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Norfolk Boreas Offshore Wind Farm

Consultation Report

Appendix 9.7 Norfolk Vanguard Health outgoing documents

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Norfolk Vanguard Offshore Wind Farm

Environmental Impact Assessment

Health Impact Assessment Method Statement

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This method statement has been prepared by Royal HaskoningDHV on behalf of Vattenfall Wind Power Limited (VWPL) in order to build upon the information provided within the Norfolk Vanguard 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.

Table of Contents

1 INTRODUCTION

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

2. This method statement has been produced following a full review of the Scoping Opinion provided by the Planning Inspectorate.

1.1 Background

3. A Scoping Report for the Norfolk Vanguard Environmental Impact Assessment (EIA) was submitted to the Planning Inspectorate on the 3rd October 2016. 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/EN010079/EN010079-000022-Scoping%20Report.pdf

4. The Scoping Opinion was received on the 11th November 2016 and can be found at:

https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010079/EN010079-000018-Scoping%20Opinion.pdf.

1.2 Norfolk Vanguard Programme

1.2.1 DCO Programme

- Scoping Request submission - 03/10/16 (complete)
- Preliminary Environmental Information submission - Q4 2017
- Environmental Statement and DCO submission - Q2 2018

1.2.2 Evidence Plan Process Programme

5. The Evidence Plan Terms of Reference (Royal HaskoningDHV, 2017) provides an overview of the Evidence Plan Process and expected logistics, below is a summary of anticipated meetings:

- Steering Group meeting -21/03/16 (complete)
- Steering Group meeting - 20/09/16 (complete)

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

1.2.3 Survey Programme

6. There is no intention to carry out specific primary surveys in relation to the health baseline, except where these are being carried out with respect to other chapters being examined, notably Noise, Air Quality, Land Quality, Water Quality, and Waste.

2 PROJECT DESCRIPTION

2.1 Site Selection Update

7. Further to the site selection information provided within the Norfolk Vanguard Scoping Report (Royal HaskoningDHV, 2016), additional site selection work has been undertaken to refine the locations of the onshore infrastructure. The Norfolk Vanguard EIA Scoping Report identified 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. The public drop-in-exhibitions in October 2016 and Scoping Opinion have also contributed to our broader understanding of local constraints and opportunities, feeding into the ongoing site selection and development of the EIA strategy. The project areas shown in Figure 1 are a draft for stakeholder consultation only and are provided in confidence. Equivalent information will be presented during open drop-in-exhibitions in March 2017, providing an opportunity for local people and the wider public to understand the way in which their feedback, as well as the Scoping Opinion and has influenced our design. Given the broad range and complexity of the factors influencing site selection and the scale of the area under discussion, it is our intention that local people and interested parties view the map for the first time, with Vattenfall and suitably qualified experts on hand. This enables a meaningful discussion of the proposed options and enables participants to refer directly to points of reference they may wish to discuss. During the March drop-in exhibitions, participants will also be invited to provide feedback on the latest design.

8. There are currently three landfall options with associated cable relay station search zones as well as an onshore substation search zone in proximity to the existing Necton 400kV National Grid substation (the grid connection point). A 200m wide cable corridor has been identified, within which the cable route will be located (see cable route parameters in Section 2.2.1). Ongoing public and stakeholder consultation as well as initial EIA data collection will be used to inform selection of final locations for the EIA and DCO application, with the aim to further avoid sensitive areas. Impacts that cannot be avoided through site selection will aim to be reduced through sensitive siting, alternative engineering solutions (mitigation by design) and additional mitigation measures where possible. Mitigation options will be developed in consultation with stakeholders.

2.1.1 Landfall Zones

9. The landfall search area was presented in the Scoping Report as Figure 1.3. This has been refined to three landfalls options (Zone 8), Bacton Green, Walcott Gap and Happisburgh South, following studies on the engineering feasibility of horizontal directional drilling (HDD). The two northern landfalls have the advantage that related onshore infrastructure (the cable relay station) could be placed close to the existing Bacton gas terminal in what is already an industrialised area thereby reducing landscape impacts, a preference stated by many at the public drop-in exhibitions. Discussions with the owners and operators of the gas terminal will inform the final landfall location.

10. Both northern options would require offshore cabling through the Cromer Shoal Chalk Beds Marine Conservation Zone (MCZ) and concerns have been expressed by members of the public and a number of statutory authorities about impacts on the MCZ. Information from the offshore cable corridor geophysical and benthic survey from within the Cromer Shoal Chalk Beds MCZ will be reviewed to understand the extent of designated features and therefore the feasibility of installing offshore cables. Data on coastal erosion, including estimates of coastline movement over the life time of the wind farm, and the likelihood of archaeological finds, will be reviewed to understand the feasibility of a landfall south of Happisburgh. This site is outside the MCZ but siting the required onshore infrastructure within a rural location would require careful consideration.

