Norfolk Boreas Offshore Wind Farm

Consultation Report

Appendix 9.24 Norfolk Boreas Air Quality outgoing documents

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Norfolk Boreas Offshore Wind Farm

Environmental Impact Assessment

Air Quality Method Statement

Draft for Consultation

Document Reference: PB5640-004-007

Author: Royal HaskoningDHV
Applicant: Norfolk Boreas Ltd
Date: January 2018

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This method statement has been prepared by Royal HaskoningDHV on behalf of Norfolk Boreas Limited in order to build upon the information provided within the Norfolk Boreas Environmental Impact Assessment (EIA) Scoping Report. It has been produced following a full review of the Scoping Opinion provided by the Planning Inspectorate. All content and material within this document is draft for stakeholder consultation purposes, within the Evidence Plan Process.

Many participants of the Norfolk **Boreas** Evidence Plan Process will also have participated in the Norfolk **Vanguard** Evidence Plan Process. This document is presented as a complete and standalone document, however in order to maximise resource and save duplication of effort, the main areas of deviation from what has already been presented through the Norfolk Vanguard Evidence Plan Process and PEIR or in the Norfolk Boreas Scoping Report are presented in orange text throughout this document.

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1 INTRODUCTION

1. The purpose of this method statement is to build upon the information provided within the Norfolk Boreas Environmental Impact Assessment (EIA) Scoping Report, in outlining the proposed approach to be taken and considerations to be made in the assessment of the air quality effects of the proposed development.

2. This method statement and the consultation around it form part of the Norfolk Boreas Evidence Plan Process (EPP). The aim is to gain agreement on this Method Statement from all members of the Air quality Expert Topic Group (ETG), all agreements will be recorded in the agreement log.

3. This method statement has been produced following a full review of the Scoping Opinion provided by the Planning Inspectorate and responses to the Norfolk Vanguard PEIR (Royal HaskoningDHV, 2017b) and consultation undertaken through the Norfolk Vanguard EPP. The EIA Scoping Opinion comments received that relate to air quality are summarised in **Table 1.1**.

4. Information provided in this Method Statement is a draft for stakeholder consultation only and is provided in confidence. It is recognised that Norfolk Vanguard ETG meetings are being held in January 2018 and that agreements will be made during those meetings which are not reflected here. However due to certain project "Mile Stones", which have been set by the Crown Estate, Norfolk Boreas must progress on a programme which requires consultation on the Norfolk Boreas Method Statements prior to the conclusion of the Norfolk Vanguard EPP. Therefore, the material provided in this document represents the best available information at the time of writing.

Table 1.1 Scoping opinion responses relevant to air quality

Consultee	Comment	Response / reference to where this addressed
Secretary of State	As no site specific air quality monitoring surveys are proposed (paragraph 967 of the Scoping Report), the Applicant should justify their position that existing air quality monitoring data coverage is appropriate having undertaken the desk based review and therefore that additional baseline surveys are not required.	Section 3.1 provides justification for the existing data to be used.
Secretary of State	The ES should clearly set out the methodology for assessing the potential impacts of dust and road traffic emissions. In particular, paragraphs 940 – 942 of the Scoping Report set out the criteria for identifying sensitive receptors to construction air quality impacts and these should be set out in the context of relevant guidance such as that of the Institute of Air Quality Management (IAQM) as referenced in section 3.3.4 of the Scoping Report.	Section 4.1.1 sets out the methodology which will be used in the assessment.
Forestry Commission	We would expect the environmental statement to consider how these techniques impact on any woodland to which they are applied: the likely impacts of disturbance, dust, water table effects and lighting. This should also encompass how the	Sections 3.3 identifies the sensitive receptors and 4.1.2.2 outlines the methodology for

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Consultee	Comment	Response / reference to where this addressed
	recommended '15 metre buffer' between any development and Ancient Woodland described in the Standing Advice for Ancient Woodland (from the canopy edge and not from the trunks of trees) will be applied as a protective measure.	assessment
Public Health England	Any assessment of impacts arising from emissions due to construction and decommissioning should consider potential impacts on all receptors and describe monitoring and mitigation during these phases. Construction and decommissioning vehicle movements and cumulative impacts should be accounted for.	Sections 4 describe the Methodology for assessing impacts and section 5 identifies impacts.
Public Health England	We would expect the promoter to follow best practice guidance during all phases from construction to decommissioning to ensure appropriate measures are in place to mitigate any potential impact on health from emissions (point source, fugitive and traffic-related).	Section 4 provides detail on which guidance will be followed for the EIA.
Public Health England	When considering a baseline (of existing air quality) and in the assessment and future monitoring of impacts these: • should include consideration of impacts on existing areas of poor air quality e.g. existing or proposed local authority Air Quality Management Areas (AQMAs) • should include modelling using appropriate meteorological data (i.e. come from the nearest suitable meteorological station and include a range of years and worst case conditions) • should include modelling taking into account local topography	There are no (AQMAs which overlap with the project (Sections 3.1). The AQMA in Swaffham, is located approximately 1km south of the A47, Section 0 describes the method ology for assessing impacts.

1.1 Background

5. A Scoping Report for the Norfolk Boreas EIA was submitted to the Planning Inspectorate on the 9th May 2017. Further background information on the project can be found in the Scoping Report which is available at:

https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010087/EN010087-000015-Scoping%20Report.pdf

6. The Scoping Opinion was received on the 16th June 2017 and can be found at:

https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010087/EN010087-000013-Scoping%20Opinion.pdf

1.2 Norfolk Boreas Programme

7. This section provides an overview of the planned key milestone dates for Norfolk Boreas.

1.2.1 Development Consent Order (DCO) Programme

- EIA Scoping Request submission - 09/05/17 (complete)
- Preliminary Environmental Information (PEI) submission - Q4 2018
- Environmental Statement (ES) and DCO submission - Q2 2019

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1.2.2 Evidence Plan Process Programme

8. The Evidence Plan Terms of Reference (Royal HaskoningDHV, 2017a) provides an overview of the Evidence Plan Process and expected logistics, below is a summary of meetings held to date and those anticipated in the future:

- Agreement of Terms of Reference - Q3 2017
- Post-scoping Expert Topic Group meetings - Q1 2018
    - Discuss method statements and Project Design Statement
- Expert Topic Group and Steering Group meetings as required - 2018
    - To be determined by the relevant groups based on issues raised
- PEI Report (PEIR) Expert Topic Group and Steering Group meetings - Q4 2018/ - Q1 2019
    - To discuss the findings of the PEI (before or after submission)
- Pre-submission Expert Topic Group and Steering Group meetings - Q1/Q2 2019
    - To discuss updates to the PEIR prior to submission of the ES

1.2.3 Consultation to Date

9. Norfolk Boreas is the sister project to Norfolk Vanguard (See section 2 for further details). A programme of consultation has already been undertaken for Norfolk Vanguard which is of relevance to Norfolk Boreas and this is listed below:

- EIA Scoping Request submission - 03/10/16
- Receipt of Scoping Opinion - 11/11/16
- Steering Group meeting - 21/03/16
- Steering Group meeting - 20/09/16
- Post-scoping Expert Topic Group meetings - Q1 2017
    - Discuss method statements and Project Design Statement
- Ongoing discussions for Norfolk Vanguard PEIR with air quality officers at Local Authorities along the cable route - Q2 2017
- Norfolk Vanguard PEIR submission - Q4 2017

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10. Responses to the Norfolk Vanguard PEIR (Royal HaskoningDHV, 2017b) were received in December 2017. This method statement has been updated to incorporate any key comments made that affect the proposed methodology for the Norfolk Boreas EIA

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2 PROJECT DESCRIPTION

2.1 Context and Scenarios

11. Norfolk Boreas is the sister project to Norfolk Vanguard. Vattenfall Wind Power Ltd (VWPL) is developing the two projects in tandem, and is planning to co-locate the export infrastructure for both projects in order to minimise overall impacts. This co-location strategy applies to the offshore and onshore parts of the export cable route, the cable landfalls, cable relay stations, and onshore substations.

