant or refuse, any relevant licences, including protected species mitigation licences.'	Section 5.3.20.	Embedded mitigation measures (with respect to onshore ornithology) are presented in section 23.7.1 and further mitigation measures are set out in sections 23.7 and 23.8.
EN-3 NPS for Renewable Energy Infrastructure		
'Proposals for renewable energy infrastructure should demonstrate good design in respect of landscape and visual amenity, and in the design of the project to mitigate impacts such as noise and effects on ecology.'	Section 2.4.2.	Project design has avoided sensitive features for birds where possible. Embedded mitigation measures are presented in section 23.7.1 and further mitigation measures are set out in sections 23.7 and 23.8.
'Ecological monitoring is likely to be appropriate during the construction and operational phases to identify the actual	Section 2.6.70.	Monitoring for birds is discussed in mitigation set

NPS requirement	NPS reference	ES reference
impact so that, where appropriate, adverse effects can then be mitigated and to enable further useful information to be published relevant to future projects.'		out in sections 23.7 and 23.8.
'There may be some instances where it would be more harmful to the ecology of the site to remove elements of the development, such as the access tracks or underground cabling, than to retain them.'	Section 2.7.15.	Decommissioning is discussed in section 23.7.8.

23.2.3.6 Local Planning Policy

23. EN-1 states, in paragraph 4.1.5 that:

24. *"Other matters that the IPC [now the Planning Inspectorate] may consider important and relevant to its decision-making may include Development Plan Documents or other documents in the Local Development Framework. In the event of a conflict between these or any other documents and an NPS, the NPS prevails for the purposes of IPC decision making given the national significance of the infrastructure."*

25. The onshore project area falls under the jurisdiction of Norfolk County Council and the following local planning authorities:

- Broadland District Council;
- North Norfolk District Council; and
- Breckland Council.

26. Table 23.2 provides details of the local planning policy documents and the relevant policies in respect of onshore ornithology. Designated areas which these policies may refer to are shown in Chapter 22 Onshore Ecology Figure 22.2.

Table 23.2 Relevant local planning policies

Document	Policy / guidance	Policy / guidance purpose
Norfolk County Council		
Norfolk County Council's Environmental Policy (2016)	1	Protect and enhance the county's wildlife and the quality and character of the Norfolk landscape and coast; encouraging the variety of habitats and species to deliver the aims of Biodiversity 2020.
	2	Ensure nature contributes to the economic and social health of urban and rural areas in Norfolk for current and future generations.
Breckland Council		
Breckland District Council Adopted Core Strategy and Development Control Policies Development	SS1 Spatial Strategy	Minimal development within the countryside, including the comprehensive protection from development of: • Breckland SPA and its qualifying features; • SSSIs; • Ramsar site at Redgrave and South Lopham Fen; • NNRs/ LNRs;

Document	Policy / guidance	Policy / guidance purpose
Plan Document (2009)		• Any areas identified as priority habitats or target areas for habitat creation in the Norfolk Biodiversity Action Plan.
	CP10 Natural Environment	The enhancement of biodiversity and geodiversity in the district will be sought. There is an expectation that development will incorporate biodiversity or geological features where opportunities exist. Development that fails to exploit opportunities to incorporate available biodiversity or geological features will not be considered appropriate. All international, national, regional and local sites (County Wildlife Sites (CWS), Ancient woodland, LNRs, UKHPI [UK Habitat of Principal Importance]) for wildlife conservation will require a full environmental assessment for any development proposals which may affect them. A buffer zone of 1,500m around the Breckland SPA, within which certain development controls are in place. Ecological networks should be considered by any development proposal. This includes major river valleys and connections between core woodland areas within and outside the district.
	DC12 Trees and Landscape	Any development that would result in the loss of, or the deterioration in the quality of an important natural feature(s), including protected trees and hedgerows will not normally be permitted. The retention of trees, hedgerows and other natural features in situ will always be preferable. Where the loss of such features is unavoidable, replacement provision should be of a commensurate value to that which is lost. Appropriate landscaping schemes to mitigate against the landscape impact of and complement the design of new development will be required, where appropriate.
Broadland District Council		
Joint Core Strategy for Broadland, Norwich and South Norfolk (2011; updated 2014)	Policy 1: Addressing climate change and protecting environmental assets	The environmental assets of the area will be protected, maintained, restored and enhanced and the benefits for residents and visitors improved. All new developments will ensure that there will be no adverse impacts on European and Ramsar designated sites and no adverse impacts on European protected species in the area and beyond including by storm water runoff, water abstraction, or sewage discharge. In areas not protected through international or national designations, development will: • Minimise fragmentation of habitats and seek to conserve and enhance existing environmental assets of acknowledged regional or local importance. Where harm is unavoidable, it will provide for appropriate mitigation or

Document	Policy / guidance	Policy / guidance purpose
		replacement with the objective of achieving a long-term maintenance or enhancement of the local biodiversity baseline.
North Norfolk District Council		
North Norfolk Local Development Framework: Core Strategy (2008, updated 2011)	SS1 Spatial Strategy for North Norfolk and SS2 Development in the Countryside	North Norfolk outside of named settlements is designated as Countryside and development will be restricted to particular types of development to support the rural economy, meet affordable housing needs and provide renewable energy.
	EN7 Renewable Energy	Renewable energy proposals will be supported and considered in the context of sustainable development and climate change, taking account of the wide environmental, social and economic benefits of renewable energy gain. Large scale renewable energy proposals should deliver economic, social, environmental or community benefits that are directly related to the proposed development and are of reasonable scale and kind to the local area.
	EN9 Biodiversity and Geology	All development proposals should: • Protect the biodiversity value of land and buildings and minimise fragmentation of habitats; • Maximise opportunities for restoration, enhancement and connection of natural habitats; and • Incorporate beneficial biodiversity conservation features where appropriate. Development proposals that would cause a direct or indirect adverse effect to nationally designated sites or other designated areas or protected species will not be permitted unless: • They cannot be located on alternative sites that would cause less or no harm; • The benefits of the development clearly outweigh the impacts on the features of the site and the wider network of natural habitats; and • Prevention, mitigation and compensation measures are provided.

23.3 Consultation

27. Consultation is a key driver of the EIA and ES, 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 onshore ornithology has been conducted through a range of fora, including:

- Responses to a Scoping Report (Royal HaskoningDHV, 2016);

- Expert Topic Group (ETG) meetings held as part of the Evidence Plan Process (EPP) in January 2017, July 2017 and January 2018 with representatives from Natural England, the Environment Agency, Norfolk County Council, Norfolk Wildlife Trust, North Norfolk District Council and Breckland Council;
- Responses to ornithological survey-specific methodologies issued to stakeholders in 2016 and 2017;
- Responses to the Preliminary Environmental Information Report (PEIR) submitted in November 2017 (Norfolk Vanguard Limited, 2017); and
- Meeting to discuss the findings of the ornithological surveys undertaken, the ornithology baseline, and confirm the approach to the assessment that had been undertaken was held in February 2018.

28. Full details of the project consultation process are presented within Chapter 7 Technical Consultation.

29. A summary of the consultation undertaken to date is provided in Table 23.3. Further consultation responses are provided in Appendix 23.5.

Table 23.3 Consultation responses

Consultee	Date /document	Comment	Response / where addressed in the ES
Natural England	Onshore Winter / Passage Bird Survey Scoping Report Response August 2016	We would normally advise that at least two years of survey are undertaken to ensure that inter-annual variation is taken into account. However, we accept that there is limited value in a second year of winter surveys if the presence of geese and swans will be determined by the crop regime. We therefore advise that together with any survey and/or WeBS data, information about predicted crop patterns at the time of the proposed work are taken into account.	Consideration of crop patterns has been included in the impact assessment (section 23.7 and 23.8).
Norfolk County Council	Onshore Winter / Passage Bird Survey Scoping Report Response August 2016	Approach seems pragmatic and sensible, we broadly support the methodology. Include a reference to County Wildlife Sites Pits near Easthaugh (CWS 669) and Sparham Pools (CWS 673) along the Wensum SAC. We would not expect wintering survey at these sites. Surveys at Cawston and Marsham Heath SSSI not required (hen harrier roost no longer active).	Designated sites which have specific interest features for onshore ornithology are assessed in section 23.7 and 23.8 of this chapter.
SoS	Scoping Opinion November 2016	The Scoping Report has identified the need to consider indirect impacts on statutory and non-statutory designated sites for nature conservation through	Direct impacts, where appropriate, are considered within section 23.7 and 23.8

Consultee	Date /document	Comment	Response / where addressed in the ES
		cable routing; however, direct impacts should also be considered if the cable route does not avoid such sites.	of this chapter.
SoS	Scoping Opinion November 2016	The ES should identify the locations where there would be loss of important habitats for example, hedgerow and/or ancient woodland.	Loss of habitat is assessed in sections 23.7 and 23.8 of this chapter.
SoS	Scoping Opinion November 2016	The ES should set out the measures for reinstating habitats which are removed during construction.	Reinstatement is set out in sections 23.7 and 23.8 of this chapter.
SoS	Scoping Opinion November 2016	The Applicant should ensure that all mitigation measures proposed within the ES are secured and with this in mind the Secretary of State welcomes the proposal for a project specific Ecological Management Plan. A draft of the plan should be provided with the DCO application. Consideration should also be made to any potential overlapping objectives of ecological and landscaping mitigation measures that may be proposed and secured through management plans.	A draft Ecological Management Plan will be provided within the Outline Landscape and Ecological Management Strategy (OLEMS) (Document reference 8.7), to be submitted with the final DCO application, which will include the specific mitigation requirements for birds.
SoS	Scoping Opinion November 2016	In terms of potential disturbance to protected species, the assessment should take account of impacts on noise, vibration and air quality (including dust); cross reference should be made to these specialist reports.	This has been considered within sections 23.7 and 23.8 of this chapter.
SoS	Scoping Opinion November 2016	The ES should include a thorough assessment of the impact of the proposals on habitats and/or species listed as 'Habitats and Species of Principal Importance' within the England Biodiversity List.	Habitats and Species of Principal Importance are considered within sections 23.7 and 23.8 of this chapter.
Hindolveston Parish Council	Scoping Opinion November 2016	It is requested that due care is taken to protect woodland (especially ancient woodland), meadows and areas that are habitats for wildlife, plants, insects even if these sites to not have special designations. For instance, this would include Roadside Nature Reserves (managed by Norfolk Wildlife Trust) e.g. at Brays Lane in Hindolveston and similar las near Guestwick leading to Wood	Woodland and these named reserves are considered within sections 23.7 and 23.8 of this chapter.

Consultee	Date /document	Comment	Response / where addressed in the ES
		Dalling.	
Natural England	Scoping Opinion November 2016	Further sites that will need consideration along the route are Cawston and Marsham Heaths, Foxley Wood, Honeypot Wood and Beetley and Hoe Meadows SSSIs, all of which are designated as representative of rare habitats.	These sites are considered within sections 23.7 and 23.8 of this chapter.
Natural England	Scoping Opinion November 2016	We advise that sites with breeding bird features are listed along with the sites identified with passage and wintering ornithological interest features. Table 3.14: Passage and over wintering birds are listed as red on BoCC 4 (Eaton *et al*., 2015), along with their relative abundance (high, medium, low), which has been based on the data from the BTO UK Bird Atlas 2007-2011. We advise the inclusion of the same information for breeding birds for the scoping area.	Details of the breeding bird receptors are set out in section 23.6 and assessed in section 23.7 and 23.8.
Norfolk County Council	January 2017 / Onshore Ecology and Ornithology ETG Minutes	Requested that those designated sites immediately outside of the survey area be considered within the assessment, e.g. Booton Common and Pigney's Wood (not yet designated).	These sites and others within 1km of the survey area have been considered within sections 23.7 and 23.8 of this chapter.
Natural England	February 2017 / Offshore Ornithology ETG Minutes	Disturbance of sand martin nesting at Happisburgh will need to be considered in relation to the onshore HDD works for landfall as well as access requirements to the landfall works (under the onshore ornithology impact assessment). The breeding bird survey should include this area. The breeding season is early summer and therefore, depending on locations, there could be seasonal constraints on the landfall HDD works to avoid breeding season.	Nesting sand martin are considered within sections 23.7 and 23.8 of this chapter.
Natural England	Norfolk Vanguard - Onshore Wintering Bird Surveys Survey Methodology Approach Update Response March 2016	Agreement with the updated wintering bird survey methodology. In winter 2016/17 there may have been no birds because the areas they surveyed were not planted with crops the birds would feed on. However, in a different year, different crops may be grown in the survey area and birds may then use these fields. So, whilst we are	Consideration of crop patterns has been included in the impact assessment (section 23.7 and 23.8).

Consultee	Date /document	Comment	Response / where addressed in the ES
		not suggesting more than 1 year of survey, we advise considering this in assessments.	
Royal Society for the Protection of Birds	PEIR response November 2017	We note that the eastern section of the onshore cable route falls within land identified by Natural England as functionally-linked to the Broadland SPA for foraging pink-footed geese. While limited evidence of foraging pink-footed geese was recorded on the site surveys, given the known importance of this area for the species, we consider that mitigation measures should be included within the Outline Landscape and Environmental Management Strategy (OLEMS). These should include measures to ensure that any mitigation planned to deter breeding birds from using the area surrounding the cable route does not adversely affect pink-footed geese by reducing availability of foraging habitat. In order to ensure that sufficient habitat is available in the wider area during construction, it may be beneficial to secure appropriate cropping outside the area directly affected by the works, to act as a refuge.	Mitigation for potential impacts upon pink-footed geese is presented in sections 23.7 and 23.8 of this chapter.
North Norfolk District Council	PEIR response November 2017	West of The Street, Ridlington (TG 34631 30520) – This area does not appear to have been surveyed in the field as part of the Water Vole, Breeding Birds or Extended Phase 1 survey, yet appears to be existing or former grazing pasture with possible reasonable habitat (semi-improved) and has an extensive ditch network and defined historical field pattern.	Undesignated habitat at Ridlington Street is proposed to be crossed using trenching. Impact upon the potential bird species at the habitat by Ridlington Street are presented within sections 23.7 and 23.8 of this chapter.
North Norfolk District Council	PEIR response November 2017	Breeding Birds Surveys – It is not clear within the reports if all features suitable to support breeding birds have been surveyed e.g. hedgerows and areas of scrub, semi-improved grassland. It appears that only the larger areas of habitat capable of supporting breeding birds have been subject to a BBS. This needs to be clarified.	All features capable of supporting breeding birds have not been surveyed. The bird surveys completed to date have focused on key sensitive areas, the scope of which was agreed during the ETG meetings held as

Consultee	Date /document	Comment	Response / where addressed in the ES
			part of the Norfolk Vanguard EPP. Mitigation for common breeding birds using all suitable habitats is provided in sections 23.7 and 23.8 of this chapter.
Natural England	Review of baseline ecology reports February 2018	The number and range of breeding bird species present at all sites highlights the importance of work methods and timing avoiding impacts to species and the full range of their associated habitats in all the areas. We wish to highlight that the floodplain grazing marsh adjacent to the River Wensum on the south side is managed under Countryside Stewardship to target wintering waders and wildfowl, so it should be presumed that these will be present from November to February inclusive.	Mitigation around the timing of the works to avoid sensitive periods for birds has been considered. Mitigation for potential impacts on birds is presented in sections 23.7 and 23.8 of this chapter.
Natural England	Onshore Ornithology Baseline Report Review Meeting February 2018	24hr working (i.e. works involving lighting) may be required for [the landfall] works, and that drills are noisy activities. Therefore, Natural England would expect further mitigation measures to minimise any effects of lighting or noise upon nesting sand martins. These would involve avoiding sensitive times of the sand martin nesting season, and directing lighting away from the nest sites.	Mitigation for potential impacts on birds is detailed in Chapter 25 Noise and Vibration and is presented in sections 23.7 and 23.8 of this chapter.
Natural England	Onshore Ornithology Baseline Report Review Meeting February 2018	Natural England agree with the recommendation to check desktop records to ensure that no significant species have been under represented due to the reduced access coverage at certain sites, lack of dawn/dusk surveys at all sites and also due to the lack of April surveys. We advise that there may be data from other surveys available, particularly for SSSIs and LNR. We also suggest considering local bird reports and at a broader scale the Atlas data and BTO Bird Track.	Additional desk-top records of bird observations have been obtained and are presented in section 23.6 of this chapter.

23.4 Assessment Methodology

23.4.1 Ecological Impact Assessment (EcIA) Methodology

30. Chapter 6 EIA Methodology details the general impact assessment method. The following sections describe more specifically the EcIA methodology proposed in relation to onshore ornithology which is based on the Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal (2nd Ed.) by CIEEM (2016a). The methodology was consulted on and agreed via ETG meetings held in July 2017 and January 2018 (with Natural England, the Environment Agency, Norfolk County Council, Norfolk Wildlife Trust, North Norfolk District Council and Breckland Council), the Scoping Report (Royal HaskoningDHV, 2016) and the Preliminary Environmental Information Report (PEIR) (Norfolk Vanguard Limited, 2017).

31. The CIEEM guidelines aim to predict the residual impacts on important ecological features affected, either directly or indirectly by a development, once all the appropriate mitigation has been implemented.

32. The approach to determining the significance of an impact follows a systematic process for all impacts. This involves identifying the qualifying features and where possible quantifying the sensitivity, value and magnitude of all ecological receptors which have been scoped into this assessment. Using this information, a significance of each potential impact has been determined. Each of these steps is set out in the remainder of this section.

33. This EcIA has used professional judgement to ensure the assessed significance level is appropriate for each individual receptor, taking account of local values for biodiversity to avoid a subjective assessment wherever possible as per the CIEEM (2016a) guidelines. As a result, the assessed significance level may not always be directly attributed to the guidance matrix detailed in the following sections.

23.4.1.1 Importance

34. The first stage of an EcIA is determining the 'importance' of ornithological features or 'receptors'. CIEEM (2016a) identifies the important ecological features as those key sites, habitats and species which have been identified by European, national and local governments and specialist organisations as a key focus for biodiversity conservation in the UK. These include:

- Statutory and non-statutory designated sites for nature conservation;
- Species occurring on national biodiversity lists;
- UK Habitats of Principal Importance (UKHPI); and
- Red listed, rare or legally protected bird species.

35. When evaluating the nature conservation importance of an ornithological receptor within the onshore project area, it is the importance of the site for the species under consideration that is assessed, rather than the importance of the species at a national or international level. For example, while a species such as skylark *Alauda arvensis* would be considered to be a species of national conservation importance by virtue of being a red-listed species of conservation concern (Eaton *et al*., 2015) and a priority species under the Biodiversity 2020 strategy for England, the importance of a site which was only used occasionally by a small number of birds would be negligible.

36. For this EcIA, the guidelines outlined in Table 23.4 will be followed to provide the relative importance of different ecological features.

Table 23.4 Definitions of importance levels for onshore ornithology

Importance	Definition
High	• An internationally designated site (e.g. SPA) as designated under the Birds Directive or Ramsar Convention), candidate sites, qualifying features connected to a nearby SPA (e.g. shorebird assemblage), or an area meeting the criteria for an international designation. • A nationally designated site or area meeting criteria for national level designations (e.g. SSSI). • A regularly occurring, nationally important population of any internationally important species listed under Annex I of the Birds Directive, or regularly occurring migratory species connected to a SPA designated for this species under the Birds Directive. • A regularly occurring, regionally important population of any nationally important species listed as a Biodiversity 2020 priority species and species listed under Schedule 1 of the Wildlife and Countryside Act or Annex I of the Birds Directive.
Medium	• Habitats or species that form part of the cited interest of a Local Nature Reserve, or some local-level designated sites depending on specific site conditions. • A feature (e.g. habitat or population) which is either unique or sufficiently unusual to be considered as being of nature conservation value up to a district or county context. • A regularly occurring, locally important population of any nationally important species listed as a Biodiversity 2020 priority species and species listed under Schedule 1 of the Wildlife and Countryside Act or Annex I of the Birds Directive. • Other species of conservation concern, including species listed under the UK Birds of Conservation Concern (BoCC).
Low	• Habitats or species that form part of the cited interest of a local-level designated site and may be designated as a non-statutory Site of Importance for Nature Conservation (SINC) or the equivalent (e.g. Local Wildlife Site, Ancient Woodland designation). • A feature (e.g. habitat or population) that is of nature conservation value in a local context only, with insufficient value to merit a formal nature conservation designation. All other species that are widespread and common and which are not present in locally, regionally or nationally important numbers which are considered to be of low or poor ecological value (e.g. UK Birds of Conservation Concern Green List species).
Negligible	• Commonplace species of little or no conservation significance. Loss of such a species from the site would not be seen as detrimental to the ecology of the area.