2.1.2 Cable Relay Station Options

11. The cable relay station search area was presented in the Scoping Report as Figure 1.6. Refined search zones (Zone 7) have been defined based on the initial constraints mapping work, the updated landfall site selection and initial consultation. A number of receptors and impacts have been considered during the selection of the scoping search area and the refined search zones, particularly noise and visual impacts, ecology traffic, human health and socio-economic impacts. As with the landfall location, discussions with the owners of the gas terminal will inform the final landfall location.

2.1.3 Onshore Cable Route

12. The onshore cable corridor search area was presented in the Scoping Report (Royal HaskoningDHV, 2016) as Figure 1.5. The route shown on Figure 1 (Zone 4) is considered to be the shortest possible route (thereby minimising disturbance impacts) whilst also aiming to avoiding main residential areas and impacts to landscape and nature conservation designations where possible.

13. Routes in the north of the scoping search area were discounted owing to the presence of existing gas pipelines and the cables from the Dudgeon Offshore Wind Farm which significantly affected the number of complex crossings that would be required. The proposed route skirts around the main towns of North Walsham, Aylsham, Reepham and Dereham. The route corridor is currently 200m wide thereby allowing for further micro-siting following feedback from the public drop-in-exhibitions planned for March 2017 and information from planned survey work.

2.1.4 Substation Zone

14. The onshore substation search area, comprising five sectors, was presented in the Scoping Report (Royal HaskoningDHV, 2016) as Figure 1.4. Public consultation during the drop-in exhibitions indicated Sector 5 (to the south of the existing Necton 400kV National Grid substation) and Sector 1 (to the east) would be the best options in this location.

15. Sectors 2, 3 and 4 were discounted due to the proximity of the residential areas of Necton, Little Dunham, Great Fransham and Little Fransham.

16. Sector 1 was maintained as an option due to the existing woodland and topography of this area which could provide screening (in addition to project screening mitigation) which may limit visual impacts. Additional access would however be required for this sector.

17. Sector 5 was maintained as an option on the basis of keeping all existing and proposed development together, the lack of housing in this sector and good access from the A47. However concerns were raised regarding the ongoing industrialisation of the area.

18. The refined substation search zone (Zone 3) includes the parts of Sectors 1 and 5, south of the A47 and south of the existing overhead line.

19. A search area for underground cables has also been delineated (the western end of Zone 4) which is required to connect the substation located within Zone 3 to the existing Necton 400kV National Grid substation.

2.1.5 Extension to the Existing Necton 400kV National Grid Extension

20. Since completion of the Norfolk Vanguard EIA Scoping Report (Royal HaskoningDHV, 2016) a decision has been made by the VWPL to include the required extension works to the existing Necton 400kV National Grid substation within the EIA and DCO application for Norfolk Vanguard. The aim of this approach is to enable a more transparent impact assessment and allow the development of more effective mitigation.

21. Appropriate search zones for the extension works have been developed in consultation with National Grid, including:

- Zone 1 - Land adjacent to the existing substation which could accommodate extension to the existing busbars (see Section 2.2.1.5).
- Zone 2 - Land where overhead line realignment works maybe required adjacent to the existing National Grid substation (see Section 2.2.1.5).

22. VWPL will work closely with National Grid to ensure the design of the extension works is appropriate.

2.1.6 Norfolk Boreas

23. Since completion of the Norfolk Vanguard EIA Scoping Report (Royal HaskoningDHV, 2016) a grid connection agreement has been granted by National Grid for Norfolk Boreas at the existing Necton 400kV National Grid substation. Therefore the Norfolk Vanguard EIA will include the option for Norfolk Boreas cable ducts to be installed at the same time as Norfolk Vanguard.

2.2 Indicative Worst Case Scenarios

24. The following sections set out the indicative worst case scenarios for human health. The PEIR/ES will provide a detailed Project Description describing the final Rochdale envelope for the Norfolk Vanguard 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 Vanguard project for the relevant receptors and impacts. Additionally, each chapter will consider separately the anticipated cumulative impacts of Norfolk Vanguard with other relevant projects which could have a cumulative impact on the receptors under consideration.

