Norfolk Vanguard Offshore Wind Farm

Consultation Report

Appendix 9.4 Traffic and Transport Outgoing Documents

Applicant: Norfolk Vanguard Limited
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Photo: Kentish Flats Offshore Wind Farm

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Norfolk Vanguard Offshore Wind Farm

Environmental Impact Assessment

Traffic and Transport Method Statement

Document Reference: PB4476-003-027

Author: Royal HaskoningDHV
Date: 13th January 2017
Client: Vattenfall Wind Power Ltd

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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.

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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 impacts on traffic and transport as a result 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

5. The tables below provide an overview of the planned key milestone dates for Norfolk Vanguard.

1.2.1 DCO Programme

- EIA 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

6. The Evidence Plan Terms of Reference 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
  - Discuss method statements and Project Design Statement - Q1 2017
- 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/
  - To discuss the findings of the PEI (before or after submission) - Q1 2018
- Pre-submission Expert Topic Group and Steering Group meetings - Q1/Q2 2018
  - To discuss updates to the ES following PEI consultation

1.2.3 Survey Programme

7. The earliest time Norfolk Vanguard traffic surveys (Section 3.2.3) will be commissioned would be within February and March 2017. No surveys would be undertaken between Friday 10 February and Tuesday 21 February 2017, as this is the Norfolk school's Spring half term.

2 PROJECT DESCRIPTION

2.1 Site Selection Update

8. 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.

9. 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

10. 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.

11. 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

12. 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

13. 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.

14. 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

15. 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.

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

17. 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.

18. 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.

19. 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.

20. 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

21. 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.

22. 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).

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

2.1.6 Norfolk Boreas

24. 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

25. The following sections set out the indicative worst case scenarios for the onshore project. 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.

26. The assessment for traffic and transport will identify the period when the maximum traffic will be generated for the construction and operation phases. For the construction phase, it is necessary to narrow down the project options (and associated infrastructure parameters) to a worst case scenario (i.e. maximum forecast traffic generation) to ensure that the assessment is proportional and easily understood.

2.2.1 Infrastructure Parameters

27. 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.

28. 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.

29. 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 alone.

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

2.2.1.1 Landfall

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

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

32. 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.

2.2.1.2 Cable Relay Station

33. A cable relay station is required for an HVAC electrical solution only and would not be included in a HVDC connection solution.

34. There are currently seven cable relay station search zones being considered and a final location will be defined following landfall site selection for the EIA and DCO application.

2.2.1.3 Cable Route

35. 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.

36. 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.
- The access tracks will be formed of protective matting, temporary metal road or permeable gravel aggregate dependant on the ground conditions.
- Joint pits with will be required every 800m along the cable route (i.e. approximately 75 in total) for installation of cables in the pre-installed cable ducts.
- Mobilisation areas will also be required for servicing the cable installation.

2.2.1.4 Onshore Substation

37. 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:

- Construction area approximately 400m x 400m.
- Substation footprint (within construction area) approximately 250m x 300m.

38. 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. Therefore the approach to baseline characterisation will initially consider

the search zone and will then be refined once a final substation location is selected. The PEIR and ES will present a single substation location.

2.2.1.5 National Grid substation extension

39. An extension to the existing Necton 400kV National Grid substation will be required regardless of whether the HVAC or HVDC electrical solution is selected. The National Grid substation extension will be included within the EIA for the Norfolk Vanguard DCO application.

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

2.2.1.6 Vehicle numbers

41. In order to understand the worst case scenario to be assessed for traffic and transport, numbers of HGVs and vehicles required for construction personnel have been calculated for each of the project components outlined above.

42. **Table** 2.1 sets out the project's infrastructure parameters and initial forecast traffic generation. The figures have been derived from a first draft material and workforce schedule supplied by the appointed project engineers. The information represents an initial worst case quantum on which to narrow down assessment scenarios, noting work is ongoing to finalise the data and it is anticipated there will be some refinement prior to assessment.