37. In addition to the features listed in Table 23.4, ecological features which play a key functional role in the landscape or are locally rare have also been considered. The importance of such features has been determined by professional judgement.

38. CIEEM places the emphasis on using professional judgement when considering importance of ecological receptors, based on available guidance, information and expert advice (CIEEM, 2016b). Different aspects of ecological importance should be taken into account, including designations, biodiversity value, potential value, secondary or supporting value, social value, economic value, legal protection and multi-functional features.

23.4.1.2 Magnitude

39. The magnitude of the impact is assessed according to:

- The extent of the area subject to a predicted impact;
- The duration the impact is expected to last prior to recovery or replacement of the resource or feature;
- Whether the impact is reversible, with recovery through natural or spontaneous regeneration, or through the implementation of mitigation measures or irreversible, when no recovery is possible within a reasonable timescale or there is no intention to reverse the impact; and
- The timing and frequency of the impact, i.e. conflicting with critical seasons or increasing impact through repetition.

40. Table 23.5 summarises the definitions of magnitude for onshore ornithology.

Table 23.5 Definitions of magnitude levels for onshore ornithology

Magnitude	Definition
High	Major impacts on the feature / population, which would have a sufficient effect to alter the nature of the feature in the short to long term and affect its long-term viability. For example, more than 20% habitat loss or damage.
Medium	Impacts that are detectable in short and long-term, but which should not alter the long-term viability of the feature / population. For example, between 10 - 20% habitat loss or damage.
Low	Minor impacts, either of sufficiently small-scale or of short duration to cause no long-term harm to the feature / population. For example, less than 10% habitat loss or damage.
Negligible / No change	A potential impact that is not expected to affect the feature / population in any way, therefore no effects are predicted.

23.4.1.2.1 Duration

41. The definitions of duration used within this EcIA are dependent on the individual ecological receptor, and how sensitive it is to effects over different timescales. However, in general terms the following definitions have been used:

- **Short term** – effects which at most occur over a part of – or over a part of a key period of – a species' active season or a habitat's growing season, i.e. typically effects which occur over a matter of days or weeks;
- **Medium term** – effects which occur over the full duration of a species' active season or a habitat's growing season, i.e. typically effects which occur over a matter of months or one year; and
- **Long term** – effects which occur over the multiple active or growing seasons, i.e. typically effects which occur over more than one year.

42. Where deviations from these definitions are used within section 23.7, this is explained within the text.

23.4.1.3 Impact significance

43. Following the identification of receptor importance and magnitude of effect, it is possible to determine the significance of the impact.

44. Ecologically significant impacts are defined as:

- *'…impacts on structure and function of defined sites, habitats or ecosystems and the conservation status of habitats and species (including extent, abundance and distribution)*' (CIEEM, 2016a).

45. Impacts are unlikely to be significant where features of low importance are subject to small scale or short-term effects. If an impact is found not to be significant at the level at which the resource or feature has been valued, it may be significant at a more local level.

46. CIEEM recommend that the following factors are taken into account when determining significance for selected ecological receptors:

23.4.1.3.1 Designated/defined sites and ecosystems

- **Designated sites** – is the project and associated activities likely to undermine the site's conservation objectives, or positively or negatively affect the conservation status of species or habitats for which the site is designated, or may it have positive or negative effects on the condition of the site or its interest/qualifying features?
- **Ecosystems** – is the project likely to result in a change in ecosystem structure and function?

23.4.1.3.2 Habitats and species

- **Habitats** – conservation status is determined by the sum of the influences acting on the habitat that may affect its extent, structure and functions as well as its distribution and its typical species within a given geographical area.

- **Species** – conservation status is determined by the sum of influences acting on the species concerned that may affect its abundance and distribution within a given geographical area (CIEEM, 2016a).

47. Following the identification of receptor importance and magnitude of effect, the significance of the impact has been considered using the matrix presented in Table 23.6 and knowledge of the ecological features affected.

48. The assessment of potential impacts has been undertaken assuming that all embedded mitigation and project commitments made during the design process to minimise impacts will be successfully implemented. Where, following this assessment, significant impacts are identified, additional mitigation measures are then proposed. A final assessment of the residual impacts remaining following implementation of these additional mitigation measures is then made.

Table 23.6 Impact significance matrix

		Negative magnitude				Beneficial magnitude			
		High	Medium	Low	Negligible	Negligible	Low	Medium	High
Sensitivity	High	*Major*	*Major*	*Moderate*	*Minor*	*Minor*	*Moderate*	*Major*	*Major*
	Medium	*Major*	*Moderate*	*Minor*	*Minor*	*Minor*	*Minor*	*Moderate*	*Major*
	Low	*Moderate*	*Minor*	*Minor*	*Negligible*	*Negligible*	*Minor*	*Minor*	*Moderate*
	Negligible	*Minor*	*Negligible*	*Negligible*	*Negligible*	*Negligible*	*Negligible*	*Negligible*	*Minor*

49. The impact significance categories are defined as shown in Table 23.7.

Table 23.7 Impact significance definitions

Impact Significance	Definition
Major	Very large or large change in receptor condition, both adverse or beneficial, which are likely to be important considerations at a regional or district level because they contribute to achieving national, regional or local objectives, or, could result in exceedance of statutory objectives and / or breaches of legislation.
Moderate	Intermediate change in receptor condition, which are likely to be important considerations at a local level.
Minor	Small change in receptor condition, which may be raised as local issues but are unlikely to be important in the decision making process.
Negligible	No discernible change in receptor condition.
No impact	No impact, therefore no change in receptor condition.

50. Note that for the purposes of the EcIA, major and moderate impacts are deemed to be significant. In addition, whilst minor impacts are not significant in their own right,

it is important to distinguish these from other non-significant impacts as they may contribute to significant impacts cumulatively or through interactions.

51. Embedded mitigation relevant to onshore ornithology has been referred to and included in the initial assessment of impact. If the impact does not require mitigation (or none is possible) the residual impact remains the same. If, however, mitigation is required an assessment of the post-mitigation residual impact is provided.

23.4.2 Cumulative Impact Assessment

52. Chapter 6 EIA Methodology provides a summary of the CIA methodology. This chapter focuses on those cumulative impacts that are specific to onshore ornithology.

53. The key consideration used in relation to linear developments such as Norfolk Vanguard is whether there is spatial or temporal overlap of effects from projects on the same receptors. For instance, for habitats and non-mobile species, unless there is a spatial overlap there is no pathway for cumulative impact between spatially separated projects. There is however a potential for a cumulative impact upon the overall habitat resource at a regional or national level. Where potential regional or national level impacts are identified and considered to be relevant they are highlighted in the CIA.

54. For mobile species there is only a pathway for cumulative impact if there is spatial overlap of potential receptor ranges in addition to temporal overlap with the activity or its resultant impact i.e. where developments follow on from one another before the species has recovered from displacement or other impact. In addition, whilst it is assumed that any consented development would be subject to mitigation and management measures which would reduce impacts to non-significant, unless there are exceptional circumstances it is accepted that such projects may contribute to a wider cumulative impact.

55. Finally, in cases where this project has negligible or no impact on a receptor (through for example avoidance of impact through routeing or construction methodology) it is considered that there is no pathway for a cumulative impact.

56. Further details of the methods used for the CIA for onshore ornithology are provided in section 23.8.

23.4.3 Transboundary Impact Assessment

57. There are no transboundary impacts with regards to onshore ornithology as the proposed onshore project area works are not sited in proximity to any international boundaries. Transboundary impacts are therefore scoped out of this assessment and will not be considered further.

23.4.4 Habitats Regulations Assessment

58. A Habitats Regulations Assessment (HRA) Report (Document reference 5.3) has been prepared for the project and will be submitted as part of the Development Consent Order (DCO) application. The HRA Report contains an assessment of whether or not the project is likely to give rise to a likely significant effect upon the integrity of a European site (i.e. SPA, SAC or Ramsar sites), either alone or in combination with other projects.

59. This chapter refers to and draws on the information provided in the HRA Report and its conclusions when discussing potential impacts upon ecological receptors which are directly or indirectly referring to European sites and their qualifying features.

60. For more details regarding the need for a HRA Report and the HRA assessment process, please refer to the HRA Report submitted alongside the ES and DCO application.

23.5 Scope

23.5.1 Study Area

61. The onshore development footprint is referred to hereafter as the onshore project area. The onshore project area considered includes the following elements:

- Landfall;
- Onshore cable route, accesses, trenchless crossing technique (e.g. Horizontal Directional Drilling (HDD)) zones and mobilisation areas;
- Onshore project substation; and
- Extension to the Necton National Grid substation and overhead line modifications.

62. These are shown in Chapter 22 Onshore Ecology in Figure 22.1. The onshore project area is set out in full detail in Chapter 5 Project Description.

63. The study areas for onshore ornithological receptors used in this EcIA are provided in Table 23.8. Different study areas have been used for different receptors depending on their sensitivity and on their habitat preferences. These study areas were selected according to standard guidance and professional judgement and agreed with Natural England during the consultation on the Scoping Norfolk Vanguard EPP, as outlined in section 23.4.1.

Table 23.8 Study areas for different onshore ornithology receptors used for this EcIA

Receptor	Study area	Study area name used in the remainder of this document
Internationally designated sites	Within and up to 5km of the onshore project area (Figure 23.1)	'internationally designated sites study area'
Nationally designated sites	Within and up to 2km of the onshore project area (Figure 23.1)	'designated sites study area'
Statutory designated sites located	Within 200m of site access routes which exceed set air quality criteria (Figure 26.1, Chapter 26 Air Quality)	'construction vehicle exhaust emissions study area'
Non-statutory designated sites	Within and up to 2km of the onshore project area (Figure 23.1)	'designated sites study area'
Protected and notable species	Within and up to 50m of the onshore project area (Figure 23.1)	'species study area'

23.5.2 Data Sources

64. This EcIA has been informed by desk-based information and field survey data that has been collected with respect to the project between July 2016 and October 2017. Field survey data has been collected for the appropriate study areas for the receptor concerned and based upon the project information available at the time of collection.

65. All of the data sources used to inform the EcIA are summarised in Table 23.9.

66. The field survey programme as proposed in the Onshore Ecology and Onshore Ornithology Method Statement Document Reference: PB4476-003-029 (Royal HaskoningDHV, 2017) commenced in October 2016 and was completed in August 2017. This EcIA contains the findings of all completed field surveys.

Table 23.9 Data sources

Data source	Date	Data	Coverage / data gaps	Status
Desk study data				
Joint Nature Conservation Committee (JNCC)	July 2016 (updated March 2018)	European designated sites (SPA, SAC, Ramsar sites)	Onshore project area plus a 5km buffer	Data obtained
JNCC Natural England	July 2016 (updated March 2018)	UK designated sites (SSSI, NNR, LNR)	Onshore project area plus a 2km buffer	Data obtained
JNCC	July 2016 (updated March 2018)	UK Habitats of Principal Importance	Onshore project area plus a 2km buffer	Data obtained
Norfolk Biodiversity Information Service (NBIS)	July 2016	Locally designated sites (CWS, Roadside Nature Reserves (RNR))	Onshore project area plus a 2km buffer	Data obtained
NBIS	July 2016	Protected and notable species records including: • Wildlife & Countryside Act 1981 Schedule 1; • Bonn Convention Appendix 1 & 2; • Bern Convention Appendix 2 & 3; • NERC Act 2006 Section 41 species; • UK species of principal importance (both local and national); • BoCC4 Red and Amber list species; • Locally Rare species; and • SSSI/SPA/Ramsar qualifying species.	Onshore project area plus a 2km buffer	Data obtained

Data source	Date	Data	Coverage / data gaps	Status
APEM	March 2017	High-resolution aerial photography data	Onshore project area plus a 50m buffer	Data obtained
NBIS	March 2017	Norfolk 'Living Map' remote sensing habitat mapping data	Onshore project area plus a 50m buffer	Data obtained
Natural England	August 2016	Sensitivity maps for the following Broadland SPA species from 1986/87 to 2012/13: • Berwick's Swan; • Whooper swan; and • Pink-footed goose	10km buffer around Broadland SPA	Data obtained
Natural England	March 2017	Location of sand martin nests at Happisburgh coastline	Happisburgh	Data obtained
Norfolk Local Biodiversity Action Plan (LBAP)	June 2017	Lists of Norfolk priority habitat and species.	Onshore project area plus a 50m buffer	Data obtained
Field survey data				
Extended Phase 1 Habitat Survey	February 2017	An Extended Phase 1 Habitat Survey following 'Extended Phase 1' methodology as set out in *Guidelines for Baseline Ecological Assessment* (Institute of Environmental Assessment, 1995). Habitats were classified and mapped following JNCC's *Handbook for Phase 1 habitat survey: A technique for environmental audit* (2010). Included a search for: • assessment of suitable habitats to support common and notable[1] breeding birds;	Onshore project area plus a 50m buffer Coverage of approx. 50% of survey area achieved.	Full survey results available
Wintering bird surveys	February 2017	A survey of ex situ habitats of the Broadland SPA, and of those SSSI within 1km of the cable route which support wintering bird interest features. This includes surveys of the following areas: • Agricultural fields in North Walsham District;	Habitats within 300m of the onshore project area and 5km of the Broadland SPA;	Full survey results available

[1] Notable species are defined here as those listed on Annex 1 of the Birds Directive, UK Red or Amber List species, UKSPI or Norfolk LBAP species.

Data source	Date	Data	Coverage / data gaps	Status
		• Dereham Rush Meadows SSSI; • Hundred Stream; and • North Norfolk Coast between Eccles-on-Sea and Paston.	SSSI within 300m of the onshore project area.	
Breeding bird survey	August 2017	Breeding bird surveys of the following areas: • Booton Common SSSI; • Dillington Carr SSSI; • Dereham Rush Meadows SSSI; • Land South of Dillington Carr CWS; • Coastal floodplain grazing marsh habitat has been identified along the habitats adjacent to the river within the survey area; and • Pigney's Wood LNR.	Onshore project area plus a 50m buffer	Full survey results available

23.5.3 Assumptions and Limitations

67. Biological records data provided by NBIS includes records collected by members of the public and volunteers, and therefore these are not necessarily subject to quality control or do not necessarily contain full details of or spatial accurate information for the species recorded. The absence of records does not imply any species, habitat or designation is absent from the search area. Nor does recorded presence imply current, continuing or breeding presence. Despite these caveats, biological records provide very useful supporting data to provide context when field survey data is not available.

68. No accuracy assessment has been carried out on the Norfolk Living Map by NBIS, and it is anticipated that there may be errors in the data, for example where there was cloud cover in the remote sensing imagery, or shadow caused by steep gulleys or on north-facing slopes. However, such errors are likely to be systematic and as such it has been possible to check the Norfolk Living Map habitat classification against the field survey data and to identify which habitat types have been misidentified. One example is the wet grassland in Wendling Carr, which has been incorrectly identified as Lowland Mixed Deciduous Woodland, likely due to the presence of a small number of scattered trees. Such errors have been identified during the production of the Extended Phase 1 Habitat Survey maps and therefore minimised as far as possible.

69. The Extended Phase 1 Habitat field surveys which inform this EcIA have been undertaken during the 2017 ecological survey season, the findings of which have been used to inform this chapter. However, landowner access was not possible for the entire onshore project area and therefore access has only been possible to approximately 50% of the species study area (i.e. the onshore project area plus a 50m buffer) for the 2017 ecological surveys. The Norfolk Living Map data provided by NBIS has been used to characterise the habitats for the remaining 50% of the species study area (see Figure 22.5, Chapter 22 Onshore Ecology) and other desk study data (e.g. the NBSG's bat data) has been used to provide additional species information where possible.

70. For the purposes of this EcIA and for areas where survey data is not available due to access restrictions, a precautionary approach has been adopted, i.e. it has been assumed that protected or notable species (as defined in Table 23.9 as Wildlife & Countryside Act 1981 Schedule 1; Bonn Convention Appendix 1 & 2; Bern Convention Appendix 2 & 3; NERC Act 2006 Section 41 species; UK species of principal importance (both local and national); BoCC4 Red and Amber list species; Locally Rare species) will be present within these inaccessible and in turn unsurveyed areas. In these instances, an assessment of the habitat and its suitability to support protected or notable species has been made using Extended Phase 1 Habitat Survey

or from reviewing the Norfolk Living Map data. Where surveys have not been possible due to the lack of landowner access, full surveys of these areas will be carried out post-consent.

71. Some habitats could not be fully accessed during the 2017 field surveys, due to physical barriers preventing entry. For example, complex field drain networks, or dense scrub. However, these areas were encountered infrequently and where they were, they were recorded as potentially providing field signs which could not be picked up during the field surveys.

72. The Extended Phase 1 Habitat Survey was conducted during February 2017 and early March 2017, which is outside of the optimal survey period for identifying ground flora species and hence habitat communities. Despite this, sufficient evidence was found during the survey to successfully identify habitats which have the potential to support breeding or wintering or on passage birds.

73. The 2017 breeding bird survey commenced in May, which resulted in no survey being undertaken in April, as set out within the Onshore Ecology and Onshore Ornithology Method Statement Document Reference: PB4476-003-029 (Royal HaskoningDHV, 2017). As all of the survey areas were surveyed throughout the remaining survey period (i.e. May until early August), the omission of a survey in April is not anticipated to result in a significant constraint on the survey results, although it is acknowledged that some early singers such as mistle thrush *Turdus viscivorus*, dunnock *Prunella modularis*, bullfinch *Pyrrhula pyrrhula*, lesser and great spotted woodpecker *Dendrocopus minor* and *Dendrocopus major* may be underrepresented.

74. Whilst the survey team made the utmost effort to cover every habitat and record all field signs present during the 2017 field surveys, on occasion due to human error some field signs can be missed or overlooked. However, and despite this, the data presented in Appendices 23.1 – 23.3 and summarised in section 23.6 is considered to provide an accurate description of the habitats and accurate account of species presence / absence within the survey area and in turn to inform a robust EcIA.

23.6 Existing Environment

23.6.1 International Statutory Designated Sites

75. A total of four international statutory designated sites for nature conservation with an ornithological interest or qualifying feature are located within the internationally designated site study area (as defined in section 23.5.1). These are:

- Broadland SPA and Ramsar site and The Broads SAC;
- Paston Great Barn SAC;

- River Wensum SAC; and
- Norfolk Valley Fens SAC.

76. One of these sites, the River Wensum SAC, is also located directly within the onshore project area. The location of these sites is shown in Appendix 23.1.

77. The River Wensum SAC, The Broads SAC, Paston Great Barn SAC and Norfolk Valley Fens SAC are not designated for ornithological interest features, and as such are not considered further within this assessment.

23.6.1.1 Broadland SPA

78. The Broadland SPA site is located approximately 4.5km south of the onshore project area. Table 23.10 provides a summary of the qualifying features (habitats and species) for this site.