12. The Norfolk Boreas project is approximately 12 months behind Norfolk Vanguard in the DCO process. As such, the Norfolk Vanguard team is leading on site selection for both projects. Although Norfolk Boreas is the subject of a separate DCO application, the project will adopt these strategic site selection decisions.

13. In order to minimise impacts associated with onshore construction works for the two projects, VWPL is aiming to carry out enabling works for both projects under the Norfolk Vanguard DCO. This covers the installation of buried ducts along the onshore cable route, from the landfall to the onshore substation, modifications at the Necton National Grid substation, visual screening works access road construction, utility connections (water, electricity and phone) and site drainage.

14. However, Norfolk Boreas needs to consider the possibility that the Norfolk Vanguard project would not be constructed. In order for Norfolk Boreas to stand as an independent project, this scenario must be provided for within the Norfolk Boreas DCO. Thus, there are two alternative scenarios to be considered in the context of the EIA and this method statement:

- **Scenario 1:** Norfolk Vanguard consents and constructs transmission infrastructure which would be used by Norfolk Boreas. This includes, cable ducts, access routes to jointing pit locations, extension of the Necton National Grid substation, overhead line modification at the Necton National Grid substation and any site drainage, landscaping and planting schemes around co-located infrastructure. Under Scenario 1 Norfolk Boreas will seek to consent the (Horizontal Directional Drilling) HDD at landfall, the creation of the jointing and transition pits onshore project substation, cable relay station and the installation of cables in the ducts through a process of cable pulling'.

- **Scenario 2:** Norfolk Vanguard is not constructed and therefore Norfolk Boreas will seek to consent and construct all required project infrastructure including: HDD at landfall, the creation of the transition and jointing pits, installation of cable ducts, cable installation, cable relay station (if required), onshore project substation, 400kV interface works (between the onshore project substation and the Necton National

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Grid substation), extension to the Necton National Grid substation, overhead line modification and any site drainage and landscape and planting schemes. For the sake of clarity, the Norfolk Boreas project would, under Scenario 2, involve the construction and installation of all onshore infrastructure necessary for a viable project.

15. **Appendix 1** contains a set of figures showing the onshore infrastructure and **Appendix 2** contains a detailed comparison of what is included in the two different scenarios across all elements of the project.

16. Norfolk Boreas Limited are proposing to employ a construction strategy whereby there are multiple moving work fronts which complete the majority of all construction works in each area before moving on. This reduces overall construction time as most works are completed in one pass and allows flexibility for areas to be avoided at sensitive times and to minimise impact through scheduling of works.

2.2 Site Selection Update

17. A detailed programme of site selection work has been undertaken by VWPL to refine the locations of the onshore infrastructure for both the Norfolk Vanguard and Norfolk Boreas projects. The Norfolk Vanguard EIA Scoping Report presented search areas for the onshore infrastructure which were identified following constraints mapping to avoid or minimise potential impacts (e.g. noise, visual, landscape, traffic, human health and socio-economic impacts). Further data review has been undertaken to understand the engineering and environmental constraints within the search areas identified. This process has been informed by public drop in exhibitions (October 2016, March and April 2017), along with the Scoping Opinion for Norfolk Vanguard and the feedback from the Expert Topic Groups. Details of the site selection process are provided in Chapter 4 of the Norfolk Vanguard Preliminary Environmental Information Report (Royal HaskoningDHV, 2017b) with a summary provided below:

2.2.1 Landfall Zone

18. The Norfolk Boreas Scoping report presented three potential landfall locations. After publication of the scoping report, VWPL concluded, taking account of all engineering and environmental factors, as well as public feedback, that the most suitable landfall location would be Happisburgh South. The decision to go to Happisburgh south was presented to the Norfolk Vanguard Evidence Plan Expert Topic groups in June and July 2017 and in the Norfolk Vanguard PEIR (Royal HaskoningDHV 2017b).

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2.2.2 Cable Relay Station Options

19. The Norfolk Boreas Scoping report presented seven potential cable relay station search zones. A single cable relay station would be required for a High Voltage Alternating Current (HVAC) electrical solution. No cable relay station would be required for a High Voltage Direct Current (HVDC) electrical solution. The decision between HVDC and HVAC solutions is not expected be taken until post consent, therefore for the purposes of the EIA, and under the project envelope approach, assessment would be conducted on the basis of the realistic worst case.

20. Two potential locations are being proposed for the cable relay station (**Appendix 1**). The final siting of the cable relay station on either footprint will have due consideration for of existing watercourses, hedgerows, landscaping, archaeology, ecology, noise, access and other known infrastructure/environmental constraints to minimise impacts, along with feedback from statutory and non-statutory consultation.

21. A Norfolk Boreas cable relay station temporary construction compound area has not yet been identified, however a location will have been determined prior to the Norfolk Boreas PEIR being published in Q4 2018.

2.2.3 Onshore Cable Route

22. A 200m wide cable corridor was presented within the Norfolk Boreas scoping report. The proposed route skirts around the main towns of North Walsham, Aylsham, Reepham and Dereham. Since the Norfolk Boreas scoping report was published further work has been completed (see Royal HaskoningDHV, 2017b for detail) to refine the cable corridor and an indicative cable route has been established suitable for infrastructure for both the Norfolk Vanguard and Boreas onshore export cables (**Appendix 1**).

2.2.4 Onshore Project Substation

23. The Norfolk Boreas scoping report presented an onshore project substation zone within which the onshore project substation was to be located. Following further site selection work (presented in chapter 4 of the Norfolk Vanguard PEIR, Royal HaskoningDHV, 2017b) a preferred onshore project substation location has been identified. Although the onshore project substation location is now well defined there remains the possibility that its exact location may change slightly following consultation on the Norfolk Vanguard PEIR, therefore an onshore project substation search area has been retained (**Appendix 1**).

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24. A Norfolk Boreas Onshore project substation temporary construction compound area has not yet been identified, however a location will have been determined prior to the Norfolk Boreas PEIR being published in Q4 2018.

2.2.5 Extension to the Existing Necton National Grid substation

25. The Norfolk Boreas Scoping report presented a National Grid substation extension zone. Since the publication of that report further work has been undertaken to define the footprint of these extension works . Further detail on this process is presented in Chapter 4 of the Norfolk Vanguard PEIR (Royal HaskoningDHV, 2017b).

26. Also presented in the Norfolk Boreas Scoping report was an overhead line modification zone within which the overhead lines leading into the Necton National Grid substation would be realigned (section 0). The area within which this work will be undertaken has been refined and is presented in **Appendix 1**. Further detail on the process behind this refinement is provided in the Norfolk Vanguard PEIR (Royal HaskoingDHV, 2017b) chapter 5 site selection and alternatives.