Table 2.1: Onshore Electrical Infrastructure Parameters and Initial Vehicle Generation

Onshore Electrical Infrastructure	Total two-way vehicle movements		Notes
	HGVs	Construction personnel[2]	
Landfall Zones			
Norfolk Vanguard (NV) HVDC	646	2,000	20 construction personnel per day - 10 week[1] programme for drilling.
NV HVAC	646	6,000	20 construction personnel per day - 30 week[1] programmes for drilling
NV & Norfolk Boreas (NB) HVDC	n/a	n/a	Norfolk Boreas Landfall Zone not assessed in project worst case scenario and is considered within the cumulative assessment
NV & NB HVAC			
Cable Relay Station Options*			
NV HVAC	1,689	14,400	20 construction personnel per day - 18 month[1] programme for construction
NV & NB HVAC	n/a	n/a	Norfolk Boreas cable relay station not assessed in project worst case scenario and is considered within the cumulative assessment
Onshore Cable Route			
NV HVDC	64,499	249,600	260 construction personnel per day (20 construction personnel per 13 work fronts (7 Primary Mobilisation Areas and 5 Secondary Mobilisation Areas)) - 24 month[1] programme for construction
NV HVAC	104,275	249,600	
NV & NB HVDC	82,911	249,600	
NV & NB HVAC	160,363	249,600	
Substation Zone			
NV HVDC	7,201	36,000	50 construction personnel per day - 18 month[1] programme for construction
NV HVAC	7,201	36,000	
NV & NB HVDC	n/a	n/a	Norfolk Boreas substation not assessed in project worst case scenario and is considered within the cumulative assessment
NV & NB HVAC			
Existing National Grid Substation Extension			
NV HVDC	2,488	36,000	50 construction personnel per day - 18 month[1] programme for construction
NV HVAC			
NV & NB HVDC	n/a	n/a	Norfolk Boreas National Grid substation extension not assessed in project worst case scenario and is considered within the cumulative assessment
NV & NB HVAC			
NV & NB HVDC	**172,388**	**342,000**	

Key

	Worst case vehicle generation per Onshore Electrical Infrastructure (two-way movements)

*	**Required for HVAC cable only**
[1]	**Assumes a 5 day working week**
[2]	**Personnel movements with no reduction for car share or mode choice (mini-bus, public transport etc.)**

43. From

44. **Table** 2.1 it can be observed that the maximum traffic generators would be the following combination:

- Norfolk Vanguard HVAC landfall;
- Norfolk Vanguard HVAC cable relay station;
- Norfolk Vanguard and Boreas HVAC onshore cable route;
- Norfolk Vanguard HVAC substation; and
- Existing National Grid Substation Extension.

45. Adopting the 'Rochdale Envelope' principle it is proposed to assess the traffic impact of this parameter combination, safe in the knowledge that this represents the maximum traffic generation.