Table 23.10 Qualifying features of the Broadland SPA (population counts are derived from the SPA citation)

This site qualifies under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive:
Over winter: Bewick's swan *Cygnus columbianus bewickii*, 495 individuals representing up to 7.1% of the wintering population in Great Britain (5 year peak mean 1987/8-1991/2) Bittern *Botaurus stellaris*, 2-3 individuals representing up to 10-15% of the wintering population in Great Britain (5 year peak mean 1987/8-1991/2) Hen harrier *Circus cyaneus*, 22 individuals representing up to 3% of the wintering population in Great Britain (5 year peak mean 1987/8-1991/2) Ruff *Philomachus pugnax*, 96 individuals representing up to 6.4% of the wintering population in Great Britain (5 year peak mean 1987/8-1991/2) Whooper swan *Cygnus*, 121 individuals representing up to 2% of the wintering population in Great Britain (5 year peak mean 1987/8-1991/2) Marsh harrier *Circus aeruginosus*, 16 individuals representing up to 16% of the wintering population in Great Britain (5 year peak mean 1987/8-1991/2)
This site also qualifies under Article 4.2 of the Directive (79/409/EEC) by supporting populations of European importance of the following migratory species:
Over winter: Gadwall *Anas strepera*, 486 individuals representing up to 4.0% of the wintering North-western Europe population (5 year peak mean 1987/8-1991/2) Shoveler *Anas clypeata*, 675 individuals representing up to 1.7% of the wintering North-western Europe population (5 year peak mean 1987/8-1991/2) Widgeon *Anas penelope*, 8,966 individuals representing up to 1.2% of the wintering North-western Europe population (5 year peak mean 1987/8-1991/2)

This site qualifies under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive:
The following species was also included under the SPA Review (Stroud et al. 2001): Pink-footed goose *Anser brachyrhynchus*, 3,290 individuals representing up to 1.5% of the wintering Eastern Greenland/Iceland/UK population (5 year peak mean 1994/5-1998/9)
Under the SPA Review (Stroud *et al.*, 2001), the area also qualifies under Article 4.2 of the Directive (79/409/EEC) by regularly supporting at least 20,000 waterfowl
Over winter, the area regularly supports 22,603 individual waterfowl (RSPB, Count 99/00) including: Cormorant *Phalacrocorax carbo*, Bewick's swan *Cygnus columbianus bewickii*, Whooper Swan *Cygnus cygnus*, Ruff *Philomachus pugnax*, Pink-footed goose *Anser brachyrhynchus*, Gadwall *Anas strepera*, Bittern *Botaurus stellaris*, Great crested grebe *Podiceps cristatus*, Coot *Fulica atra*, Bean goose *Anser fabalis*, White-fronted goose *Anser albifrons*, Wigeon *Anas penelope*, Teal *Anas crecca*, Pochard *Aythya ferina*, Tufted duck *Aythya fuligula*, Shoveler *Anas clypeata*.

79. Natural England has supplied draft maps of functionally-linked (i.e. supporting) land for pink-footed goose outside of the Broadland SPA boundary (Natural England, 2016). This information provides additional baseline data on the key areas for this Broadland SPA qualifying species within the onshore project area. A copy of these draft maps are provided in Appendix 23.3.

80. The maps indicate that, based on the 2008/9-2012/3 distribution, the key feeding areas for pink-footed goose within the internationally designated sites study area are located in a triangle between the villages of Happisburgh, Bacton and Witton Bridge, all of which are towards the east of the internationally designated sites study area.

23.6.1.2 Broadland Ramsar site

81. Broadland Ramsar site is located approximately 4.5km south of the onshore project area at its closest point. Table 23.11 provides a summary of the qualifying features for which this site is afforded protection.

Table 23.11 Qualifying features of the Broadland Ramsar site (population counts are derived from the Ramsar Information Sheet)

Ramsar criterion 6 – species/populations occurring at levels of international importance. Qualifying Species/populations (as identified at designation):
Species with peak counts in winter: Tundra swan, NW Europe 196 individuals, representing an average of 2.4% of the GB population (5 year peak mean 1998/9- 2002/3). Eurasian wigeon, NW Europe 6769 individuals, representing an average of 1.6% of the GB population (5 year peak mean 1998/9-2002/3). Gadwall, NW Europe 545 individuals, representing an average of 3.1% of the GB population (5 year peak mean 1998/9- 2002/3). Northern shoveler, NW & C Europe 247 individuals, representing an average of 1.6% of the GB population (5 year peak mean 1998/9- 2002/3).

Ramsar criterion 6 – species/populations occurring at levels of international importance. Qualifying Species/populations (as identified at designation): Species/populations identified subsequent to designation for possible future consideration under criterion 6.
Species with peak counts in winter: Pink-footed goose, Greenland, Iceland/UK 4263 individuals, representing an average of 1.7% of the population (5 year peak mean 1998/9-2002/3). Greylag goose, *Anser anser anser*, Iceland/UK, Ireland 1007 individuals, representing an average of 1.1% of the population (Source period not collated).

82. All international statutory designated sites for nature conservation are considered to be of high importance.

23.6.2 National Statutory Designated Sites

83. A total of 17 national statutory designated sites for nature conservation are located within the designated sites study area. Of these, six are notified or designated in part due to the breeding or wintering bird species they support. These six sites are:

- River Wensum SSSI;
- Dereham Rush Meadow SSSI;
- Dillington Carr, Gressenhall SSSI;
- Cawston and Marsham Heaths SSSI;
- Booton Common SSSI; and
- Pigney's Wood LNR.

84. One of these sites, the River Wensum SSSI is also located directly within the onshore project area. Pigney's Wood LNR is also located immediately adjacent to the onshore project area.

85. Table 23.12 lists the six statutory designated sites that are located within the designated sites study area. This table also provides a summary of the reasons for the designation of these sites. The legislation underpinning statutory designated sites is discussed in section 23.2.1. The locations of these statutory designated sites are shown on Figure 22.2 in Chapter 22 Onshore Ecology.

86. All national statutory designated sites for nature conservation are considered to be of high importance.

Table 23.12 National designated sites for nature conservation of relevance to onshore ornithology

Name	Designation	Location (NGR) / size (ha)	Distance to onshore project area at their closest point	Qualifying features/reasons for notification
River Wensum	SSSI	TF 942246 to TG 250078 306.79	Located within	The Wensum has been selected as one of a national series of rivers of special interest as an example of an enriched, calcareous lowland river. ***Ornithological interest features***: Kingfisher *Alcedo attthis* and little grebe *Tachybaptus ruficollis* breed along the River, whilst the adjacent wetlands have good populations of reed warblers *Acrocephalus scirpaceus*, sedge warblers *Acrocephalus schoenobaenus* and barn owls *Tyto alba*. Extensive areas of reedbed and tall mixed fen communities have developed which provide valuable breeding and hunting grounds for birds such as the barn owl *Tyto alba* and hen harrier *Circus cyaneus*.
Dereham Rush Meadow	SSSI	TF 976140 20.6	300m south	This site comprises an area of winter-flooded meadowland and alder carr along the valley of a small tributary of the River Wensum, and exhibits a wide range of grassland and woodland communities which are particularly unusual in Norfolk. ***Ornithological interest features***: The site is of interest for its breeding bird population including snipe *Gallinago gallinago*, lapwing *Vanellus vanellus*, sedge warbler and reed warbler, and winter floods are periodically used by waterfowl.
Dillington Carr, Gressenhall	SSSI	TF 971158 49.0	300m north	This site is an extensive area of carr woodland and open water occupying the valley floor and sides of a small tributary of the River Wensum. ***Ornithological interest features***: The freshwater habitats support a wide range of breeding birds including gadwall, pochard, teal, tufted duck, shoveler, great crested grebe and kingfisher. The surrounding woodland is also rich in breeding species, the more notable being barn owl, little owl *Athene noctua*, lesser spotted woodpecker *Dryobates minor*, willow tit *Poecile montanus*, nuthatch *Sitta europaea*, nightingale *Luscinia megarhynchos* and garden warbler *Sylvia borin*.
Cawston and Marsham Heaths	SSSI	TG 170235 125.7	1.5km south	Cawston and Marsham Heaths form the largest area of heather-dominated heathland now remaining in east Norfolk. ***Ornithological interest features***: A wide variety of heathland birds nest on the site including

Name	Designation	Location (NGR) / size (ha)	Distance to onshore project area at their closest point	Qualifying features/reasons for notification
				tree pipits *Anthus trivialis*, whinchats *Saxicola rubetra* and occasional nightjars *Caprimulgus europaeus* and the site is important as a winter roost for hen harriers.[2]
Booton Common	SSSI	TG 113230 7.73	700m south	The principal interest of the site is associated with a mosaic of wet calcareous fen grassland and acid heath communities which have developed due to the naturally undulating ground. ***Ornithological interest features***: A variety of breeding birds are present including snipe, woodcock *Scolopax rusticola*, grasshopper warbler *Locustella naevia* and lesser whitethroat *Sylvia curruca*.
Pigney's Wood	LNR	TG295319 20.87	Located adjacent	Pigney's Wood is a woodland site with reedbeds, a scrape, and wildflowers, butterflies, trees and birds.

[2] Consultation with Norfolk Wildlife Trust confirmed that the hen harrier winter roost at Cawston and Marsham Heaths is no longer active (Norfolk Wildlife Trust, 2016)

23.6.3 Non-statutory Designated Sites

87. A total of 95 non-statutory designated sites (CWS and RNR) have been identified within the designated sites study area, as shown on Figure 22.3 in Chapter 22 Onshore Ecology. Five of these sites are located directly within the onshore project area and are of potential ornithological interest. These sites are:

- Wendling Carr CWS (CWS no. 1013);
- Necton Wood CWS (CWS no. 2024);
- Land South of Dillington Carr CWS (CWS no. 1025);
- Marriott's Way CWS (CWS no. 2176) (crossed twice); and
- Paston Way and Knapton Cutting CWS (CWS no. 1175).

88. Of the remaining sites, seven are located adjacent to the onshore project area, 11 are located within 300m of the onshore project area and the remaining sites are located between 300m and 2km from the onshore project area.

89. In addition, there is a proposed CWS which, if it is designated, will be located within the onshore project area at Kerdiston between Kerdiston Hall and the Marriott's Way ('Kerdiston Old Hall Meadows')

90. All non-statutory designated sites are considered to be of medium importance.

23.6.4 Terrestrial Habitats

91. The baseline presented here is based on the findings from the 2017 field surveys, i.e. the 2017 Extended Phase 1 Habitat Survey. Where habitats were not recorded during this survey, habitats have been described here using the information gathered from the Norfolk 'Living Map'. Full details of the habitats present are provided in Appendix 22.1: Extended Phase 1 Habitat Survey Report. Features of interest are denoted using Target Notes (TNs), which are referenced using a numbering system. The locations of the TNs are shown on Figure 22.5, and further details are provided within Appendix 22.1. Please note that habitat areas provided here relate to the areas of habitat found within the onshore project area, not the species study area (i.e. the onshore project area plus a 50m buffer).

23.6.4.1 Woodland

92. Several woodland habitats are UKHPI, including the following three habitat types, which are present within the species study area:

- Lowland mixed woodland;
- Wet woodland; and
- Wood-pasture and parkland.

93. Lowland mixed deciduous woodland, wet woodland, and wood-pasture and parkland are also listed as Priority Habitats on the Norfolk LBAP.

94. There are approximately 8.8ha of woodland habitat located within the onshore project area (see Figure 22.5), equating to approximately 1.9% of the onshore project area. The majority of this woodland habitat is comprised of broadleaved and coniferous plantation woodland (3.9ha), and broadleaved semi-natural woodland (4.9ha).

95. Small parcels of lowland mixed woodland are located within the onshore project area at TN7 on the east side of the River Bure, TN10 at the King's Beck, TN78, at the railway cutting at Northall Green (TN173), at two locations on The Marriott's Way (TN264), and at Witton Hall (see Figure 22.5). Land at Dillington Carr (TN158) is also transitional wet woodland habitat.

96. Typical semi-natural woodland composition recorded during the 2017 Extended Phase 1 Habitat Survey was English oak *Quercus robur* and ash *Fraxinus excelsior* woodland, with alder *Alnus glutinosa* and goat willow *Salix caprea* with an understorey dominated by hazel *Corylus avellana*, hawthorn *Crataegus monogyna* and elder *Sambucus nigra*. Ground flora typically comprised of dog's mercury *Mercurialis perennis*, nettle *Urtica dioica*, lords and ladies *Arum maculatum*, wood avens *Geum urbanum* and ground ivy *Glechoma hederacea*.

97. Mixed semi-natural woodland is also present within the species study area and typically consists of: beech *Fagus sylvatica*, ash, English oak, sweet chestnut *Castanea sativa*, larch *Larix decidua* and cherry laurel *Prunus laurocerasus*.

98. Small areas within the 2017 survey area were classified as wood-pasture and parkland, typically where oak standards in hedgelines had become overgrown and remained after the hedgeline had been removed.

99. All woodland habitats have the potential to support common or notable breeding birds.

23.6.4.2 Scrub

100. Approximately 0.6ha of scrub habitat is located in scattered parcels throughout the onshore project area (see Figure 22.5). The areas where scrub was recorded represented a range of habitat sub-types, including transitional habitat between woodland and grassland, boundary features, waste ground, watercourse margins or field margins. Species composition varied, with elder and crack willow *Salix fragilis* common in wood scrub and bramble dominating where no woody species were present.

101. All areas of scrub have the potential to support common or notable breeding birds.

23.6.4.3 Isolated trees

102. Isolated trees are located throughout the species study area, associated with previous hedgerow lines, other linear features, isolated within the middle of pasture fields or domestic gardens.

103. Two veteran trees (one English oak, one alder) were noted during the 2017 field survey at TN168 and TN288 (see Figure 22.5).

104. All isolated trees have the potential to support common or notable breeding birds.

23.6.4.4 Hedgerows

105. Hedgerows are both UKHPI and Norfolk LBAP priority habitats.

106. A total of 310 hedgerows were recorded within the species study area during the 2017 Extended Phase 1 Habitat Survey, of which 110 are located within the onshore project area. A further 55 were identified from the Norfolk 'Living Map', totalling approximately 3.3km in length of hedgerow. These hedgerows are located both along the margin of the onshore project area and also throughout the onshore project area (see Figure 22.5).

107. Of the 110 hedgerows recorded within the onshore project area during the 2017 Extended Phase 1 Habitat Survey, 58 hedgerows are species-rich (both intact and defunct, and with/without trees). There are a total of 52 species-poor hedgerows (both intact and defunct, and with/without trees), all of which are common features throughout the onshore project area.

108. Species-rich hedgerows typically consisted of shrub and tree species including field maple, elm, hawthorn, blackthorn *Prunus spinosa*, rose *Rosa canina*, hazel, English oak, holly *Ilex spp*., ash, ivy *Hedera spp*., with ground flora typically including common nettle, cleavers *Galium aparine,* broad-leaved dock *Rumex obtusifolius*, herb Robert *Geranium robertianum*, dog's mercury, lords and ladies, red dead nettle *Lamium purpureum*. Species-poor hedgerows were characterised as having fewer than five species in a 30m stretch, and were typically dominated by hawthorn.

109. All hedgerows have the potential to support common or notable breeding birds.

23.6.4.5 Unimproved and semi-improved grassland

110. No areas of unimproved grassland were recorded within the species study area.

111. No areas of semi-improved grassland were recorded within the onshore project area during the 2017 Extended Phase 1 Habitat Survey, although one area was identified

from the Norfolk 'Living Map' (see Figure 22.5). These areas total approximately 1.2ha of semi-improved grassland (0.3% of the onshore project area).

112. The 2017 Extended Phase 1 Habitat Survey recorded areas of semi-improved grassland in areas outside of the onshore project area, but within the species study area. These areas comprise coarse, ruderal grass species and ruderal herbs. Cock's foot *Dactylis glomerata*, rough meadow grass *Poa trivialis*, meadow foxtail *Alopecurus pratensis*, ribwort plantain *Plantago lanceolata*, creeping buttercup *ranunculus repens*, white clover *Trifolium repens* and red dead-nettle *Lamium purpureum* are common species found within these habitats.

113. No species-rich grasslands were noted during the 2017 Extended Phase 1 Habitat Survey.

114. All semi-improved grassland has the potential to support common and notable wintering / on passage birds as roosting, feeding and loafing sites, and also to support notable ground-nesting breeding birds.

23.6.4.6 Marshy grassland

115. Marshy grassland was recorded within six locations within the onshore project area during the 2017 Extended Phase 1 Habitat Survey, totalling approximately 8.1ha (1.7% of the onshore project area).

116. Marshy grassland was recorded adjacent to watercourses within the species study area, at the River Wensum, River Bure, Dilham Canal and at minor watercourses near Salle and Sparham during the 2017 Extended Phase 1 Habitat Survey. Patches of common rush *Juncus effuses* in the wet areas are typical, with pendulous sedge *Carex pendula*, common vetch *Agrostis capillaris*, common bent, cranesbill *Geranium pratense*.

117. Selected areas of marshy grassland are also classified as coastal and floodplain grazing marsh, which is both a UKHPI and Norfolk LBAP priority habitat. This habitat is located in three areas within the species study area: namely at the River Wensum, Salle, and the Dilham Canal (see Figure 22.4).

118. All marshy grassland has the potential to support common and notable wintering / on passage birds as roosting, feeding and loafing sites, and also to support notable ground-nesting breeding birds.

23.6.4.7 Improved grassland

119. Improved grassland which is subject to regular grazing is the most common grassland type found within the onshore project area. This habitat type was recorded in 11 separate locations within the onshore project area during the 2017 Extended Phase

1 Habitat Survey, and a further seven areas were identified from the Norfolk 'Living Map' (see Figure 22.5) totalling approximately 1.8% of the onshore project area. Typically, where this habitat has been recorded, the sward was short and grazed, and of low diversity, dominated by cock's foot and perennial rye-grass *Lolium perenne* with broad-leaved dock *Rumex obtusifolius*, sorrel *Rumex acetosa*, and patches of nettle, ragwort *Senecio jacobaea* and thistle species *Cirsiurn sp*.

120. Improved grassland has the potential to support common and notable wintering / on passage birds as roosting, feeding and loafing sites, although is not an optimal habitat for this function.

23.6.4.8 Tall ruderal vegetation

121. Localised areas of tall ruderal habitat were recorded within the species study area during the 2017 Extended Phase 1 Habitat Survey (see Figure 22.5). This habitat was recorded typically along roads or track boundaries, or adjacent to scrub land. The typical species recorded include common nettle, common hogweed *Heracleum sphondylium*, broad-leaved dock and ribwort plantain.

23.6.4.9 Lowland fen

122. Lowland fen, which is a UKHPI, was also noted within the species study area at Dillington Carr in the data received as part of the desk study (JNCC, 2016). Survey access to this location has not been possible at the time of preparing this document, and the Norfolk Living Map identifies this habitat as deciduous woodland, so it is uncertain as to the actual nature of this habitat. Prior to ground-truthing post-consent, and based on JNCC data and aerial photography of the site, it is assumed that this habitat is indeed lowland fen. Desk study data received from JNCC indicates that there is 1.0ha of lowland fen within the species study area, all of which is located at Dillington Carr.

123. Lowland fen is also a Norfolk LBAP priority habitat.

124. All lowland fen has the potential to support common and notable wintering / on passage birds as roosting, feeding and loafing sites, and also to support notable breeding birds.

23.6.4.10 Standing water

125. Ponds are a UKHPI and Norfolk LBAP priority habitat.

126. There are a total of 206 standing water bodies (i.e. ponds, lakes, ditches) located within the great crested newt study area[3], of which six are located within the onshore project area (see Figure 22.5). Standing water accounts for approximately 0.2ha (0.1%) of habitat within the onshore project area.

127. All standing water has the potential to support common and notable wintering / on passage birds as feeding and loafing sites, and common breeding birds along pond edges.

23.6.4.11 Running water

128. Rivers are a UKHPI; they are not a Norfolk LBAP priority habitat.

129. There are five main rivers located within the species study area (see Chapter 20 Water Resources and Flood Risk for locations). These are:

- River Wensum;
- River Bure;
- King's Beck;
- Wendling Beck; and
- North Walsham and Dilham Canal.

130. In addition, there are numerous minor watercourses and field drains located throughout the species study area.

131. All running water has the potential to support common and notable wintering / on passage birds as feeding and loafing sites, and common breeding birds along river margins.

23.6.4.12 Coastal habitats

132. There are two coastal habitat types within the species study area. These include intertidal sand and dune grassland, which cover 6.3ha (1.4%) and 0.8ha (0.2%) of the onshore project area respectively. Coastal sand dunes are a UKHPI and Norfolk LBAP priority habitat.

133. All coastal grassland and intertidal sand habitats have the potential to support common and notable wintering / on passage birds.

[3] Within 250m of the temporary onshore project area and within 500m of the permanent onshore project area (Figure 22.5).

23.6.4.13 Other habitats

23.6.4.13.1 Arable land

134. The largest habitat by area within the species study area is arable land (405.7ha). This equates to approximately 87% of the onshore project area.

135. All arable land, in particular arable field margins, has the potential to support notable wintering / on passage birds as feeding and loafing sites. Arable land also has the potential to support certain notable ground-nesting breeding birds.

