

Norfolk Boreas Offshore Wind Farm

Outline Code of Construction Practice

(Version 2) (Clean)

DCO Document 8.1

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Glossary of Acronyms

ALO	Agricultural Liaison Officer
BAT	Best Available Technique
BPM	Best Practicable Means
CCS	Considerate Constructors Scheme
CDM	Construction Design & Management
CIRIA	Construction Industry Research and Information Association
CNMP	Construction Noise Management Plan
CoCP	Code of Construction Practice
DCO	Development Consent Order
ECoW	Environmental Clerk of Works
EIA	Environmental Impact Assessment
EMS	Environmental Management System
ES	Environmental Statement
EWC	European Waste Catalogue
HDD	Horizontal Directional Drilling
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
INSS	Invasive non-native species
MLWS	Mean Low Water Springs
MMP	Materials Management Plan
MPA	Mineral Planning Authority
NNSS	Non-Native Species Secretariat
NPPF	National Planning Policy Framework
NPS	National Policy Statement
OCoCP	Outline Code of Construction Practice
OLEMS	Outline Landscape and Ecological Management Plan
OPEMP	Outline Project Environmental Management Plan
PPE	Personal protective equipment
PPG	Pollution Prevention Guidance
PRoW	Public rights of way
RPE	Respiratory protective equipment
SMP	Soil Management Plan
SPZ	Source Protection Zone
SuDS	Sustainable Urban Drainage Schemes
SWDP	Surface Water and Drainage Plan
SWMP	Site and Waste Management Plan
TMP	Traffic Management Plan
VWPL	Vattenfall Wind Power Ltd

Glossary of Terminology

Cable pulling	Installation of cables within pre-installed ducts from jointing pits located along the onshore cable route.
Ducts	A duct is a length of underground piping, which is used to house electrical and communications cables.
Jointing pit	Underground structures constructed at regular intervals along the onshore 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
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.
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.
Necton National Grid substation	The grid connection location for Norfolk Boreas and Norfolk Vanguard.
Norfolk Vanguard	Norfolk Vanguard offshore wind farm, sister project of Norfolk Boreas.
Onshore cable route	The up to 35m working width within a 45m wide corridor which will contain the buried export cables as well as the temporary running track, topsoil storage and excavated material during construction.
Onshore cables	The cables which take power and communications from landfall to the onshore project substation.
Onshore infrastructure	The combined name for all onshore infrastructure associated with the project from landfall to grid connection.
Onshore project area	The area of the onshore infrastructure (landfall, onshore cable route, accesses, trenchless crossing zones and mobilisation areas; onshore project substation and extension to the Necton National Grid substation and overhead line modifications).
Onshore project substation	A compound containing electrical equipment to enable connection to the National Grid. The substation will convert the exported power from HVDC to HVAC, to 400kV (grid voltage). This also contains equipment to help maintain stable grid voltage.
Order limits	The area of the land (as defined by the DCO) within which the project may be constructed, operated and maintained.
Overhead line	An existing 400kV power line suspended by towers.
Running track	The track along the onshore cable route which the construction traffic would use to access work areas.
The Applicant	Norfolk Boreas Limited
The project	Norfolk Boreas Wind Farm including the onshore and offshore infrastructure.
Trenchless crossing compound	Pairs of compounds at each trenchless crossing zone to allow boring to take place from either side of the crossing.
Trenchless crossing zone	Areas within the onshore cable route which will house trenchless crossing entry and exit points.
Workfront	A length of onshore cable route within which duct installation works will occur, approximately 150m.

1 INTRODUCTION

1.1 Background

1. Norfolk Boreas Limited ('the Applicant', an affiliate company of Vattenfall Wind Power Ltd (VWPL)) is seeking a Development Consent Order (DCO) for the Norfolk Boreas offshore wind farm (herein referred to as 'the project' or 'Norfolk Boreas').
2. The offshore wind farm comprises of a 725km² area located approximately 73km from the Norfolk coastline within which wind turbines would be located. Norfolk Boreas would have a maximum export capacity of 1,800 megawatts (MW). The offshore wind farm would be connected to the shore by offshore export cables installed within the offshore cable corridor from the wind farm to a landfall point at Happisburgh South, Norfolk. From there, onshore cables would transport power over approximately 60km to the onshore project substation at Necton, Norfolk.

1.2 Development Scenarios

3. Vattenfall Wind Power Limited (VWPL) (the parent company of Norfolk Boreas Limited) is also developing Norfolk Vanguard, a 'sister project' to Norfolk Boreas. The Norfolk Vanguard project is approximately one year ahead of Norfolk Boreas in its development programme having submitted its DCO application in June 2018. In order to minimise impacts associated with onshore construction works for the two projects, Norfolk Vanguard are seeking consent to undertake the duct installation and some enabling works for both projects at the same time. This is the preferred option and considered to be the most likely however, Norfolk Boreas needs to consider the possibility that Norfolk Vanguard may not proceed to construction.
4. In line with this, the Outline Code of Construction Practice (OCoCP) considers the following two alternative scenarios:
 - **Scenario 1** – Norfolk Vanguard proceeds to construction and installs ducts and other shared enabling works for Norfolk Boreas.
 - **Scenario 2** – Norfolk Vanguard does not proceed to construction and Norfolk Boreas proceeds alone. Norfolk Boreas undertakes all works required as an independent project.
5. Under Scenario 1, Norfolk Vanguard proceeds to construction and would have undertaken the following to benefit Norfolk Boreas:
 - Installation of ducts to house Norfolk Boreas cables along the entirety of the onshore cable route from the landfall zone to the onshore project substation;
 - A47 junction works for both projects and installation of a shared access road up to the Norfolk Vanguard substation; and

- Overhead line modifications at the Necton National Grid substation, which will accommodate both projects.
6. Under Scenario 1, the following onshore elements would therefore be undertaken by Norfolk Boreas:
- Installation of ducts and cables at the landfall;
 - Cable pulling through pre-installed ducts, including reinstallation of up to approximately 12km of temporary running track;
 - Construction of onshore project substation, including extension of the access road from the A47 (installed by Norfolk Vanguard);
 - Extension of the Necton National Grid Substation in an easterly direction, with a footprint of approximately 135m by 150m; and
 - Landscape mitigation planting.
7. Under Scenario 2, the following onshore elements would be undertaken by Norfolk Boreas:
- Installation of ducts and cables at the landfall;
 - Duct installation via open trenching and trenchless crossings, including installation of 60km of temporary running track;
 - Installation of mobilisation areas and trenchless crossing compounds;
 - Cable pulling through pre-installed ducts, including retaining or reinstalling up to 12km of temporary running track;
 - Construction of onshore project substation, including installation of new permanent access road from A47 and associated junction improvement works;
 - Extension of the Necton National Grid Substation in a westerly direction, with a footprint of approximately 200m by 150m;
 - Modifications to the existing National Grid overhead lines; and
 - Landscape mitigation planting.
8. Full details of the development scenarios are in Chapter 5 Project Description of the Environmental Statement (ES) (document reference 6.1.5), including a further detailed comparison provided in Appendix 5.1 (document reference 6.3.5.1).
9. This OCoCP is an outline plan and takes into account both potential development scenarios, as described above. Where proposed mitigation measures differ under Scenario 1 or Scenario 2, this is explicitly stated, and mitigation measures are provided for both scenarios. Otherwise the mitigation detailed is applicable to both scenarios.
10. The final CoCP for Norfolk Boreas will be drafted post-consent and be based on the final development scenario which will be taken forward to construction.

1.3 Purpose of this document

11. This OCoCP forms part of a set of documents that support the DCO application to be submitted by Norfolk Boreas Limited to the Planning Inspectorate for consent to construct and operate the project.
12. This OCoCP is provided as part of the DCO application in order to demonstrate the linkages between the impact assessments for the onshore components of Norfolk Boreas (detailed in ES Chapters 19 to 31), onshore development activities, and likely requirements associated with any development consent. An Outline Project Environmental Management Plan (OPEMP) (document reference 8.14) is provided with the DCO application to provide information relating to the offshore works.
13. A final detailed CoCP will be produced prior to construction of the project and will be based on the content of this OCoCP and the final design of the project. Both the OCoCP and the CoCP are secured by Requirement 20 of the draft DCO, which states:
 - 1) No stage of the onshore transmission works may commence until for that stage a code of construction practice has been submitted to and approved by the relevant local planning authority, in consultation with Norfolk County Council, the Environment Agency and the relevant statutory nature conservation body.
 - 2) The code of construction practice must accord with the outline code of construction practice and include details, as appropriate to the relevant stage on—
 - (a) relevant health, safety and environmental legislation and compliance;
 - (b) local community liaison responsibilities;
 - (c) artificial light emissions;
 - (d) contaminated land and groundwater;
 - (e) construction noise and vibration;
 - (f) soil management;
 - (g) construction method statements;
 - (h) site and excavated waste management;
 - (i) construction surface water and drainage;
 - (j) materials management;
 - (k) screening, fencing and site security;
 - (l) air quality;
 - (m) invasive species management; and
 - (n) proposals for managing public rights of way.

- 3) The code of construction practice approved in relation to the relevant stage of the onshore transmission works must be followed in relation to that stage of the onshore transmission works.
 - 4) Pre-commencement screening, fencing and site security works must only take place in accordance with a specific plan for such pre-commencement works which must accord with the relevant details for screening, fencing and site security set out in the outline code of construction practice, and which has been submitted to and approved by the relevant local authority.
14. The CoCP provides a key mechanism, enforceable via DCO Requirement 20, through which the relevant regulatory authorities can be assured that environmental impacts associated with the construction of the onshore infrastructure will be formally controlled and mitigated.
15. This OCoCP reinforces commitments made in the ES and complements other requirements set out in the DCO. A Schedule of Mitigation (document reference 6.6) is also provided with the DCO application, outlining the approach to mitigation for Norfolk Boreas. The Schedule of Mitigation (document reference 6.6) also specifies a number of embedded mitigation measures, which have been designed into the project to ensure that their delivery is secured.

1.4 Scope

16. The OCoCP sets out the management measures which Norfolk Boreas Limited will require its contractors to adopt and implement for any onshore construction works for the project and related off-site activities. Works and locations within the scope of this document include site preparation works, infrastructure construction, and commissioning phases of the project for onshore works (from the landfall at Happisburgh South to the grid connection at the Necton National Grid Substation). Details of the onshore elements under each scenario are presented in section 1.2.
17. The offshore project may be constructed as one or two phases and elements of the onshore construction will also be phased to reflect this:
- i. Cable ducts would be installed in one phase regardless of the offshore strategy (Scenario 1 only);
 - ii. Cable pulling activities would be undertaken in one or two phases depending on the commissioning of the offshore wind turbines;
 - iii. The onshore project substation ground preparation and main construction works would be done in one phase; and
 - iv. The required electrical infrastructure and plant within the onshore project substation could then be installed as required for each phase of offshore construction.

18. This document is relevant to the construction of the onshore elements of the project whichever approach is taken.
19. The term 'construction' in the OCoCP includes all onshore site preparation, material delivery, excavated material disposal, waste removal and all related engineering and construction activities as assessed within the EIA and reported upon within the ES.