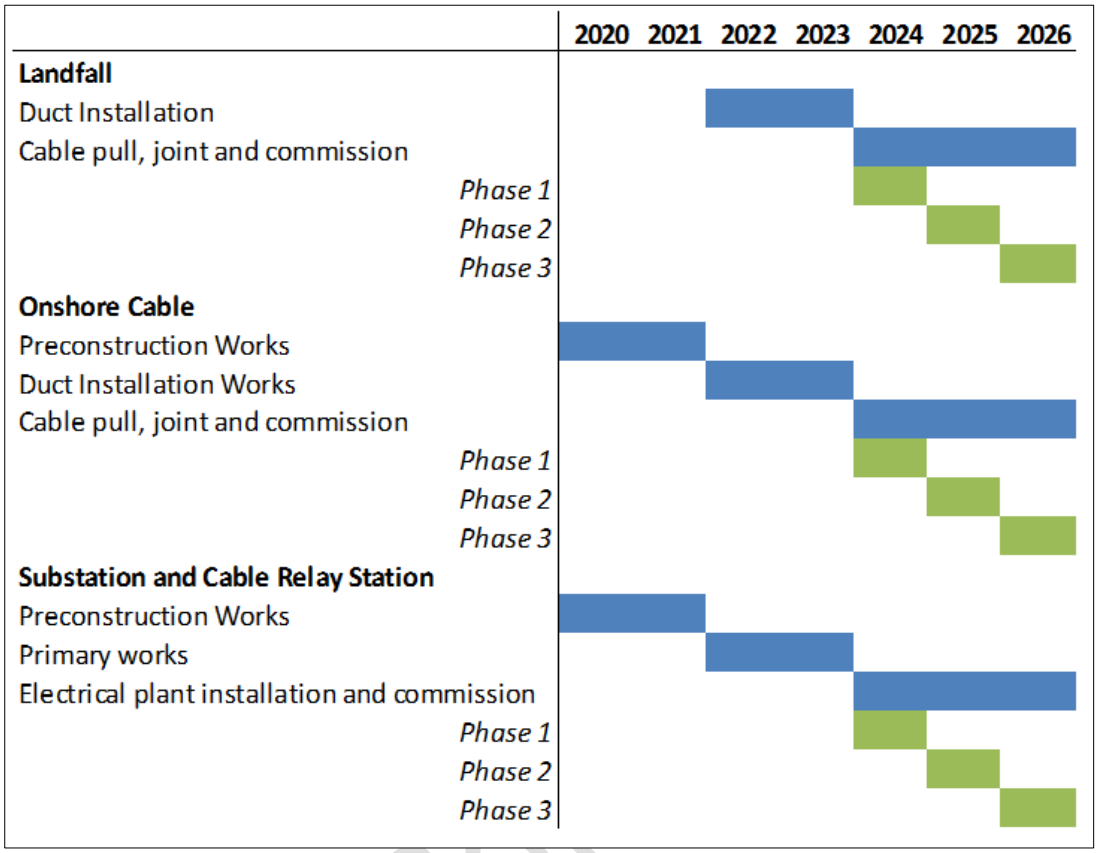
46. To ensure that minor omissions and uncertainties in design can be accommodated within future assessed traffic flows, an appropriate level of contingency would be applied to all material quantities.

2.2.2 Construction Programme

47. Having identified the worst case construction scenario it is necessary to identify the construction period when the maximum intensity of activities will occur and therefore the maximum demand for workforce and material movement.

48. **Plate 2.1** details the project construction programme. It can be noted a sequential approach has been adopted for construction stages with the duct installation/primary works period representing the maximum construction intensity period in terms of traffic.

Plate 2.1: Project Construction Programme



49. Having identified the maximum construction intensity period the assessment will disaggregate the demand for materials and workforce by month/day to identify temporal periods when traffic demand will be highest. In addition, demand during highway network peak hours will be established to assess if there are any capacity impacts on the highway network (further details are provided in Construction Methodology).

2.2.3 Construction Methodology

50. The main cable installation method will be through the use of open cut trenching with High Density Polyethylene (HDPE) ducts installed backfilled and cables then pulled though the pre-laid ducts.

51. Where the cable route crosses transport routes, waterways or underground services the standard open cut trenching installation technique may not be suitable and alternative trenchless methods may be utilised.

52. A running track will provide safe access for construction vehicles along the cable corridor, from mobilisation areas to cable installation sites. The running track could be up to 6m wide and extend the full length of the cable route.

53. To enable construction, primary mobilisation areas will be required to store equipment and provide welfare facilities. These mobilisation areas will be located adjacent to the onshore cable route corridor, accessible from the local highways network suitable for the delivery of cable drums and other heavy and oversized equipment. Each mobilisation area will serve an installation gang and will be evenly distributed along the route length where possible.

54. Secondary mobilisation areas are required to serve construction crews working remotely from the primary mobilisation areas to allow close proximity to storage and welfare facilities during installation.

55. There will be a total of seven primary mobilisation areas and five secondary mobilisation areas serving the onshore cable corridor.