2.3 Indicative Worst Case Scenarios

27. The following sections set out the indicative worst case scenarios for air quality. The PEIR/ES will provide a detailed Project Description describing the final project design envelope (also referred to as the Rochdale envelope) for the Norfolk Boreas DCO application. Each chapter of the PEIR/ES will define the worst case scenario arising from the construction, operation and decommissioning phases of the Norfolk Boreas project for the relevant receptors and impacts. Additionally, each chapter will consider separately the anticipated cumulative impacts of Norfolk Boreas with other relevant projects which could have a cumulative impact on the receptors under consideration.

28. The worst case scenario for air quality is generally either where construction works occur closest to sensitive receptors, or scenarios which give rise to the greatest project-related vehicle movements which have associated pollutant emissions.

29. The parameters discussed in this section are based on the best available information for Norfolk Boreas at the time of writing and are subject to change as the project progresses.

2.3.1 Infrastructure Parameters

30. Two export schemes are being considered for Norfolk Boreas, a HVAC and a HVDC scheme. The decision as to which electrical solution will be used for the project is likely to be taken post consent and will depend on availability, technical considerations and cost. Both electrical solutions will have implications on the

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required onshore infrastructure. Typically the HVAC scenario involves a greater area of land take and additional infrastructure, and as such the HVAC scenario is assumed as the worst case in the remainder of this section. Where the worst case assumes the HVDC scenario, this is stated in the text.

31. The following key onshore project parameters are considered within this method statement. Explanation of which parameters are considered for Scenario 1 and Scenario 2 is provided in the sections below. For full details of what is considered in Scenario 1 and what is considered in Scenario 2 please see **Appendix 2**:

- Landfall (Horizontal Directional Drilling (HDD) and associated compounds);
- Cable relay station (required for HVAC only);
- Cable corridor (with associated trenchless crossing technique areas, construction compounds and mobilisation areas and access);
- Onshore project substation;
- Interface cables connecting the onshore project substation and the Necton National Grid substation; and
- Extension to the existing Necton National Grid Substation, including overhead line modification.

32. Under Scenario 1, the Norfolk Vanguard project would be considered within the Cumulative Impact Assessment (CIA), together with the parameters of Norfolk Boreas (as listed in the bullets points above). Other projects which would be considered in the CIA are discussed in section 2.3.5.

2.3.1.1 Landfall

33. The landfall compound zone (**Appendix 1**) denotes the location where up to six Norfolk Boreas offshore export cables would be brought ashore. These would be jointed to the onshore cables in transition pits located within the eastern most "trenchless crossing technique" area shown in **Appendix 1**. Norfolk Boreas would share the landfall area with Norfolk Vanguard.

34. Works associated at landfall would be the same under both Scenario 1 and 2. Under Scenario 1, the Norfolk Boreas ducts would be installed (by Norfolk Vanguard) only on the landward (western) side of the transition pits and not on the seaward side.

35. Under both Scenarios ducts on the seaward side of the transition pits would be installed using HDD which is a trenchless installation technique.

36. Key parameters of works at landfall which could affect air quality are:

- Installation of temporary construction compound area to accommodate the drilling rig, ducting and associated materials and welfare facilities (60m x 50m).

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- Temporary access route.
- A total of up to six ducts for the HVAC solution or two ducts for the HVDC solution would be required at the landfall for Norfolk Boreas.
- Volume of material excavated during HDD works: 1,178m^3.
- Maximum of six joint transition pits, each measuring 10m x 15m x 5m.
- For a drill length of 500m, it is anticipated that site establishment, drilling of up to six ducts and demobilisation will take approximately 30 weeks when considering 12 hour (7am-7pm), 7 day shifts. 24 hour operation could be employed for drilling activities, subject to planning and environmental restrictions, and could reduce the installation to approximately 20 weeks. Cable pulling would be undertaken subsequent to the duct installation.
- The site would fully reinstated upon completion of the landfall works.
- This work is estimated to result in a maximum of 494 HGV deliveries (Two way trips) over the full duration of this work element. This will consist of 14 during mobilisation and demobilisation and a daily average of 1.8 whilst drilling takes place.

2.3.1.2 Cable Relay Station

37. A cable relay station would be required for a HVAC electrical solution but not a HVDC solution. Therefore the HVAC solution is the worst case scenario for this element of the onshore infrastructure. The cable relay station would be constructed by Norfolk Boreas under both Scenarios 1 and 2 if a HVAC solution is chosen. The two proposed sites for the cable relay stations are presented in **Appendix 1**.

38. Key parameters of works relating to traffic movements at the cable relay station are as follows:

- One cable relay station with a footprint of approximately 10,410m^2.
- A temporary construction compound with a maximum temporary footprint of 15,000m^2.
- Predicated maximum traffic generation of 498 HGV deliveries (two way trips) for construction of the cable relay station and 553 deliveries (two way trips) for construction of the temporary construction compound over the duration of the works. Resulting in an average of 7.3 deliveries per day.
- A site access road with width of 6m and an approximate length of 1000m:
    - Under Scenario 1 this would have been constructed by Norfolk Vanguard,
    - Under Scenario 2 this would be constructed by Norfolk Boreas and its construction would result in additional HGV deliveries.

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39. The location of the temporary construction compound has not yet been determined but will be presented within the Norfolk Boreas PEIR being published in Q4 2018. The compound would likely be tarmacked with some concrete hard standing for heavier plant and equipment. Appropriate access to the B1159 would be provided to permit safe delivery of plant and equipment required for construction. The construction programme for the cable relay station would be 18 months.

2.3.1.3 Onshore Cable Corridor

40. The onshore cable corridor would contain the final onshore cable route. Currently an indicative cable corridor has been identified and is displayed in **Appendix 1**. This will be refined for the PEIR.

2.3.1.3.1 Onshore cable route

41. The onshore cable route would contain the main 220kV HVAC or ±320kV HVDC export cables housed within ducts and 400kV HVAC interface cables connecting the onshore project substation with the Necton National Grid substation. The main onshore cable corridor connects the landfall to the onshore project substation, an indicative cable route has been identified which is displayed in **Appendix 1**.

42. The key elements of the onshore cable route for Scenarios 1 and 2 are detailed in **Appendix 2**, and summarised below.

Scenario 1

43. Norfolk Vanguard would install cable ducts and undertake enabling works for Norfolk Boreas along the entire length of the onshore cable corridor. Therefore, all excavations (except jointing pits and associated temporary construction compounds) and crossings would have already been constructed. In addition, all ducts will be installed and ground reinstated by Norfolk Vanguard.

Scenario 2

44. Norfolk Boreas would be responsible for installing all onshore cable route infrastructure required for the project, including installing ducts along the entire cable route and reinstating land. Under this scenario the duct installation would also require:

- Trenches for the cable circuits;
- A running track to deliver equipment to the installation site from mobilisation areas; and
- Storage areas for topsoil and subsoil.

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2.3.1.3.2 Trenching and duct installation

Scenario 1

45. No trenching would be required under this scenario for Norfolk Boreas as these works would have been completed under Norfolk Vanguard.

Scenario 2

46. Norfolk Boreas would be responsible for all duct installation. The main duct installation method would be through the use of open cut trenching with HDPE ducts installed, backfilled and cables pulled though the pre-laid ducts.