2 GENERAL PRINCIPLES

20. The following general principles would apply under either proposed development scenario as detailed in section 1.2.

2.1 Environmental Management Principles

21. Norfolk Boreas Limited is a subsidiary company of VWPL and operates under their Environmental Management System (EMS) based on the requirements of ISO 14001:2015, that describes the processes and procedures by which VWPL identifies and manages significant risks associated with its operations. The EMS is a primary mechanism by which environmental policy commitments, such as compliance with relevant legislation and standards, pollution prevention and continual improvement in environmental performance are delivered. Norfolk Boreas Limited will be compliant with the requirements of the EMS.
22. Through the EMS, contractors undertaking work on behalf of Norfolk Boreas Limited are screened and selected as part of the tender process using a variety of criteria that include environmental credentials.
23. The relevant management plans will set out how the appointed contractor will manage environmental risks associated with construction activities and will set out specific control measures necessary to deliver the requirements of the CoCP and any other mitigation measures that have been committed to by Norfolk Boreas Limited that relate specifically to the construction phase of the project.
24. A number of environmental plans and strategies for construction management relevant to the project will be prepared and implemented; these are detailed in the sections below. These plans may be captured by Requirement 20 of the draft DCO as a subsidiary of the CoCP and/or certain plans and strategies are individual Requirements in their own right. An outline description of the plans is provided below in Table 2.1.
25. During construction all appointed contractors must ensure compliance with all obligations, mitigation and control measures detailed within the CoCP and all other individual plans as listed in Table 2.1.

Table 2.1 Code of Construction Practice – subsidiary and related plans

Description	Section of OCoCP	DCO Requirement
Within the CoCP		
A Health, Safety and Environmental Legislation and Compliance Plan	2.2	Requirement 20 (2)(a)
A Community Liaison Procedure will be prepared.	2.4	Requirement 20 (2)(b)
An Artificial Light Emissions Management Plan will be prepared and	3.7	Requirement

Description	Section of OCoCP	DCO Requirement
implemented. The plan will detail the appropriate mitigation measures to be taken to manage artificial light emissions.		20 (2)(c)
A Contaminated Land and Groundwater Plan will be prepared.	6	Requirement 20 (2)(d)
A Construction Noise Management Plan for construction will be prepared.	9	Requirement 20 (2)(e)
A Soil Management Plan will be prepared.	8	Requirement 20 (2)(f)
Construction Method Statements will be prepared.	2.3.1	Requirement 20 (2)(g)
A Site and Excavated Waste Management Plan will be prepared and implemented. The plan will manage construction waste across the project in accordance with a waste hierarchy to minimise, reuse and recycle waste materials.	7	Requirement 20 (2)(h)
A Construction Surface Water and Drainage Plan will be prepared pre-construction and implemented during construction. The plan will include the approach to surface water and foul water drainage, and water supply during construction. This will include details of existing drainage.	11	Requirement 20 (2)(i)
A Materials Management Plan will be prepared to cover the use of material during construction.	6	Requirement 20 (2)(j)
A Construction Screening, Fencing and Site Security Plan will be prepared.	3.3	Requirement 20 (2)(k)
An Air Quality Management Plan will be prepared and implemented incorporating emission control measures outlined in best practice guidance.	10	Requirement 20 (2)(l)
An Invasive Species Management Plan will be prepared to cover the approach to managing invasive species on site and any biosecurity protocols.	5	Requirement 20 (2)(m)
A Public Rights of Way (PRoW) Strategy has been prepared.	4 and Document 8.4	Requirement 20 (2)(n)
Separate requirements outwith the OCoCP		
An Archaeology Written Scheme of Investigation (Onshore) will be prepared.	n/a	Requirement 23
An Outline Landscape and Ecological Management Strategy has been prepared and will set out the overarching principles of landscape and ecological management to be adhered to. An Ecological Management Plan and a Landscape Management Scheme will be prepared based on the principles contained in the OLEMS.	n/a	Requirement 24 (EMP) and Requirement 18 (LMS)
A Traffic Management Plan will be prepared. An Outline Traffic Management Plan has been prepared and submitted as part of the DCO application.	n/a	Requirement 21 (1) (a)
A Travel Plan will be prepared. An Outline Travel Plan has been prepared and submitted as part of the DCO application.	n/a	Requirement 21 (1) (b)
An Access Management Plan will be prepared. An Outline Access Management Plan has been prepared and submitted as part of the DCO application.	n/a	Requirement 21 (1) (c)
A Design and Access Statement has been prepared and submitted as part of the DCO application.	n/a	Requirement 16 (4)

26. The EMS will, inter alia, provide for the preparation and implementation of a programme of environmental monitoring and auditing to ensure that Norfolk Boreas Limited environmental standards are being adhered to. A number of positions (relating to clerks of works, officers etc.) are specified by this OCoCP and the other plans within Table 2.1.
27. Prior to the commencement of each stage of construction works, the CoCP for that stage will be issued to the relevant local authorities for review and approval (DCO Requirement 20).

2.2 Health and Safety Principles

28. Norfolk Boreas Limited recognises that its decisions and activities have a direct impact on the health, safety and welfare of those working for Norfolk Boreas Limited and on their behalf. Norfolk Boreas Limited will set specific health and safety goals and monitor performance in relation to the construction, operation and maintenance of their renewable energy generating projects. The final CoCP will include a health and safety plan, within which Norfolk Boreas Limited will:
 - Demonstrate commitment to health and safety by their actions and behaviours;
 - Ensure that health and safety issues are fully considered as an integral part of project management throughout the project life; from design, through construction, operation and maintenance, and future demolition;
 - Require all designers to consider and include the control measures necessary to minimise the risks to the health and safety of all those engaged in construction, maintenance (and demolition) of the project or to others who may be affected;
 - Ensure that suitably competent Norfolk Boreas Limited employees and other designers, engineers, supervisors and contractors from other organisations are engaged to undertake the responsibilities associated with the project;
 - Ensure that all products, materials and processes used in construction, operation and maintenance present no significant risk to the health and safety of persons carrying out those duties or to others who may be affected by that activity;
 - Ensure that suitable and sufficient resources, (including labour, materials, time and finances), are made available to effectively manage the health and safety requirements;
 - Require that all those parties involved in the construction or operation and maintenance or demolition of their renewable energy generating projects (Client, Designer, CDM¹ Coordinator, Principal Contractor and all other Contractors), fulfil their roles and responsibilities both legal and organisational to health, safety and welfare.

¹ Co-ordinator required on projects falling within certain parameters as defined in the Construction (Design and Management) Regulations 2015

- Require that parties involved in their renewable energy generating projects have, where appropriate, a readily available, valid, suitable and sufficient Pre-Construction Information document and Health and Safety Plan as defined in the Construction (Design and Management) Regulations 2015; and
- Ensure that upon completion of construction activity a suitable and sufficient Health and Safety File is completed and transferred, where appropriate, to the ultimate owner.

2.3 Construction Principles

29. The appointed Norfolk Boreas Limited Construction Manager and associated management team will be responsible for implementation of the CoCP provisions, and for ensuring that the various construction contractors are in compliance with these requirements. The practical implementation arrangements and responsibilities conferred to the construction contractors will be detailed in further management protocols to be developed, such as the associated plans as identified in Table 2.1.
30. The provisions of the OCoCP / CoCP will be incorporated into the contracts for the construction of the project and will be required to be adhered to as a requirement of the DCO. Norfolk Boreas Limited and its implementing contractors will be required to comply fully with the terms of the CoCP.
31. Aims of the OCoCP/CoCP include mitigation of nuisance to the public and to safeguard the environment during construction. Construction activities will be monitored and policed by an Environmental Clerk of Works (ECoW) supported by other specialists as necessary (such as ecological, archaeological, auditing specialists). In addition, a pre-construction land survey would be undertaken by a qualified Agricultural Liaison Officer (ALO) to record details of crop regimes, position and condition of field boundaries, existing drainage and access arrangements, and private water supplies. Contact details for the ALO must be included in the final CoCP.
32. In addition to the arrangements under this OCoCP, the appointed contractors will be encouraged to register with the Considerate Constructors Scheme (CCS) which is a voluntary code of practice that seeks to:
 - Enhancing the appearance of the site;
 - Securing everyone's safety;
 - Respecting the community;
 - Caring for the workforce; and
 - Protecting the environment.

33. The scheme requires constructors to adhere to the Scheme's Code of Considerate Practice.

2.3.1 Construction Method Statements

34. Detailed Construction Method Statements will be developed by the Principal Contractor for relevant construction operations. Relevant Construction Method Statements will be included as part of the final CoCP for each phase of the works.
35. Each Construction Method Statement will follow construction industry good practice guidance in accordance with the Environment Agency's Pollution Prevention Guidance (PPG²), the Sustainable Urban Drainage Schemes (SuDS) and the Construction Industry Research and Information Association (CIRIA) which include the following guidance documents:
- PPG01 – General guide to the prevention of water pollution
 - PPG05 – Works near or liable to affect watercourses
 - PPG06 – Working at construction and demolition sites
 - PPG08 – Storage and disposal of used oils
 - PPG11 – Preventing pollution at industrial sites
 - PPG20 – Dewatering of underground ducts and chambers
 - PPG 21 – Pollution incident response planning
 - The Sustainable Drainage System (SuDS) Manual, C697, CIRIA (2007a) Site Handbook for the Construction of SuDS, C698, CIRIA (2007b)
 - CIRIA Report C502 Environmental Good Practice on Site
 - CIRIA Report C532 Control of Water Pollution from Construction Sites
 - CIRIA Report C648 Control of Pollution from Linear Construction Project Technical Guidance
 - CIRIA Handbook C692 Environmental Good Practice on Site
 - CIRIA Handbook C651 Environmental Good Practice on Site Checklist
 - Defra Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (2009)
 - Bat Conservation Trust Bats and Lighting in the UK guidance (2018)
 - British Standard [BS] 5228 BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites.
 - National Joint Utilities Group (NJUG) 'Guidelines for the Planning, Installation and Maintenance of Utility Apparatus in Proximity to Trees' (Volume 4, Issue 2 November 2007).

² It should be noted that the Pollution Prevention Guidelines are no longer the current documents used by the Environment Agency, although the mitigation presented in the guidelines is still appropriate for managing pollution prevention on construction sites.

2.4 Local Community Liaison

36. Norfolk Boreas Limited will ensure effective and open communication with local residents and businesses that may be affected by noise or other aspects affecting amenity caused by the construction works. Communications will be co-ordinated on site by a designated member of the construction management team. A proactive public relations campaign will be maintained, keeping local residents informed of the type and timing of works involved, paying particular attention to potential evening and night time works and activities which may occur in close proximity to receptors. A combination of communication mechanisms such as information boards, posters and parish meetings will be employed to keep local residents informed.
37. A designated Norfolk Boreas Limited local community liaison officer will respond to any public concerns, queries or complaints in a professional and diligent manner as set out by a project community and public relations procedure which will be submitted for comment to the Local Authorities.
38. Parish Councils in the relevant area will be contacted (in writing) in advance of the proposed works and ahead of key milestones. This information will include indicative details for timetable of works, a schedule of working hours, the extent of the works, and a contact name, address and telephone number in case of complaint or query. Enquiries will be dealt with in an expedient and courteous manner. Any complaints will be logged, investigated and, where appropriate, rectifying action will be taken.
39. The above will be captured in a communications plan as part of the final CoCP.
40. In the event that Norfolk Boreas and Hornsea Project Three have concurrent construction works in the vicinity of Oulton and Cawston parishes, the Norfolk Vanguard communication plan will set out the following:
 - Procedures for engaging with Hornsea Project Three;
 - Procedures for Norfolk Boreas and Hornsea Project Three to engage with the Highway Authority; and
 - Measures that Norfolk Boreas and Hornsea Project Three will initiate if any complaints are made by the local community which provide how these are communicated between the two developers.