2.2.1 Infrastructure Parameters

25. Two electrical solutions are being considered for Norfolk Vanguard, a High Voltage Alternating Current (HVAC) and a High Voltage Direct Current (HVDC) scheme. The decision as to which option will be used for the project will be agreed post consent and will depend on availability, technical considerations and cost. Both electrical solutions will have implications on the 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.

26. The following key onshore project parameters are considered:

- Landfall (Horizontal Directional Drilling (HDD) and associated compounds);

- Cable relay station if required (HVAC only) within the cable relay station search zones;
- Cable corridor (with associated construction compounds and mobilisation areas);
- Onshore substation (within the substation search zone); and
- Extension to the existing Necton 400kV National Grid Substation, including overhead line modification.

27. There is an option for the cable ducts for Norfolk Boreas, (the sister project to Norfolk Vanguard) to be constructed and installed simultaneously with Norfolk Vanguard within a single cable corridor (see parameters in Section 2.2.1.3). Therefore this scenario will be considered within the Norfolk Vanguard EIA as associated development as part of the DCO application. There is also the scenario that the ducts for Norfolk Boreas cannot be installed at the same time as Norfolk Vanguard and therefore this scenario will be considered within the Cumulative Impact Assessment (CIA), together with the parameters of Norfolk Vanguard (as listed in the bullets points above).

28. All other components of Norfolk Boreas will be considered as part of the Norfolk Vanguard CIA.

2.2.1.1 Landfall

29. There are three potential landfall locations for Norfolk Vanguard:

- Bacton Green;
- Walcott Gap; and
- Happisburgh South.

30. Initial survey and data collection for the EIA will enable the selection of the landfall location for Norfolk Vanguard. Therefore the approach to baseline characterisation will initially consider all options and will then be refined once a final landfall location is selected. The PEIR and ES will present a single landfall option.

31. Key parameters:

- Horizontal directional drilling (HDD) will be used at the landfall.
- A total of 6 ducts for the HVAC option or 2 ducts for the HVDC option would be required at the landfall for Norfolk Vanguard.
- Temporary footprint of works will be up to 3000m2, of which up to 900m2 (6 transition pits, based on the HVAC option) will involve excavation for Norfolk Vanguard.
- There will be no permanent above ground infrastructure at landfall.

- Noise from each HDD site is generally associated with generators at the location with a noise emission of 77 dB L_{Aeq} at 10m. At 50m distance from an average HDD site the noise level is 70dB(A) and at 100m is typically 60dB(A).
- Drilling and demobilisation will take approximately 30 weeks when considering 12 hour (7am-7pm), 7 day shifts. 24 hour lighting of the temporary footprint will be required through construction.

32. If Norfolk Boreas cable ducts are installed concurrently with the Norfolk Vanguard ducts, the Norfolk Boreas ducts will be installed up to the joint pits on the landward site of the landfall works. No landfall works (e.g. transition pits, HDD works) will be undertaken for Norfolk Boreas and therefore the landfall works for Norfolk Boreas do not form part of the Norfolk Vanguard DCO and will be considered in the CIA (see Section 2.2.5).

2.2.1.2 Cable Relay Station

33. A Norfolk Vanguard cable relay station is required for an HVAC electrical solution only and would not be included in a HVDC connection solution. The largest infrastructure, along with potential to produce any form of emissions (e.g. electromagnetic radiations, solid, liquid or gaseous materials and discharges) that are in the closest proximity to human receptors would result in the worst case scenario in relation to human health. Therefore the HVAC option is considered to be the worst case scenario for this onshore infrastructure.

34. The cable relay station accommodates the reactive compensation equipment required to compensate the capacitive losses generated by long power cables, and will be located within 5km of the landfall.

35. There are currently seven cable relay station search zones being considered and a final location will be defined following landfall site selection and will be known for the EIA and DCO application. The PEIR and ES will present a single cable relay station location.

2.2.1.3 Cable Route

36. There are several potential scenarios for the cable easement:

- Norfolk Vanguard HVDC: This would require a 35m temporary strip during construction, and a 13m permanent strip (including 8m access) during operation.
- Norfolk Vanguard HVAC: This would require a 50m temporary strip during construction, and a 25m permanent strip (including 8m access) during operation.

- Norfolk Vanguard and Norfolk Boreas HVDC: This would require a 45m temporary strip during construction, and a 20m permanent strip with (including 8m access) during operation.
- Norfolk Vanguard and Norfolk Boreas HVAC: This would require a 100m temporary strip during construction, and a 54m permanent strip (including two separate 8m access tracks and 6m separation between circuits) during operation.