56. The total onshore cable corridor length will be split equally into 13 onshore cable corridor sections known as workfronts. These workfronts will allow efficient distribution of plant, materials and personnel and will be served by the 12 mobilisation areas.

57. At this stage it is not known how many of the workfronts will be active at one time so for the purpose of deriving a theoretical worst (traffic demand) case scenario it is assumed all workfronts will be active at the same time. In turn, the substation site and cable relay site are also assumed to be at peak activity at the same time as the onshore cable corridor workfronts to create a theoretical worst case.

58. Delivery routes to each of the mobilisation areas will be established in consultation with the highway authorities. This will enable traffic demand to be assigned to the highway network within the defined study area. The construction strategy will be to utilise the Strategic/Principal network as far as possible to accommodate the project traffic, diverting onto the local road network for short distances to access the mobilisation areas and substation/cable relay station sites as required.

59. If further work identifies a lower number of active workfronts is optimal, a reduction factor will be applied to the assumptions of traffic along the Strategic/Principal road network to reflect a lower intensity project traffic demand. For example, if it was established that seven workfronts would be active at the same time, a multiple of 7/13 (0.54) would be applied to the project traffic flows on the Strategic /Principal road network. This reduction factor would not be applied to the local road network as traffic will be assigned to discrete workfronts and is less influenced by multiple workfront activity.

60. The supply chain is not identified at this stage. It is proposed to agree the likely distribution of deliveries and workforce with the highway authorities once further

information of the supply chain is understood. In terms of workforce it is anticipated that there will be a mixture of local and 'in-migrant labour'. Again, the likely origins of the workforce will be informed by supply chain analysis and this in turn will inform the assignment of workforce traffic to the network. A realistic 'worker to vehicle' ratio will be agreed with highway authorities informed by further work on appropriate travel plan measures.

61. It is anticipated that the workforce will adopt a two shift pattern operating on a 5 day working week as follows:

- Early shift arrives 6:30-7am and leaves 2:30-3pm; and
- Late shift arrives 11-11:30 and leaves 7-7:30.

62. As a sensitivity test (to allow for seasonal/project site variations) an element of the workforce demand will be assumed to occur during the network peak hours, the proportion of which will be agreed with the highway authorities.

63. To derive HGV delivery origins it is proposed to identify the likely major suppliers in close proximity to the study area (e.g. aggregate companies and ports). It is anticipated a 'gravity model' approach (with distance deterrence) will be appropriate to identify and agree traffic assignments to the highway network. A proportion of HGV demand will be distributed to the network peak hours.

2.2.4 Operation and Maintenance (O&M) Strategy

64. The operations and maintenance strategies for each aspect of the proposed project would result in limited, periodic traffic demand (see Section 4.2.2). The traffic demand will be derived to enable the necessary screening for traffic, noise and air quality effects.

65. It is anticipated the level of daily traffic demand will be indiscernible from day to day traffic fluctuations on the local highway network and therefore unlikely to have a significant impact on traffic receptors.

2.2.5 Decommissioning

66. 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 transition 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.

67. For the purposes of the EIA, it is not proposed to undertake a full assessment of decommissioning, rather the likely process for decommissioning will be outlined as per the text above and shown to be within any worst case defined for construction.

2.2.6 Cumulative Impact Scenarios

68. A select number of major projects has been identified as having the potential to change the future baseline highway conditions or act cumulatively to increase assessed project impacts.

69. **Table 2.2** details the cumulative projects selected for further investigation for inclusion in the EIA assessment. Consultation with Norfolk County Council and other stakeholders will be required to ensure this list is fully comprehensive.