2.5 Embedded Mitigation Measures

41. Norfolk Boreas Limited 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 Environmental Impact Assessment (EIA) process.

42. The following embedded mitigation measures are project commitments and are stated here to ensure that they are captured and that their delivery is secured. These measures are presented in Table 2.2 and discussed throughout this section of the OCoCP.

Table 2.2 Embedded mitigation

Parameter	Mitigation measures embedded into the project design	Notes
Project Wide		
Commitment to HVDC technology	<p>Commitment to HVDC technology minimises environmental impacts through the following design considerations;</p> <ul style="list-style-type: none"> • HVDC requires fewer cables than the HVAC solution. During the duct installation phase this reduces the cable route working width for Norfolk Boreas to 35m from the previously identified worst case of 50m. As a result, the overall footprint of the onshore cable route required for the duct installation phase is reduced from approx. 300ha to 210ha; • The width of permanent cable easement is also reduced from 25m to 13m; • Removes the requirement for a cable relay station as permanent above ground infrastructure; • Reduces the maximum duration of the cable pulling phase from three years down to two years; • Reduces the total number of jointing pits for Norfolk Boreas from 450 to 150; and • Reduces the number of drills needed at trenchless crossings (including landfall). 	<p>Norfolk Boreas 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.</p>
Site Selection	<p>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 Necton National Grid extension and associated infrastructure, a preference for the shortest route length (where practical) and developing construction methodologies to minimise potential impacts.</p> <p>Key design principles from the outset were followed (wherever practical) and further refined during the EIA process, including;</p> <ul style="list-style-type: none"> • 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 	<p>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 Boreas Limited has reviewed consultation received to inform the site selection process (including from 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</p>

Parameter	Mitigation measures embedded into the project design	Notes
	<p>agricultural ditches;</p> <ul style="list-style-type: none"> • 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. 	and Assessment of Alternatives.
Long Horizontal Directional Drill (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 Boreas Limited have also agreed to not use the beach car park at Happisburgh South.	Norfolk Boreas 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.
Watercourse crossings	<p>Trenchless crossing techniques will be employed at the following major watercourses: River Wensum, River Bure, King's Beck, Wendling Beck (two crossing points), and the North Walsham and Dilham Canal.</p> <p>Stop ends would be employed on the running track at each of the trenchless crossing points outlined above, with the exception of the crossing of Wendling Beck at Bushy Common.</p> <p>Reinstatement of the channel would achieve the pre-construction depth of the watercourse, and the dams removed.</p> <p>The width of the running track at watercourse crossings will be minimised from 6m to 3m to limit the area of direct disturbance.</p>	These measures apply to the cable route only.
Cable pulling	During the cable pulling works, short sections of the running track are required to be retained or reinstated for access to the works. In total this will comprise approximately 20% of the running track that was required for duct installation. At each location where the running track is retained or reinstated this would only be required for up to approximately 16 weeks per annum 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%.	n/a
Scenario 1		
Strategic approach to delivering	Under Scenario 1, onshore ducts will be installed for both projects at the same time, as part of the Norfolk Vanguard	The strategic approach to delivering Norfolk Boreas

Parameter	Mitigation measures embedded into the project design	Notes
Norfolk Boreas and Norfolk Vanguard	<p>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.</p> <p>In accordance with the Horlock Rules, the co-location of Norfolk Boreas and Norfolk Vanguard onshore project substations will keep these developments contained within a localised area and, in so doing, will contain the extent of potential impacts.</p>	and Norfolk Vanguard in order to minimise environmental impacts has been a consideration from the outset.
Scenario 2		
Duct Installation Strategy	Under Scenario 2, the onshore cable duct installation strategy is to install ducts in sections to minimise impacts. Construction teams would work on a short section (approximately 150m length) and once the cable ducts have been installed, the section would be back filled and the top soil reinstated 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.	This has been a very early project commitment. Chapter 5 Project Description provides a detailed description of the process.
Trenchless Crossings	<p>Commitment to trenchless crossing techniques to minimise impacts to the following specific features;</p> <ul style="list-style-type: none"> • 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, A1067. 	A commitment to a number of trenchless crossings at certain sensitive locations was identified at the outset. However, Norfolk Boreas Limited has committed to certain additional trenchless crossings as a direct response to stakeholder requests.
Hedgerow crossings	Under Scenario 2 through the selection of a HVDC electrical solution, this has further reduced the maximum width of hedgerow gaps that are required. The maximum size of the hedgerow gap created during the two-year duct installation phase would be 13m to 16.5m. The amount of	n/a

Parameter	Mitigation measures embedded into the project design	Notes
	<p>hedgerow removed during construction of a HVDC design compared to a HVAC design is reduced by over 50%. These reduced widths will reduce the influence of the onshore cable route construction on landscape and visual receptors and reduce the area of hedgerows to be removed.</p> <p>The minimum width assumes that the 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 16.5m. Where this is the case for a particular receptor, it is noted within this report.</p> <p>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 the width will be no wider than 6m.</p>	

3 GENERAL SITE OPERATIONS

43. The following general site operations would apply under either proposed development scenario as outlined in section 1.2.

3.1 Working Hours and Timing of Works

44. Onshore construction working hours (and exceptions to these) are specified in Requirement 26 of the draft DCO. Onshore construction activities would normally be conducted during working hours of 7am to 7pm Monday to Friday and 7am to 1pm Saturdays.
45. Evening or Saturday pm / Sunday working may be required to maintain programme progress and for specific time critical activities such as transformer oil filling and processing, concrete pouring or trenchless drilling; however, these would be kept to a minimum and would be subject advance notification and approval by the relevant local planning authority.
46. Up to one hour before and after the consented working hours, start-up and shut-down activities may be undertaken. During these periods, the contractor may undertake the following activities:
- Arrival and departure of the workforce at the site and movement to and from areas across the project;
 - Site inspections and safety checks;
 - Site meetings (briefings and quiet inspections/walkovers);
 - Site clean-up (site housekeeping that does not require the use of plant); and
 - Low-key maintenance including site maintenance, safety checking of plant and machinery (provided this does not require or cause hammering or banging).
47. Start-up and shut-down does not include heavy good vehicle (HGV) movements into and out of mobilisation areas, i.e. HGV deliveries to mobilisation areas would only occur during the consented working hours unless otherwise agreed, although suppliers can make use of the wider highway network outside of these hours to travel.
48. Perimeter and site lighting would be required during working hours and a lower level of lighting would remain overnight for security purposes. This lighting would be kept to a minimum and adhere to the Artificial Light Emissions Management Plan detailed in section 3.7.
49. Works at the landfall would require 12 hour (7am to 7pm), 7 day shifts. 24 hour operation can be employed for drilling activities subject to advance notification.

50. Where works are undertaken outwith consented hours in response to emergency situations, the local authorities will be advised as soon as practical, outlining the circumstances for the works, the likely duration and the mitigation measures implemented.
51. Norfolk Boreas Limited will use best endeavours to minimise the duration of, and sensitively time, construction activities. The relevant local planning authorities will be advised of the likely timetable of works. This timetable will also be shared with affected communities through the local community liaison officer.

3.2 Construction Site Layout and Housekeeping

52. The final CoCP will include a site layout showing the location of mobilisation areas, trenchless crossing technique (e.g. HDD) compounds, onshore project substation temporary works area and National Grid substation extension temporary works area and main features of these sites. Ahead of construction, further site investigations will be required for the project. Prior to any intrusive investigation or construction work, all existing service plans would be consulted and a comprehensive service line location survey carried out in order to ensure that existing services are not disrupted. This would include radio detection, ground penetration radar and vacuum excavation where necessary.
53. A good housekeeping policy will be applied across all construction areas throughout the construction period. This will include the following requirements:
 - All working areas will be kept in a clean and tidy condition;
 - All site compound areas will be non-smoking. Specific areas within the worksites will be designated as smoking areas and will be equipped with containers for smoking waste. These will not be located at the boundary of working areas or adjacent to areas deemed sensitive to local residents, workers or visitors;
 - Open fires and burning of rubbish are prohibited at all times;
 - Music shall not be played through speakers on any worksite;
 - Site waste susceptible to spreading by wind or liable to cause litter will be stored in enclosed suitable containers and waste will be removed at frequent intervals and the site kept clean and tidy;
 - Static plant will have suitable drip tray protection;
 - Hoardings and boundary fences will be frequently inspected, repaired and repainted as necessary; and
 - Adequate welfare facilities will be provided for all site staff and visitors.
54. In addition, where working areas are within Flood Zone 2 or 3 (relevant to the onshore cable route only) additional measures will be taken to minimise pollution risk during periods of extreme weather (i.e. flooding) by including:

- Staff toolbox talks on pollution prevention and spill procedures;
 - The Contractor will be required to sign up to the Environment Agency 'Floodline' flood warning service;
 - Stores of fuels, oils and chemicals will be surrounded by an impervious bund wall. The volume of the banded compound will be at least equivalent to the capacity of the tank or tanks plus 10%. This should constitute general site practice for the prevention of spills. In addition, the banded installation will be installed in the remotest location possible from rising water and the walls of sufficient height and structural soundness to withstand flood water ingress;
 - Debris will be safely contained, reducing the risk of large items entering the flood flow;
 - Weekly monitoring of sediment traps (visual inspection) with increased monitoring during inclement weather. If required these traps can be pumped via settling tanks to remove sediment, based on a pre-defined level / depth of sediment; and
 - Machinery will be stored or returned to areas of hard standings, preferably remote from flood waters, or where this is not possible, sufficiently constrained so as not to wash away.
55. Where working areas are adjacent to watercourses or cross Flood Zone 2 or 3 (relevant to cable route only), the following measures will be implemented:
- Spoil will not be stored in the functional floodplain (Flood Zone 3b); and
 - There shall be no storage of spoil directly on watercourse banks. Where possible, spoil will be set back from watercourses by 5m. This will prevent excessive loading on the watercourse banks and minimise the risk of stored material entering the watercourses.

3.3 Screening and Fencing

56. Site fencing requirements are controlled under Requirement 20 (2)(k) of the draft DCO, which requires details of permanent and temporary fencing, walls and other means of enclosure to be submitted to the relevant planning authorities for approval before the relevant stage of construction works can commence. A Construction Fencing Plan will be included within each CoCP and will include both temporary and permanent fencing principles, which include the following:
- The landfall HDD temporary construction compound will be securely fenced and access from the local road network, suitable for haulage equipment, will be installed along the onshore cable route to the drilling site.
 - During construction of the onshore cable route, fencing will be installed to demarcate the working area. Stock fencing will be used where necessary; post and wire or similar will be used otherwise.

- Under Scenario 2 once duct installation in each work area is completed, it may be possible to bring the fences in to the sides of the running track so that the land occupied by the trenches and soil storage areas can be returned to normal use.
- The onshore project substation will be enclosed by a temporary perimeter fence for the duration of the construction period with a permanent fence installed as part of the construction works.

3.3.1 Woodland/Tree/Hedgerow Protection

57. Full details showing the position of fencing to protect all woodland areas, trees and hedgerows shown to be retained within the development will be submitted to the local authorities for approval prior to construction. The protective fencing will comply with BS 5837, and will be erected to demarcate the canopy spread of the trees and hedgerows. Any requirement for protective fencing will be informed by the Hedgerow Mitigation Plan and arboricultural survey, which are described in the Outline Landscape and Ecological Management Strategy (OLEMS) (document reference 8.7), secured under Requirement 18 of the draft DCO.
58. Works shall be in accordance with the National Joint Utilities Group (NJUG) 'Guidelines for the Planning, Installation and Maintenance of Utility Apparatus in Proximity to Trees' (Volume 4, Issue 2 November 2007) to protect trees and their root systems, including works carried out in highways.
59. In addition to the above mitigation measures, where possible during detailed project design, the project will seek to avoid mature trees within hedgerows through the micro-siting of individual cables, in order to retain as many mature trees as possible.