37. Key parameters:

- The length of the onshore cable route will be approximately 60km.
- The main cable installation method will be through the use of open cut trenching with High Density Polyethylene (HDPE) ducts installed, backfilled and cables pulled though the pre-laid ducts.
- Under the worst case scenario, i.e. both the Norfolk Vanguard and the Norfolk Boreas windfarms being constructed simultaneously, an onshore temporary easement of 100m width corridor will be required. This will result in a temporary loss of a 100m area strip of habitat along the full length of the onshore cable corridor during the installation of the cable ducts. This will include a 38m wide strip for cable excavation (up to 12 cable trenches), two 6m wide access tracks either side of the 38m strip, and two 9m and two 13m strips for excavated material storage and topsoil storage respectively.
- The access tracks will be formed of protective matting, temporary metal road or permeable gravel aggregate dependant on the ground conditions.
- Joint pits with a footprint of 90m^2 will be required every 800m along the cable route (i.e. approximately 75 intotal) for installation of cables in the pre-installed cable ducts.
- Where trenchless techniques (i.e. HDD) are required (e.g. at water crossings), there will a temporary loss of habitat of approximately 2500m^2 and 5000m^2 to support the HDD launch and receptor sites.
- Mobilisation areas will also be required for servicing the cable installation. These will be required to store equipment and provide welfare facilities. These will involve a temporary loss of habitat of 10000m^2 for the footprint of these areas. Hardstanding will be laid for the duration of construction.

38. The Norfolk Vanguard EIA worst case scenario for the onshore cable route will be where ducts for Norfolk Vanguard and Boreas are installed concurrently using the HVAC scenario, due to the larger area required for this option, and associated earthworks and traffic movements resulting in the worst case potential impacts for noise, air quality and visual impacts.

2.2.1.4 Onshore Substation

39. A single onshore substation will be required regardless of whether HVAC or HVDC options are selected and the two options will have similar land take requirements:

- HVAC:
  - Construction area approximately 400m x 400m
  - Substation footprint (within construction area) approximately 250m x 300m
- HVDC:
  - Construction area approximately 400m x 400m
  - Substation footprint (within construction area) approximately 250m x 300m

40. Low level lighting will be required for the duration of the construction phase.

41. A substation search zone (which has been refined from the substation search area shown in the Norfolk Vanguard EIA Scoping Report (Royal HaskoningDHV, 2016)) is located to the south and east of the existing Necton 400kV National Grid substation. Initial survey and data collection, and feedback from the local community and stakeholders, will enable the selection of the substation location for Norfolk Vanguard. The PEIR and ES will present a single substation location.

42. The maximum infrastructure parameters will be the worst case scenario considered in the assessment, along with potential to produce any form of emissions (e.g. electromagnetic radiations, solid, liquid or gaseous materials and discharges).

2.2.1.5 National Grid substation extension

43. An extension to the existing Necton 400kV National Grid substation will be required regardless of whether the HVAC or HVDC electrical solution is selected.

44. For Norfolk Vanguard, the busbar would be extended in an east west direction with seven additional Air Insulation Switchgear (AIS) bays.

45. The extension to the existing Necton 400kV National Grid substation for Norfolk Vanguard and Norfolk Boreas combined would require a further busbar extension and five further AIS bays for Norfolk Boreas. This extension to the Necton 400kV National Grid substation will be included in the Norfolk Vanguard DCO and EIA.

46. Re-configuration of overhead lines to change the arrangements of the 400kV circuits in close proximity to the substation would also be required.

47. The National Grid substation extension will be included within the EIA for the Norfolk Vanguard DCO application.

2.2.2 Construction Programme

48. The HVAC option is based on a three phase development programme which would take a total of seven years (2020-2026), while the HVDC option is based on a two phase development programme which would take a total of six years (2020-2025). Both programmes include two years of enabling works during 2020 and 2021, consisting of road modifications, hedge and tree removal, preconstruction drainage, mobilisation area establishment and major crossing construction.

49. Duct installation for the landfall and onshore cable and primary works for the substation and cable relay station would take place during 2022 and 2023. The installation of the onshore cables would occur in phases in parallel with the commissioning of the phases of the offshore wind farm. In the HVAC programme, the cable and electrical plant installation and commissioning will take place over three years from 2024 to 2026. In the HVDC programme, installation and commissioning will take place over 2 years, from 2024 to 2025.

50. Construction works will not take place continuously in all locations during the proposed construction time. Construction activity along the onshore cable route will move along the route, between different sections and activity will be phased, with the trenching and laying of ducts taking place first, followed by the cable installation.