Table 2.2: Cumulative Projects for Worst Case Scenario Assessment

Project name	Developer	Site location	Development time period
Norwich Northern Distributor Road	Norfolk County Council	North of Norwich	2015-2018
Hornsea Project Three Offshore Windfarm	Dong Energy Limited	Trimmingham, North of Cromer Landfall site	2021 - 2026
A47 Improvement Corridor Programme	Highways England	A47 North Tuddenham to Easton, A47 Blofield to North Burlingham.	Starts 2019/2020 with projected finish year of 2022.
		A47/A11 Junction; Thickthorn Junction Development.	
		A47/A12 Junction enhancements to the following junctions and roundabouts: Vauxhall, Gapton, Harfreys, Bridge Road and James Paget Hospital.	
Norfolk Boreas	Vattenfall Wind Power Ltd	Similar locations to Norfolk Vanguard onshore electrical infrastructure.	TBD
Existing National Grid Substation Extension (Norfolk Boreas)	National Grid	Necton	TBD

3 BASELINE ENVIRONMENT

3.1 Desk Based Review

70. A review of the baseline conditions will be undertaken; including the consideration of the following desk based information sources:

- Department for Transport – http://www.dft.gov.uk/traffic-counts;
- Norfolk County Council – http://www.norfolk.gov.uk
- Sustrans – http://www.sustrans.org.uk
- Crashmap - http://www.crashmap.co.uk/search

3.1.1 Initial Study Area

71. The initial study area has been informed by determining the most probable routes for traffic, for both the movement of materials and employees, during both construction and operational phases of Norfolk Vanguard.

72. The initial study area has been determined by identifying the routes on the 'A' class road network most likely to serve the trip ends at the landfall zones, cable relay station options, onshore cable route, primary and secondary mobilisation areas and the substation zones.

73. The initial study area is illustrated in **Figure 1** and would potentially include the following roads as detailed in **Table 3.1, Table 3.2** and **Table 3.3.**

3.1.2 Available Data

74. The initial study area has been disaggregated into three road types, 'A' roads, 'B' roads and minor roads.

75. **Table 3.1, Table 3.2 and Table 3.3** detail the roads within the defined study area to be assessed and any 'open source' data that are available

Table 3.1: Main Routes ('A' Roads) to Onshore Destinations

Potential Quantity of Links	Road	Source	Total Annual Average Daily Traffic Range
7	A47	DfT traffic counts	15,380 – 42,551
2	A12	DfT traffic counts	23,061 – 33,788
5	A140	DfT traffic counts	11,725 – 29,064
1	A146	DfT traffic counts	11,947
3	A148	DfT traffic counts	9297 – 11,404
8	A149	DfT traffic counts	6,276 – 34,323
1	A1042	DfT traffic counts	26,996
2	A1065	DfT traffic counts	4,866 – 6,754
5	A1067	Dft traffic counts	7,698 – 16,067
1	A1074	DfT traffic counts	21,564
3	A1151	DfT traffic counts	9,148 – 15,610
3	North Distributor Road	DCO Planning Application	TBD

Table 3.2: Potential Routes ('B' Roads) to Onshore Destinations

Potential quantity of Links	Road	Source	Total Annual Average Daily Traffic Range
1	B1110 – Holt Road	Potential survey required	TBD
6	B1145	Potential survey required	TBD
2	B1146	Potential survey required	TBD
2	B1147	Potential survey required	TBD
3	B1149	Potential survey required	TBD
2	B1159	Potential survey required	TBD
1	B1436	Potential survey required	TBD

Table 3.3: Potential Minor Routes to Onshore Destinations

Potential Quantity of Links	Road	Source	Total Annual Average Daily Traffic Range
1	Cromer Road - Ingworth	Potential survey required	TBD
1	Elsing Lane	Potential survey required	TBD
1	Mill Common Lane	Potential survey required	TBD
1	North Walsham Road – Edingthorpe Green	Potential survey required	TBD
1	Northgate – from junction with B1146 (Holt Road)	Potential survey required	TBD
1	Unnamed road adjacent to Glebe Crescent	Potential survey required	TBD

3.2 Planned Data Collection

3.2.1 Existing Traffic Data

76. Where existing traffic data do not exist, suitable traffic flow data will be obtained from the following sources in order of preference;

    a. Norfolk County Council (NCC); and

    b. New traffic counts commissioned by VWPL.