23.6.4.13.2 Buildings

136. There are no significant built-up areas within the species study area; however, there are several buildings and structures which were noted during the 2017 Extended Phase 1 Habitat Survey. These are primarily residential dwellings and farm buildings.

137. Certain buildings with open roof cavities or flat roofs have the potential to support notable breeding or roosting birds (for example, barn owl, or gull species).

23.6.4.14 Summary

138. Table 23.13 summarises the footprints of each habitat type described in section 23.6.4. The totals below are the combined totals derived from the 2017 Extended Phase 1 Habitat Survey, unless otherwise specified.

Table 23.13 Habitat footprints within the onshore project area

Habitat type	Area (ha)	Potential to support common or notable breeding birds	Potential to support common or notable wintering / on passage birds
Lowland Mixed Deciduous Woodland	7.0	Yes	-
Lowland Mixed Deciduous Woodland	3.6	Yes	-
Semi-natural broadleaved woodland - plantation	1.2	Yes	-
Plantation broadleaved woodland	0.4		
Plantation coniferous woodland	3.3	Yes	-
Plantation mixed woodland	0.2	Yes	-
Scrub - dense/continuous	0.4	Yes	-
Scrub - scattered	0.2	Yes	-
Broadleaved Parkland/scattered trees	<0.1	Yes	-
Mixed Parkland/scattered trees	0.1	Yes	-
Semi-improved grassland	1.2	Yes	Yes
Poor semi-improved grassland	8.1	Yes	Yes

Habitat type	Area (ha)	Potential to support common or notable breeding birds	Potential to support common or notable wintering / on passage birds
Improved grassland	0.2	Yes	Yes
Marshy grassland	8.1	Yes	Yes
Coastal and Floodplain Grazing Marsh	0.3	Yes	Yes
Woodland Rides	<0.1	Yes	-
Tall ruderal	0.1	Yes	Yes
Standing water	0.2	Yes	Yes
Running water	0.3	Yes	Yes
Intertidal mud and sand	6.3	-	Yes
Dune grassland	0.8	-	Yes
Beach	<0.1	-	Yes
Coastal Sand Dunes	<0.1	-	Yes
Coastal Sediment	0.1	-	Yes
Maritime Cliff and Slopes	<0.1	-	Yes
Cultivated/disturbed land - arable	383.5	Yes	Yes
Cultivated/disturbed land - amenity grassland	0.7	-	Yes
Gardens	0.9	Yes	Yes
Bare ground	1.4	-	-
Urban	9.7	-	-

Habitat type	Area (ha)	% of onshore project area	Potential to support common or notable breeding birds	Potential to support common or notable wintering / on passage birds
Lowland mixed deciduous woodland	3.6	0.8%	Yes	No
Broadleaved semi-natural woodland	1.3	0.3%	Yes	No
Broadleaved plantation woodland	0.4	0.1%	Yes	No
Coniferous plantation woodland	3.3	0.7%	Yes	No
Mixed plantation woodland	0.2	0.0%	Yes	No
Dense/continuous scrub	0.4	0.1%	Yes	No
Scattered scrub	0.2	0.0%	Yes	No
Broadleaved parkland / scattered trees	<0.1	0.0%	Yes	No
Woodland rides	<0.1	0.0%	Yes	No

Habitat type	Area (ha)	% of onshore project area	Potential to support common or notable breeding birds	Potential to support common or notable wintering / on passage birds
Improved grassland	8.4	1.8%	Yes	Yes
Marshy grassland	8.1	1.7%	Yes	Yes
Coastal and floodplain grazing marsh	0.3	0.1%	Yes	Yes
Semi-improved grassland	1.2	0.3%	Yes	Yes
Poor semi-improved grassland	8.3	1.8%	Yes	Yes
Tall ruderal	0.1	0.0%	Yes	Yes
Standing water	0.2	0.1%	Yes	Yes
Running water	0.8	0.2%	Yes	Yes
Cultivated / disturbed land - arable	405.7	87.4%	Yes	Yes
Cultivated / disturbed land - amenity grassland	0.7	0.2%	No	Yes
Gardens	1.2	0.3%	Yes	Yes
Bare ground	1.4	0.3%	No	No
Urban	11.3	2.4%	No	No
Other habitat	0.1	0.0%	No	No
Intertidal mud / sand	6.3	1.4%	No	Yes
Dune grassland	0.8	0.2%	No	Yes
Beach	<0.1	0.0%	No	Yes
Maritime Cliff and Slopes	<0.1	0.0%	No	Yes

23.6.5 Bird Species

139. This section provides a summary of the bird species recorded within the species study area during the ornithological surveys that have been undertaken to date. The baseline presented here draws on information provided by NBIS and Natural England, the findings of the 2017 Extended Phase 1 Habitat Survey and the findings of the Wintering Bird Survey (October 2016 – March-2017) and of the Breeding Bird Survey (May 2017 – August 2017). The background to these surveys is presented in Appendix 23.1, and the full results of these surveys to date are presented in Appendix 23.2 and in Appendix 22.5 in Chapter 22 Onshore Ecology.

23.6.5.1 Wintering / on passage bird species

140. A desk-based scoping exercise was undertaken in August 2016 to identify those habitats which may support wintering / on passage bird species associated with

statutory designated sites for nature conservation (Onshore Winter / Passage Bird Survey Scoping Report. Document Reference: PB4476-003-024 (Royal HaskoningDHV, 2016b)). This assessment identified both in situ and ex situ habitats[4] that have the potential to support the ornithological interest features of all internationally designated sites within 5km of the project scoping area[5] and nationally designated sites within 1km of the scoping area. As such a suite of wintering bird surveys focussing on these habitats and areas was undertaken. These surveys focussed on wintering bird species rather than on passage species as the relevant designated sites within the scoping area (Broadland SPA and Ramsar site and Dereham Rush Meadow) are designated for wintering rather than on passage qualifying features. Results from the surveys are shown on Figures 23.2 – 23.5.

141. As part of the site selection process for the project, the scoping area was revised into a more detailed development footprint in December 2016[6]. Following this, the scope of the planned wintering bird surveys was revised to only include those habitats with the potential to support the ornithological interest features of all internationally designated sites within 5km and nationally designated sites within 1km of the revised development footprint. Therefore, the data for the full survey period, October – March, was collected for the following habitats:

- Agricultural land within 5km of the Broadland SPA and Ramsar site, and also within – or within a precautionary 1km disturbance buffer of – the onshore project area;
- Coastal habitats within 5km of the Broadland SPA and Ramsar site, and also within – or within a precautionary 1km disturbance buffer of – the onshore project area;
- Lowland fen, rivers and lakes and lowland heathland habitats of the Hundred Stream within 5km of the Broadland SPA and Ramsar site, and also within – or within a precautionary 1km disturbance buffer of – the onshore project area; and
- Habitats within the boundaries of the Dereham Rush Meadows SSSI.

142. The findings of the wintering bird surveys of these habitats are summarised in the following section, and a full copy of the survey report can be found in Appendix 23.1.

[4] Ex situ habitats are those habitats located outside the boundary of an internationally designated site boundary which support features of the relevant designated site.
[5] The project scoping area was used as this assessment was undertaken early in the project design development process when more detailed onshore project area had not yet been determined, and was used to inform the site selection process.
[6] This more detailed development footprint was further revised into the onshore project area (as presented in section 23.5.1) in August 2017, however given this revision occurred once the wintering bird surveys were completed, it is the more detailed development footprint upon which the wintering bird surveys were based.

23.6.5.1.1 Agricultural fields in North Walsham District

143. All agricultural habitats (i.e. pasture and arable) within 5km of the Broadland SPA and Ramsar site were surveyed for their potential to support wintering populations of qualifying features of the Broadland SPA. These habitat areas were identified by the Onshore Wintering / Passage Bird Survey Scoping Report (Appendix 23.1), and are shown on Figure 23.2.

Table 23.14 Agricultural fields in North Walsham District: Peak count of waterbird species across six visits (peak counts in yellow)

Importance	Visit 1 11/11/2016	Visit 2 29/11/2016	Visit 3 15/12/2016	Visit 4 10/01/2017	Visit 5 07/02/2017	Visit 6 02/03/2017
Golden plover	-	-	-	-	-	120
Lapwing	-	-	-	-	-	197
Black-headed gull	-	-	-	-	28	192
Common gull	-	-	-	-	23	74

144. The counts of waterbirds recorded during the survey are not of a scale to be of national (or greater) importance (i.e. less than 1% of the Great Britain or international population) or to be a significant component of the Broadland SPA or its constituent SSSIs.

145. Flocks of pink-footed geese were observed in flight during the surveys, but no evidence to confirm their roosting, foraging or loafing was noted within the internationally designated sites study area. The peak size of these mobile flocks was approximately 2,000 individuals.

23.6.5.1.2 Dereham Rush Meadow SSSI

146. The Dereham Rush Meadow SSSI was surveyed to provide data on the wintering bird resource at this site. This site is located 300m south of the onshore project area. This site was identified for detailed survey by the Onshore Wintering / Passage Bird Survey Scoping Report (Appendix 23.1). The location of this site and survey results are shown on Figure 23.3.

Table 23.15 Dereham Rush Meadow SSSI: Peak count of waterbird species across six visits (peak counts in yellow)

Species	Visit 1 11/11/2016	Visit 2 30/11/2016	Visit 3 16/12/2016	Visit 4 12/01/2017	Visit 5 07/02/2017	Visit 6 02/03/2017
Egyptian Goose	-	2	-	-	-	2
Teal	-	-	3	-	-	-
Mallard	4		5	-	4	-

Species	Visit 1 11/11/2016	Visit 2 30/11/2016	Visit 3 16/12/2016	Visit 4 12/01/2017	Visit 5 07/02/2017	Visit 6 02/03/2017
Little Egret	-	1	1	2	3	-
Grey Heron	-	1	-	1	-	-
Water Rail	1	-	2	2	-	2
Moorhen	-	-	-	-	2	1
Snipe		1	1	-	-	-
Black-headed Gull	29	23	32	77	64	62
Common Gull	3	2	1	5	32	6
Lesser Black-backed Gull	-	-	-	1	-	-
Herring Gull	-	1	3	6	-	5
Pied Wagtail	1	2	-	-	-	-
Grey Wagtail	1	-	1	-	-	-
Meadow Pipit	9	-	1	-	-	2
Reed Bunting	-	-	3	3	1	-

147. The counts of waterbirds recorded during the survey are not of a scale to be of national (or greater) importance (i.e. less than 1% of the Great Britain or international population) or to be a significant component of the Dereham Rush Meadow SSSI.

148. The gulls recorded during the Dereham Rush Meadow SSSI survey were largely associated within the nearby sewage treatment works.

149. Flocks of pink-footed geese were observed in flight during the surveys, but no evidence of their roosting, foraging or loafing within the internationally designated sites study area was noted. The peak size of these mobile flocks was approximately 2,000 individuals.

23.6.5.1.3 Hundred Stream

150. Reedbed, lowland fen, rivers and lakes and lowland heathland within 5km of the Broadland SPA and Ramsar site were surveyed for their potential to support wintering populations of qualifying features of the Broadland SPA. These habitats areas were identified along the Hundred Stream by the Onshore Wintering / Passage Bird Survey Scoping Report (Appendix 23.1), and are shown on Figure 23.4.

Table 23.16 Habitats along the Hundred Stream: Peak count of waterbird species across six visits (peak counts in yellow)

Species	Visit 1 10/11/2016	Visit 2 29/11/2016	Visit 3 15/12/2016	Visit 4 10/01/2017	Visit 5 07/02/2017	Visit 6 02/03/2017
Pink-footed Goose	-	-	75	-	-	-
Mallard	-	2	-	4	-	3
Black-headed Gull	-	-	47	1	4	2

151. Flocks of pink-footed geese were observed in flight during the surveys, but no evidence of them roosting, foraging or loafing was noted.

152. The counts of waterbirds recorded during the survey are not of a scale to be of national (or greater) importance (i.e. less than 1% of the Great Britain or international population) or to be a significant component of the Broadland SPA or its constituent SSSIs.

23.6.5.1.4 North Norfolk Coast between Eccles-on-Sea and Paston

153. Coastal habitats within 5km of the Broadland SPA and Ramsar site were surveyed for their potential to support wintering populations of qualifying features of the Broadland SPA. These habitats areas were identified along the coast between Eccles-on-Sea and Paston by the Onshore Wintering / Passage Bird Survey Scoping Report (Appendix 23.1), and are shown on Figure 23.5.

Table 23.17 North Norfolk Coast between Eccles-on-Sea and Paston: Peak count of waterbird species (and other species) across six visits (peak counts in yellow)

Species	Visit 1 31/10/2016 01/11/2016	Visit 2 28/11/2016	Visit 3 14/12/2016	Visit 4 11/01/2017	Visit 5 08/02/2017	Visit 6 01/03/2017
Red-throated Diver	5	11	3	16	14	17
Black-throated Diver	-	-	1	1	2	-
Great Northern Diver	-	-	-	1	-	-
Great Crested Grebe	-	1	-	-	-	-
Cormorant	15	-	-	-	-	6
Gannet	2	1	-	2	7	70
Dark-bellied Brent Goose	4	-	1	-	-	-
Wigeon	-	-	11	-	-	-
Teal	14	-	-	-	-	-
Mallard	-	2	4	-	-	-
Shoveler	-	-	1	-	-	-
Eider	-	11	-	-	-	-
Common Scoter	14	53	-	3	15	-
Goldeneye	4	-	-	-	-	-
Red-breasted Merganser	-	4	-	-	-	-
Kestrel	-	1	-	-	-	-
Oystercatcher	-	-	-	2	-	3
Ringed Plover	-	8	12	1	5	3
Sanderling	-	7	2	3	2	-
Dunlin	-	2	-	-	-	-

Species	Visit 1 31/10/2016 01/11/2016	Visit 2 28/11/2016	Visit 3 14/12/2016	Visit 4 11/01/2017	Visit 5 08/02/2017	Visit 6 01/03/2017
Purple Sandpiper	-	1	-	-	-	-
Turnstone	30	38	26	26	29	49
Mediterranean Gull	1	2	2	1	2	2
Little Gull	-	-	-	1	-	-
Black-headed Gull	1,479	1,269	3,530	189	143	664
Common Gull	256	500	1,106	26	54	207
Lesser Black-backed Gull	4	7	1	1	2	3
Herring Gull	150	355	172	125	110	218
Great Black-backed Gull	110	568	79	41	16	47
Glaucous Gull	-	-	-	-	2	-
Kittiwake	-	-	-	-	-	8
Guillemot	10	7	16	20	10	1
Razorbill	-	2	2	2	2	-
Puffin	-	-	-	1	-	-
Auk sp.	1	-	-	1	-	-
Great Skua	1	2	-	-	-	1
Kingfisher	-	2	-	-	-	-
Carrion Crow	13	3	11	8	8	8
Jackdaw	8	-	1	-	-	-
Pied Wagtail	1	2	8	5	2	11
Meadow Pipit	-	2	3	-	-	3
Rock Pipit	-	-	-	-	-	2
Wren	-	-	1	-	-	-
Stonechat	-	1	-	-	-	-
Black Redstart	1	-	-	-	-	-
Starling	-	42	8	16	27	48
Snow Bunting	1	7	-	-	-	-
House Sparrow	-	-	1	-	-	1

154. The counts of waterbirds recorded during the survey are not of a scale to be of national (or greater) importance (i.e. less than 1% of the Great Britain or international population) or to be a significant component of the Broadland SPA or its constituent SSSIs.

23.6.5.2 Breeding bird species

23.6.5.2.1 Breeding bird surveys

155. Selected areas were identified during the 2017 Extended Phase 1 Habitat Survey as being suitable to support populations of breeding birds of conservation importance. The following criteria were used to scope in suitable habitats for supporting breeding birds:

- Statutory designated sites with notified breeding bird species located within a precautionary 1km buffer of the onshore project area;

- Non-statutory designated sites which support breeding birds located within the onshore project area; and
- UKHPI suitable to support breeding bird species located within the onshore project area.

156. Following these scoping guidelines, the following sites were identified for further bird surveys:

- Booton Common SSSI;
- Dillington Carr SSSI;
- Dereham Rush Meadows SSSI;
- River Wensum SSSI;
- Land South of Dillington Carr CWS;
- Pigney's Wood LNR;
- Floodplain grazing marsh UKHPI adjacent to the River Wensum; and
- Floodplain grazing marsh and lowland fen UKHPI adjacent to Dilham Canal.

157. The locations of these areas are shown in Appendix 23.2 and Figure 23.6. These locations have been surveyed for breeding birds, with surveys completed in August 2017. Table 23.18 summarises the results of these surveys. The floodplain grazing marsh habitat at the River Wensum and the River Wensum SSSI were surveyed together, as were Pigney's Wood and floodplain grazing marsh habitat at Dilham Canal.

Table 23.18 2017 Breeding Bird Survey results

Location	Survey dates	Total number of species recorded	Total number of species holding territories	Species of note[7]
Rush Meadows BB01	Five survey visits between May (2 visits) and August	35	21	Bullfinch (BOCC, Amber) Dunnock (BOCC, Amber) Reed bunting (BOCC, Amber; LBAP) Reed warbler (SSSI) Song thrush (BOCC, Red; LBAP) Willow warbler (BOCC, Amber)
Dillington Carr BB02	Five survey visits between May (2 visits) and August	47	30	Coot (SSSI) Cuckoo (BOCC, Red) Dunnock (BOCC, Amber) Gadwall (BOCC, Amber; SSSI) Great-crested grebe (SSSI)

[7] BOCC Amber = Amber listed species on Birds of Conservation Concern 4 (Eaton et al., 2015).
BOCC Red = Red listed species on Birds of Conservation Concern 4 (Eaton et al., 2015).
SSSI = notified feature of the surveyed SSSI
LBAP = Species subject to a Norfolk LBAP
Schedule 1 = Species listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended)

Location	Survey dates	Total number of species recorded	Total number of species holding territories	Species of note[7]
				Little grebe (SSSI) Mallard (BOCC, Amber) Mistle thrush (BOCC, Red) Moorhen (SSSI) Mute swan (BOCC, Amber; SSSI) Reed bunting (BOCC, Amber; LBAP) Song thrush (BOCC, Red; LBAP) Stock dove (BOCC, Amber)
Booton Common BB03	Five survey visits between May (2 visits) and August	29	21	Dunnock (BOCC, Amber) Marsh tit (BOCC, Red) Song thrush (BOCC, Red; LBAP)
Pigney's Wood BB04	Five survey visits between May (2 visits) and August	38	26	Cuckoo (BOCC, Red) Dunnock (BOCC, Amber) Mute swan (BOCC, Amber) Reed bunting (BOCC, Amber; LBAP) Song thrush (BOCC, Red; LBAP) Stock dove (BOCC, Amber)
Land south of Dillington Carr BB05	Five survey visits between May (2 visits) and August	41	29	Bullfinch (BOCC, Amber) Dunnock (BOCC, Amber) Reed bunting (BOCC, Amber; LBAP) Reed warbler (SSSI) Song thrush (BOCC, Red; LBAP) Willow warbler (BOCC, Amber)
Wensum Floodplain BB06	Five survey visits between May and August (note: 2 visits were undertaken in June)	42	33	Barn owl (Schedule 1; SSSI; LBAP) Bullfinch (BOCC, Amber) Cuckoo (BOCC, Red) Dunnock (BOCC, Amber) Great spotted woodpecker Kestrel (BOCC, Amber) Linnet (BOCC, Red) Mallard (BOCC, Amber) Mute swan (BOCC, Amber) Reed Bunting (BOCC, Amber; LBAP) Skylark (BOCC, Red; LBAP) Song Thrush (BOCC, Red; LBAP) Stock Dove (BOCC, Amber)

158. No birds listed on Schedule 1 of the Wildlife and Countryside Act as amended (1981) have been recorded nesting within the survey area.

23.6.5.2.2 Other species recorded within the onshore project area

159. A number of notable bird species were also recorded in the onshore project area along the onshore cable route during the 2017 Extended Phase 1 Habitat Survey. Wader species were observed at five locations within the species study area. Species observed included snipe, common sandpiper and woodcock, of which the latter is a BoCC4 Red List species. Woodcock was observed within hedgerows at TN313 and

TN394, while snipe and common sandpiper were observed in wet grassland habitat at TN148, TN205 and TN233 (see Figure 22.5 in Chapter 22 Onshore Ecology).