47. There would be larger traffic movements associated with Scenario 2 with respect to trenching.

2.3.1.3.3 Running Track

48. A running track would be required to provide safe access for construction vehicles within the onshore cable corridor. The running track could be up to 6m wide, with speed limits on the running track would typically be limited to 20mph.

Scenario 1

49. Under Scenario 1 approximately 20% of the Norfolk Vanguard running track would need to be retained or reinstatement for the cable pulling phases; therefore the worst case scenario for receptors sensitive to construction dust and PM_{10} emissions would be reinstatement.

Scenario 2

50. Under Scenario 2 running track would be installed along the entire length of the cable route (approximately 60km).

51. During the duct installation process, each work team would use the running track to travel from the Primary Mobilisation Area (PMA) (see section 2.3.1.3.6) or appropriate running track access point to the work front. The running track would also be used for transport of plant and materials between the PMA and the work front. The running track would be extended piece-wise as the work front moves outward from the PMA. When duct installation is completed, the running track would be taken up and the topsoil replaced. All recovered stone and other materials would be removed from site via the PMA.

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2.3.1.3.4 Cable pulling and jointing pits

52. Under either Scenario, the onshore cables would be pulled through the installed ducts later in the construction programme in a staged approach. Cable pulling would not require the trenches to be reopened, but cables pulled through the preinstalled ducts between the jointing pits. Access to and from the jointing pits would be required to facilitate these works.

53. The cable pulling and jointing process would take approximately six weeks per 1km of cable length, including installing and removing any temporary hard standing and delivering the cables to the jointing pits. However any one joint pit may be open for up to 12 weeks to allow its neighbouring joint pit to be opened and the cables pulled from one pit to the next, dependant on the level of parallel work being conducted.

54. Jointing pits would be required along the onshore cable route to allow cable pulling and jointing of two sections of cable. Under both Scenario 1 and 2, the jointing pits would be installed by Norfolk Boreas for pulling cables through.

55. Under Scenario 1 the reinstatement of running track, cable pulling and jointing and reinstatement of side accesses (see section 2.3.1.3.7) is currently estimated to result in a maximum of 59,982 HGV deliveries (two way trips) over the two year duration of the works.

56. Under Scenario 2 the construction of running track, side accesses (section 2.3.1.3.7), duct installation, cable pulling and jointing is currently estimated to result in a maximum of 76,874 HGV deliveries (two way trips) over the two year duration of the works.

2.3.1.3.5 Crossing installation methods

Scenario 1

57. Under this scenario all necessary crossing installation would have been completed by Norfolk Vanguard. No additional works would be required by Norfolk Boreas.

Scenario 2

58. Under this scenario all crossings would be consented and installed by Norfolk Boreas. When crossing some features along the onshore cable route, alternative or amended installation approaches would be required to minimise the impact on the feature or obstacle being crossed as much as reasonably practicable.

59. The construction of all crossings is currently estimated to result in 2,953 HGV deliveries (two way trips) over the duration of the works. With a peak daily average of 13.7 during mobilisation and demobilisation and a normal daily average of 1.8.

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2.3.1.3.6 Temporary construction compounds

Scenario 1

60. Under Scenario 1 no primary and secondary mobilisation areas would be required as materials will be delivered directly to jointing pits locations.

Scenario 2

61. Primary and secondary mobilisation areas would be required to store equipment and provide welfare facilities. Indicative locations for these are provided in **Appendix 1**. They would be located adjacent to the onshore cable route corridor, accessible from the local highways network and suitable for the delivery of cable drums and other heavy and oversized equipment.

62. The primary mobilisation areas would typically be of 100m x 100m dimensions (or 150m x 100m if combined with a trenchless drilling compound) and the secondary mobilisation areas would be approximately 40m x 40m with specific sizing and dimensions for each location based on site constraints and land boundaries.

63. The mobilisation areas would remain in place for the duration of the onshore duct installation activities, anticipated to be up to two years. Following installation of the ducts, the mobilisation areas would be removed and the land reinstated.

64. The secondary mobilisation areas would serve construction crews working remotely from the primary mobilisation areas to allow close proximity to storage and welfare facilities during installation.

65. The construction of the temporary mobilisation areas is expected to result in approximately 2,858 HGV deliveries (two way trips) over the duration of the works with a daily average of 3.9 and 1.3 for the Primary and secondary mobilisation areas consecutively

2.3.1.3.7 Cable route side access

66. Small temporary access routes would be required to facilitate the safe ingress and egress from the public highways to the construction locations termed side accesses. The current proposed locations for these are displayed in **Appendix 1**. They would be used for the following:

- To gain access to jointing pit locations during cable pulling and jointing phase;
- To gain to access to link boxes; and
- To gain access to cables to make repairs during operational phase.

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67. Detailed traffic and transport assessments are ongoing to identify where these side accesses are likely to be required; the current proposed locations are displayed in **Appendix 1**. They link each mobilisation area and intersections between the public highway and cable route, where suitable, to facilitate side access to the haul road.

Scenario 1

68. Under Scenario 1 some of these side accesses would be retained or reinstated from the Norfolk Vanguard project. For the purposes of this Method Statement the worst case scenario would be the reinstatement of these accesses.

Scenario 2

69. Under Scenario 2 side accesses to the cable route would need to be constructed and would be left in place for three years for provision of cable pulling before being removed and land reinstated.

2.3.1.4 Onshore Project Substation

70. The onshore project substation would consist of either an HVAC substation or HVDC substation[1], dependant on the electrical solution utilised. Only one project substation (HVAC or HVDC) would be required for Norfolk Boreas. The proposed onshore project substation location is presented in **Appendix 1**.

71. The location of the onshore project substation was determined by an optioneering process which is explained in Chapter 4 site selection and alternatives of the Norfolk Vanguard PEIR (Royal HaskoningDHV, 2017).

72. During construction of the onshore project substation, a temporary construction compound would be established to support the works. The compound would be formed of hard standing with appropriate access to the A47 to allow the delivery and storage of large and heavy materials and assets, such as power transformers.

73. The construction of the onshore project substation is expected to result in approximately 4,145 HGV deliveries (two way trips) over the duration of the works. This would include an average daily delivery rate of 10 for the construction compound and 9.8 for the onshore project substation.

74. The location of the temporary construction compound has not yet been determined but will be presented within the Norfolk Boreas PEIR.

75. The construction programme for the onshore substation is 18 months.

[1] Also referred to as a HVDC converter station. For the purposes of consistency both HVAC and HVDC solutions will be referred to as the onshore project substation.

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Scenario 1

76. Under Scenario 1, a number of enabling works would be undertaken by Norfolk Vanguard. These include:

- Landscaping to reduce visual impacts;
- Access roads; and
- Site drainage infrastructure.

77. In Scenario 1, the access road would be shared with the onshore project substation for Norfolk Vanguard. As such there would be slightly less HGV movements under Scenario 1.

Scenario 2

78. Under Scenario 2, all enabling works would be undertaken by Norfolk Boreas including construction of the access road.

2.3.1.5 Necton National Grid substation extension

Scenario 1

79. The existing Necton National Grid substation would be extended to accommodate the Norfolk Boreas and Norfolk Vanguard connection points. The proposed footprint of this extension is provided in **Appendix 1**.