77. A review of the type of traffic count data held by NCC will be undertaken and the most suitable data will be selected to be used for further assessment.

3.2.2 Personal Injury Collision Data

78. A review of the collision rates provided by Department for Transport (2015) shows that the rate of people killed or seriously injured per billion vehicles miles in Norfolk is 73. This rate is higher than the average for the East of England (67) but lower than for England as a whole (80).

79. The NCC Local Transport Plan also raises concerns with regard to road safety, noting that:

    "Despite some real achievements, road safety continues to be a major public concern and is reflected in our conversations with residents."

80. Norfolk County Council considers a 'collision cluster' as five personal injury collisions occurring within a 3 year period in a 50m radius for built up areas and a 100m radius in non-built up areas.

81. It is planned to utilise http://www.crashmap.co.uk/ open source data to conduct a high level search within the proposed study area for collision clusters as identified by Norfolk County Council.

82. The high level search will involve a three year time period between 1st January 2014 to 31st December 2016.

83. Once collision cluster locations have been identified, more detailed historic personal injury collision data will be obtained from Norfolk County Council.

3.2.3 Further Data Collection

84. In addition to the data sources detailed above, a desk based assessment supported by site visits would be undertaken to provide information with regard to the existing baseline highway network environment and to identify sensitive receptors.

85. As a minimum, any new traffic counts commissioned by VWPL will include 7 day classified Automatic Traffic Counts (ATC) and will be undertaken during periods of normal traffic flow conditions on the transport network (e.g. non-school holiday periods, typical weather conditions).

4 IMPACT ASSESSMENT METHODOLOGY

4.1 Defining Impact Significance

86. The principal guidelines for the assessment of the environmental impacts of road traffic associated with new developments are the 'Guidelines for the Environmental Assessment of Road traffic' (GEART) published by the Institute of Environmental Assessment in January 1993. The guidance provides a framework for the assessment of traffic-borne environmental impacts such as pedestrian severance and amenity, driver delay, accidents and safety; and noise, vibration and air quality.

87. GEART suggests the following rules to define the extent and scale of the assessment required:

    a. Rule 1: Include highway links where traffic flows are predicted to increase by more than 30% (or where the number of HGVs is predicted to increase by more than 30%); and

    b. Rule 2: Include any other specifically sensitive areas where traffic flows (or HGV component) are predicted to increase by 10% or more.

88. The above criteria applied to the project traffic assignment in the study area will dictate the scale of the impact assessment.

89. Traffic demand will be derived by way of a 'first principles' approach whereby traffic generation is calculated from the understanding of likely material demand and resourcing requirements. These numbers will be informed by industry experts, drawing on their experience of delivering and operating offshore wind farm projects.

90. The project's traffic demand will be assigned to the highway links within the study area and the increase in traffic flow to baseline conditions determined. This will facilitate an assessment of the magnitude of effect as set out in **Table 4.1**:.

4.1.1 Magnitude

91. **Table 4.1**: Details the assessment framework for magnitude thresholds adapted from GEART. These thresholds are guidance only and provide a starting point by which transport data will inform a local analysis of the impact magnitude.

Table 4.1: Example definitions of the magnitude levels for a generic receptor

Magnitude	Definition			
Effects	Very Low	Low	Medium	High
Severance	Changes in total traffic flows of less than 30%	Changes in total traffic flows of 30 to 60%	Changes in total traffic flows of 60 to 90%	Changes in total traffic flows of over 90%
Pedestrian amenity	Change in traffic flows (or HGV component) less than 100%	Greater than 100% increase in traffic (or HGV component) and a review based upon the quantum of vehicles, vehicle speed and pedestrian footfall.		
Highway Safety	Informed by a review of existing collisions patterns and trends based upon the existing personal injury collision records and the forecast increase in traffic			
Driver Delay	Informed by projected traffic increases through sensitive junctions within the study area.			