160. BoCC4 Red List species skylark, starling and lapwing were observed during the field survey. Skylarks were observed in songflight over arable fields in 13 locations within the survey area. Murmurations of starling were observed in and around the survey area and a flock (approximately 200 in number) of lapwing were observed loafing in an arable field at TN166 (see Figure 22.5 in Chapter 22 Onshore Ecology). These BoCC4 red list species present throughout the arable habitats of the onshore project area are receptors of medium importance.

161. Woodpecker were heard drilling in two locations within the species study area, and woodpecker holes were observed in a further five locations. No individuals were observed in order to confirm which woodpecker species. Lesser spotted woodpecker is a BoCC4 Red List species. Two owl nests were also observed at TN326 and TN329, although the species was not confirmed, they are likely to be barn owl (a species listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended)) (see Figure 22.5 in Chapter 22 Onshore Ecology).

162. A number of other bird species (all of which are common species) were also observed during the 2017 ecological walkover including egret, goldfinch, cormorant, robin, chaffinch, siskin, long tailed tit, blue tit, great tit, blackbird, bullfinch, wren, woodpidgeon, rook, buzzard, herring gull, kestrel, Egyptian goose, goldcrest, tree creeper and tawny owl. Common bird species are considered to be a receptor of low importance.

163. All hedgerows, parkland, isolated trees and woodland (all types) habitats were identified as potentially providing suitable nesting habitat for common species nesting birds. The wet grassland observed adjacent to the River Bure, River Wensum and Dilham Canal may also provide suitable breeding habitat for wader species including snipe. Arable fields provide habitat for breeding skylark.

164. A review of the Norfolk Living Map dataset and the 2017 aerial survey data identified 31 additional locations which may support common nesting or foraging birds within areas which was not accessible during the 2017 field survey. Of these, 29 locations were identified as providing potential nesting habitat for common bird species, and one was identified as potentially providing suitable habitat for waders and wildfowl (Coastal flooding plain grazing marsh on the left-hand bank of the River Wensum). These are shown on Figure 22.5 in Chapter 22 Onshore Ecology.

165. A sand martin nesting colony, a common breeding bird, has also been recorded along the coast at Happisburgh.

166. Advice from Natural England during the EPP indicated that the River Wensum floodplain on the southern (right hand) bank of the river within the species study area is currently subject to a Countryside Stewardship to target wintering waders and wildfowl. Consequently, Natural England advised that for this area it should be presumed that such species are present between November and February inclusive.

23.6.5.3 Conservation importance of receptors

167. The conservation importance of those wintering / on passage (non-breeding) receptors which have been identified in section 23.6.5.1 as potentially being impacted by the project is summarised in Table 23.19. The conservation importance for each receptor at the scale of the onshore project area has been determined following the approach described in section 23.4.1.1.

Table 23.19 Conservation status of wintering / on passage birds (yellow highlighting indicates exceedance of threshold)

Species	Peak count (waterbirds)	Population 1% thresholds		Conservation Status	Conservation importance for onshore project area	Comments
		GB	Int'l			
Red-throated Diver	17	2,600	170	Annex 1	Low	Numbers recorded well below GB threshold
Black-throated Diver	2	3,500	6	Annex 1; BoCC4 Amber	Low	Numbers recorded well below GB threshold
Great Northern Diver	1	50	25	Annex 1; BoCC4 Amber	Low	Numbers recorded well below GB threshold
Great Crested Grebe	1	3,500	190		Negligible	No conservation status
Cormorant	15	350	1,200		Negligible	No conservation status
Gannet	70	-	-	BoCC4 Amber	Low	UK Amber list only
Dark-bellied Brent Goose	4	910	2,400	UKSPI [UK Species of Principal Importance]	Low	Numbers recorded well below GB threshold
Wigeon	11	15,000	4,400	BoCC4 Amber	Low	Numbers recorded well below GB threshold
Teal	14	2,100	5,000	BoCC4 Amber	Low	Numbers recorded well below GB threshold
Mallard	4	6,800	45,000	BoCC4 Amber	Low	Numbers recorded well below GB threshold
Shoveler	1	400	180	BoCC4 Amber	Low	Numbers recorded well below GB threshold

Species	Peak count (waterbirds)	Population 1% thresholds		Conservation Status	Conservation importance for onshore project area	Comments
		GB	Int'l			
Eider	11	12,850	550	BoCC4 Amber	Low	Numbers recorded well below GB threshold
Common Scoter	53	5,500	1,000	BoCC4 Red; UKSPI	Medium	Numbers recorded well below GB threshold; UK Red list
Goldeneye	4	11,400	200	BoCC4 Amber	Low	Numbers recorded well below GB threshold
Red-breasted Merganser	4	1,700	84		Low	Numbers recorded well below GB threshold
Kestrel	N/A[8]	N/A	N/A	BoCC4 Amber	Low	Numbers recorded well below GB threshold
Oystercatcher	3	3,200	8,200	BoCC4 Amber	Low	Numbers recorded well below GB threshold
Ringed Plover	12	340	730	BoCC4 Red; Norfolk LBAP	Medium	Numbers recorded well below GB threshold; UK Red list
Sanderling	7	1,200	160	BoCC4 Amber	Low	Numbers recorded well below GB threshold
Dunlin	2	3,500	13,300	BoCC4 Amber	Low	Numbers recorded well below GB threshold
Purple Sandpiper	1	710	130	BoCC4 Amber	Low	Numbers recorded well below GB threshold
Turnstone	38	480	1,400	BoCC4 Amber	Low	Numbers recorded well below GB threshold
Mediterranean Gull	2	18	770	Annex 1	Low	Numbers recorded well below GB threshold
Little Gull	1	-	1,100		Low	Numbers recorded well below Int'l threshold
Black-headed Gull	3,530	22,000	20,000	BoCC4 Amber	Low	Numbers recorded well below GB threshold
Common Gull	1,106	7,000	16,400	BoCC4 Amber	Low	Numbers recorded well below GB threshold

[8] Species recorded in observation during other field surveys. Species not observed during Breeding Bird Surveys, therefore no formal count taken.

Species	Peak count (waterbirds)	Population 1% thresholds		Conservation Status	Conservation importance for onshore project area	Comments
		GB	Int'l			
Lesser Black-backed Gull	7	1,200	5,500	BoCC4 Amber	Low	Numbers recorded well below GB threshold
Herring Gull	355	7,300	10,200	BoCC4 Red; UKSPI	Medium	Numbers recorded well below GB threshold; UK Red list
Great Black-backed Gull	568	760	4,200	BoCC4 Amber	Low	Numbers recorded well below GB threshold
Glaucous Gull	2	2,000	2	BoCC4 Amber	Medium	Numbers recorded well below GB threshold; Int'l threshold breached
Kittiwake	8	20,000	-	BoCC4 Red	Medium	Numbers recorded well below GB threshold; UK Red list
Guillemot	20	-	-	BoCC4 Amber	Low	UK Amber list only
Razorbill	2	-	-	BoCC4 Amber	Low	UK Amber list only
Puffin	1	-	-	BoCC4 Amber	Low	UK Amber list only
Auk sp.	1	-	-		Negligible	No conservation status
Great Skua	2	-	-	BoCC4 Amber	Low	UK Amber list only
Kingfisher	N/A	N/A	N/A	Annex 1; BoCC4 Amber	Low	Numbers recorded well below GB threshold
Carrion Crow	N/A	N/A	N/A		Negligible	No conservation status
Jackdaw	N/A	N/A	N/A		Negligible	No conservation status
Pied Wagtail	N/A	N/A	N/A		Negligible	No conservation status
Meadow Pipit	N/A	N/A	N/A	BoCC4 Amber	Low	UK Amber list only
Rock Pipit	N/A	N/A	N/A		Negligible	No conservation status
Wren	N/A	N/A	N/A		Negligible	No conservation status
Stonechat	N/A	N/A	N/A		Negligible	No conservation status
Black Redstart	N/A	N/A	N/A	BoCC4 Red	Medium	UK Red list
Starling	N/A	N/A	N/A	BoCC4 Red; UKSPI	Medium	UK Red list
Snow Bunting	N/A	N/A	N/A	BoCC4 Amber	Low	UK Amber list only
House Sparrow	N/A	N/A	N/A	BoCC4 Red; UKSPI	Medium	UK Red list

Species	Peak count (waterbirds)	Population 1% thresholds		Conservation Status	Conservation importance for onshore project area	Comments
		GB	Int'l			
Pink-footed goose	75	3,500	3,600	BoCC4 Amber	Low	Numbers recorded well below GB threshold
Egyptian Goose	N/A	N/A	N/A		Negligible	No conservation status
Little Egret	3	1,300	45	Annex 1	Low	Numbers recorded well below GB threshold
Grey Heron	1	2,700	610		Negligible	No conservation status
Water Rail	2	10,000	-		Negligible	No conservation status
Moorhen	2	20,000	3,200		Negligible	No conservation status
Snipe	1	20,000	10,000	BoCC4 Amber	Low	Numbers recorded well below GB threshold
Grey Wagtail	N/A	N/A	N/A	BoCC4 Red	Medium	UK Red list
Reed Bunting	N/A	N/A	N/A	BoCC4 Amber; UKSPI, Norfolk LBAP	Low	UK Amber list only
Golden plover	120	9,300	4,000	Annex 1	Low	Numbers recorded well below GB threshold
Lapwing	197	20,000	6,200	BoCC4 Red; UKSPI	Medium	Numbers recorded well below GB threshold; UK Red list

168. The conservation importance of those breeding receptors which have been identified in section 23.6.5.2 as potentially being impacted by the project is summarised in Table 23.20. The conservation importance for each receptor at the scale of the onshore project area has been determined following the approach described in section 23.4.1.1.

169. Following refinement of the onshore project area, Booton Common SSSI, Dillington Carr SSSI and Dereham Rush Meadows SSSI are now located more than 300m from the onshore project area. Therefore, they have been scoped out as requiring any further consideration and/or assessment. Conversation status has, however, been considered for the receptors recorded at Pigney's Wood (BB04), Land south of Dillington Carr (BB05), and Wensum Floodplain (BB06).

Table 23.20 Conservation status of breeding birds (yellow highlighting indicates exceedance of threshold)

Species	Peak count	Conservation Status	Conservation importance for onshore project area	Comments
Pigney's Wood BB04				
Cuckoo	4	BoCC4 Red	Medium	Recorded in low numbers
Dunnock	5	BoCC4 Amber	Low	Recorded in low numbers
Mute swan	1	BoCC4 Amber	Low	Recorded in low numbers
Reed bunting	0	BoCC4 Amber, LBAP	Low	Recorded in low numbers
Song thrush	4	BoCC4 Red, LBAP	Medium	Recorded in low numbers
Stock dove	5	BoCC4 Amber	Low	Recorded in low numbers
Land South of Dillington Carr BB05				
Bullfinch	4	BoCC4 Amber		Recorded in low numbers
Dunnock	5	BoCC4 Amber	Low	Recorded in low numbers
Reed bunting	1	BoCC4 Amber, LBAP	Low	Recorded in low numbers
Reed warbler	0	SSSI	Low	Recorded in low numbers
Song thrush	4	BoCC4 Red, LBAP	Medium	Recorded in low numbers
Willow warbler	5	BoCC4 Amber		Recorded in low numbers
River Wensum BB06				
Barn owl	1	Schedule 1; SSSI; LBAP	Low	Recorded in low numbers
Bullfinch	2	BoCC4 Amber	Low	Recorded in low numbers
Cuckoo	1	BoCC4 Red	Medium	Recorded in low numbers
Dunnock	2	BoCC4 Amber	Low	Recorded in low numbers
Great spotted woodpecker	4		Low	Recorded in low numbers
Kestrel	1	BoCC4 Amber	Low	Recorded in low numbers
Linnet	2	BoCC4 Red	Medium	Recorded in low numbers
Mallard	11	BoCC4 Amber	Low	Recorded in low numbers
Mute swan	8	BoCC4 Amber	Low	Recorded in low numbers
Reed bunting	3	BoCC4 Amber, LBAP	Low	Recorded in low numbers
Skylark	1	BoCC4 Red	Medium	Recorded in low numbers
Song thrush	1	BoCC4 Red, LBAO	Medium	Recorded in low numbers
Stock dove	1	BoCC4 Amber	Low	Recorded in low numbers

23.6.6 Biodiversity

170. As outlined within the new Infrastructure Planning (Environmental Impact Assessment) Regulations 2017, an EcIA must now consider the potential impact not upon 'flora and fauna' but instead upon 'biodiversity, with particular attention to species and habitats protected under the Habitats Directive and Birds Directive'. This EcIA has considered potential impacts upon biodiversity through considering the potential impacts on those sites, habitats and species protected through EU and UK

law or through local policy, as representing the elements of UK ornithological biodiversity most at risk of loss, isolation or degradation.

23.6.7 Anticipated Trends in Baseline Conditions

171. The ecological baseline described in the preceding sections provides a summary of the habitats and species present within the study areas. In broad terms, the study areas represent typical lowland UK habitat types comprising largely arable farmland with hedgerows, pockets of woodland, wetland and standing and flowing water. The key habitats within this mosaic for notable species and habitats are typically designated sites and parcels of woodland and wetland, with species in other areas relying strongly on ecological corridors such as watercourses and hedgerows between arable farmland.

172. The overall trend in the UK is for a decline in priority species since the 1970s, although the gradient of this decline has lessened since 2000 (Defra, 2017). In particular, species of farmland environments have declined over the short and long term (Defra, 2017).

173. Attempts to manage trends in biodiversity are delivered through EU, UK and local legislation and policies. The UK has transposed protection for European protected species and habitats into UK law, and also provides domestic legislation for species and sites not covered by European protection. These species will continue to be protected under the forthcoming EU Withdrawal Bill. The UK's approach to managing Biodiversity Loss is set by *Biodiversity 2020: a strategy for England's wildlife and ecosystem services* (Defra, 2011). The policies set out under this strategy seek to reverse these declining trends. Data is still being gathered to determine success of these measures, however for the time being it appears that declining trends in biodiversity for the species present within the study area may continue. As a consequence, it is assumed that the ornithological baseline within the study area will continue to change over time as measures to try and manage the decline in protected species continues.

23.7 Potential Impacts

23.7.1 Embedded Mitigation

174. Norfolk Vanguard Ltd has committed to a number of techniques and engineering designs/modifications inherent as part of the project, during the pre-application phase, in order to avoid a number of impacts or reduce impacts as far as possible. Embedding mitigation into the project design is a type of primary mitigation and is an inherent aspect of the EIA process.

175. A range of different information sources has been considered as part of embedding mitigation into the design of the project (for further details see Chapter 5 Project Description, Chapter 4 Site Selection and Assessment of Alternatives and the Consultation Report (document reference 5.1)) including engineering requirements, feedback from community and landowners, ongoing discussions with stakeholders and regulators, commercial considerations and environmental best practice.

176. The following sections outline the key embedded mitigation measures relevant for this assessment. These measures are presented in Table 23.21. Where embedded mitigation measures have been developed into the design of the project with specific regard to onshore ornithology, these are described in Table 23.22.

Table 23.21 Embedded mitigation

Parameter	Mitigation measures embedded into the project design	Notes
Strategic approach to delivering Norfolk Vanguard and Norfolk Boreas	Subject to both Norfolk Vanguard and Norfolk Boreas receiving development consent and progressing to construction, onshore ducts will be installed for both projects at the same time, as part of the Norfolk Vanguard construction works. This would allow the main civil works for the cable route to be completed in one construction period and in advance of cable delivery, preventing the requirement to reopen the land in order to minimise disruption. Onshore cables would then be pulled through the pre-installed ducts in a phased approach at later stages. In accordance with the Horlock Rules, the co-location of Norfolk Vanguard and Norfolk Boreas onshore project substations will keep these developments contained within a localised area and, in so doing, will contain the extent of potential impacts.	The strategic approach to delivering Norfolk Vanguard and Norfolk Boreas has been a consideration from the outset.
Commitment to HVDC technology	Commitment to HVDC technology minimises environmental impacts through the following design considerations; • HVDC requires fewer cables than the HVAC solution. During the duct installation phase this reduces the cable route working width (for Norfolk Vanguard and Norfolk Boreas combined) to 45m from the previously identified worst case of 100m. As a result, the overall footprint of the onshore cable route required for the duct installation phase is reduced from approx. 600ha to 270ha; • The width of permanent cable easement is also reduced from 54m to 20m; • Removes the requirement for a CRS; • Reduces the maximum duration of the cable pull phase from three years down to two years;	Norfolk Vanguard Limited has reviewed consultation received and in light of the feedback, has made a number of decisions in relation to the project design. One of these decisions is to deploy HVDC technology as the export system.

Parameter	Mitigation measures embedded into the project design	Notes
	• Reduces the total number of jointing bays for Norfolk Vanguard from 450 to 150; and • Reduces the number of drills needed at trenchless crossings (including landfall).	
Site Selection	The project has undergone an extensive site selection process which has involved incorporating environmental considerations in collaboration with the engineering design requirements. Considerations include (but are not limited to) adhering to the Horlock Rules for onshore project substations and National Grid infrastructure, a preference for the shortest route length (where practical) and developing construction methodologies to minimise potential impacts. Key design principles from the outset were followed (wherever practical) and further refined during the EIA process, including; • Avoiding proximity to residential dwellings; • Avoiding proximity to historic buildings; • Avoiding designated sites; • Minimising impacts to local residents in relation to access to services and road usage, including footpath closures; • Utilising open agricultural land, therefore reducing road carriageway works; • Minimising requirement for complex crossing arrangements, e.g. road, river and rail crossings; • Avoiding areas of important habitat, trees, ponds and agricultural ditches; • Installing cables in flat terrain maintaining a straight route where possible for ease of pulling cables through ducts; • Avoiding other services (e.g. gas pipelines) but aiming to cross at close to right angles where crossings are required; • Minimising the number of hedgerow crossings, utilising existing gaps in field boundaries; • Avoiding rendering parcels of agricultural land inaccessible; and • Utilising and upgrading existing accesses where possible to avoid impacting undisturbed ground.	Constraints mapping and sensitive site selection to avoid a number of impacts, or to reduce impacts as far as possible, is a type of primary mitigation and is an inherent aspect of the EIA process. Norfolk Vanguard Limited has reviewed consultation received to inform the site selection process (including local communities, landowners and regulators) and in response to feedback, has made a number of decisions in relation to the siting of project infrastructure. The site selection process is set out in Chapter 4 Site Selection and Assessment of Alternatives.
Duct Installation Strategy	The onshore cable duct installation strategy is proposed to be conducted in a sectionalised approach in order to minimise impacts. Construction teams would work on a short length (approximately 150m section) and once the cable ducts have been installed, the section would be back filled and the top soil	This has been a project commitment from the outset in response to lessons learnt on other similar NSIPs. Chapter 5 Project Description

Parameter	Mitigation measures embedded into the project design	Notes
	replaced before moving onto the next section. This would minimise the amount of land being worked on at any one time and would also minimise the duration of works on any given section of the route.	provides a detailed description of the process.
Long HDD at landfall	Use of long HDD at landfall to avoid restrictions or closures to Happisburgh beach and retain open access to the beach during construction. Norfolk Vanguard Limited have also agreed to not use the beach car park at Happisburgh South.	Norfolk Vanguard Limited has reviewed consultation received and in response to feedback, has made a number of decisions in relation to the project design. One of those decisions is to use long HDD at landfall.
Trenchless Crossings	Commitment to trenchless crossing techniques to minimise impacts to the following specific features; • Wendling Carr County Wildlife Site; • Little Wood County Wildlife Site; • Land South of Dillington Carr County Wildlife Site; • Kerdiston proposed County Wildlife Site; • Marriott's Way County Wildlife Site / Public Right of Way (PRoW); • Paston Way and Knapton Cutting County Wildlife Site; • Norfolk Coast Path; • Witton Hall Plantation along Old Hall Road; • King's Beck; • River Wensum; • River Bure; • Wendling Beck; • Wendling Carr; • North Walsham and Dilham Canal; • Network Rail line at North Walsham that runs from Norwich to Cromer; • Mid-Norfolk Railway line at Dereham that runs from Wymondham to North Elmham; and • Trunk Roads including A47, A140, A149.	A commitment to a number of trenchless crossings at certain sensitive locations was identified at the outset. However, Norfolk Vanguard Limited has committed to certain additional trenchless crossings as a direct response to stakeholder requests.