80. Under Scenario 1 the majority of these works, including modifications to overhead lines, would be undertaken by Norfolk Vanguard for both projects. All extension enabling works would be completed to facilitate both Norfolk Vanguard and Norfolk Boreas including access roads, earthworks, foundations, buildings and all civil engineering works.

81. The works undertaken by Norfolk Vanguard would extend the substation by 470m to provide seven Air Insulated Switchgear (AIS) bays for Norfolk Vanguard and five further AIS bays for Norfolk Boreas (however this would not include the busbar). All overhead line modification would also have been carried out under the Norfolk Vanguard project.

82. The electrical busbar extensions and other electrical equipment required for Norfolk Boreas would be installed under Norfolk Boreas consent.

83. A temporary construction compound would be constructed to facilitate these works. This would be removed and ground reinstated following completion of the works.

84. The construction of the temporary compound and extension of the Necton National Grid substation under Scenario 1 is expected to result in approximately 2,059 HGV

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deliveries (two way trips) over the duration of the works. This would include a daily average of 13.1 deliveries during construction and removal of the temporary compound and 2.3 during works on the extension of the substation.

Scenario 2

85. Under Scenario 2, the extension would be undertaken for Norfolk Boreas only, and would form part of the Norfolk Boreas DCO application.

86. The Necton National Grid Substation outdoor busbar would be extended in an east and west direction to an estimated total length of approximately 340m with seven AIS bays installed along the busbar extension for Norfolk Boreas.

87. During construction of the Necton National Grid Substation, two temporary construction compounds would be established to support the works. Access to the A47 would be provided utilising the existing access road to the site to permit safe delivery of plant and equipment required for construction.

88. The construction programme for the Necton National Grid substation extension and overhead line modification works is 18 months (see section 2.3.2 for further detail) and is expected to result in approximately 4,129 HGV deliveries (two way trips). This would include a daily average of 31.2 deliveries during construction and removal of the temporary compound and 3.5 during works on the extension of the substation.

2.3.2 Construction Programme

89. This section summarises the main construction activities and sequence associated with installation of the Norfolk Boreas Wind Farm onshore infrastructure under a three-phased approach (as this represents the worst-case scenario in terms of duration of impact). Separate time lines are discussed for both Scenario 1 and 2.

90. The peak year of onshore construction in terms of maximum development-generated traffic and highest base traffic flows for both Scenario 1 and Scenario 2 will be considered in the assessment.

2.3.2.1 Scenario 1

91. The worst case scenario for development-generated traffic flows would occur if the project were completed in a two phased approach, as construction-generated traffic would be condensed to a shorter time period and would therefore result in higher average daily flows. Under this scenario, peak construction is anticipated to occur in 2027.

92. The highest base traffic flows would occur if the project were carried out in a three-phase approach, with the duration extending to 2029.

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2.3.2.2 Scenario 2

93. The worst case scenario for development-generated traffic flows would occur if the project were completed in a two phased approach, as construction-generated traffic would be condensed into a shorter time period and would therefore result in higher average daily flows. Under this scenario, peak construction is also anticipated to occur in 2027.

94. The highest base traffic flows would occur if the project were carried out in a three phased approach, with an anticipated end date of 2028.

2.3.3 Operation and Maintenance (O&M) Strategy

95. O&M activities were scoped out of the assessment, as agreed by the Planning Inspectorate in the Scoping Opinion.

2.3.4 Decommissioning

96. No decision has been made regarding the final decommissioning policy for the substation and cable relay station, as it is recognised that industry best practice, rules and legislation change over time. However, the substation and cable relay station equipment will likely be removed and reused or recycled. It is expected that the onshore cables will be removed from ducts and recycled, with the jointing pits and ducts left in situ. The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator. A decommissioning plan will be provided.

2.3.5 Cumulative Impact Scenarios

2.3.5.1 Norfolk Vanguard

97. VWPL are seeking to minimise cumulative impacts between Norfolk Boreas and Norfolk Vanguard through the alignment of onshore cable route and the preference for Norfolk Vanguard to pre-install ducts and undertake other enabling works for Norfolk Boreas. Cumulative impacts between the two sister projects will be assessed within the Norfolk Boreas EIA as part of the CIA assessment. It is recognised however CIA impacts would only occur under Scenario 1 as under Scenario 2 Norfolk Vanguard would not have been constructed.

2.3.5.2 Other Projects

98. The assessment will also consider the potential for significant cumulative impacts to arise as a result of the construction, operation and decommissioning of Norfolk Boreas in the context of other developments that are existing, consented or at application stage.

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99. Potential projects may include offshore wind farms, coastal defence projects (such as the Bacton sandscaping scheme) road or large infrastructure projects (including the dualling of the A47, Sizewell Nuclear Power Station and the Norwich Northern Distributor Road) which have a potential to act together with the construction, operation or decommissioning phases of Norfolk Boreas in a cumulative way. In particular, VWPL are committed to working with Ørsted (formally DONG Energy) on identifying the potential interactions between the Norfolk Boreas and Norfolk Vanguard onshore cable corridor with the Hornsea Project 3 Offshore Wind Farm onshore cable route, and assessing and mitigating any cumulative effects.

100. Construction and commissioning of the substation for the Dudgeon Offshore Wind Farm is complete and operation commenced in 2017. The cumulative impacts during construction are therefore likely to be minimal, however this will be considered further in the CIA. CIA screening will be undertaken in consultation with stakeholders.

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3 BASELINE ENVIRONMENT

3.1 Desk Based Review

101. A desk-based review was undertaken for the Norfolk Vanguard PEIR (Royal HaskoningDHV, 2017b) which is used for this method statement to determine the air quality baseline along the cable route. Monitoring data within the air quality study area were obtained from the following Local Authority websites for use in the method statement:

- North Norfolk District Council (NNDC);
- Broadland District Council (BDC);
- Breckland Council (BC); and,
- Norwich City Council (NCC).
- Great Yarmouth District Council (GYDC);
- South Norfolk District Council (SNDC);
- Waveney District Council (WDC); and,
- Kings Lynn and West Norfolk District Council (KLWNDC).

102. The monitoring locations in close proximity to the onshore cable corridor or roads anticipated to be considered in the assessment are considered to provide a suitable spatial coverage to determine a baseline environment within the study area. The monitoring locations identified with the study area are detailed in **Figure 1**.

103. There are no statutory designated Air Quality Management Areas (AQMAs) within the onshore project area. The statutory designated AQMA in Swaffham, declared in May 2017, is located approximately 1km south of the A47, which forms part of the affected road network. However, as project-generated traffic will not pass through the AQMA itself, it is not anticipated that at this distance there would be any significant increases in pollutant concentrations within the AQMA.

3.1.1 Available Data

3.1.1.1 North Norfolk District Council

104. A review of the 2017 Annual Status Report (North Norfolk District Council, 2017) identified that no monitoring was undertaken in the vicinity of the onshore cable corridor or roads anticipated to be considered in the assessment.

3.1.1.2 Broadland District Council

105. BDC does not undertake automatic air pollution monitoring, however diffusion tube monitoring is undertaken at 16 locations in the district, mainly focussed in the south in Hellesdon, Burlingham and Wroxham. Three of these monitoring locations (BN1,

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BN2 and BN3) are located in the vicinity of the A47, which is likely to be used by construction traffic. Recent monitoring data within the study area, up to 2014, undertaken by BDC was obtained from the 2015 Updating and Screening Assessment from BDC's website (BDC, 2015), and is presented in **Table 3.1**.