3.4 Site Induction

60. The construction of Norfolk Boreas will require all personnel working on site to have a site induction that includes an environmental protection and good practice component. Prior to commencing work on site, personnel must attend the site induction.
61. Site inductions will include reference to compliance with relevant planning / licence conditions, client environmental requirements (including the CoCP), environmental management structure and contacts, site specific environmental sensitivities, waste management arrangements, water and wastewater management, hazardous material management, fuel, oil and chemical management; spill contingency and environmental emergency response, reporting of incidents and complaints. More specific information will be provided to staff according to their role.

3.5 Site Security

62. Adequate security will be provided by contractors working on behalf of Norfolk Boreas Limited to protect the public and staff, prevent theft from or damage to the works, and prevent unauthorised entry to or exit from the site. Site gates will be closed and locked when there is no site activity and appropriate security measures shall be implemented. Further details on site security measures will be provided in the final CoCP.

3.6 Welfare

63. The construction areas will be serviced by temporary construction offices and necessary welfare facilities, including mess rooms, locker rooms, showers and toilet facilities, plus facilities for mobile construction teams. These will be in compliance with relevant legislation and codes of practice and will be sited at the mobilisation areas.

3.7 Artificial Light Emissions

64. An Artificial Light Emissions Management Plan will be prepared in accordance with Requirement 20(2)(c) of the draft DCO.
65. The plan will detail the mitigation measures to be taken to manage emissions from artificial light in accordance with Bats and Lighting in the UK guidance (Bat Conservation Trust, 2018) , such as the use of directional beams, non-reflective surfaces and barriers and screens, to avoid light nuisance whilst maintaining safety and security obligations.
66. Details of the location, height, design and luminance of all floodlighting to be used during the construction of the project, together with measures to limit obtrusive glare to nearby residential properties, will be set out in the Artificial Light Emissions Management Plan which will be submitted to the local authorities for approval prior to construction commencing. The approved scheme will be maintained throughout the construction of the relevant works.
67. Site lighting will be positioned and directed to minimise nuisance to footpath users, residents, to minimise distractions to passing drivers on adjoining public highways and to minimise skyglow, so far as reasonably practicable. Lighting spillage will also avoid or minimise impacts on ecological resources, including nocturnal species.
68. So far as is practicable, all power to temporary lighting will be taken from mains supplies rather than from portable generators. Where portable generators are used, industry best practice will be followed to minimise noise and pollution from such generators.

3.8 Reinstatement

69. Under Scenario 2, once all the trenching for each approximate 150m workfront section is completed and back-filled, the stored topsoil will be re-distributed over the area of the relevant work section, with the exception of the running track and any associated drainage.
70. Long-term storage of topsoil in bunds or heaps will be avoided where possible. However, some topsoil will have to be reserved for re-covering the final area when the running track is removed at the end of the duct installation phase.
71. All areas used temporarily during construction, such as mobilisation areas, must be reinstated as soon as reasonably practicable. Specific replanting measures will be set out within the Ecological Management Plan produced post consent for each stage of the works, which is secured through Requirement 24.

4 PUBLIC RIGHTS OF WAY

72. A number of Public Rights of Way (PRoWs) which will be impacted during the construction phase of the project have been identified in Chapter 30 Tourism and Recreation of the ES (document reference 6.1.30). A PRoW Strategy has been prepared and submitted as part of the DCO application (document reference 8.4) and management of PRoW should be undertaken in accordance with the strategy.
73. There are no interactions with PRoW at the onshore project substation or the National Grid substation extension. The onshore cable route interacts with PRoWs at 46 locations (these are described in ES Appendix 30.1, document reference 6.3.30.1). PRoWs identified include Weavers Way and Paston Way long distance trails, Marriott's Way, Wensum Way, three public bridleways, one restricted byway, Regional Cycle Route 30, Regional Cycle Route 33, and National Cycle Routes 1 and 13.
74. The following PRoW control measures will be employed by the project under Scenario 1 in reference to the construction at landfall and the onshore cable route (cable pulling at jointing pits and associated access locations), and under Scenario 2 for the construction at landfall and the onshore cable route (duct installation and cable pulling at jointing pits location and associated access locations).
75. During the cable pulling works (under both scenarios) the cables will be pulled through the pre-installed ducts from jointing pits located along the onshore cable route. Access to and from the jointing pits would be required to facilitate the works. The exact location of the jointing pits and their interactions with PRoW will not be determined until post consent; however, the identified control measures will be applied to all relevant locations once identified.

4.1 Control measures

76. During construction, disruption to any PRoW will be managed by the Principal Contractor to ensure continued safe access along the PRoW for members of the public, and all efforts will be made to minimise PRoW closure duration. The exact method will be agreed in advance with the relevant local authority and detailed within the final CoCP. Methods available include:
- Appropriately fenced (unmanned) crossing points;
 - Manned crossing points; and
 - Temporary alternative routes (assumed to be approximately 1 week).
77. There will be no permanent closures of these routes.

78. Soft management techniques will be employed where cycle routes intersect the onshore cable route. These methods will include (but not be limited to) the use of pilot vehicles and stop and go signs.
79. Safety measures will be implemented where running tracks for site access cross a PRoW, including raising awareness of the PRoW to running track users and informing PRoW users of the hazards associated with the running track. Where a PRoW is used as part of a running track, an alternative route for the PRoW will be provided.
80. Following the cessation of construction works, all PRoWs will be reinstated to their original condition or otherwise agreed with the relevant local authority.
81. Precise details for management of PRoWs to remain available during works will be agreed with the relevant local authority prior to commencement of the relevant phase of works.
82. For all temporary alternative routes required, the following measures will be followed:
 - A pre- and post-construction survey (including identification of surface condition and street furniture) of the PRoW affected will be undertaken. PRoW surveys will be undertaken by an experienced surveyor with scope of coverage and methodology to be agreed with the relevant local authority. A qualified ALO will be employed to ensure that information on existing land conditions is obtained, recorded and verified during the rights of way surveys;
 - Where impacted by the works, the surveyed PRoW will be restored to its original condition or otherwise as agreed with the relevant local authority. The ALO will act as the point of contact for the restoration of the PRoW;
 - Norfolk Boreas Limited will advertise all alternative routes following the local authority's standards for advertising temporary closures of PRoW. This will include:
 - Provision of a map showing the extent of the temporary closure and an alternative route;
 - Confirmation that the alternative route is to another PRoW or roads or on land in Norfolk Boreas Limited control;
 - Confirmation that the alternative route across land in Norfolk Boreas Limited's control is safe and fit for public use.
 - County, District and Parish Councils would be notified in advance (4 - 6 weeks) of temporary closure;
 - A notice describing the temporary closure would be published in the press (e.g. Eastern Daily Press) a minimum of two weeks in advance of closure;

Consideration will also be given to publishing the temporary closures via additional alternative methods such as websites;

- Advanced site notices (i.e. notices to members of the public warning of diversions ahead) would be posted at appropriate locations to minimise the likelihood of trespassing and to avoid aborted journeys:
 - These site notices would be erected in visible locations on site 1 – 2 weeks in advance of temporary closures;
 - The above notices would describe the duration of temporary closure and the alternative route proposed.

83. Whilst any extensions to closure of a PRow would be avoided where possible, if required, this would be discussed with the relevant local authority.

5 INVASIVE SPECIES

84. There is the potential for impacts to invasive species to occur during the construction process under both scenarios. The control measures set out below are to be applied to ensure that any potential effects upon these receptors are adequately mitigated.

5.1 Control Measures

85. Prior to construction, an Invasive Species Management Plan (as outlined in Table 2.1) will be developed. This plan will be agreed with the Environment Agency and Natural England in advance of construction and will include the following:
- A plan of all invasive species locations and extents;
 - A protocol for removing the Japanese knotweed stand east of the River Bure and for managing the waste generated;
 - Good site practice measures for managing the spread of invasive species, which will include the following measures:
 - Wheel-washing required before plant leaves each 150m workfront;
 - All plant to be disinfected prior to use;
 - Good site practice measures for managing the spread of invasive species during works at watercourses, which will include the following measures:
 - All water-based plant to be subject to the Environment Agency's clean / check / dry procedure when leaving site.
 - All equipment in place during trenched water crossings must be checked for the presence of signal crayfish individuals and disinfected prior to reuse using suitable disinfectant (e.g. Vircon).
 - A requirement for an ECoW and details of their responsibilities with respect to non-native invasive species, including:
 - Procedure required should invasive species be found during construction, including demarcation of the area, installation of appropriate signage and procedure for updating and communicating the Invasive Species Management Plan;
 - Toolbox talk for contractors prior to construction on the known locations of and the identification of non-native invasive species, including information about other common invasive species and about the measures outlined above.

6 CONTAMINATED LAND AND GROUNDWATER (INCLUDING MATERIALS MANAGEMENT)

86. Chapter 19 Ground Conditions and Contamination of the ES identifies receptors of perturbations to ground conditions (including groundwater) and mitigation measures proposed to reduce impacts.
87. The control measures set out below are to be applied for both scenarios unless specified, in order to ensure that any potential effects upon these receptors are adequately mitigated.

6.1 Control Measures

88. Good environmental practice shall be followed during the construction phase of the project, in accordance with the Environment Agency's Pollution Prevention Guidance (PPG1, PPG5, PPG6, PPG21 and PPG22)³. In addition, the following management measures shall be employed during the construction:
- Mobilisation areas within the onshore project area will comprise hardstanding of permeable gravel aggregate underlain by geotextile, or other suitable material;
 - Concrete and cement mixing and washing areas will be situated at least 10m away from the nearest watercourse. These will incorporate settlement and recirculation systems to allow water to be re-used. All washing out of equipment will be undertaken in a contained area, and all water will be collected for off-site disposal;
 - All fuels, oils, lubricants and other chemicals will be stored in an impermeable bund with at least 110% of the stored capacity. Damaged containers will be removed from site. All refuelling will take place in a dedicated impermeable area, using a bunded bowser. Biodegradable oils will be used where possible;
 - Spill kits will be available on site at all times. Sand bags or stop logs will also be available for deployment on the outlets from the site drainage system in case of emergency spillages;
 - Site security and preventing public access;
 - Personal hygiene, and washing and changing procedures; and
 - Adoption of dust suppression methods, wheel washing facilities for vehicles leaving the site, covering of stockpiled materials and materials being transported to and from site.
89. A written scheme dealing with contamination of any land and groundwater will be submitted and approved by the relevant planning authority before any stage of the

³ It should be noted that the Pollution Prevention Guidelines are no longer the current documents used by the Environment Agency, although the mitigation presented in the guidelines is still appropriate for managing pollution prevention on construction sites.

project commences (this is secured by Requirement 20(2)(d) in the draft DCO). The scheme will be based upon the model procedures for the management of land contamination (CLR11) and should include protocols for dealing with unexpected contamination to ensure that procedures are known and agreed should contaminated materials be encountered.