Table 23.22 Embedded mitigation for onshore ornithology

Parameter	Mitigation measures embedded for onshore ornithology	Notes
Designated sites	Constraints mapping was undertaken prior to the publication of the Norfolk Vanguard EIA Scoping Report (Royal HaskoningDHV, 2016). This constraints mapping exercise was used to determine the route options for the onshore project area for the project. The following ecological receptors were considered as part of the constraints mapping process:	More information can be found in Chapter 4 Site Selection and Assessment of Alternatives.

Parameter	Mitigation measures embedded for onshore ornithology	Notes
	• International designated sites for nature conservation (SAC, SPA, Ramsar sites); • National designated site for nature conservation (The Broads National Park, SSSI, NNR, LNR); and • Ancient woodland. These ecological receptors have been avoided during the onshore project area route selection process.	
Route Refinement	Route refinements have included consideration of more detailed ecological constraints, and the following principles have been applied when refining the onshore project area: • Ancient woodland – following the Forestry Commission's Standing Advice on Ancient Woodland and Veteran Trees, a buffer of 15m around all ancient woodlands has been used (Forestry Commission, 2014); • Woodland – areas of woodland have been avoided where possible during the route selection process; • Habitat – standing water bodies, trees, and agricultural ditches have been avoided where possible; and • Hedgerows – the number of hedgerow crossings has been minimised as far as possible, taking other fixed constraints into account.	Further information on the route refinement process can be found in Chapter 4 Site Selection and Assessment of Alternatives.
Hedgerow and watercourse crossings	The working width at hedgerow and watercourse crossings is 20m[9] (reduced from 54m at PEIR) due to the selection of a HVDC electrical solution. Where hedgerow gaps are required beyond the two-year duct installation phase (i.e. for the duration of the subsequent two-year cable pull phase), the number of gaps required will be minimised as far as possible and will be no wider than 6m.	Further information can be found in Chapter 5 Project Description.

[9] This width assumes that the onshore cable route bisects each hedgerow in a perpendicular fashion. In reality, some hedgerows will be crossed at an angle, therefore increasing the maximum width of the gap required up to a possible 25m. Where this is the case for a particular receptor, it is noted within this report.

Parameter	Mitigation measures embedded for onshore ornithology	Notes
Country Wildlife Sites	In response to comments from stakeholders raised in response to the PEIR as part of the EPP, Norfolk Vanguard Limited is now proposing to use trenchless crossing techniques (e.g. HDD) at all CWS and proposed CWS crossed by the onshore project area in order to minimise the impacts upon the habitats contained within these sites. This includes proposed trenchless crossing techniques (e.g. HDD) at the following locations: • Wendling Carr CWS (CWS no. 1013); • Little Wood CWS (CWS no. 2024), • Land South of Dillington Carr CWS (CWS no. 1025), • Kerdiston proposed CWS (no CWS number); • Marriott's Way CWS (CWS no. 2176) (in two locations); and • Paston Way and Knapton Cutting CWS (CWS no. 1175). At five of these six locations, no works will be undertaken within the CWS boundary.	Further information on trenchless crossing techniques can be found in Chapter 5 Project Description. At one location, Wendling Carr CWS, only a running track will be required to pass through the CWS. This will be a 6m by up to 180m road located within the CWS. This is shown on Figure 22.3.
Construction Programme	The construction programme for the onshore cables has been designed to minimise the duration and extent of impacts to ecological receptors at any given location along the onshore cable route. Specifically: • During the two-year duct installation phase, each duct installation team will work along a section of the cable route, tackling a short section (approximately 150m) at a time. Where possible, each 150m workfront (approximately 0.7ha in area) will be reinstated following duct installation, before works commence on the next section. The works at each section, including reinstatement, will take approximately one week (up to two in a worst case scenario). Within each section, a 6m wide strip will be retained for the running track, for up to the remainder of the two-year duct installation phase (i.e. as a worst case a 60km by 6m strip along the onshore cable route will be lost for the duration of the cable duct installation); • During the cable pulling phase, a reduced 12km by 6m strip along the onshore cable route is anticipated to be lost for up to approximately 16 weeks during the cable pull for the running track, thus minimising the number of hedgerow gaps required for the duration of construction down to approximately 20%; and • The majority of disturbance to watercourses will only occur during the two-year duct installation phase. Once the ducts are in the ground, subsequent cable pulling operations will not result in further disturbance to watercourses. There may be disturbance to a small number of watercourses which	For further details on the construction approach and programme, please see Chapter 5 Project Description.

Parameter	Mitigation measures embedded for onshore ornithology	Notes
	need to be crossed when the running track is reinstated to facilitate the cable pulling operations.	
Strategic landscape mitigation	Mitigation measures associated with the onshore project substation, National Grid substation extension and access from the A47 form part of a strategic approach to enhancing landscape character and biodiversity in the local area. Figure 29.12 in Chapter 29 Landscape and Visual Impact Assessment shows how mitigation planting will contribute to the wider landscape structure of the area and help consolidate green corridors for wildlife.	For further details on project landscaping, please see Chapter 29 Landscape and Visual Impact Assessment.

23.7.2 Outline Landscape and Environmental Management Strategy

177. The mitigation measures set out within this EcIA will be delivered via an Outline Landscape and Environmental Management Strategy (OLEMS) (document reference 8.7). This document, submitted alongside the final ES, will be the primary document detailing the ecological mitigation measures required in order to ensure that all potential impacts identified within this EcIA are reduced to a non-significant level. The document will encapsulate those mitigation measures proposed for individual ecological receptors within this EcIA and will set out how they will fit into the wider approach to managing landscape impacts during construction and operation of the project.

178. The Outline OLEMS (document reference 8.7) will aim to ensure that all mitigation proposed within this EcIA is part of an integrated management strategy which will ensure that adverse impacts upon biodiversity and ecological networks are not treated in isolation.

179. The Outline OLEMS (document reference 8.7) has been developed as follows:

- Initial outline mitigation measures were identified and outlined at the PEIR stage. These mitigation measures were indicative only, as they were based on partial ecological field data, as the 2017 data collection programme was ongoing at the time of the PEIR;
- Further survey data from the 2017 survey effort became available from December 2017. These findings provided details about the nature of ecological constraints within the survey area (where survey access had been granted);
- All of the collected survey data from the 2017 survey effort was consulted upon with the project ETG as part of the EPP in spring 2018;
- Following consultation, detailed mitigation measures have now been identified and are included within this EcIA, and included within the OLEMS.

180. As outlined in section 22.5.3, survey access for the full survey area was not possible in 2017. As a consequence, the detailed mitigation measures set out within the OLEMS (document reference 8.7) for these inaccessible areas has applied a precautionary, non-specific approach along with a requirement that further post-consent surveys for these unsurveyed areas will be undertaken. The OLEMS (document reference 8.7) therefore provides a route map of how potential ecological impacts in those inaccessible areas will be managed.

181. Chapter 29 Landscape and Visual Impact Assessment includes details of mitigation planting schemes for the proposed permanent works at the onshore substation. These have been developed in consultation with Norfolk County Council. These requirements are included within the OLEMS (document reference 8.7).

23.7.3 Monitoring

182. The development of the detailed design and Code of Construction Practice (CoCP) (DCO Requirement 20) will refine the worst-case impacts assessed in this EIA. It is recognised that monitoring is an important element in the management and verification of the actual project impacts. The requirement for and appropriate design and scope of monitoring will be agreed with the appropriate stakeholders and included within the CoCP (DCO Requirement 20) and the Ecological Management Plan (which will be based on the OLEMS) (document reference 8.7) commitments prior to construction works commencing.

23.7.4 Worst Case

183. The EcIA has used the Rochdale Envelope principle and assessed impacts against a defined project worst case scenario (or scenarios).

184. This section sets out the worst case scenario with respect to onshore ornithology. The 'worst case scenario' includes the parameters of the different potential construction options for the project which would result in the greatest potential impact upon the ecological receptors described in section 23.6. Chapter 5 Project Description sets out the details of the project.

185. Table 23.23 sets out those parameters which comprise the worst case scenario for onshore ornithology.

Table 23.23 Worst case assumptions

Worst case assumptions			
Parameter	**Worst case criteria**	**Worst case definition**	**Notes**
Landfall			
Construction	Construction method	Trenchless technique	Worst case construction noise

Worst case assumptions			
Parameter	**Worst case criteria**	**Worst case definition**	**Notes**
		(e.g. HDD)	levels are as set out within Chapter 25 Noise and Vibration.
	Maximum drill length	1,000m	
	Temporary works footprint	6,000m^2	
	Maximum works duration	20 weeks	
Landfall HDD compounds	Maximum number and maximum land take for temporary HDD compounds	Assumes 2 at 3,000m^2 to support parallel drill rigs	
Onshore cable route			
Construction	Construction method	Open cut trenching	Mitigation by design with respect to hedgerows already included in Chapter 5 Project Description. Gaps at hedgerows are indicative, depending on the angle of crossing. Cable installation footprints include the running track and joint bays (Norfolk Vanguard only). Onshore cable route footprint covers all works required for duct installation (trenching, spoil storage, etc.). It does not include all onshore cable route associated works footprints (mobilisation areas, trenchless launch and reception sites). Maximum gaps at hedgerows, this width assumes that the onshore cable route bisects each hedgerow in a perpendicular fashion. In reality, some hedgerows will be crossed at an angle, therefore increasing the maximum width of the gap required up to a possible 25m.
	Maximum working width and length	45m and 60km	
	Cable installation maximum footprint	447,688m^2	
	Onshore cable route maximum footprint	2,700,000m^2	
	Maximum gaps at hedgerow / other crossing points	20m	
	Maximum hedgerows to be affected by the works	165[10]	
	Running track excavated material	108,000m^3	
	Trench excavated material	360,000m^3	

[10] Estimated based on 110 hedgerows surveyed within the onshore project area plus a further 55 identified from the Norfolk Living Map and aerial photography taken in 2017. The final number of hedgerows to be affected by the works (i.e. to be subject to removal of a 20m length) will be determined during surveys of the unsurveyed areas post-consent when access becomes available.

Worst case assumptions			
Parameter	**Worst case criteria**	**Worst case definition**	**Notes**
Permanent joint pits	Maximum number and required dimensions	Assume 150 at 90m^2 and 2m deep each	Norfolk Vanguard only, spaced approximately one per circuit per 800m cable.
Mobilisation areas	Maximum number and required dimensions	Assumes 14 at 10,000m^2	
Trenchless launch and reception sites	Maximum number and maximum land take for trenchless launch and reception sites	Assumes 17 pairs at 7,500m^2 and 5,000m^2 respectively	
Construction programme - ducting	Ducting at any 150m long section Trenchless works at each watercourse Running track topsoil storage area Total ducting duration	2 weeks 8 weeks 2 years 2 years	Where considered necessary, hedgerows will be reinstated immediately after duct installation, with a small number left open to facilitate access for cable pulling. As the locations of these openings are not available at this time, the WCS assumes at this stage that no hedgerows will be reinstated during construction between trenching and cable pulling. Mitigation by design with respect to hedgerows included in Chapter 5 Project Description.
Construction programme - cable pull, joint and commission	Hardstand area Running track topsoil storage area Total duration	10 weeks 16 weeks 2 years	
Construction programme	Total construction duration	6 years	
Decommissioning		Joint pits and ducts left in situ	Where cables are in pre-installed ducts, cables may be extracted once de-energised.
Onshore project substation			
Construction	Maximum land take for temporary works area Maximum duration	20,000m2 (200m x 100m) 30 months	Norfolk Vanguard only. Worst case construction and operation noise levels are as set out within Chapter 25 Noise and Vibration.

Worst case assumptions			
Parameter	**Worst case criteria**	**Worst case definition**	**Notes**
	Foundations	Piled	For converter station and plinth. Indicative construction timing 24 months.
Operation	Maximum land take for permanent footprint Access	75,000m^2 1 visit per week, site lighting required during maintenance visits	The site will not be lit under normal conditions, although low level movement-detecting security lighting may be utilised for health and safety purposes.
Decommissioning	No decision has been made regarding the final decommissioning policy for the onshore project substation, as it is recognised that industry best practice, rules and legislation change over time. However, the onshore project equipment will likely be removed and reused or recycled. 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, for the purposes of a worst case scenario, impacts as for the construction phase are assumed.		
National Grid extension and overhead line modification			
Construction	Maximum land take for temporary works area – substation extension Maximum land take for temporary works area – overhead line Maximum duration	67,500m^2 174,264m^2 30 months	Indicative construction timing 24 months.
Operation	Maximum land take for substation extension permanent footprint Maximum land take for overhead line permanent footprint Access	49,300m^2 9,250m^2 1 visit per month, site lighting required during maintenance visits	Includes existing Necton National Grid substation area. Not normally illuminated other than infrequent inspection and maintenance activities (during working hours only).

23.7.5 Assessment Scenarios

186. Chapter 5 Project Description outlines the scenarios to be assessed in relation to the phasing of the works. The phasing of the construction works is as follows:

- The offshore project may be constructed as one or two phases and elements of the onshore construction would also be phased to reflect this;
- Pre-construction works (e.g. hedgerow clearance) for the onshore cable route to be conducted over a two year period, prior to duct installation.
- Cable ducts would be installed in one operation over two years, regardless of the offshore strategy;
- Cable pull through would be done in either one or two phases;
- The onshore project substation s ground preparation and enabling works would be done in one phase, anticipated to take two years for pre-construction works and two years for primary works;
- The required electrical infrastructure and plant within the onshore project substation would then be installed as required for each phase if the one or two phase options were adopted for offshore construction; and
- Total construction window for the one phase scenario is anticipated to be five years, and six years for the two phase scenario.

187. In all cases for onshore ecology, the two phase option is assumed to be the worst case, due to the increased length of time that receptors may be potentially impacted by the project.

23.7.6 Potential Impacts during Construction

23.7.6.1 Impact 1: Impacts to statutory designated sites

23.7.6.1.1 Landfall

188. The Broadland SPA and Ramsar site is located approximately 4.5km from the landfall. As such, there is the potential for qualifying ornithological features of the Broadland SPA and Ramsar site which have been recorded wintering on the coastal and arable ex situ habitats to be affected by the project.

189. The relative importance of each qualifying ornithological feature of the Broadland SPA and Ramsar site, based on its local population size is summarised in Table 23.24. The importance of each qualifying feature is used to determine the overall significance of impact for each element of the onshore project area.

190. The following potential effects upon qualifying features of the Broadland SPA and Ramsar utilising ex-situ habitats outside of the SPA and Ramsar boundary could arise during the construction phase:

- Medium term (i.e. over the duration of a single season), temporary habitat loss of approximately 0.6ha of arable habitat at the landfall HDD entry point for approximately 20 weeks; and

- Medium term, temporary visual, noise and light disturbance of bird species utilising arable or coastal habitats.

191. The effects are medium term, given the duration of the project construction phase, however they do not directly affect either a sensitive habitat or a habitat which is not abundant in the wider area, including the area within 5km of the Broadland SPA and Ramsar site. As such the magnitude of these effects is low.

192. The relative importance and the magnitude of effect against those qualifying features of the Broadland SPA and Ramsar site are summarised Table 23.24.

Table 23.24 Ornithological receptors of the Broadland SPA and Ramsar site

Species	Present in number exceeding the threshold (1%) of SPA / Ramsar site?	Importance	Magnitude of effect
Shoveler	No	Low	Medium
Wigeon	No	Low	Medium
Teal	No	Low	Medium
Great crested grebe	Assemblage only	Negligible	Medium
Cormorant	Assemblage only	Negligible	Medium
Pink-footed goose	No	Low	Medium

23.7.6.1.2 Onshore cable route

193. The Broadland SPA and Ramsar site is located within 5km of the onshore cable route. Approximately 9ha of the cable route is located within a 5km buffer surrounding the Broadland SPA and Ramsar site. As such, there is the potential for qualifying ornithological features of the Broadland SPA and Ramsar site which have been recorded wintering on arable ex situ habitats to be affected by the project.

194. The relative importance of each qualifying ornithological feature of the Broadland SPA and Ramsar site, based on its local population size, is summarised in Table 23.24. The importance of each qualifying feature (along with the magnitude of effect) is used to determine the overall significance of impact for each element of the onshore project area.

195. The following potential effects upon the qualifying features of the Broadland SPA and Ramsar site utilising ex-situ habitats outside of the SPA and Ramsar boundary are anticipated to arise during the construction phase:

- Long term, temporary habitat loss of approximately 7.5ha of arable habitat over approximately two years (duct installation), plus a further 16 weeks during the two year cable pull element of the construction phase; and

- Long term, temporary habitat loss of approximately 1.5ha of improved grassland habitat over approximately two years (duct installation) plus a further 16 weeks during the two year cable pull element of the construction phase; and
- Long term, temporary visual, noise and light disturbance of bird species utilising arable habitats.

196. The effects are long term, given the duration of the project construction phase, however they do not affect either a sensitive habitat or a habitat which is not abundant in the wider area, including the area within 5km of the Broadland SPA and Ramsar site. As such the magnitude of these effects is considered to be medium (as per Table 23.24).

23.7.6.1.3 Onshore project substation

197. The onshore project substation is located more than 5km from the Broadland SPA and Ramsar site. As such there will be no change upon statutory designated sites due to the proposed project landfall works.

23.7.6.1.4 National Grid substation extension and overhead line modifications

198. The National Grid Extension and overhead line modifications are located more than 5km from the Broadland SPA and Ramsar site. As such there will be no change upon statutory designated sites due to the proposed project landfall works.

23.7.6.1.5 Road transport network

199. Chapter 26 Air Quality considers the potential impacts of increases in nitrogen deposition arising from increases in road traffic during the construction phase of the project upon sensitive habitats and species which are qualifying features of SACs, SPAs and SSSIs located within 250m of the road transport network. This assessment of the air quality impacts arising from increases in road traffic on the road transport network has been undertaken following the latest IAQM guidance on assessment of impacts on air quality arising from road traffic emissions (IAQM, 2014). This assessment is presented in Chapter 26 Air Quality.

200. The assessment presented in Chapter 26 Air Quality found impacts of at most negligible magnitude on qualifying features of SPAs, SACs or SSSIs associated with increases in road traffic on the local network during the construction phase of the project.

201. Chapter 26 Air Quality considered the potential impacts of increases in nutrient nitrogen deposition arising from increases in road traffic during the construction phase of the project upon sensitive habitats and species which are qualifying features of SAC, SPA and SSSIs located within 200m of the road transport network. This assessment of the air quality impacts arising from increases in road traffic on the road transport network has been undertaken following the latest IAQM guidance

on assessment of impacts on air quality arising from road traffic emissions (IAQM, 2014).

202. There are eight sites located within the construction vehicle emissions study area. Of these, Chapter 26 Air Quality predicted nutrient nitrogen deposition of >1% of the critical load to occur at two of the sites. These sites are summarised in Table 23.25 below.

Table 23.25 Statutory designated sites subject to >1% of the relevant nutrient nitrogen deposition

Statutory Designated site	Nutrient nitrogen deposition sensitive habitat or features present within the site	Lowest Critical Load ($kgN.ha^{-1}.y^{-1}$)	Suitable habitat present within 50m of road network?	% of critical load
Felbrigg Woods SSSI	Broadleaved, mixed and yew woodland	10	Yes	2%
Broadland SPA	Eurasian marsh harrier Eurasian wigeon Great bittern	15	No	N/A

203. Felbrigg Wood SSSI, the only habitat type within the study area is broadleaved woodland. This habitat type supports wood warbler and redstart, two qualifying features of the SSSI. At the critical load for broadleaved woodlands, nutrient nitrogen deposition is anticipated to result in changes in soil processes, nutrient imbalance, altered composition mycorrhiza and ground vegetation (Bobink et al., 2011). As the project is anticipated to result in a temporary increase in nutrient nitrogen deposition at only 2% of the critical load for areas immediately adjacent to the road network only (woodland provide a rough surface which will ensure that nutrient nitrogen deposition rapidly drops off with distance from source) for the duration of the construction period, the localised, temporary effect upon this habitat is anticipated to be of negligible magnitude.