Table 3.1: Annual Mean NO_2 Monitoring Undertaken by BDC

Site ID	Location	Site type	Monitored Annual Mean NO_2 Concentration ($\mu g.m^{-3}$)				
			2010	2011	2012	2013	2014
BN1	A47 N Burlingham	Kerbside	30.0	32.5	35.6	33.7	30.8
BN2	Norwich Rd, Acle	Kerbside	21.0	22.5	24.3	23.5	21.6
BN3	Cox Hill, Beighton	Kerbside	14.0	15.4	14.7	17.9	16.5

106. As detailed in Table 3.1, annual mean NO_2 concentrations were below the Objective at all monitoring locations in the study area in 2010 – 2014.

3.1.1.3 Breckland Council

107. BC undertakes automatic and diffusion tube monitoring within its area of jurisdiction. Monitoring is undertaken in Dereham and at several locations in the Swaffham AQMA; however, development-generated traffic is not anticipated to travel through these areas and therefore there are no relevant data within the study area.

3.1.1.4 Great Yarmouth Borough Council

108. There are 12 diffusion tube locations operated by GYBC within Great Yarmouth, in the vicinity of the affected road network. Monitoring data were obtained from the 2016 Annual Status Report (Great Yarmouth Borough Council, 2016) obtained from the GYBC website; these data are presented in **Table 3.2**.

Table 3.2: Annual mean NO2 monitoring undertaken by Great Yarmouth Borough Council

Site	Type	Monitored Annual Mean NO_2 Concentration ($\mu g.m^{-3}$)				
		2011	2012	2013	2014	2015
DT1	Roadside	25.3	25.8	22.1	22.0	21.9
DT2	Roadside	24.9	24.8	24.0	24.1	22.5
DT3	Roadside	27.1	25.6	25.4	26.9	25.4
DT5	Roadside	25.8	25.1	25.3	23.5	23.8
DT6	Roadside	27.5	26.4	25.8	25.6	24.4
DT6	Roadside	27.5	26.4	25.8	25.6	24.4
DT7	Roadside	24.3	23.8	20.8	22.9	20.9
DT4	Roadside	39.6	38.8	37.5	37.8	37.4
DT8	Urban	20.3	18.5	18.2	17.8	16.0

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Site	Type	Monitored Annual Mean NO_2 Concentration ($\mu g.m^{-3}$)				
		2011	2012	2013	2014	2015
	background					
DT8	Urban background	19.9	18.3	14.3	16.9	16.3
DT8	Urban background	19.5	17.8	17.2	15.4	15.7
DT9	Roadside	21.5	20.0	20.2	18.7	19.9
DT3	Roadside	25.9	27.7	N/A	N/A	N/A
DT10	Roadside	35.9	33.2	33.97	30.6	32.8
DT11	Roadside	32.3	28.8	N/A	N/A	31.6

109. As detailed in **Table 3.2**, concentrations were approaching the annual mean NO_2 Objective at location DT4 across the five year period. This location is close to a major road in the town centre where congestion may be experienced. Concentrations at other locations were below the annual mean Objective.

3.1.1.5 Kings Lynn and West Norfolk Borough Council

110. A review of the 2016 Annual Status Report (Kings Lynn and West Norfolk Borough Council, 2016) identified that no monitoring was undertaken in the vicinity of the onshore cable corridor or roads considered in the assessment.

3.1.1.6 South Norfolk District Council

111. There are six diffusion tubes operated by SNDC that are located in the vicinity of the affected road network. Monitoring results were obtained from the 2015 and 2017 South Norfolk District Council Annual Status Reports (South Norfolk District Council 2015, South Norfolk District Council 2017[2]) and are presented in **Table 3.3**.

Table 3.3: Annual mean NO_2 monitoring undertaken by South Norfolk District Council

Site	Type	Monitored annual mean NO_2 concentration ($\mu g.m^{-3}$)				
		2012	2013	2014	2015	2016
1	Suburban	24.1	19.5	21.5	17.1	20.2
3	Suburban	21.1	17.3	18.0	15.4	19.3
6	Suburban	15.5	13.0	12.0	10.4	13.5
9	Roadside	30.4	22.8	26.7	21.4	25.4
11	Suburban	16.6	15.0	15.9	12.8	15.8
29	Suburban	44.9	38.9	38.6	31.8	38.2

[2] The 2017 Annual Status Report was released after model verification was carried out using data from the 2015 Annual Status Report. The modelling carried out for the final ES and DCO application in June 2018 will use the most suitable up to date monitoring data for the model verification process.

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112. Results shown in **Table 3.3** show that pollutant concentrations were in exceedance of the annual mean NO_2 Objective in 2012 at location 29. Annual mean NO_2 concentrations at all other locations were below the air quality Objective.

3.1.1.7 Norwich City Council

113. Following a review of its latest Local Air Quality Management report (NCC, 2016), NCC does not undertake any air pollution monitoring within the study area; monitoring is focussed within the city centre statutory designated AQMA which is bordered by the inner ring road. This area is not anticipated to experience increases in project development-generated traffic.

3.1.1.8 Waveney District Council

114. There are eight diffusion tube locations situated in proximity to the affected road network; recent data for these sites, obtained from the Waveney District Council 2016 Annual Status Report (Waveney District Council, 2016), are detailed in **Table 3.4.**

Table 3.4: Annual mean NO2 monitoring undertaken by Waveney District Council

Site	Type	Monitored annual mean NO_2 concentration ($\mu g.m^{-3}$)			
		2011	2012	2013	2014
DT1	Roadside	16.7	15.7	16.2	15.2
DT7	Roadside	22.8	20.9	19.6	18.7
DT9	Roadside	32.8	29.2	24	29.3
DT10	Roadside	32.8	30	25.7	31.2
DT11	Roadside	35.1	30.8	35.3	29.9
DT12	Roadside	N/A	25.8	26	25.2
DT14	Roadside	35.4	31.2	32.3	31.6
DT15	Roadside	N/A	25.1	33.2	23.9

115. As detailed in **Table 3.4**, pollutant concentrations were below the annual mean Objective in recent years.

3.1.2 Designated sites

116. There are a number of designated ecological sites within the study area, which may contain features that are sensitive to nutrient nitrogen and NOx deposition. Where possible, Norfolk Boreas site selection has avoided these designated sites. Consideration will be given to potential impacts on designated sites within the study area, as detailed in section 3.3. These will be identified in the Onshore Ecology PEIR/ES Chapter and the potential inter-relationships will be assessed.

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3.2 Planned Data Collection

117. Sufficient Local Authority air quality monitoring data are available for use in the air quality assessment and therefore a site-specific monitoring survey will not be undertaken. This was agreed during the Norfolk Vanguard EPP by the Air Quality ETG, and the same approach is considered to be appropriate for Norfolk Boreas (Royal HaskoningDHV, 2017b). The latest available monitoring data will be obtained during consultation.

3.3 Sensitive Receptors

118. Sensitive receptors such as hospitals and schools were avoided where practicable during the project design. The following receptors will be considered in the assessment:

- Human receptor locations sensitive to dust within 350m of proposed construction phase activities;
- Receptors sensitive to air pollution situated within 200m of the road network to be utilised by construction traffic;
- Ecological receptor locations sensitive to dust within 50m of the proposed construction phase activities; and,
- Ecological receptor locations within 200m of roads affected by the proposed development.