51. The construction period for the cable relay station and substation is expected to be approximately 18 months. The worst case scenario for the construction programme would occur if the HVAC connection arrangement is utilised, as a longer construction phase is required. This is because of the duration of construction and a greater intensity of construction activities and related disturbance in the closest proximity to human receptors.

2.2.3 Construction Methodology

52. The greater the scale of disturbance and emissions (traffic, noise, air, visual, as well as the volumes of solid, liquid or gaseous materials and discharges) derived from a particular construction method and the closer the proximity to human receptors, the greater the potential disturbance (in terms of noise levels, emissions to air, large vehicular movements, vibration, and visual disturbance). Greater levels of disturbance and associated emissions can impact on human health, either physically ranging from direct impact (transport accident risk) to indirect impact (inhalation of particulates, hearing damage) particularly with regard to vulnerable sectors of the population such as the very young or elderly.

2.2.4 Operation and Maintenance (O&M) Strategy

53. There is no ongoing requirement to maintain the onshore cables following installation. However, periodic access to installed link boxes / test pits may be required for inspection, estimated to be annually. No emissions are anticipated to arise from the onshore cables during operation.

54. The operational emissions from the substation and cable relay station are restricted to light and noise. It is not anticipated that the cable relay station or substation will be illuminated under normal operating conditions. Site lighting will be provided during operations and maintenance activities only, which are anticipated to occur on average once per week during operation. Peak unmitigated noise levels will be approximately 95 dB Sound Pressure Level (SPL) at 0.3m across a frequency spectrum up to 800 Hz, peaking at 315 Hz.

2.2.5 Decommissioning

55. 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 joint 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.

2.2.6 Cumulative Impact Scenarios

2.2.6.1 Norfolk Boreas

56. If Norfolk Boreas uses the same landfall as Norfolk Vanguard, a total of 12 ducts would be required at the landfall (under the worst case HVAC electrical solution). The Happisburgh South landfall site is the only landfall option which can accommodate 12 ducts.

57. The following landfall scenarios for Norfolk Vanguard and Norfolk Boreas are currently being considered:

- HVDC - Landfalls for Norfolk Vanguard and Norfolk Boreas at Bacton Green (4 ducts in total)
- HVDC - Landfalls for Norfolk Vanguard and Norfolk Boreas at Walcott Gap (4 ducts in total)
- HVDC - Landfalls for Norfolk Vanguard and Norfolk Boreas at Happisburgh South (4 ducts in total)

- HVAC North - Landfall for Norfolk Vanguard at Bacton Green (6 ducts) with Norfolk Boreas at Walcott Gap (additional 6 ducts); or
- HVAC South - Landfall for Norfolk Vanguard and Norfolk Boreas at Happisburgh South (12 ducts)

58. As discussed in Section 2.2.1, initial data collection for the Norfolk Vanguard EIA will enable selection of the landfall location for Norfolk Vanguard which will also inform the site selection for Norfolk Boreas. Final landfall locations for Norfolk Vanguard and Norfolk Boreas will be confirmed in the Norfolk Vanguard CIA. The options of HVAC and HVDC will be retained in the Norfolk Vanguard DCO application. Due to the greater number of ducts, an HVAC option will represent the worst case scenario.

59. The Norfolk Boreas cable relay station (only required under the HVAC scenario) will be located within one of the cable relay station search zones shown for Norfolk Vanguard. The Norfolk Vanguard and Norfolk Boreas cable relay stations may be co-located or at separate locations, subject to the landfall site selection. Final cable relay station site locations will be known for the Norfolk Vanguard CIA. The cable relay stations for Norfolk Vanguard and Norfolk Boreas will be constructed separately, although construction periods could overlap. The footprint of the Norfolk Boreas cable relay station will be the same as described for Norfolk Vanguard in Section 2.2.1.

60. The CIA for Norfolk Boreas cable installation includes the following scenarios:

- Ducts for Norfolk Boreas are pre-installed during Norfolk Vanguard construction with cable pull through required during Norfolk Boreas construction;
  - Norfolk Boreas duct installation will be assessed in the project impact assessments for Norfolk Vanguard;
  - The cable pull through for Norfolk Boreas will be considered as part of the Norfolk Vanguard CIA); or
- Norfolk Boreas ducts and cables are installed at a separate time to Norfolk Vanguard.
  - This scenario will also be considered in the CIA, together with the parameters of Norfolk Vanguard alone.

61. The Norfolk Boreas substation will be located in the substation search zone shown for Norfolk Vanguard but will be constructed separately, although Norfolk Vanguard and Norfolk Boreas construction periods could overlap. The footprint of the Norfolk Boreas substation will be the same as those described for Norfolk Vanguard (Section 2.2.1).