204. At the Broadland SPA, no suitable habitats for supporting the nutrient nitrogen deposition sensitive features of the site (Eurasian marsh harrier, Eurasian wigeon, great bittern) are present within 50m of the road network. As such, no change is anticipated.

23.7.6.1.6 Impact without mitigation

205. Without mitigation, the greatest magnitude arising from one element of the onshore project area is medium magnitude on a low importance receptor, resulting in an impact of at worst **minor adverse** significance.

206. An HRA Screening for Likely Significant Effect of the Broadland SPA and Ramsar site was undertaken in October 2017 (Norfolk Vanguard Limited, 2017). The HRA

Screening concluded that, given the distance of the Broadland SPA and Ramsar site from the onshore project area (3.6km at the time of publication of the HRA Screening, now 4.5km), and as no qualifying ornithological features of either site had been recorded within the onshore project area at a scale of national or greater importance or at levels to qualify as a significant component of the Broadland SPA, concluded that no likely significant effect would occur. These findings were presented within the PEIR (Norfolk Vanguard Limited, 2017) and, as detailed in Table 23.3, agreement with the approach was received from Natural England.

23.7.6.1.7 Mitigation

207. The following mitigation is proposed in relation to statutory designated sites:

- Adherence to JNCC's scheme to reduce disturbance to waterfowl during severe winter weather (available on the JNCC website (http://jncc.defra.gov.uk/page-2894)) during construction works at the landfall and along the onshore cable route in areas within 5km of the Broadland SPA and Ramsar site, including ceasing operations when temperatures drop below agreed criteria during the period 9th November to 20th February; and
- All habitats which are temporarily lost during construction will be reinstated following completion of construction.

208. These mitigation measures are captured with the OLEMS (Document reference 8.7).

23.7.6.1.8 Impact following mitigation

209. With mitigation, the magnitude of effect will remain medium, resulting in a residual impact of **minor adverse** significance.

23.7.6.2 Impact 2: Impacts to wintering / on passage bird species

23.7.6.2.1 Landfall

210. Notable bird species (i.e. those listed on Annex 1 of the Birds Directive, UK Red or Amber List species, UKSPI or Norfolk LBAP species) have been recorded within the species study area during the wintering bird surveys in numbers of between negligible to medium importance. As such, there is potential for these species to be affected by the project.

211. The following potential effects upon notable wintering / on passage bird species may arise during the construction phase at the landfall:

- Medium term, temporary habitat loss of approximately 0.6ha of arable habitats at the landfall HDD exit point for approximately 30 weeks; and
- Medium term, temporary visual, noise and light disturbance of bird species utilising coastal and arable habitats.

212. The effects are medium term, given the duration of the project construction phase, however they do not affect either a sensitive habitat or a habitat which is not abundant in the wider area. As such the magnitude of these effects is low.

213. Table 23.26 summarises those notable bird species which have been assessed as wintering within the species study area in numbers of medium importance.

Table 23.26 Notable ornithological receptors recorded within the species study area over winter (October 2016 – March 2017) including receptor importance and magnitude of effect

Impact	Importance	Distance from landfall	Magnitude of effect	Comments
Common Scoter	Medium	Adjacent	Low	N/A
Ringed plover	Medium	Adjacent	Low	N/A
Herring gull	Medium	Adjacent	Low	N/A
Glaucous gull	Medium	Adjacent	Low	N/A
Kittiwake	Medium	Adjacent	Low	N/A
Black redstart	Medium	Adjacent	No change	Suitable habitats for this species not affected by landfall works.
Starling	Medium	Adjacent	No change	Suitable habitats for this species not affected by landfall works.
House Sparrow	Medium	Adjacent	No change	Suitable habitats for this species not affected by landfall works.
Grey wagtail	Medium	Adjacent	No change	Suitable habitats for this species not affected by landfall works.
Lapwing	Medium	1.8km south-west	No change	N/A

23.7.6.2.2 Onshore cable route

214. The following potential effects upon notable wintering / on passage bird species may arise during the construction phase along the onshore cable route:

- Long term, temporary habitat loss of approximately 7.5ha of arable habitat over approximately two years (duct installation) plus a further 16 weeks during the two year cable pull element of the construction phase;
- Long term, temporary habitat loss of approximately 1.5ha of improved grassland habitat over approximately two years (duct installation) plus a further 16 weeks during the two year cable pull element of the construction phase;
- Long term, temporary habitat loss of approximately 3.3km of hedgerow habitat across approximately 165 hedgerows over approximately two years (duct installation), of which approximately 650m across 33 hedgerows will also be lost for two years during the cable pull element of the construction phase; and
- Long term, temporary visual, noise and light disturbance of bird species utilising arable habitats.

215. The effects are long term, given the duration of the project construction phase, however they do not affect either a sensitive habitat or a habitat which is not abundant in the wider area.

216. Table 23.27 summarises those notable bird species which have been assessed as wintering within the species study area in numbers of medium importance. The potential magnitude of effect upon different species is summarised on Table 23.27.

Table 23.27 Notable ornithological receptors recorded within the species study area over winter (October 2016 – March 2017) including receptor importance and magnitude of effect

Impact	Importance	Distance from cable route	Magnitude of effect	Comments
Common Scoter	Medium	Adjacent	No change	Suitable habitats for these species not affected by cable route works
Ringed plover	Medium	Adjacent	No change	
Herring gull	Medium	Adjacent	No change	
Glaucous gull	Medium	Adjacent	No change	
Kittiwake	Medium	Adjacent	No change	
Black redstart	Medium	Adjacent	Low	Suitable habitat for these species – hedgerow - is localised (maximum 20m in any one location) and small in scale in relation to the available habitat surrounding the onshore project area. An approximately 3.3km loss of hedgerow habitat equates to approximately 0.63km of hedgerow lost per km^2 across the onshore project area, which represents approximately 15% of the typical amount of hedgerow per km^2 within the county (NBP, 2009). This is an effect of low magnitude.
Starling	Medium	Adjacent	Low	
House Sparrow	Medium	Adjacent	Low	
Grey wagtail	Medium	Adjacent	Low	
Lapwing	Medium	1.8km south-west	Low	7.5ha of habitat which supports this species over winter is located within the wintering bird survey area. This loss of habitat represents approximately 5% of this habitat available in the areas surrounding the cable route, so this is an effect of low magnitude.

217. In addition to the effects outlined above, it has also been noted that the River Wensum floodplain on the southern (right hand) bank of the river within the species study area is currently under a Countryside Stewardship scheme to target wintering waders and wildfowl. Natural England has confirmed that for this area it should be presumed that such species will be present between November and February inclusive. It is therefore assumed that this is a sensitive habitat for wintering waders and wildfowl. This habitat will be subject to disturbance for up to eight weeks during the trenchless crossing activities at these locations, plus an additional 16 weeks during the two-year cable installation phase. If these periods occur during winter,

there is a potential effect of low magnitude to a medium sensitivity receptor (species present not known).

23.7.6.2.3 Onshore project substation

218. No notable species have been recorded wintering / on passage within 300m of the onshore project substation. As such there will be no change upon notable wintering / on passage bird species due to the proposed onshore project substation works.

23.7.6.2.4 National Grid substation extension and overhead line modifications

219. No notable species have been recorded wintering / on passage within 300m of the National Grid substation extension and overhead line modifications. As such there will be no change upon notable wintering / on passage bird species due to the proposed project National Grid substation extension works.

23.7.6.2.5 Impact without mitigation

220. Without mitigation, the greatest magnitude arising from one element of the onshore project area is low magnitude on a medium importance receptor, resulting in an impact of at worst **minor adverse** significance.

23.7.6.2.6 Mitigation

221. The following mitigation is proposed in relation to wintering / on passage birds:

- To minimise the potential effects upon lapwing and other species using arable land within the onshore project area, it is proposed that these habitats are only subject to works for one winter period in any one area in consecutive years (for example, if works occur during the winter period 2020-2021 (November to February), no winter works are undertaken in the same location in winter 2021-2022);
- All habitats which are temporarily lost during construction will be reinstated following completion of construction. All hedgerows which are removed to enable the project will be reinstated following guidance within the Norfolk hedgerow BAP and will include appropriate species for north-east Norfolk (NBP, 2009). Future hedgerow management to include allowing standard trees to develop; and
- The project is aiming for a construction scenario whereby construction works within the River Wensum floodplain (i.e. land north of Penny Spot Beck) are not required, and a trenchless crossing technique (e.g. HDD) at the River Wensum would run beneath this area. However, in advance of a more detailed assessment of ground conditions, this cannot be confirmed at this stage. If land north of Penny Spot Beck within the River Wensum floodplain is used during construction, then works will take place outside of the winter period (October – February inclusive). If this is not possible, an area of the floodplain habitat will

be left undisturbed to provide wintering habitat for waders / wildfowl using this site for the duration of the works in this area.

222. These mitigation measures are captured within the OLEMS (Document reference 8.7).

23.7.6.2.7 Impact following mitigation

223. With mitigation, the magnitude of effect will remain low, resulting in a residual impact of **minor adverse** significance.

23.7.6.3 Impact 3: Impacts to breeding bird species

23.7.6.3.1 Landfall

224. Sand martin are known to nest in the Happisburgh cliffs, approximately 130m from the landfall.

225. Construction methodologies proposed at the cliffs at Happisburgh will involve trenchless techniques (e.g. HDD) beneath the cliffs. As a consequence, this nesting site will not be directly affected by the proposed works. The proposed works will potentially give rise to noise, vibration and light emissions in the vicinity of these nests. Chapter 25 Noise and Vibration has considered the potential vibration effects arising from HDD activities. As the drill will be between 10-20m below ground level vibration effects will be minimal and are unlikely to affect nesting sand martin. The landfall compound will need to be illuminated during construction. Effects of light disturbance are considered below.

226. Construction methodologies proposed for site vegetation clearance include the removal of all nesting habitat for common breeding birds outside of the bird breeding season (which is typically between March and August inclusive, but is weather and temperature dependant). As such risk of damaging, destroying or disturbing the nest of any wild bird during the landfall works has been removed.

227. The following potential effects upon breeding bird species will arise during the construction phase at the landfall:

- Medium term, temporary habitat loss of approximately 0.6ha of arable habitats at the landfall HDD exit point for three construction periods for approximately 30 weeks;
- Risk of damaging or destroying ground nesting birds (i.e. skylarks) during construction); and
- Disturbance of nesting sand martin due to 24hr lighting at the landfall compound.

228. As a BoCC4 red list species present throughout the arable habitats of the onshore project area, skylarks are a receptor of medium importance. Common bird species are a receptor of low importance.

229. The loss of arable breeding habitat will occur at most across a single season over a habitat which is abundant in the wider area, and therefore is classified as an effect of low magnitude.

230. Potential disturbance effects upon nesting sand martins and common bird species are of low magnitude.

23.7.6.3.2 Onshore cable route

231. Construction methodologies proposed for site vegetation clearance include the removal of all nesting habitat for common breeding birds outside of the bird breeding season (which is typically between March and August inclusive, but is weather and temperature dependant). As such risk of damaging, destroying or disturbing the nest of any wild bird (either during construction or whilst in use) during the onshore cable route works has been removed. In addition, as part of the project embedded mitigation, the maximum size of the hedgerow gap created is 20m, thus reducing the amount of hedgerow removed from construction by 50%. As part of the embedded mitigation, ancient woodland has been avoided during site selection, as have woodland parcels where possible. In addition, trenchless techniques (HDD) are proposed to be used at any areas of mixed lowland deciduous woodland which could be avoided during route selection.

232. The following potential effects upon breeding bird species will arise during the construction phase along the onshore cable route:

- Long term, temporary habitat loss of approximately 349ha of arable habitats along the onshore cable route for approximately two years (duct installation) plus up to approximately 7ha of this for a further 16 weeks during the two year cable pull element of the construction phase;
- Long term, temporary habitat loss of approximately 0.15ha of semi-natural broadleaved woodland habitat along the cable route for approximately two years (duct installation), plus a further 16 weeks during the two year cable pull element of the construction phase;
- Long term, temporary habitat loss of approximately 3.3km of hedgerow habitat along the cable route for approximately two years (duct installation), of which approximately 650m will also be lost for an additional two years (cable pull) during the construction phase;
- Long term, temporary habitat loss of approximately 1ha of coastal floodplain grazing marsh habitat along the onshore cable route for approximately two

years (duct installation) plus a further 16 weeks during the two year cable pull element of the construction phase;

- Long term, temporary habitat loss of approximately 1ha of lowland fen habitat along the onshore cable route for approximately two years (duct installation) plus a further 16 weeks during the two year cable pull element of the construction phase; and
- Risk of damaging or destroying ground nesting birds (i.e. skylarks) during construction.

233. As a BoCC4 red list species present throughout the arable habitats of the onshore project area, skylarks are a receptor of medium importance. Common bird species are a receptor of low importance.

234. The loss of arable breeding habitat is of sufficient duration to be classified as an effect of medium magnitude.

23.7.6.3.3 Onshore project substation

235. Construction methodologies proposed for site vegetation clearance include the removal of all nesting habitat for common breeding birds outside of the bird breeding season (which is typically between March and August inclusive, but is weather and temperature dependant). As such risk of damaging, destroying or disturbing the nest of any wild bird (either during construction or whilst in use) during the onshore project substation works has been removed.

236. The following potential effects upon breeding bird species will arise during the construction phase at the onshore project substation:

- Permanent loss of approximately 390m of hedgerow (of which 360m is species-poor hedgerow with trees, and 30m species-rich hedgerow with trees);
- Long term, temporary habitat loss of approximately 25.8ha of arable habitats at the onshore project substation for 30 months (construction phase);
- Long term, temporary habitat loss of approximately 390m of hedgerow (of which 270m is species-rich hedgerow, and 130m species-rich hedgerow with trees) habitat at the onshore project substation for 30 months (construction phase); and
- Risk of damaging or destroying the nest of ground nesting birds (i.e. skylarks) during construction).

237. As a BoCC4 red list species present throughout the arable habitats of the onshore project area, skylarks are a receptor of medium importance. Common bird species are a receptor of low importance.

238. The permanent and temporary loss of hedgerow is of low magnitude given the context of the surrounding available hedgerow habitat. The loss of arable breeding habitat is of sufficient duration to be classified as an effect of medium magnitude.

23.7.6.3.4 National Grid substation extension and overhead line modifications

239. Construction methodologies proposed for site vegetation clearance include the removal of all nesting habitat for common breeding birds outside of the bird breeding season (which is typically between March and August inclusive, but is weather and temperature dependant). As such risk of damaging, destroying or disturbing the nest of any wild bird (either during construction or whilst in use) during the National Grid substation extension and overhead line modifications has been removed.

240. The following potential effects upon breeding bird will arise during the construction phase at the National Grid substation extension and overhead line modifications:

- Long term, temporary habitat loss of approximately 14.8ha of arable habitats at the National Grid substation extension for 30 months (construction phase);
- Long term, temporary habitat loss of approximately 210m of species-poor hedgerow (100m of which is with trees) habitat at the National Grid substation extension for 30 months (construction phase); and
- Risk of damaging or destroying the nests of ground nesting birds (i.e. skylarks) during construction).

241. As a BoCC4 red list species present throughout the arable habitats of the onshore project area, skylarks are a receptor of medium importance. Common bird species are a receptor of low importance.

242. The loss of arable breeding habitat is of sufficient duration to be classified as an effect of medium magnitude.

23.7.6.3.5 Impact without mitigation

243. Without mitigation, the greatest magnitude arising from one element of the onshore project area is medium magnitude on a medium importance receptor, resulting in an impact of at worst **moderate adverse** significance.

23.7.6.3.6 Mitigation

244. The following mitigation is proposed in relation to breeding birds:

- Keep the winter crop stubble within the onshore project area low during the bird breeding season (which is typically from March to August, although can commence earlier or later depending on the weather conditions) in order to

minimise the chance of notable ground nesting birds (i.e. skylarks, corn bunting and stone curlew) nesting prior to work on arable land;

- Set aside ground-nesting bird areas outside of 50m of the cable route prior to construction works. The locations for these set-aside mitigation areas would be agreed in consultation with Natural England post-consent, and would follow the RPSB's Skylark: Advice for Farmers in creating skylark habitat;
- All hedgerows which are removed to enable the project will be reinstated following guidance within the Norfolk hedgerow BAP and will include appropriate species for north-east Norfolk (NBP, 2009). Future hedgerow management to include allowing standard trees to develop. Hedgerow removal will be undertaken outside of the bird nesting season where possible (which is typically between March and August inclusive, but is weather and temperature dependant). Hedgerows will be reinstated during early winter when they have the greatest chance of taking root, meaning that in practice there will be a gap of one season (one year) between each hedgerow removal and its reinstatement;
- The landscaping proposals described in Chapter 29 Landscape and Visual Impact Assessment have been designed to ensure that new planting is created to compensate for the permanent loss of species-rich hedgerow at the onshore project substation. Approximately 230m of new hedgerow is proposed along the western margin of onshore project substation, and a further approximately 1km of existing hedgerow will be enhanced with adjacent woodland and species-rich grassland planting. Please see Chapter 29 Landscape and Visual Impact Assessment for full details of the proposed landscape mitigation planting; and
- Bat Conservation Trust's (BCT) Artificial lighting and wildlife guidance (2014) will be adhered to when designing lighting during temporary works at the HDD compound.

245. Landscaping and ecological management proposals are contained within the draft OLEMS (Document reference 8.7).

23.7.6.3.7 Impact following mitigation

246. Following mitigation, the magnitude of effect upon breeding skylark (a receptor of medium importance) reduces to low, resulting in a residual impact of **minor adverse** significance.

23.7.7 Potential Impacts during Operation

23.7.7.1 Impact 1: Disturbance to habitats and species from maintenance activities

23.7.7.1.1 Onshore project substation

247. Routine maintenance of the onshore project substation will require an average of one visit per week, involving a single vehicle and staff during daylight hours. As a consequence, disturbance from noise and human presence (above general operational movements on and off site) is predicted to be of negligible magnitude and only affect receptors in the immediate vicinity of the onshore project substation.

23.7.7.1.2 National Grid substation extension

248. Routine maintenance of the National Grid substation extension will require an average of one visit per week, involving a single vehicle and staff during daylight hours. As a consequence, disturbance from noise and human presence (above general operational movements on and off site) is predicted to be of negligible magnitude and only affect receptors in the immediate vicinity of the National Grid substation extension.

23.7.7.1.3 Impact without mitigation

249. Without mitigation, the greatest magnitude arising from one element of the onshore project area is negligible magnitude on at worst medium importance receptors, resulting in an impact of at worst **negligible** significance.

23.7.7.1.4 Mitigation

250. None is required as the magnitude of effect is already negligible.

23.7.7.2 Impact 2: Disturbance onshore ornithology from operational lighting and noise

23.7.7.2.1 Onshore project substation

251. Operational lighting at the onshore project substation will be provided for operations and maintenance activities only, and under normal conditions the substation would not be lit. As a consequence, disturbance from lighting (above general operational movements on and off site) is predicted to be of negligible magnitude and only affect receptors in the immediate vicinity of the onshore project substation.

23.7.7.2.2 National Grid substation extension

252. Routine maintenance of the National Grid substation extension will require an average of one visit per week, involving a single vehicle and staff during daylight hours. As a consequence, disturbance from noise and human presence (above general operational movements on and off site) is predicted to be of negligible

magnitude and only affect receptors in the immediate vicinity of the National Grid substation extension.

23.7.7.2.3 Impact without mitigation

253. Without mitigation, the greatest magnitude arising from one element of the onshore project area is negligible magnitude on at worst medium importance receptors, resulting in an impact of at worst **negligible** significance.

23.7.7.2.4 Mitigation

254. A lighting scheme will be designed for the final design for the permanent infrastructure, which will include measures to minimise light spill following the Bat Conservation Trust's (BCT) Artificial lighting and wildlife guidance (2014).

23.7.8 Potential Impacts during Decommissioning

255. This section describes the potential impacts of the decommissioning of the onshore project area with regards to impacts on onshore ornithology. Further details are provided in Chapter 5 Project Description.

256. No decision has been made regarding the final decommissioning for the onshore cables, as it is recognised that industry best practice, rules and legislation change over time. It is likely the cables would be pulled through the ducts and removed, with the ducts themselves left in situ.