119. Identification of all specific sensitive receptors within these categories will be undertaken once the number and location of traffic movements has been finalised and this will be presented within the PEIR

120. The maximum extents of the study area, for the construction phase dust assessment and road traffic emissions assessment, showing the spatial distribution of receptors, are detailed in **Figure 2** and **Figure 3.**

121. It should be noted that not all road links within the study area shown in **Figure 3** will be affected by traffic associated with Norfolk Boreas project. Those links which are expected to receive additional traffic during the construction of the project will be screened as part of the air quality assessment and a detailed assessment will be undertaken for those links that exceed the screening criteria.

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4 IMPACT ASSESSMENT METHODOLOGY

4.1 Defining Impact Significance

122. Air quality guidance identifies specific methodologies for assessing the significance of impacts associated with construction dust and fine particulate matter, and road traffic exhaust emissions. These approaches differ from the standard EIA significance methodology, and are detailed below.

123. The assessment will consider Scenario 1 and Scenario 2 separately, so that potential impacts from each scenario can be assessed. Within each scenario, reference will be made to the various elements of the project infrastructure and associated works where relevant.

4.1.1 Construction Dust and Fine Particulate Matter

124. The potential effects of the construction phase on nearby receptors are associated with dust soiling onto buildings and cars and people's exposure to airborne dust and fine particulate matter. The Institute of Air Quality Management (IAQM) guidance (IAQM, 2014) on assessing the significance of construction dust effects advises a risk-based approach, considering the scale of the activities and the sensitivity of the potential receptors. The guidance is applicable for standard construction activities, including construction and earthworks, and is therefore considered to be appropriate for the assessment of the potential for construction phase dust impacts associated with a development of this nature.

125. The dust emission magnitude is determined based on the scale of each construction activity to be undertaken. The sensitivity of the study area is determined based on the sensitivity of receptors and their proximity to the construction works. The dust emission magnitude and sensitivity of the area are then combined to determine the risk of effects prior to mitigation.

126. The IAQM recommends mitigation measures that are commensurate with the level of risk of the site. Once these are identified, the significance of construction phase effects can be determined. The aim is to prevent significant effects at receptors due to the implementation of effective mitigation, which is usually achievable.

127. Sensitive receptors within 350m from the onshore construction site boundaries will be considered in both Scenario 1 and Scenario 2 to provide a conservative assessment. Therefore the area considered under Scenario 2 will be greater than that for Scenario 1.

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4.1.2 Construction Phase Road Traffic Exhaust Emissions

128. In accordance with IAQM and EPUK guidance (IAQM and EPUK, 2017), the requirement for a detailed air quality assessment will be screened using the two-stage criteria approach detailed in the guidance.

129. The Stage 1 criteria are as follows:

- The development comprises 10 or more residential units or a site area of more than 0.5ha; or,
- The development has more than 1,000m^2 of floor space for all other uses or a site area greater than 1ha; coupled with either of the following:
- The development has more than 10 parking spaces; or,
- The development will have a centralised energy facility or combustion process.

130. If the above criteria are exceeded, then the screening should proceed to stage 2 and the following criteria should be applied:

- A change in Light Duty Vehicle (LDV) flows of more than 100 Annual Average Daily Traffic (AADT) within or adjacent to an AQMA, or more than 500 AADT elsewhere; or
- A change in Heavy Duty Vehicle (HDV) flows of more than 25 AADT within or adjacent to an AQMA or 100 AADT elsewhere.

131. If the stage 2 criteria are exceeded, a detailed air quality assessment should be undertaken for each road link exceeding the criteria. This approach will be carried out for both Scenarios 1 and 2.

4.1.2.1 Approach Human Receptors

132. Guidance is also provided by the IAQM and EPUK (IAQM and EPUK, 2017) to determine the significance of a development's impact on local air quality. **Table 4.1** details the impact descriptors at identified individual receptors that take account of the magnitude of changes in pollutant concentrations, and the concentration in relation to the air quality objectives.

Table 4.1: IAQM and EPUK Impact Descriptors for Individual Receptors

Long Term Average Concentration at Receptor in Assessment Year	% Change in Concentration Relative to the Air Quality Assessment Level (AQAL)			
	1	2 - 5	6-10	>10
75% or less of AQAL	Negligible	Negligible	Slight	Moderate
76-94% of AQAL	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Slight	Moderate	Moderate	Substantial
103-109 of AQAL	Moderate	Moderate	Substantial	Substantial

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Long Term Average Concentration at Receptor in Assessment Year	% Change in Concentration Relative to the Air Quality Assessment Level (AQAL)			
	1	2 - 5	6-10	>10
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial

Note: Figures are to be rounded up to the nearest round number. Any value less than 1% after rounding (effectively less than 0.5%) will also be described as "Negligible".

133. Further to the determination of the impact at individual receptors, IAQM and EPUK guidance (IAQM and EPUK, 2017) recommends that assessment is made of the overall significance of the impact of a development on local air quality. The overall significance will need to take into account the following factors:

- The existing and future air quality in the absence of the development;
- The extent of current and future population exposure to the impacts; and
- The influence and validity of any assumptions adopted when undertaking the prediction of impacts.

134. The guidance also states that a judgement of the significance should be made by a competent professional who is suitably qualified. The air quality assessment and determination of the significance of the development on local air quality will be undertaken by experienced members of the IAQM.

4.1.2.2 Ecological Receptors

135. Critical loads (CLs) for habitat sites in the UK are published on the Air Pollution Information System (APIS) website (Centre for Ecology and Hydrology (CEH), 2017). These are the maximum levels of nutrient nitrogen and acid deposition that can be tolerated without harm to the most sensitive features of these habitat sites.

136. Guidance provided by the Environment Agency (Environment Agency, 2017) states that where the contribution of a project leads to nutrient nitrogen deposition values below 1% of the critical load, impacts can be considered to be not significant. Therefore, any project-generated nutrient nitrogen deposition values above 1% of the critical load will require additional assessment by an ecologist to determine whether any impacts may be experienced at the affected habitats.