62. As discussed in Section 2.2.1, the extension to the existing Necton 400kV National Grid substation for Norfolk Boreas would be done concurrently with Norfolk Vanguard construction under the Norfolk Vanguard DCO and therefore this is considered as part of the Norfolk Vanguard EIA.

2.2.6.2 Other Projects

63. Construction and commissioning of the substation for the Dudgeon Offshore Wind Farm is complete and operation is due to commence in 2017. The cumulative impacts on human health arising during the operational phase of Dudgeon Offshore Wind Farm will be considered further in the CIA.

64. The cable corridor for the Hornsea Project 3 Offshore Wind Farm makes landfall at Weybourne with grid connection at Norwich Main. Where the Hornsea Project 3 cable corridor crosses the Norfolk Vanguard cable corridor, there may be potential cumulative impacts on human health both during construction and operational phases of the projects and these will be assessed in the CIA.

65. Other developments (such as housing and roads) will be considered in the CIA. The CIA screening will be undertaken in consultation with stakeholders.

3 BASELINE ENVIRONMENT

3.1 Desk Based Review

3.1.1 Available Data

66. Data sources related to human receptors that will be reviewed and updated are presented in the following method statements:

- Marine water and sediment quality;
- Ground conditions and contamination;
- Air quality;
- Onshore noise and vibration;
- Traffic and transport;
- Landscape and visual; and
- Socio-economics (including tourism and recreation).

67. Other data sources include:

- ONS and Neighbourhood statistics regarding Health and Care for local, County, and regional data, particular focussing on general health.
- OS maps combined with ONS data for lower level super output areas to identify detailed community and population data at relevant spatial locations.

3.2 Planned Data Collection

68. No additional survey is planned as it is considered that appropriate data will be obtained as detailed in the relevant chapters listed in Section 3.1.1 above.

4 IMPACT ASSESSMENT METHODOLOGY

4.1 Defining Impact Significance

69. There is no defined or recommended procedure or guidance for assessing the significance of health impacts within the context of an EIA. The methodology used therefore would adopt the standard source-pathway-receptor model approach, and utilise various relevant and appropriate criteria extracted from international guidance and best practice documents for determining impact significance.

70. The significance of the impact is determined through the identification of the magnitude of the impact and the likelihood of the impact occurring. The following sections describe these elements of the approach.

4.1.1 Likelihood

71. The likelihood (or probability) of a health impact will be determined using the definitions presented in Table 4.1, which is derived from risk methodology examples in IFC (2009).

Table 4.1 Example definitions of likelihood of a particular health impact occurring

Likelihood	Description	Probability
High	Very likely	>50%
Medium	Likely	25% to 50%
Low	Possible	5% to 25%
Negligible	Unlikely	<5%

4.1.2 Magnitude

72. The magnitude of each health impact is determined from a consideration of the numbers of receptors (human) within the influenced zone (pathway), the frequency (constant or intermittent) and duration of the source impact, and the actual physical or mental effect that would arise. The magnitude of the impacts will be determined and classified using the description presented in Table 4.2 (based on various guidance (e.g. ICMM (2010) and IFC (2009)), on the basis of expert judgement. Justification will be provided.

73. The health impact assessment will consider the residual impacts as assessed and determined in other relevant topic chapters, to ensure that the focus of any required mitigation will be on remaining potential health risks.

Table 4.2 Example definitions of the magnitude levels for health impacts

Magnitude	Definition
High	Deaths, acute or chronic diseases or mental ill health would arise. Exposure to noise, odour, visual amenity of high intensity and/or long duration and/or over a wide geographical area and/or likely to affect a large number of people (e.g. over 500) and/or vulnerable groups e.g. children/older people. Long-term and/or permanent effects on physical and mental health.
Medium	Exacerbation of existing illness, or temporary symptoms. Exposure to noise, odour, visual amenity of medium term and/or moderate intensity and/or over a relatively localised area and/or of intermittent duration and/or likely to affect a moderate-large number of people e.g. between 100-500 or so and/or vulnerable groups. Medium-term and/or temporary effects which may affect physical and mental health.
Low	Disruption to quality of life or wellbeing. Exposure to noise, odour, visual amenity of low intensity and/or short/intermittent duration and/or over a small area and/or affect a small number of people e.g. less than 100 or so. Short-term and/or temporary effects which are unlikely to affect physical and mental health.
Negligible	Health effects are barely discernible or measurable though complete absence cannot be shown.