90. Ground investigation and further assessment of potential contamination should be undertaken in accordance with the recommendations of the Phase 1 Preliminary Risk Assessment (Chapter 19 Ground Conditions and Contamination of ES, Appendix 19.2, document reference 6.3.19.2) including in the areas of potential made ground at the dismantled railways lines and historic military jet crash area.
91. The ground investigation and further assessment will identify if remedial works to remove any contaminated materials are required prior to the start of construction to ensure the project does not pose a risk to human health or the environment. If required, the type and extent of any remedial works will be defined following the ground investigation and further assessment, but remedial works may include soil removal , soil capping or soil treatment.
92. Construction workers will be made aware of the possibility of encountering contaminated soils in made ground through toolbox talks. Safe working procedures will be implemented, good standards of personal hygiene will be observed and appropriate levels of personal protective equipment (PPE) and respiratory protective equipment (RPE) will be provided and utilised as necessary, thereby minimising the risk of exposure to potentially contaminated soils, ground gas and groundwater.
93. A Materials Management Plan (MMP) will be developed post-consent and include information regarding the coordination of planning, sourcing, purchasing, moving, storing and controlling materials in a sustainable manner, for example reusing materials on site where possible. The MMP will include an auditable tracking system and make allowance for contingency arrangements, e.g. discovery of unexpected soil materials on-site. The contractor will have to comply with the MMP during construction.
94. The landfall and eastern extent of the onshore cable route falls within a coal mining area although this is within the defined Development Low Risk Area, meaning there is no recorded risk from past coal mining activities likely to affect the project. However, the coal mining area may contain unrecorded coal mining related hazards. Therefore, if any coal mining feature is encountered during construction, this should be reported immediately to the Coal Authority on 0345 762 6848. Further information is also available on the Coal Authority website at: www.gov.uk/coalauthority.

6.1.1 Additional Groundwater Protection

95. Where trenchless crossings or piling works are proposed within any Source Protection Zone (SPZ) 1 or SPZ2 areas, a more detailed hydrogeological risk assessment meeting the requirements of Groundwater Protection Principles and Practice (GP3) (Environment Agency, 2017) shall be undertaken. The outcomes of the hydrogeological risk assessment will be discussed with the Environment Agency and additional mitigation agreed if necessary, including excavations are to be designed to minimise groundwater disturbance and the use of best available techniques (BAT) in accordance with the Energy Network Association Guidance are to be adopted.
96. Additionally, for all areas where piling works are proposed a piling risk assessment in accordance with the guidance by the Environment Agency 'Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance Pollution Prevention NC/99/73 (EA, 2201) will be undertaken and discussed with the Environment Agency.
97. Under Scenario 2 ground investigations and a hydrogeological risk assessment are to be undertaken at each trenchless crossing (e.g. HDD) site and will be discussed with the Environment Agency and additional mitigation agreed if necessary. Trenchless crossing techniques in these locations will ensure that a sufficient thickness of glacial material is present to prevent migration of contaminants into the protected principal aquifer beneath.

7 WASTE MANAGEMENT

98. The project waste assessment (ES Appendix 19.3, document reference 6.3.19.3) assesses the impacts of the onshore project area in terms of waste generation during the construction, operation and decommissioning phases under both scenarios. The assessment takes into account the proposed options for recycling, recovery or disposal of waste, and the capability of the existing local or regional waste management facilities to manage the waste. The below control measures should be adopted under both scenarios.

7.1 Control Measures

99. A Site Waste Management Plan (SWMP) will be prepared to record any decisions given to materials resource efficiency when designing and planning the works. Any assumptions on the nature of the project; its design; the construction method or materials employed, in order to minimise the quantity of waste produced on site; or maximise the amount of waste reused, recycled or recovered, will be captured within the SWMP.
100. The SWMP will provide information on each waste type that is expected to be produced by the project with the appropriate European Waste Catalogue (EWC) code and description for each waste type. It will provide an estimate of the quantity of each type of waste and the proposed waste management option for each waste produced (i.e. re-use, recycling, recovery or disposal; on or off-site).
101. There are certain principles of waste management that can be applied to the majority of wastes that would be created during the construction phase. These are:
- Adhere to waste legislation for storage and handling on-site; and also ensure that the relevant regulatory controls have been applied to the reuse, recycling or recovery of waste on-site;
 - No waste from the project shall be deposited outside the boundary of the site, unless it is at a facility that holds a valid environmental permit or suitable authorised exemption. Off-site waste management facilities are legally obliged to operate under an environmental permit (or an authorised exemption), which is in place to ensure that the site is operated in a manner to prevent emissions causing harm to human health or the environment;
 - Ensure that those who remove waste from site have the appropriate authorisation (i.e. are registered waste carriers); and those facilities that receive waste from the site hold a valid environmental permit or authorised exemption;
 - Allocate space on site for the storage of waste materials and ensure that storage areas and containers are clearly labelled (appropriate signage) so site workers

- know which wastes should be put there. Paved areas/impermeable surfaces may be required, as considered necessary, to prevent direct contact with the ground;
- Hazardous waste must be stored separately from non-hazardous wastes to avoid contamination. The Hazardous Waste Regulations make it illegal to mix hazardous waste with non-hazardous waste;
 - Provide separate containers for dry recyclables, such as paper and cardboard, plastic, glass, wood and metal at welfare facilities within contractor compounds. This would encourage recycling and increase the potential value of the recyclable items by avoiding contamination;
 - Monitor the actual quantities of wastes produced during construction and update the SWMP to allow comparison with waste arisings estimated prior to construction. Record the proposed waste management option (e.g. reuse on site, recycle off-site, or dispose off-site) for each waste produced;
 - All wastes that are removed off site would be described on a waste transfer note or hazardous waste consignment note (as appropriate) that tracks the movement of the waste to the specified disposal or recovery facility; and
 - The appointed contractors should identify appropriate staff that are responsible for waste management; and ensure that all contractor staff are aware of the appropriate reuse, recovery or disposal routes for each waste.
102. These measures would promote sustainable waste management practices by maximising waste prevention, re-use, recycling and recovery opportunities for material destined for offsite waste management. This would actively discourage sending waste to landfill and would promote the waste hierarchy, which is a legal requirement.

8 SOIL MANAGEMENT

103. Chapter 21 Land Use and Agriculture of the ES (document reference 6.2.12) identifies the soil resource potentially affected by the project. There is the potential for soil compaction and erosion as well as changes to soil drainage during the construction process during both scenarios.
104. The following measures will therefore be implemented on site under both scenarios to minimise any effects.

8.1 Control Measures

105. A Soil Management Plan (SMP) would be produced by a competent soil science contractor and agreed with the relevant regulator, in advance of the works. This would be completed pre-construction once an earthworks contractor has been appointed and detailed earthworks phasing information is available. The contractor would be required to comply with the SMP. The SMP will include, but not be limited to, the following measures:
- Soils handling, storage and reinstatement by a competent contractor under Defra (2009) Construction code of practice for the Sustainable Use of Soils on Construction Sites;
 - Topsoil stripping within all construction areas and storage adjacent to where it is extracted, where practical;
 - Topsoil will be reinstated where it originated;
 - Storage of the excavated subsoil separately from the topsoil, with sufficient separation to ensure segregation;
 - Handling of soils according to their characteristics e.g. within wooded areas it is unlikely that topsoil resources of any quality could be separated and preserved for reuse. If current wooded areas are to be used for storage it would not be necessary to undertake topsoil stripping. Topsoil from agricultural land may be treated as a single resource for stockpiling and reuse;
 - Where necessary, tree roots would be removed by screening;
 - Where under storage areas, loosening of subsoils is proposed when dry to improve permeability before the topsoil is replaced;
 - For most after-uses, subsoils may be treated as a single resource for stockpiling;
 - During wet periods, limiting mechanised soil handling in areas where soils are highly vulnerable to compaction;
 - Restricting movements of heavy plant and vehicles to specific routes and avoidance of trafficking of construction vehicles in areas of the site which are not subject to construction phase earthworks;
 - Minimising the excavation footprint where possible; and

- In circumstances where construction has resulted in soil compaction, further remediation may be provided, through an agreed remediation strategy.
 - Reinstatement of soils damaged or compacted during the works following Defra's *Construction Code of Practice for the Sustainable Use of Soils on Construction Sites* (2009). Specifically, measures set out in the *relief of soil compaction section*.
106. Appendix A contains further details of the scope of the SMP.
107. A pre-construction land survey would be undertaken by a qualified Agricultural Liaison Officer (ALO) (refer to Appendix B for further details of the role of the ALO) to record details of crop regimes, position and condition of field boundaries, existing drainage and access arrangements, and private water supplies.
108. Land drainage systems would be maintained during construction, where possible, and reinstated on completion. Consultation with landowners and occupiers would be undertaken to establish existing drainage arrangements, location of drains and any other relevant information. Refer to Appendix C for further details.
109. Following construction, field drainage systems and ditches would be fully reinstated where possible in consultation with landowners / occupiers.
110. Reinstatement as far as practicable of fences, and re-planting sections of hedgerows, hedgebanks, would be undertaken. Reinstatement of ditches and culverts that were removed or disturbed during construction would also be undertaken.
111. Temporary means of access will be provided to severed fields for vehicles and machinery in order to ensure access is maintained wherever practicable.
112. Wherever practicable, appropriate planning and timing of works will be agreed with landowners and occupiers, subject to individual agreements, to reduce conflicts.

9 NOISE AND VIBRATION

113. There is the potential for noise and vibration to be generated during the construction process, especially from heavy plant and machinery under both scenarios. Measures will be implemented on site to minimise any effects and a programme of monitoring may be required.

9.1 Control Measures

114. A Construction Noise (and vibration) Management Plan (CNMP) will be included in the final CoCP, as required under Requirement 20 (2)(e) of the draft DCO.
115. The CNMP will apply throughout the construction phase and will detail the 'Best Practicable Means' (BPM) and where applicable, enhanced mitigation measures.

9.1.1 Best Practicable Means

116. 'Best Practicable Means' (BPM) that the contractor will adopt to minimise noise during construction include:
- No crushing or screening works at any time on any of the mobilisation areas, without the prior written consent of the relevant local authority;
 - Where possible, locating temporary plant so that it is screened from receptors by on-site structures, such as site cabins;
 - Using modern, quiet equipment and ensuring such equipment is properly maintained and operated by trained staff;
 - Applying enclosures to particularly noisy equipment/ plant where possible;
 - Ensuring that mobile plant is well maintained such that loose body fittings or exhausts do not rattle or vibrate;
 - Avoiding unnecessary revving of engines;
 - Avoiding reversing wherever possible;
 - Vehicles should be fitted with low noise reversing warnings where possible;
 - Reporting any defective equipment/plant as soon as possible so that corrective maintenance can be undertaken;
 - Any plant found to be requiring interim maintenance to be taken out of use;
 - Ensuring plant machinery is turned off when not in use;
 - Providing local residents with 24-hour contact details for a site representative in the event that disturbance due to noise from the construction works is perceived;
 - Establishing a community engagement process including informing local residents about the construction works, detailing the timing and duration of any particularly noisy elements, and providing a contact telephone number to them; and

- Keeping noisy deliveries to the middle of the day where possible.

9.1.2 Enhanced Mitigation

117. In order to ensure that any identified residual impacts that remain following the application of standard mitigation are reduced to non-significant additional site specific solutions such as increased separation distance of noisy plant and the use of temporary noise barriers will be applied.
118. A potential requirement for enhanced mitigation has been identified for the following receptors (refer to ES Chapter 24 Noise and Vibration for location and noise exceedance details): LFR2H, CRR1, CRR2, CRR3, CRR5, CRR10, CRR30, CRR26, CRR31, CRR1E and CRR3F. Enhanced mitigation has also been identified for CRR20 should night-time working take place as a result of the trenchless crossing of the A1067.