4.1.2.3 ADMS-Roads Modelling

137. Traffic flows from the peak year of construction under Scenario 1 and Scenario 2 would be considered in the assessment. As the peak year for construction under Scenario 1 would occur when there is no construction phase traffic for Norfolk Vanguard, the baseline traffic scenario would not include construction phase traffic

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movements from Norfolk Vanguard. The ADMS-Roads modelling will be carried out using the following parameters:

- Met data from the Norwich recording station will be used in the ADMS-Roads model. This is the most centralised meteorological station within the study area.
- Traffic speeds will be included in the air dispersion modelling as follows:
    - Queues will be modelled at locations where assessed road links converge and on roundabouts; and
    - Speed data for free-flowing traffic conditions will be obtained from national speed limits. Where speeds vary across a road link, the lowest speed will be used to provide a conservative assessment. For the purposes of model verification, the road speed adjacent to the monitoring location will be used to more adequately represent monitored conditions.
- Emission factors will be provided from most recent Emission Factor Toolkit provided by Defra. There is uncertainty regarding the rate of reduction in emissions from road vehicles in the future. To provide a conservative assessment, emission factors for the base year scenario will be used in all future year assessment scenarios.
- Model verification is the process of adjusting model outputs to improve the consistency of modelling results with respect to available monitored data. In this assessment, model uncertainty will be minimised following Defra (Defra, 2016) and IAQM and EPUK (IAQM and EPUK, 2017) guidance.
- Monitoring locations in each Local Authority within the study area, detailed in section 3.1.1, will be reviewed to establish the suitability for use in model verification. Locations will only be considered suitable where the assessed road links provided sufficient representation of road traffic sources that would affect monitored concentrations at that point.
- Oxides of nitrogen (NOx) concentrations will be predicted using the ADMS-Roads model. The modelled road contribution of NOx at the identified receptor locations will then be converted to NO_2 using the most recent the NOx to NO_2 calculator provided by Defra, in accordance with Defra guidance (Defra, 2016).
- The ADMS-Roads assessment requires the derivation of background pollutant concentration data that are factored to the year of assessment, to which contributions from the assessed roads are added. Background NO_2, PM_{10} and $PM_{2.5}$ concentrations will therefore be obtained for the 1km x 1km grid squares covering the onshore project area and receptor locations for the future year assessment.

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5 POTENTIAL IMPACTS

5.1 Potential Impacts during Construction

138. The impacts of Scenario 1 and Scenario 2 will be assessed separately but the approach to the assessment for each scenario will be the same. It is anticipated that construction dust emissions and road traffic movements would be less under Scenario 1, and therefore air quality impacts are likely to be less.

5.1.1 Impact: Construction Dust and Fine Particulate Matter

139. Dust emitted by construction activities has the potential to affect nearby receptors, such as residential properties, through:

- Nuisance caused by soiling of surfaces; and,
- Effects on human health as a result of exposure to fine particulate matter.

5.1.1.1 Approach to Assessment

140. Assessment of potential impacts associated with the construction phase will be undertaken in accordance with the IAQM guidance '*Guidance on the Assessment of Dust from Demolition and Construction*' (IAQM, 2014). Mitigation approaches to minimise generation of dust and fine particulate matter will be recommended where appropriate.

141. There are likely to be fewer dust emissions and fewer areas where construction takes place for Scenario 1 therefore impacts will occur at less locations and will be of a lower magnitude rating.

5.1.2 Impact: Construction Phase Road Vehicle Exhaust Emissions

142. There is the potential for exhaust emissions from road traffic generated during the construction phase to lead to impacts at receptors in the vicinity of the affected road network.

5.1.2.1 Approach to Assessment

143. The increases in traffic flows as a result of the construction phase of the project will be screened using the stage 1 and stage 2 criteria provided by the IAQM and EPUK (IAQM and EPUK, 2017) to determine whether a detailed air quality assessment is required. The screening criteria will be applied to roads in the study area for both Scenario 1 and Scenario 2.

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144. Where the stage 2 criteria are exceeded, a detailed air quality assessment will be undertaken to consider potential impacts at receptors. The detailed assessment will incorporate each road link exceeding the stage 2 criteria.

145. If required, the detailed air quality assessment will be undertaken using the dispersion model ADMS-Roads. The assessment will consider the impact of construction phase-generated vehicle movements on NO_2 and particulate matter (PM_{10} and $PM_{2.5}$) concentrations at identified existing receptor locations adjacent to road links that exceed the stage 2 criteria. Changes in pollutant concentrations as a result of the proposed development will be compared to significance criteria provided in IAQM and EPUK guidance (IAQM and EPUK, 2017).

5.2 Potential Impacts during Operation and Maintenance

146. Operational phase air quality impacts were scoped out of the assessment, which was agreed by the Planning Inspectorate in the Norfolk Boreas Scoping Opinion. Impacts associated with O&M were therefore not considered.

5.3 Potential Impacts during Decommissioning

147. There is the potential for nearby receptors to experience dust soiling and human health impacts as a result of decommissioning activities. With regard to section 2.3.4 it is anticipated that these impacts will generally be similar or less in nature to those of construction. The main impact of decommissioning is likely to be Dust and Fine Particulate Matter

5.3.1 Impact: Dust and Fine Particulate Matter

5.3.1.1 Approach to Assessment

148. The programme for decommissioning is expected to be similar in duration to the construction phase. The detailed activities and methodology for decommissioning will be determined later within the project lifetime. A qualitative assessment will therefore be undertaken on the basis that it is anticipated that impacts during decommissioning would be similar to, or less than, those experienced during the construction phase. An EIA will be carried out ahead of any decommissioning works being undertaken.

5.4 Potential Cumulative Impacts

149. Projects which have the potential to act cumulatively with Norfolk Boreas will be identified and assessed as part of the CIA and are therefore screened into the assessment. Such projects will be identified during the consultation process and will include those that are existing, consented or at application stage, where relevant.

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150. The CIA will consider the potential for significant cumulative impacts to arise as the result of the construction, operation or decommissioning of Norfolk Boreas based on the known worst case scenario in relation to those projects identified.

151. Projects considered in the assessment will include the proposed Norfolk Vanguard project (under Scenario 1); the proposed Hornsea Project Three Offshore Wind Farm, Dudgeon Offshore Wind Farm, the approved Bacton Gas terminal extension and coastal protection projects and the approved Bacton Coastal Protection Scheme. Other projects with the potential to impact upon the air quality will also be considered and the full list of projects for consideration will be updated as the project progresses, agreed in consultation with local authorities.

152. Potential cumulative impacts arising from the proposed project will be considered in line with the EIA Methodology. Potential impacts will be identified and assessed in terms of significance and magnitude using the same methodology outlined in the impact assessment. Where appropriate, potential mitigation measures will be outlined.

5.4.1 Impact: Construction Dust and Fine Particulate Matter

153. There is the potential for cumulative impacts associated with nearby developments, including the Norfolk Vanguard project under Scenario 1, and Hornsea Project 3, at receptors. These may occur where developments are located within 700m of each other, or in the case of Hornsea Project Three where the cable routes cross, and the study areas will overlap.

5.4.1.1 Approach to Assessment

154. A qualitative assessment will be undertaken to consider the potential for cumulative impacts, taking into account the distance to committed developments and the proposed mitigation measures and management plans.

5.4.2 Impact: Construction Phase Road Vehicle Exhaust Emissions

155. There is the potential for cumulative impacts to occur at receptors as a result of interactions with committed developments in the vicinity of the proposed development. It is anticipated that there could be some minor cumulative traffic impacts associated with the final phase of cable pull through for Norfolk Vanguard and some preconstruction works for Norfolk Boreas under Scenario 1. This would not occur under Scenario 2 and Norfolk Vanguard would not have been constructed. There may also be cumulative road traffic impacts associated with Hornsea Project 3, where there is overlap in road links affected by the projects. This could occur under either scenario.

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5.4.2.1 Approach to Assessment

156. Where a detailed air quality assessment is required, traffic flow data utilised in the assessment will include traffic associated with committed developments within the study area, which will be agreed with the relevant stakeholders. These traffic flows will be included in the 'without development' and 'with development' scenarios, and therefore any cumulative impact of road traffic emissions will be considered in the assessment. The assessment will be undertaken using the methodology described in section 4.1.2.

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6 REFERENCES

Breckland Council (BC) (2016) Air Quality Annual Status Report

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