257. In relation to the onshore project substation, no decision has been made regarding the final decommissioning, however the programme for decommissioning is expected to be similar in duration to the construction phase. The detailed activities and methodology would be determined later within the project lifetime, but are expected to include:

- Dismantling and removal of outside electrical equipment from site located outside of the onshore project substation buildings;
- Removal of cabling from site;
- Dismantling and removal of electrical equipment from within the onshore project substation buildings;
- Removal of main onshore project substation buildings and minor services equipment;
- Demolition of the support buildings and removal of fencing;
- Landscaping and reinstatement of the site (including land drainage); and
- Removal of areas of hard standing.

258. Considering the worst case scenario which would be the removal and reinstatement of the current land use at the onshore project substation, it is anticipated that the impacts would be similar to those during construction.

259. The decommissioning methodology would need to be finalised nearer to the end of the lifetime of the project so as to be in line with current guidance, policy and legislation at that point. Any such methodology would be agreed with the relevant authorities and statutory consultees. The decommissioning works could be subject to a separate licencing and consenting approach.

23.8 Cumulative Impacts

260. The assessment of cumulative impact has been undertaken here as a two stage process. Firstly, all the impacts from previous sections have been assessed for potential to act cumulatively with other projects. This summary assessment is set out in Table 23.28.

Table 23.28 Potential cumulative impacts

Impact		Potential for cumulative impact	Rationale
Construction			
1	Statutory designated sites	Yes	Impacts to interest features of designated sites may be exacerbated by other projects
2	Wintering / on passage bird species	Yes	Impact to species due to other projects may increase the cumulative impacts to species within the county
3	Breeding bird species	Yes	Impact to species due to other projects may increase the cumulative impacts to species within the county
Operation			
1	Disturbance to habitats and species from maintenance activities	Yes	Impact to species due to other projects may increase the cumulative impacts to species within the county
2	Disturbance to onshore ornithology from operational lighting and noise	Yes	Impact to species due to other projects may increase the cumulative impacts to species within the county
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.			

261. The second stage of the CIA is an assessment of whether there is spatial or temporal overlap between the extent of potential effects of the onshore project area and the potential effects of other projects scoped into the CIA upon the same receptors. To identify whether this may occur, the potential nature and extent of effects arising from all projects scoped into the CIA have been identified and any overlaps between these and the effects identified in section 23.7 have also been identified. Where there is an overlap, an assessment of the cumulative magnitude of effect is provided.

262. The projects identified for potential cumulative impacts with Norfolk Vanguard have been discussed during ETG meetings with stakeholders and the full list has been agreed with local authorities.

263. Table 23.29 summarises those projects which have been scoped into the CIA due to their temporal or spatial overlap with the potential effects arising from the project. The remainder of the section details the nature of the cumulative impacts against all those receptors scoped in for cumulative assessment.

Table 23.29 Summary of projects considered for the CIA in relation to onshore ornithology

Project	Status	Development period	[11]Distance from onshore project area (km)	Project definition	Project data status	Included in CIA	Rationale
National Infrastructure Planning							
Norfolk Boreas Offshore Wind Farm	Pre-Application	Expected construction 2026.	0	Pre-application outline only	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	Pre-Application	Expected construction date 2021	0 – cable intersects project.	Full PEIR available: http://www.dongenergy.co.uk/en/Pages/PEIR-Documents.aspx	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	Overlapping proposed project boundaries at Necton may result in impacts of a direct and / or indirect nature during operation
A47 corridor improvement programme – North Tuddenham to Easton	Pre-application	Expected construction date 2021-23	2.5	https://infrastructure.planninginspectorate.gov.uk/projects/eastern/a47-north-tuddenham-to-easton/	Medium	No	Development is located 2.5km from the project boundary and is therefore within the internationally designated site study area, but is more than 5km from the internationally designated sites considered in this chapter. No cumulative impacts are anticipated.
A47 corridor improvement programme –	Pre-application	Expected construction date 2021-	25	https://infrastructure.planninginspectorate.gov.uk/project	Medium	No	Development is located 25km from the project boundary and is therefore outwith the study area for onshore

[11] Shortest distance between the considered project and Norfolk Vanguard – unless specified otherwise.

Project	Status	Development period	[11]Distance from onshore project area (km)	Project definition	Project data status	Included in CIA	Rationale
A47 Blofield to North Burlingham		22		s/eastern/a47-blofield-to-north-burlingham/			ornithology. No cumulative impacts are anticipated.
A47 corridor improvement programme – A47 / A11 Thickthorn	Pre-application	Expected construction date 2020-21	18	https://infrastructure.planninginspectorate.gov.uk/projects/eastern/a47a11-thickthorn-junction/	Medium	No	Development is located 18km from the project boundary and is therefore outwith the study area for onshore ornithology. No cumulative impacts are anticipated.
Norwich Western Link	Pre-application	Expected construction date 2019-22	2.8	https://www.norfolk.gov.uk/roads-and-transport/major-projects-and-improvement-plans/norwich/norwich-western-link/timeline	Medium	No	Development is located 2.8km from the project boundary and is therefore within the internationally designated site study area, but is more than 5km from the internationally designated sites considered in this chapter. No cumulative impacts are anticipated.
Third River Crossing (Great Yarmouth)	Pre-application	Expected construction date 2020-23	28	https://www.norfolk.gov.uk/roads-and-transport/major-projects-and-improvement-plans/great-yarmouth/third-river-crossing	Medium	No	Development is located 18km from the project boundary and is therefore outwith the study area(s) identified for onshore ornithology. No cumulative impacts are anticipated.
King's Lynn B Power Station	Awaiting	Expected construction	28	https://www.kingsl	High	No	Development is located 18km from the project boundary and is therefore

Project	Status	Development period	[11]Distance from onshore project area (km)	Project definition	Project data status	Included in CIA	Rationale
amendments	decision	date 2018-21		ynnbccgt.co.uk/			outwith the study area(s) identified for onshore ornithology. No cumulative impacts are anticipated.
North Norfolk							
PF/17/1951 Erection of 43 dwellings and new access with associated landscaping, highways and external works	Awaiting decision	Anticipated Q2 2018	0.7	Application available: https://idoxpa.north-norfolk.gov.uk/online-applications/applicationDetails.do?activeTab=summary&keyVal=_NNORF_DCAPR_92323	High	No	Development is located 0.7km from the project boundary and is therefore within the internationally designated site and designated sites study areas, but is more than 5km from the internationally designated sites and 2km from the nationally designated sites considered in this chapter. No cumulative impacts are anticipated.
Bacton Gas Terminal Extension	Approved	Approved 20/09/2016. Expires 20/09/2019	3.0	Approved PDS available https://idoxpa.north-norfolk.gov.uk/online-applications/applicationDetails.do?activeTab=summary&keyVal=_NNORF_DCAPR_88689	Medium	No	Terminal extension is located 3km from the project boundary and is therefore within the internationally designated site study area. The project is located within an existing industrial site, and as such no cumulative impacts are anticipated.
Bacton Gas Terminal Coastal Protection	Approved	Approved 18/11/2016. Expires 18/11/2019	2.5	Approved PDS available	Medium	Yes	Coastal protection scheme may result in changes to coastal habitats at the landfall site.

Project	Status	Development period	[11]Distance from onshore project area (km)	Project definition	Project data status	Included in CIA	Rationale
Bacton and Walcott Coastal Management Scheme	Approved	Expected construction date 2018	1.0	Public information leaflets available: https://www.north-norfolk.gov.uk/media/3371/bacton-to-walcott-public-information-booklet-july-2017.pdf	Medium	Yes	Coastal protection scheme may result in changes to coastal habitats at the landfall site.
Breckland							
21-31 new dwellings in Necton (BLR/2017/0001/PIP)	Awaiting decision	Not known. Application submitted November 2017.	1.0	http://planning.breckland.gov.uk/OcellaWeb/showDocuments?reference=BLR/2017/0001/PIP&module=pl	Medium	No	Development is located 3km from the project boundary and is therefore within the internationally designated site study area, but is more than 5km from the internationally designated sites considered in this chapter. No cumulative impacts are anticipated.
4-8 new dwellings in Necton (BLR/2017/0002/PIP)	Awaiting decision	Not known. Application submitted November 2017.	1.0	http://planning.breckland.gov.uk/OcellaWeb/showDocuments?reference=BLR/2017/0002/PIP&module=pl	Medium	No	Development is located 3km from the from the project boundary and is therefore within the internationally designated site study area, but is more than 5km from the internationally designated sites considered in this chapter. No cumulative impacts are anticipated.
70 dwellings (3PL/2016/0298/D) (Phase 2 of	Approved (21/09/16)	Not known. Application submitted	6.4	http://planning.breckland.gov.uk/OcellaWeb/planningDet	Medium	No	Development is located 6.4km from the project boundary, and is therefore outwith the study area for onshore

Project	Status	Development period	[11]Distance from onshore project area (km)	Project definition	Project data status	Included in CIA	Rationale
3PL/2012/0576/O)		March 2016.		ails?reference=3PL/2016/0298/D&from=planningSearch			ornithology. No cumulative impacts are anticipated.
98 dwellings at Swans Nest with access from Brandon Road (3PL/2017/1351/F) (Phase 3 of 3PL/2012/0576/O)	Awaiting decision (due 30/03/2018)	Not known. Application submitted Jan 2016.	6.4	http://planning.breckland.gov.uk/OcellaWeb/planningDetails?reference=3PL/2017/1351/F&from=planningSearch	Medium	No	Development is located 6.4km from the project boundary and is therefore outwith the study area for onshore ornithology. No cumulative impacts are anticipated.
175 dwellings with access at land to west of Watton Road, Swaffham (3PL/2016/0068/O) (Swans Nest Phase B)	Awaiting decision (due 13/10/2017)	Not known. Application submitted Jan 2016.	6.4	http://planning.breckland.gov.uk/OcellaWeb/planningDetails?reference=3PL/2016/0068/O	Medium	No	Development is located 6.4km from the project boundary and is located on agricultural land. No cumulative impacts are anticipated.

264. As identified in Table 23.29, through one of its subsidiaries, Vattenfall Wind Power Ltd is also developing the sister project Norfolk Boreas Offshore Wind Farm (herein the 'Norfolk Boreas project'), with the DCO application following approximately a year behind the Norfolk Vanguard DCO application. The development of Norfolk Boreas will use the same offshore cable route as Norfolk Vanguard with the addition of a spur to the Norfolk Boreas site.

265. The worst case scenario for this EcIA set out in section 23.7.4 has assumed that the installation of ducts for the onshore cable route for the Norfolk Boreas project will be conducted as part of the Norfolk Vanguard project construction (as a worst case). Therefore, the only elements of Norfolk Boreas not considered in the assessment conducted in section 23.7 are the Norfolk Boreas cable pull and onshore project substation (including the National Grid substation extension, any landscaping or planting, and the onshore 400kV cable route).

266. Potential cumulative impacts arising from these elements of the Norfolk Boreas project are considered, alongside all other projects set out in Table 23.29.

267. In summary, the following projects will be assessed for potential cumulative impacts:

- National Infrastructure Planning projects:
  - Norfolk Boreas Offshore Wind Farm;
  - Hornsea Project Three;
  - Dudgeon Offshore Wind Farm;
  - Bacton Gas Terminal Coastal Protection; and
  - Bacton and Walcott Coastal Management Scheme.

268. To avoid confusion between different projects, the Norfolk Vanguard offshore wind farm, previously referred to as 'the project', is referred to as 'the Norfolk Vanguard project' within this section.

23.8.1 Cumulative Impacts during Construction

23.8.1.1 Cumulative Impact 1: Impacts to statutory designated sites

269. The Norfolk Boreas onshore project substation footprint is located more than 5km from the Broadland SPA and Ramsar site. As such no change upon these habitats is anticipated to arise as a result of cumulative effects, and therefore cumulative effects are of the same significance set out in section 23.7 (**minor adverse**).

270. No ex-situ habitats within 5km of the Broadland SPA and Ramsar site are located within a precautionary 1km buffer of both Hornsea Project Three project and the Norfolk Vanguard project. As such no change upon these habitats is anticipated to

arise as a result of cumulative effects, and therefore cumulative effects are of the same significance set out in section 23.7 (**minor adverse**).

23.8.1.2 Cumulative Impact 2: Impacts to wintering / on passage bird species

271. No notable species have been recorded wintering / on passage within a precautionary 1km buffer of the Norfolk Boreas onshore project substation. As such there will be no change upon notable wintering / on passage birds is anticipated to arise as a result of cumulative effects, and therefore cumulative effects are of the same significance set out in section 23.7 (**minor adverse**).

272. No notable species have been recorded wintering / on passage within a precautionary 1km buffer of both Hornsea Project Three project and the Norfolk Vanguard project. As such no change upon these habitats is anticipated to arise as a result of cumulative effects, and therefore cumulative effects are of the same significance set out in section 23.7 (**minor adverse**).

23.8.1.3 Cumulative Impact 3: Impacts to breeding bird species

273. The Norfolk Boreas onshore project substation footprint will result in the additional loss of 9.5ha of arable land (suitable for breeding skylarks). This habitat loss is of the same order of magnitude as the Norfolk Vanguard project, the cumulative magnitude of effect is anticipated to remain as medium. As such, cumulative effects are of the same significance set out in section 23.7 (**minor adverse**).

274. The Norfolk Boreas onshore project substation footprint will result in the additional loss of 270m of species-poor hedgerow with trees. This habitat loss is of the same order of magnitude as the Norfolk Vanguard project, the cumulative magnitude of effect is anticipated to remain as medium. As such, cumulative effects are of the same significance set out in section 23.7 (**minor adverse**).

23.8.2 Cumulative Impacts during Operation

23.8.2.1 Cumulative Impact 1: Disturbance to habitats and species from maintenance activities

275. The Norfolk Boreas and Dudgeon Offshore Windfarm are anticipated to have similar maintenance requirements as the Norfolk Vanguard project (i.e. an average of one visit per week, involving a single vehicle and staff during daylight hours), all of which are small in scale. As a consequence, disturbance from noise and human presence (above general operational movements on and off site) is predicted to be of negligible cumulative magnitude and only affect receptors in the immediate vicinity of the substation. As such, cumulative effects are of the same significance set out in section 23.7 (**negligible**).

23.8.2.2 Cumulative Impact 2: Disturbance to onshore ornithology from operational lighting and noise

276. Operation lighting from the Dudgeon offshore wind farm substation is subject to mitigation measures including screen to minimise the levels of light pollution arising from the site. Operational lighting at the Norfolk Boreas onshore project substation will be provided for operations and maintenance activities only, and under normal conditions it would not be lit. As a consequence, disturbance from lighting (above general operational movements on and off site) is predicted to be of negligible cumulative magnitude and only affect receptors in the immediate vicinity of the onshore project substation. As such, and therefore cumulative effects are of the same significance set out in section 23.7 (**negligible**).

23.8.3 Cumulative Impacts during Decommissioning

277. Decommissioning of the Norfolk Boreas and Hornsea Project Three may potentially take place at the same time as the Norfolk Vanguard project. The detail and scope of the decommissioning works for the Norfolk Vanguard project 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.

23.9 Inter-relationships

278. Table 23.30 lists out the inter-relationships between this chapter and other chapters within the ES.

Table 23.30 Chapter topic inter-relationships

Topic and description	Related Chapter	Where addressed in this Chapter	Rationale
Habitats which support onshore ornithology	Chapter 22 Onshore Ecology	Section 23.7.6.1 Section 23.7.6.3	Impacts to habitats supporting onshore ornithology may affect the bird species in the area.
Noise disturbance on bird species	Chapter 25 Noise and Vibration	Section 23.7.6 (all impacts)	Any impacts from the project on noise may disturb protected bird species
Air quality impacts on bird species	Chapter 26 Air Quality	Section 23.7.6.1	Nutrient nitrogen deposition on habitats which support bird species
Lighting impacts to bird species	Chapter 29 Landscape and Visual Impact Assessment	Section 23.7.6 (all impacts)	Construction and maintenance lighting (covered in Chapter 29 Landscape and Visual Impact Assessment) may cause disturbance to protected bird

Topic and description	Related Chapter	Where addressed in this Chapter	Rationale
			species.

23.10 Interactions

279. The impacts identified and assessed in this chapter have the potential to interact with each other, which could give rise to synergistic impacts as a result of that interaction. The worst case impacts assessed within the chapter take these interactions into account and for the impact assessments are considered conservative and robust. For clarity the areas of interaction between impacts are presented in

280. Table 23.31, along with an indication as to whether the interaction may give rise to synergistic impacts.

Table 23.31 Interaction between impacts

Potential interaction between impacts			
Construction			
	1 Statutory designated sites	**2 Wintering / on passage bird species**	**3 Breeding bird species**
1 Statutory designated sites	-	Yes	Yes
2 Wintering / on passage bird species	Yes	-	Yes
3 Breeding bird species	Yes	- Yes	-
Operation			
	1 Habitat and species during maintenance	**2 Bird species during operational lighting and noise**	
1 Habitat and species during maintenance	-	No	
2 Bird species during operational lighting and noise	No	-	
Decommissioning			
It is anticipated that the decommissioning impacts will be similar in nature to those of construction.			

23.11 Summary

Table 23.32 Potential impacts identified for onshore ornithology

Potential Impact	Receptor	Importance	Magnitude	Significance	Mitigation	Residual Impact
Construction						
1	Statutory designated sites	Low	Medium	Minor adverse	Yes	Minor adverse
2	Wintering / on passage bird species	Medium	Low	Minor adverse	Yes	Minor adverse
3	Breeding bird species	Medium	Medium	Moderate adverse	Yes	Minor adverse
Operation						
1	Habitat and species during maintenance	Medium	Negligible	Negligible	N/A	Negligible
2	Bird species during operational lighting and noise	Medium	Negligible	Negligible	Yes	Negligible
Decommissioning						
Impacts similar to those during construction						
Cumulative - construction						
1	Statutory designated sites	As per construction and operation				
2	Wintering / on passage bird species	As per construction and operation				
3	Breeding bird species	As per construction and operation				
Cumulative - operation						
1	Habitat and species during maintenance	As per construction and operation				

Potential Impact	Receptor	Importance	Magnitude	Significance	Mitigation	Residual Impact
2	Bird species during operational lighting and noise	As per construction and operation				
Cumulative - operation						
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.						

23.12 References

Bat Conservation Trust (2014). Artificial lighting and wildlife. Interim Guidance: Recommendations to help minimise the impact artificial lighting.
British Standard 42020:2013 – Biodiversity. Code of Practice for planning and development
CIRIA Guidance note C692 Environmental Good Practice on Site Guide (3rd edition).
Chartered Institute of Ecology and Environmental Management (2016a) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal, 2nd edition. Chartered Institute of Ecology and Environmental Management, Winchester.
Chartered Institute of Ecology and Environmental Management (2016b) Professional Code of Conduct, Revised June 2016.
Department for Energy and Climate Change (2011a). Overarching NPS for Energy (EN-1).
Department for Energy and Climate Change (2011b). NPS for Renewable Energy Infrastructure (EN-3).
Eaton, M., Aebischer, N., Brown, A., Hearn, R., Lock, L., Musgrove, A., Noble, D., Stroud, D. and Gregory, R. (2015). Birds of Conservation Concern 4: the population status of birds in the UK, Channel Islands and Isle of Man. British Birds 108, December 2015, 708–746.
Natural England and Forestry Commission (2018) Ancient woodland and veteran trees: protecting them from development. Natural England and Forestry Commission Standing Advice;
Institute of Environmental Assessment (1995). Guidelines for Baseline Ecological Assessment.
Joint Nature Conservation Committee (2010). Handbook for Phase 1 habitat survey: A technique for environmental audit.
Natural England (2015). Standing advice on wild birds.
Royal HaskoningDHV (2016a). Norfolk Vanguard Offshore Wind Farm Environmental Impact Assessment Scoping Report. Document Reference PB4476-003-001.
Royal HaskoningDHV (2016b). Onshore Winter / Passage Bird Survey Scoping Report. Document Reference: PB4476-003-024.
Royal HaskoningDHV (2017). Norfolk Vanguard Offshore Wind Farm: Onshore Ecology and Onshore Ornithology Method Statement. Document Reference PB4476.003.029.