9.1.2.1 Construction plant mitigation

119. Careful scrutiny of plant selection at procurement stage will ensure that the potential noise impact of the modelled plant is reduced as much as reasonably possible.

9.1.2.2 Localised screening/temporary noise barriers

120. Noise barriers may be installed within the Order limits to further reduce noise emissions in proximity to noise sensitive receptors, such as residential properties. The exact specification of any noise barriers that may be required to mitigate significant residual construction noise will be determined during detailed design. Noise barriers will be introduced with the appropriate specification for the location and noise reduction required.
121. As an example of the relative effectiveness of applying a temporary localised noise barrier BS 5228 states:
- “as a working approximation, if there is a barrier or other topographic feature between the source and the receiving position, assume an approximate attenuation of 5 dB when the top of the plant is just visible to the receiver over the noise barrier, and of 10 dB when the noise screen completely hides the sources from the receiver. High topographical features and specifically designed and positioned noise barriers could provide greater attenuation.”*
122. The exact specification of any noise barriers that may be required to mitigate significant residual construction noise will be determined during detailed design based on the confirmed list of plant and equipment and presented in the CNMP. Noise barriers will be introduced with the appropriate specification for the location and noise reduction required.

10 AIR QUALITY

123. Chapter 26 Air Quality of the ES identifies receptors that are potentially sensitive to air and dust emissions under both scenarios. The control measures set out below are to be applied to ensure that any potential effects upon these receptors are adequately mitigated.

10.1 Control Measures

124. A number of mitigation measures in relation to the emission of dust and other emissions during construction works have been identified.
125. The name and contact details of person(s) accountable for air quality and dust issues shall be clearly displayed at suitable positions along the site boundary. This would generally be the environment manager/engineer or the site manager. In addition, it is recommended that contact information for the contractor's head or regional office is also clearly displayed.

10.1.1 Dust management

126. Throughout the construction works, the following dust management measures shall be implemented to maintain suspended particulates to suitable levels.
- A complaints log shall be made available to the local authority, if requested;
 - Any exceptional incident that causes dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation shall be recorded in the log book; In-combination effects with other ongoing developments within 500m of the site boundary shall be managed through liaison with other sites to ensure plans are co-ordinated and dust and particulate matter emissions are minimised; Measures may include consideration of the local road network and delivery routes;
 - Daily onsite and offsite inspections shall be conducted where there are nearby receptors. Collected data is to be recorded in a log book which shall be made available to the local authority to audit on request. This log book shall also include recordings of regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of the site boundary (subject to landowners' approval);
 - Should a certain construction activity be considered to have a high potential to produce dust, or during prolonged periods of dry or windy conditions, the frequency of site inspections by the person accountable for air quality and dust issues on site shall increase;
 - Any stockpiles of excavated material shall be covered, seeded or fenced to prevent wind whipping;

- Wherever practicable, battery powered equipment shall be used over petrol or diesel-powered options. The use of petrol or diesel-powered generators should be avoided where possible;
- A Traffic Management Plan (TMP), secured under Requirement 21 of the draft DCO, shall be produced in accordance with the Outline TMP (document reference 8.8) to manage the sustainable delivery of goods and materials to and from site. An accompanying Travel Plan, secured under Requirement 21 of the draft DCO, shall also be developed in accordance with the Outline Travel Plan (document reference 8.9) that supports and encourages sustainable travel for contractor operatives and staff (public transport, cycling, walking and car-sharing);
- An adequate water supply must be provided onsite for effective dust suppression measures. Water should be non-potable water wherever possible;
- Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods;
- Ensure sand, other aggregates, bulk cement and other fine powder material are stored in a controlled and well-managed manner; and
- For smaller supplies of fine powder materials, ensure bags are sealed after use and stored appropriately to prevent dust release.

10.2 Measures specific to earthworks

127. Measures specific to earthworks include:

- Avoid dry sweeping of large areas;
- Inspect running track for integrity and instigate necessary repairs to the surface as soon as reasonably practicable and regularly dampen down with fixed or mobile sprinkler systems, or mobile water bowsers, where necessary;
- Record all inspections of the running track and any subsequent action in a site log book; and
- Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits. Locate site access gates at least 10m from receptors where practicable.

11 PROTECTION OF SURFACE AND GROUNDWATER RESOURCES

128. Chapter 20 Water Resources and Flood Risk of the ES includes applicable mitigation measures for the construction and operational phases of the project. The measures have been provided to reduce the impact of the project on the surface and groundwater resources. In particular, the control measures are designed to manage flood risk and sediment management.
129. The Applicant has committed to develop a scheme and programme for each watercourse crossing, diversion and reinstatement, which will include site specific details regarding sediment management and pollution prevention measures. This scheme will be submitted to and approved by the relevant planning authority in consultation with Natural England, which is secured through Requirement 25 (Watercourse Crossings) of the DCO. The site specific measures set out within the scheme of watercourse crossings, referred to in Requirement 25, will be the principal mechanism for protecting watercourses at crossings, and will be transferred across to the final CoCP to ensure consistency.
130. Control measures identified are set out below, which are applicable to Scenario 1 and/or Scenario 2 where stated.

11.1 Control Measures

11.1.1 Sediment Management – all onshore areas

11.1.1.1 Scenario 1 and Scenario 2

131. To minimise potential impacts from the construction phase on land, surface water or groundwater receptors, Norfolk Boreas Limited has committed to the following measures:
- Temporary works areas (e.g. mobilisation areas and trenchless crossing areas) within the onshore project area will comprise hardstanding of permeable gravel aggregate underlain by geotextile, or other suitable material to a minimum of 50% of the total area to minimise the area of open ground
 - Subsoil exposure will be minimised and strips of undisturbed vegetation will be retained on the edge of the working area where possible;
 - Where surface vegetation has been removed (with the exception of arable crops), this will be reseeded to prevent future runoff. See section 11.1.2 for specific removal method to be employed in the functional floodplain.
 - Spoil storage areas along the cable route will be located at least 8m away from major surface watercourses (e.g. main rivers, IDB drains) and, wherever possible, outwith Flood Zone 3b (functional floodplain) to ensure that there is no loss of flood storage capacity within the functional floodplain;

- On-site retention of sediment will be maximised by routing all drainage through the site drainage systems and sediment traps would be incorporated into the design of the surface water drainage (see 11.1.7);
- The drainage system will include silt fences at the foot of soil storage areas to intercept sediment runoff at source. Where practicable, runoff will be routed into swales, which incorporate check dams to further intercept sediment and/or attenuation ponds which incorporate sediment forebays. Suitable filters will be used to remove sediment from any water discharged into the surface drainage network;
- Additional silt fences will be included in parts of the working area that are in proximity to surface drainage channels. It is not intended that silt fences will be used where works are located in the functional floodplain as spoil will not be stored in these locations;
- Soil and sediment will not be allowed to accumulate on roads. Traffic movement would be restricted to minimise the potential for surface disturbance; and
- Buffer strips will be retained adjacent to watercourses where possible. Where surface vegetation has been removed (with the exception of arable crops), this will be reseeded to prevent future runoff.

11.1.1.2 Scenario 2

132. In addition to the measures outlined in section 11.1.1.1 the following measures would also be implemented under Scenario 2.

- The area of open ground at any one time within one sub-catchment will be restricted, across a notional 5km length, to 2 working areas (configured as 35m x 300m strips); with the assumptions that 50% of one mobilisation area, 50% of one set of trenchless crossing compounds and 25% of 5km running track will be open ground. This represents a maximum area of disturbed open ground of 0.062 km² per 5km of cable at any one time;
- Topsoil would be stripped from the entire width of the onshore cable route for the length of each approximately 150m workfront and stored and capped to minimise wind and water erosion within the onshore cable route;
- Once all the trenching is completed and back-filled within each workfront, the stored topsoil will be re-distributed over the area of the workfront, with the exception of the running track and any associated drainage; and
- Measures will be developed and implemented to minimise water within the cable trench and ensure ongoing drainage of surrounding land. Where water enters the trenches during installation, this will be pumped via settling tanks, sediment basins or mobile treatment facilities to remove sediment, before being discharged into local ditches or drains via temporary interceptor drains to prevent increases in fine sediment supply to the watercourses.

11.1.2 Sediment Management – works within the functional floodplain and with particular reference to the Wensum catchment

133. In addition to the measures set out in section 11.1.1 additional measures will be introduced for works within a functional floodplain under both scenarios unless stated. The extent of functional floodplain is shown on Figure 20.5 of ES Chapter 20 Water Resources and Flood Risk:

- The preferred way of working within the functional floodplain will be to place geotextile on top of the existing pasture grassland. Whilst it is accepted that grass covered by geotextile will die back, it will not expose bare soils beneath and the grass will recover more quickly than reseeding or natural regeneration in the case of topsoil stripping.
- Where a topsoil strip is required, for existing grassland located within the functional floodplain, this will be undertaken using a turf cutter. Turf rolls will be retained and reinstated after the works within the functional floodplain are complete (approximately eight weeks) to maximise the potential for reinstatement / restoration to be effective.
- Removed topsoil and turf will be stored outside of the functional floodplain.
- Any damage to ground conditions caused by vehicle tracking will be rectified prior to the reinstatement of topsoil/turf – see section 8.1.
- Construction drainage will be introduced along the onshore cable route in advance of the works (see section 11.1.7).
- Existing tracks and roadways will be utilised for access where possible. Temporary construction accesses within the functional floodplain at the River Wensum crossing are only required under Scenario 2 if the third trenchless crossing compound (north of Penny Spot Beck) is used. Any topsoil removal and subsequent post-construction reinstatement will follow the steps outlined above.
- The River Wensum Restoration Strategy and River Wensum SAC conservation objectives will be reviewed during the development of the final CoCP. In addition, where possible the HDD compound within the River Wensum floodplain will be restored to the current soil/ground moisture conditions so that water levels are similar to those pre-disturbance.

11.1.3 Sediment Management - works within the Wensum catchment but outside the functional floodplain

134. The measures for turf stripping and reinstatement of grassland within the functional floodplain, as set out in section 11.1.2 will also be implemented under both scenarios for all grassland habitats located within 10m of any watercourse within the River Wensum catchment.

11.1.4 Pollution Prevention

11.1.4.1 Scenario 1 and Scenario 2

135. The works will follow construction industry good practice guidance, as detailed in the Environment Agency's Pollution Prevention Guidance (PPG) notes (including PPG01, PPG05, PPG08 and PPG21)22, and CIRIA's 'Control of water pollution from construction sites – A guide to good practice' (2001), including:

- Spill kits will be available on site at all times and staff will be trained in their use
- Sand bags or stop logs will also be available for deployment on the outlets from the site drainage system in case of emergency spillages.
- Equipment will be regularly checked to ensure leakages do not occur.
- All refuelling of construction plant will be restricted to designated impermeable areas, using bunded bowser.
- All fuels, oils, lubricants and other chemicals will be stored in an impermeable bund with at least 110% of the stored capacity. Damaged containers will be removed from site. Biodegradable oils will be used where possible.
- Concrete and cement mixing and washing areas will be situated at least 10m away from the nearest watercourse. These will incorporate settlement and recirculation systems to allow water to be re-used. All washing out of equipment will be undertaken in a contained area, and all water will be collected for off-site disposal.

136. Suitable biosecurity protocols (such as those outlined by the Non-Native Species Secretariat (NNSS)) would be put in place during the works in order to minimise the risk of contamination and the spread of the invasive non-native species (INNS), including the spread of crayfish plague. This includes the implementation of strict biosecurity protocols such as stringent 'Check, Clean, Dry' working methodology for plant, equipment and construction crews.