4.1.3 Significance

74. Following the identification of likelihood and magnitude of the effect, it is possible to determine the significance of the impact. The matrix presented in Table 4.3 will be used to identify the significance of an impact. However, the matrix (and indeed the definitions of likelihood and magnitude) is a framework to aid understanding of how a judgement has been reached from the narrative of each impact assessment and it is not a prescriptive formulaic method.

75. Each of the technical chapters provides the criteria, including sources and justifications, for quantifying the different levels of impact. Where possible, this is based upon quantitative and accepted criteria (for example, noise assessment guidelines, air quality thresholds, water quality thresholds), together with the use of value judgement and expert interpretation to establish to what extent an impact is significant.

Table 4.3 Impact Significance Matrix

		Magnitude			
		High	Medium	Low	Negligible
Likelihood	High – likely to occur frequently	*Major*	*Major*	*Moderate*	*Negligible*
	Medium – likely to occur infrequently	*Major*	*Moderate*	*Minor*	*Negligible*
	Low – unlikely to occur	*Moderate*	*Minor*	*Minor*	*Negligible*
	Negligible	*Minor*	*Negligible*	*Negligible*	*Negligible*

76. Table 4.4 presents a definition of the impact significance identified through the matrix approach.

Table 4.4 Impact Significance Definitions

Impact Significance	Definition
Major	The impacts could result in permanent physical health effects of a permanent nature or long-term intermittent impacts affecting large numbers across the district.
Moderate	The impact could be notable across the district or number of areas, and result in long-term continuous impacts with direct physical impacts to populations.
Minor	The impact could be locally important though either intermittent or temporary and limited in scale.
Negligible	The impact may be noticeable at very localised temporary levels but with no lingering after effects.

77. Note that for the purposes of the EIA, major and moderate impacts are usually deemed to be significant. In addition, whilst minor impacts are not significant in their own right, it is important to distinguish these from other non-significant impacts as they may contribute to significant impacts cumulatively or through interactions.

78. Embedded mitigation will be referred to and included in the relevant topic chapter assessment of impacts. However, if further mitigation is required additional measures will be identified, and an assessment made of the post-mitigation residual impact.

4.2 Potential Impacts

79. The following potential impacts have been recommended for assessment within the Scoping Opinion (or as specific requests by consultees):

- Health impact from electromagnetic radiation from substations, cable relay stations and cables during operation.
- Health impact resulting from accidental or incidental chemical spills/leaks/releases during transport during construction, operation & maintenance, and decommissioning.
- Health impact as a result of emissions to air (from plant/vehicles and fugitive emissions (e.g. dust)) during construction, operation & maintenance, and decommissioning.
- Health impact as a result of emissions to water (surface and groundwaters) during construction, operation & maintenance, and decommissioning.
- Health impact as a result of emissions to soil (contaminants and ground gas) during construction, operation & maintenance, and decommissioning.
- Health impact as a result of waste disposal and disposal transport during construction, operation & maintenance, and decommissioning.
- Health impact as a result of community anxiety and stress during construction, operation & maintenance, and decommissioning.

4.2.1 Potential Impacts during Construction

4.2.1.1 Impact: Accidental / Incidental Chemical Spills/Leaks/Releases during Transport

80. The accidental spillage or leak of chemicals transport during construction or within the equipment being installed could have potential health risks.

4.2.1.1.1 Approach to assessment

81. Scoping has requested that all known chemicals to be used should be identified (to Chemical Abstract Service (CAS) numbers alongside the names). Whilst assessment to quantify impact of unplanned spills is not possible, the intent would be to highlight the potential risks of the chemicals in use and make recommendations or clarify the required procedures for transporting and managing such chemicals in order to avoid the risk of spillage, or identifying response measures to minimise the risk in the event of spillage or leakage.

4.2.1.2 Impact: Emissions to Air

82. Emissions from plant, machinery and road transport can impact on air quality, particularly in relation to particulates and other chemicals such as nitrogen oxides, ozone, sulphur dioxide, carbon dioxide and carbon monoxide. Similarly dust during construction can result in significant increases in airborne particulates. These all can result in temporary or permanent respiratory health risks in particular to vulnerable receptors (i.e. the young, old, or those with existing related health issues). Elevated dust levels can also represent a significant nuisance impact to all receptors.

4.2.1.2.1 Approach to assessment

83. The approach to the assessment of impacts on air quality is detailed in the Air Quality method statement.

4.2.1.3 Impact: Emissions to Water

84. Emissions of contaminants to water (surface, coastal, and groundwater) could, through these liquid pathways, be ingested by and impact on human health. As there would be limited if any planned chemical discharges this impact crosses over with the accidental spillage or leaks considered earlier.