137. If works are required in the SPZ1 or SPZ2 areas or across the functional floodplain of the main watercourses, the construction working methodology (for example a Construction Method Statement (see section 2.3.1) will stipulate that Best Available Techniques (BAT) are used for any installations, in accordance with the Energy Network Association Guidance, and in agreement with the Environment Agency.

11.1.4.2 Scenario 2

138. In addition to the measures outlined in section 11.1.4.1 the following mitigation measures would also be implemented under Scenario 2:

- Consultation with the Environment Agency will be undertaken to ensure excavations for cable ducts will be designed not to disturb groundwater in any

significant manner i.e. excavations will be shallow (approximately 1.5m) and above the water table of the Principal Aquifer;

- A hydrogeological risk assessment in accordance with Groundwater Protection Principles and Practice (GP3) (Environment Agency, 2017), will be undertaken for any trenchless crossing locations in SPZ1 or SPZ2 areas (specifically the North Walsham and Dilham Canal). If significant risks are identified, alternatives including alternative trenchless drilling techniques (other than HDD) to cross the SPZ area will be considered; and
- A break-out contingency plan will be drafted in case of break-out of drilling fluid during trenchless crossing construction. The details of this plan will be included in the final CoCP.

11.1.5 Watercourse Crossings

11.1.5.1 Scenario 1 and Scenario 2

139. The following measures would be implemented along the onshore cable route at watercourse crossings to minimise changes to surface water runoff and flood risk during construction resulting from the use of culverts at watercourse crossings:

- Ensuring that the culvert is adequately sized to avoid impounding flows (including an allowance for potential increases in winter flows as a result of projected climate change);
- Installing the culvert below the active bed of the channel, so that sediment continuity and movement of fish and aquatic invertebrates can be maintained;
- Where appropriate (e.g. where temporary culvert installation is likely to have an impact on channel morphology and ecology), alternative techniques such as temporary bridges will be considered.; and
- The width of the running track at watercourse crossings will be minimised from 6m to 3m to limit the area of direct disturbance.

140. In order to ensure that there are no adverse impacts resulting from the installation of temporary dams, the following measures would be employed:

- Specific dam and divert method for larger watercourses, are to be agreed at detailed design with the relevant drainage authority, as part of the relevant secondary consent processes;
- Restricting the amount of time that temporary dams are in place, e.g. typically no more than one week;
- Fish rescue will be undertaken in the area between the temporary dams prior to dewatering;
- Ensure pumps, flumes (pipes) or diversion channels are appropriately sized to maintain flows downstream of the obstruction whilst minimising upstream impoundment;

- Where appropriate, selecting a technique that can allow fish passage to be maintained in watercourses which support migratory fish species such as brown trout; and
 - Where diversion channels are used, geotextiles or similar techniques will be used to line the channel and prevent sediment entering the watercourse.
141. Where possible, localised improvements to the geomorphology and in-channel habitats will be considered where they are crossed using trenched techniques e.g. by replacing resectioned banks with more natural profiles that are typical of the natural geomorphology of the watercourse. Note that any enhancements to directly affected watercourse improvements would be limited to within the project Order limits.

11.1.5.2 Scenario 2

142. In addition to the measures proposed in section 11.1.5.1, the following measures would also be implemented under Scenario 2.
143. Trenchless crossing techniques will be employed at the following major watercourses: River Wensum, River Bure, King's Beck, Wendling Beck (two crossing points), and the North Walsham and Dilham Canal. Stop ends would be employed on the running track at each of the trenchless crossing points outlined above, with the exception of the crossing of Wendling Beck at Bushy Common.
144. The cable ducts shall be buried a minimum of 2m below the bed level at trenchless crossings and a minimum of 1.5m below bed level at trenched crossings, allowing the necessary water volumes and flows (sufficient to account for climate-related changes in fluvial flows and erosion). This would be dependent upon local geology and associated risks, and other associated risks, to prevent geomorphological impacts (e.g. bed scour and channel instability) and avoid exposure during periods of higher energy flow where the bed could be mobilised. Installation depths at watercourse crossings will be confirmed with the relevant drainage authority post-consent. Reinstatement of the channel would achieve the pre-construction depth of the watercourse.

11.1.6 Drilling Fluid Breakout

145. Under Scenario 2 trenchless crossing are proposed at a number of watercourse crossings. During the drilling process there is the potential for the release / breakout of inert drilling fluids, such as bentonite, which may impact the watercourse. Bentonite is an inert clay based material (comprising 95% water and 5% clay) used as a lubricant at the drill head for trenchless crossing techniques. It does not represent a pollutant but can cause smothering of habitats.

146. The following controls will be in place to minimise the risk of drilling fluid breakout, or limit fluid loss to small volumes if a breakout does occur and ensure appropriate mitigation measures are employed during the trenchless crossings.

11.1.6.1 Pre-construction

147. Prior to construction the following will be undertaken:

- Develop a trenchless crossing design and profile using ground condition information, hydro-fracturing modelling and associated calculations. This will include consideration for the trenchless crossing design to have sufficient depth below the surface to ensure adequate ground pressures to minimise risk of breakout occurring.
- Development of breakout contingency plan based on the site specific trenchless crossing design (see section 11.1.6.3).
- Select experienced and competent contractors for all works and draw on experience from other similar wind farm projects.

11.1.6.2 Construction

148. During construction the following controls will be in place:

- Derive, maintain and monitor drilling fluid viscosity and properties for the required ground conditions through appropriate contractor mud management techniques to minimise the risk of breakout.
- Monitor drilling fluid returns, pressures and volumes to quickly identify and limit any losses should a breakout occur.
- Have appropriate containment measures and equipment available onsite such as sandbags, excavators, pumps, etc.
- Have lost circulation environmentally friendly additive materials to be on site to seal any breakout.

11.1.6.3 Breakout Contingency Plan

149. For small breakouts it may cause more damage to habitats to attempt to contain the breakout and remove the escaped material, i.e. trampling of grassland associated with responding to the breakout and the potential for exposing bare ground. A breakout contingency plan will be developed and will be included in the final CoCP, which will define the approach for responding to breakouts. The steps of the contingency plan will include:

- Measures to ensure drilling stops once a breakout is reported (there will be a drop in pressure at the drill head);
- Measures to contain the breakout, for example sand bags, to minimise the extent of any smothering;

- Measures to remove the released bentonite if a significant volume of material is contained – for example pumped back to the bentonite lagoon within the trenchless crossing compound, or pumped to the interceptor drains, or pumped to the mobile settling tanks that will be used for managing sediment traps; and
150. The exact specification for the contingency plan will be informed by further ground investigation and the specific design of the trenchless crossing.

11.1.7 Surface Water Drainage

11.1.7.1 Scenario 1 and Scenario 2

151. A pre-construction drainage plan will be developed and agreed with the relevant planning authority and implemented to minimise water within the working areas and ensure ongoing drainage of surrounding land.
152. Existing land drains along the onshore cable route and the onshore project substation will be reinstated following construction. A local specialised drainage contractor will undertake surveys to locate drains and create drawings both pre- and post-construction and ensure appropriate reinstatement (see Appendix C). The pre-construction drainage plan will include provisions to minimise water within the working area and ensure ongoing drainage of surrounding land.
153. A Construction Surface Water and Drainage Plan (DCO Requirement 20 (2)(i)) will be developed, agreed with the relevant regulators and implemented to minimise surface water run-off into working areas and ensure ongoing drainage of surrounding land. This typically includes interceptor drainage ditches being temporarily installed parallel to excavations (e.g. trenches under Scenario 2) and soil storage areas to provide interception of surface water runoff and the use of pumps to remove water from excavations.
154. The Construction Surface Water Drainage Plan will include the following measures:
- Any pumps, flumes or channels will be designed to have sufficient capacity to convey the required range of flows at each location.
 - The surface water drainage introduced in advance of construction will include interceptor drains for surface water flows. The interceptor drains will include areas for the settlement of sediment (sediment traps). Sediment traps are locally wider/deeper areas of the drains that will encourage passive sediment deposition.
 - Weekly monitoring of sediment traps (visual inspection) with increased monitoring during inclement weather. If required these traps can be pumped via settling tanks to remove sediment, based on a pre-defined level / depth of sediment.

- Where water enters the construction areas, this will be pumped via settling tanks or ponds to remove sediment before being discharged into local ditches or drains via the interceptor drains in order to prevent increases in fine sediment supply to the watercourses.
- When the interceptor drains and associated sediment traps are decommissioned any standing water within the drains would be pumped out to settling tanks as described above. Sediment that has settled out within the interceptor drain would be left in place. Soils would be replaced in the reverse order that they were removed and turf reinstated.

11.1.7.2 Scenario 2

155. In addition to the measures proposed for in section 11.1.7.1, during duct installation under Scenario 2, the onshore cable route will be bounded by drainage channels (one on each side) to intercept drainage from within the working corridor. Additional drainage channels will be installed to intercept water from the cable trench. Depending upon the precise location, water from the channels will be infiltrated or discharged into the surface drainage network.
156. Furthermore, the sectionalised duct installation method (excavate, lay and reinstate approximately 150m/week) is designed to minimise water ingress to the trenches.

11.1.8 Foul Drainage

157. Under both scenarios during the construction phase, foul drainage at the onshore project substation, temporary works areas and mobilisation areas will be collected through a mains connection to existing local authority sewer system (if available) or septic tanks located within the development boundary. Foul drainage from welfare facilities along the cable route will be collected in septic tanks and taken off site for disposal at a licensed site.

11.1.9 Licences

158. Table 11.1 sets out the additional licences or permits necessary prior to construction in relation to water resources and flood risk.

Table 11.1 Licences or permits necessary prior to construction in relation to water resources and flood risk

Issuing body	Name of consent	Applicable to
Environment Agency	Environmental Permit for flood defence or flood risk activity works	Any proposed works or structures within 8m of any tidal or fluvial defence; any proposed works or structures in/under/over/within 8m of the top of the bank of a main river
	Water Abstraction licence	Abstractions of more than 20 cubic metres / day from main and ordinary watercourses, and groundwater
	Environmental Permit for water discharge or waste operations / registration of exempt waste operations and water discharges (as necessary or registered exemption from such)	Discharge to surface water (main river or ordinary watercourse) or groundwater of anything other than clean, uncontaminated surface water run-off
Lead Local Flood Authority (Norfolk County Council) or Norfolk Rivers Internal Drainage Board	Consent for works affecting ordinary watercourses (Ordinary Watercourse Consent – also known as Land Drainage Consent)	Works in/over/under/near an ordinary watercourse

12 MONITORING AND SITE INSPECTIONS

159. The mitigation measures described above will be monitored by the Contractor's environmental management representative and the ECoW throughout the construction phase. If non-conformity with any of the mitigation measures is identified, it will be recorded during a site audit and appropriate remedial actions will be implemented.
160. A monitoring programme will be established for environmental aspects associated with the project site, which will be documented in the final CoCP. The Norfolk Boreas Limited EMS and associated audit programme includes a requirement for Norfolk Boreas Limited or an experienced nominated delegate to audit Norfolk Boreas Limited construction sites on a periodic basis; included in the audit scope will be the appointed Contractor's monitoring and inspection regime.

13 ENVIRONMENTAL INCIDENT RESPONSE AND CONTINGENCY

161. As part of the CoCP, a project specific environmental emergency / incident response plan will be prepared. The plan will include a response flow chart and detail how to report and deal with an environmental incident, including the measures available to contain/clean up an incident (e.g. spill kits, waste reception facilities). The Natural England Site Officer must be consulted within 24 hours if any incident occurs within proximity to a designated site. A contact list for notifying relevant stakeholders will be appended to the plan.
162. Personnel working on site, including any subcontractors will be trained in the project environmental emergency response procedures, so that they are prepared and able to respond to an incident promptly and effectively. Where appropriate, Norfolk Boreas Limited encourages environmental emergency response plans to be tested on-site in consultation with Norfolk Boreas Limited.
163. During construction, all site staff would be made aware of sections of the route that are located within a Flood Zone, and aware of the evacuation process in the event of a flood and any Flood Warning Systems would be subscribed to.
164. If, during construction, remains are found unexpectedly on a site not known to be a burial ground, they will not be removed (DCO Part 4, Article 17). In such circumstances, the local environmental health officer and the project archaeologist will be consulted to assess the remains. If it is concluded that they are modern, the police will be consulted. If the police assess the remains and do not require involvement and it is necessary to exhume the remains, then the procedure as outlined in the DCO Part 4, Article 17 shall be followed or an application for a licence will be made to the Ministry of Justice immediately.

14 REFERENCES

Construction Industry Research and Information Association (2007a) The Sustainable Drainage System (SuDS) Manual, C697.

Construction Industry Research and Information Association (2007b) Site Handbook for the Construction of SuDS, C698.

Environment Agency (2017) Groundwater Protection Principles and Practice (GP3).
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/598799/LIT_7660.pdf

15 APPENDIX A – SCOPE OF SOIL MANAGEMENT PLAN

15.1 Pre-construction soil survey

165. Pre-construction detailed soil survey work will be undertaken by a competent person (e.g. a soil scientist) in order to produce specific soil resource topsoil and subsoil unit plans and restoration specifications for areas of agricultural land within individual land holdings that will be occupied by Norfolk Boreas. These surveys will form the basis of the pre-construction condition assessments of the land prior to soil stripping operations and will be used to monitor the progress of soil handling and restoration operations. The surveys will provide a baseline schedule of soil condition against which the restoration of the soil post-construction will be assessed.
166. The survey work will include the identification of the physical characteristics of profiles at a standard density of 100 m intervals (with additional profiles examined where the 100 m grid sampling does not enable a suitable density of sampling in an agricultural enclosure that will otherwise be missed). Soil pits will also be examined at appropriate locations to provide additional detail on soil structure and stoniness. The survey will provide information on the following soil physical characteristics:
- Soil horizon depths for topsoil and subsoil horizons;
 - Soil textures of all horizons;
 - Soil colour;
 - Stone contents, estimated from augering, confirmed by soil pit excavation/and or sample analysis;
 - Presence and characteristics of mottling, a soil wetness indicator;
 - Presence of manganese concretions, a soil wetness indicator;
 - Identification of gleyed horizons;
 - Identification of slowly permeable layers; and
 - Identification of impenetrable rock layers.

15.2 Soil Scientist

167. The Applicant will appoint a soil scientist for conducting the pre-construction surveys and production of the Soil Management Plan (SMP). The SMP will set out the approaches for soil handling and storage and define the conditions when it is not suitable for works to take place (specifically in relation to rainfall). The ALO and the Applicant will be responsible for undertaking the works in accordance with the approved SMP.

15.3 Construction Method

168. The Applicant's construction method for duct installation is proposed to be conducted in a sectionalised approach in order to minimise impacts (Chapter 5 project Description of the ES, document reference 6.1.5). This method minimises the volume and time in which soils are stored.

15.4 Soil Handling, Management and Reinstatement Principles

169. The following principles are applicable to the handling, management and reinstatement of topsoil and subsoils during construction:
- Topsoil will be stripped and stored in a bund.
 - Subsoil which is excavated for trenching will be stored in a separate bund to topsoil.
 - Ducts, stabilised backfill and marker tiles will be installed within the trench and subsoil replaced.
 - Topsoil will be replaced so far as possible across the working width (typically excluding the running track and associated temporary drainage) within 3 months of stripping where the following conditions are met:
 - The subsoil is dry and in a suitable condition to take topsoil reinstatement.
 - The landowner does not reasonably object to reinstatement.
170. Following partial restoration of the working width, the Applicant will not:
- Be obliged to install the post scheme drainage works until such time as programmed on the wider scheme.
 - Be obliged to hand back possession of the working area if they do not reasonably consider it appropriate to do so.
 - The restoration of the topsoil will not be full restoration and the conditions associated with full restoration do not have to be met until the appropriate time as agreed.
171. In the event that the topsoil will be stored in excess of 3 months, the following conditions are to apply:
- Topsoil and subsoil are kept in separate bunds.
 - Entrenched vertical entrapment fences (e.g. Silt Fences) are to be installed around the bund as per EA/SEPA Pollution Prevention Guidelines.
 - Hydroseeding of bunds with an agreed/appropriate grass mix at soonest opportunity recommended by specialist contractors.
 - Installation of biodegradable erosion control (e.g. Geo-Jute Erosion Control Blanket) to stabilise the surface and give a 'key' for the Hydroseeding growing medium.

- Assessment to be carried out where water may pond on subsoil in the stripped working area and, where appropriate, means to drain this water away installed through the bund if necessary.
 - Dewatering pits to be located on the running track side of the working area.
172. The restored working width will be seeded with a cover crop of an agreed species mix for the soil type, land use and time of year.
173. The Applicant is not obliged to restore the working area within an area at an agreed distance either side of the running track, a mobilisation area, a trenchless crossing area or any other area where for good technical and engineering reasons it is not appropriate to do so.
174. The ALO will work alongside the soil specialist and drainage consultant as necessary during the works to have an input into the preparation, construction and reinstatement of the working area with a brief as follows:
- To agree when conditions in the working area are suitable for construction of the works specifically required at the time of assessment.
 - To assess when work can recommence in the following situation:
 - There has been more than 12mm of rain falling on the working area in any preceding 24 hour period.
 - There has been more than 20mm of rain falling on the working area in any preceding 96 hour period.
 - Where the thresholds specified above have not been met but long term adverse weather conditions have led to cumulative wetting of the working area.
 - Where the landowner considers the conditions to be unsuitable for working without unavoidable long term soil damage.

16 APPENDIX B – ROLE OF AGRICULTURAL LIAISON OFFICER

175. The Agricultural Liaison Officer (ALO) will be appointed by the Applicant prior to the commencement of pre-construction activities and will be the prime contact for ongoing engagement about practical matters with landowners, occupiers and their agents before and during the construction process. There may be more than one ALO if required.
176. The ALO will have relevant experience of working with landowners and agricultural businesses and will have knowledge of the compulsory acquisition process (if required) and working on a linear infrastructure project.
177. The ALO (or their company) will be contactable from 7am to 7pm during the construction phase to landowners, agents and occupiers and will provide 24-hour team or company contact details for use in the event of emergency. Contact details for the ALO must be included in the final CoCP.
178. Post-construction the ALO will remain in place for up to one year in order to manage remediation issues.
179. After that year the Applicant will ensure that ongoing contact details are provided in order for landowners and occupiers to seek consent, if required, in respect of restrictive covenants for the lifetime of the project or to highlight any defects. Information in relation to the process of management of restrictive covenants will be issued to landowners and occupiers upon any change in the person/s responsible for the process on behalf of the Applicant or the OFTO.
180. The ALO will have responsibility for liaising with landowners, agents and occupiers in respect of the following:
- Coordinating drainage surveys and sharing pre and post-construction drainage schemes with landowners or occupiers in advance for their consideration;
 - Discussing the location, grouping and marking of link boxes, including why they are subject to overriding constraints (such as cable lengths and environmental constraints), with the landowner/occupier;
 - Coordinating the provision of a detailed pre-construction condition survey to include a soil survey as detailed in Appendix A, as well as a record of condition of the following elements:
 - existing crop regimes;
 - the position and condition of field boundaries;
 - the condition of existing access arrangements;
 - the location of private water supplies (as far as reasonable investigations allow);
 - the type of agricultural use taking place;

- the yield of crops;
- the quality of grazing land; and
- the existing weed burden.

- Advising on risks relating to the translocation of soil diseases and ensuring appropriate protective provisions are implemented;
- Ensuring that landowners and occupiers are consulted in respect of requirements relating to field entrances and accesses across the construction strip and land-locked or severed land parcels;
- Arrange quarterly meetings with agent representatives of landowners;
- Undertake pre-construction and day-to-day discussions with affected parties to minimise disruption, where possible, to existing farming regimes and timings of activities;
- Undertake site inspections during construction to monitor working practices and ensure landowners' and occupiers' reasonable requirements are fulfilled; and
- Discussing and agreeing reinstatement measures following completion of the works.

17 APPENDIX C – Field Drainage

17.1 Irrigation

181. Details of the irrigation system on each land holding will be gathered during the detailed design stage and irrigation plans will be developed to inform the management of agricultural land drainage during construction. The ALO will be responsible for consulting with each individual landowner to obtain the relevant information and to be a point of contact to report concerns regarding irrigation systems during construction. The plans will include the following information:

- Location of boreholes and water supplies used by each farmer;
- Irrigation or impoundment licence granted by the EA; and
- System of irrigation applied and the location of irrigation network for each field.

17.2 Agricultural Land Drainage

182. Particular care will be taken to ensure that the existing land drainage system is not compromised as a result of construction. Land drainage systems will be maintained during construction and reinstated on completion.

183. The ALO will coordinate drainage surveys to establish the existing drainage position including any related farm drainage that may be affected by the scheme. The services of a suitably qualified drainage consultant will be employed by the Applicant to act as a drainage expert during the detailed design process and liaise with landowners or occupiers (through the ALO) to consult on the pre and post drainage schemes required. This will include the design of any land drainage works required during construction, and on the design and timing of any land drainage works required for the subsequent restoration of the land. This process will take due regard of any local and site-specific knowledge.

184. Subject to the consultation, existing agricultural land drains, where encountered during the construction, will be appropriately marked. The location of drains cut or disturbed by the construction works will be photographed, given a unique number and logged using GPS coordinates. The actual condition and characteristics (e.g. depth of installation, pipe type and diameter) of the existing drain will also be recorded upon excavation.

185. During the construction works, temporary drainage will be installed either side of the cable trenches, within the onshore cable route working width, to intercept existing field drains and ditches in order to maintain the integrity of the existing field-drainage system during construction and ensure existing flow is not channelled by the onshore cable route. Such measures will also assist in reducing the potential for

wet areas to form during the works, thereby reducing the impact on soil structure and fertility. Drainage systems however will not be installed into areas where they are not currently present, e.g. environmental wetlands.

186. Any field drainage intercepted during the duct installation will either be reinstated following the installation of the ducts or diverted to a secondary channel. Landowners and occupiers will be informed of the design of drainage works required during construction and following installation of the ducts and associated works, including: pipe layout, falls, dimensions and outfalls (if required). The drainage would be reinstated in a condition that is at least as effective as the previous condition and will follow best practice for field drainage installations taking into account site specific conditions.
187. Where it is reasonable for the reinstatement of drainage to involve works outside of the Order limits it will be done subject to the agreement of the landowner.
188. Landowners and occupiers will be provided with the opportunity to inspect land drainage works as they progress, subject to health and safety considerations. Furthermore, records of existing and remedial drainage will be maintained by the Applicant with copies provided to the Landowner (and the Occupier, if applicable) following the completion of construction works.
189. A dispute resolution process will be established including the appointment of a jointly agreed Independent Expert for drainage design and implementation, where required. Where agreement cannot be reached on the appointment of the expert the matter will be referred to the President of the Institution of Civil Engineers.

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