4.2.1.3.1 Approach to assessment

85. The approach to the assessment of impacts on onshore water quality is detailed in the Onshore Water Resources and Flood Risk method statement.

86. A method statement on Marine Water and Sediment Quality will be available in February 2017 and can be provided on request.

4.2.1.4 Impact: Emissions to Soil

87. Emissions of contaminants to soil could be ingested by, and impact on, human health, for example if they occur in areas used for agriculture or if ground gas is created. As there would be limited if any planned chemical discharges this impact crosses over with the accidental spillage or leaks considered in Section 4.2.1.1.

4.2.1.4.1 Approach to assessment

88. The approach to the assessment of impacts on soil quality is detailed in the Ground Conditions and Contamination method statement.

4.2.1.5 Impact: Waste Disposal and Transport

89. Public Health England requested the consideration of impacts of waste disposal and the transport of the waste to the disposal locations.

4.2.1.5.1 Approach to assessment

90. All waste will be disposed of through licenced waste transport provider to the appropriately licensed disposal sites. As these are licenced, the impacts of receiving and managing the waste have already been considered and form part of the site's operation and management regime. Consequently, there is no further consideration for this element. The transport of the waste will be considered in line with the assessment method in relation to the Accidental / Incidental Chemical Spills/Leaks/Releases during transport as described earlier. However, there will be less certainty over the nature of the waste material, however, similar risk avoidance and mitigation measures will be identified.

4.2.1.6 Impact: Community Anxiety and Stress

91. Public Health England state that large scale industrial projects can result in increased anxiety and stress across receptor communities particularly with respect to the lack of information that is often provided and uncertainties over how they will be affected.

4.2.1.6.1 Approach to assessment

92. There is no established methodology for quantifying community anxiety or stress. Communities that are within a zone of influence / disturbance (i.e. noise, air, transport, water, and visual) that could arise will be identified. Focussed information will be provided to the Norfolk Vanguard communications team regarding the nature of the disturbance activities that could impact on those communities (essentially a summary of each of the particular impacts and their scale alongside the description of activities and programme). The project is committed to regular community consultation and engagement through a range of media and events. These public fora and consultation tools will provide an indication regarding the level of community stress or anxiety associated with the proposed project. Elements of the engagement material will be tailored to seek feedback from the consultees.

4.2.2 Potential Impacts during O&M

4.2.2.1 Impact: Electromagnetic Radiation

93. Concern regarding the long-term exposure to electromagnetic radiation from electricity cables and related infrastructure from this and other wind farm and grid connection projects has been raised as a concern.

4.2.2.1.1 Approach to assessment

94. The project will be designed and locations for electricity cables and infrastructure selected to ensure that the relevant ICNIRP (2009) guidelines will not be exceeded. Confirmation will be made through clarification of the relevant exposure levels for the different cables and thresholds in relation to the presence of receptors and probability.

4.2.2.2 Impact: Community Anxiety and Stress

95. Public Health England state that large scale industrial projects can result in increased anxiety and stress across communities particularly with respect to the lack of information that is often provided and uncertainties over how they will be affected.

4.2.2.2.1 Approach to assessment

96. The approach to the assessment will be as described for the construction phase, though the operational lifetime of the project will be taken into account.

4.2.3 Potential Impacts during Decommissioning

97. No decision has been made regarding the final decommissioning plans for the substation, as it is recognised that industry best practice, rules and legislation change over time.

98. A full EIA will be carried out ahead of any decommissioning works being undertaken. The programme for decommissioning is expected to be similar in duration to the construction phase of 18 months.

4.2.4 Potential Cumulative Impacts

99. Any other project with the potential to result in impacts that may act cumulatively with Norfolk Vanguard will be identified during consultation as part of the EPP and following a review of available information. These projects will then be included in the CIA and therefore are scoped into the assessment.

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

101. Cumulative impacts as a result of the proposed Norfolk Boreas project; the Dudgeon offshore wind farm and the proposed Hornsea Project 3 Offshore Wind Farm (see Section 2.2.6) will be considered as part of the assessment.

102. The following potential cumulative impacts will be assessed:

- Construction phase
  - Emissions to air
  - Emissions to water
  - Emissions to soil
  - Community anxiety and stress
- Operational phase
  - Electromagnetic radiation
  - Community Anxiety and Stress
- Decommissioning phase
  - Emissions to air
  - Emissions to water
  - Emissions to soil
  - Community anxiety and stress

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