4.1.2 Link Based Sensitive Receptors

92. The sensitivity of a road can be defined by the type of user groups who may use it. A sensitive area may be a village environment or where pedestrians or cyclist activity may be high, for example in the vicinity of a school. **Table 4.2** provides broad definitions of the different sensitivity levels.

Table 4.2: Example Definitions of the Different Sensitivity Levels for a Highway Link

Sensitivity	Definition
Low	Few sensitive receptors and / or highway environment can accommodate changes in volumes of traffic.
Medium	A low concentration of sensitive receptors (e.g. residential dwellings, pedestrian desire lines, etc.) and limited separation from traffic provided by the highway environment.
High *	High concentrations of sensitive receptors (e.g. hospitals, schools, areas with high tourist footfall etc.) and limited separation provided by the highway environment.
Negligible	Links that fall below GEART Rule 1 and 2 screening thresholds.
*High sensitivity links are considered to be 'specifically sensitive areas' for the purposes of GEART Rule 2.	

93. A desktop exercise augmented by site visits would be undertaken to identify the sensitive receptors in the study area utilising the definitions outlined in **Table 4.2.**

4.1.3 Abnormal Indivisible Loads (AILs)

94. The importing of large Abnormal Indivisible Loads (AILs) may lead to delays on the highway network. The quantum of AIL deliveries has not been established at this stage. When components have been established an AIL routing study will be undertaken to inform the management measures required.

4.1.4 Cumulative Impacts

95. To take account of sub-regional growth in housing and employment, light vehicle flows will be factored to the future year baseline traffic demand using the Department for Transport Trip End Model Presentation Programme (TEMPro) Version 7.0 with data set 7.0 for Norfolk geographical areas and HGV's would be factored up with National Trip End Model (NTEM) factors.

96. In additional to TEMPro growth, it will be necessary to quantify and assign traffic demand from identified significant committed developments within the study area (heading 2.2.6. refers)

4.1.5 Other Impacts

97. Traffic-bourne noise and vibration effects and air quality effects will be informed by the traffic data outlined within the Traffic and Transport assessment.

98. Air quality will be assessed in accordance with the Institute of Air Quality Management guidance 'Land-Use Planning & Development Control: Planning for Air Quality' May 2015 (V1.1) and will be assessed based on the following criteria;

- More than 100 vehicles within or adjacent to an Air Quality Management Area (AQMA), or more than 500 elsewhere; or,
- More than 25 HDVs (>3.5 tonnes) within or adjacent to an AQMA or more than 100 elsewhere.

99. Noise quality will follow the methodology contained in the Design Manual for Roads and Bridges DMRB, Volume 11, Section 3, Chapter 3 and will be assessed based on the following criteria

- Road links with a predicted increase in traffic volume of 25%
- Road links with a predicted decrease in traffic volume of 20%

4.1.6 Significance

100. **Table 4.3** sets out the assessment matrix which combines the initial impact assessment derived from the assessment framework presented in **Table 4.1** with the sensitive receptor value to determine the magnitude of impact.

Table 4.3: Impact Significance Matrix

		Magnitude			
		High	Medium	Low	Negligible
Sensitivity	High	*Major*	*Major*	*Moderate*	*Minor*
	Medium	*Major*	*Moderate*	*Minor*	*Minor*
	Low	*Moderate*	*Minor*	*Minor*	*Negligible*
	Negligible	*Minor*	*Negligible*	*Negligible*	*Negligible*

101. **Table 4.4** details the impact significance definitions for reference.

Table 4.4: Impact Significance Definitions

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

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

4.1.7 Mitigation

103. The environmental assessment will determine the requirement for the implementation of mitigation measures to reduce the significance of the impact to transport receptors.

104. The following 'embedded or designed in' mitigation informs the traffic assignments included in the environmental assessment:

- Suitable access points and identification of optimum routes for construction traffic to use (minimising the impact on sensitive receptors);
- Reducing points of access through the adoption of a running track;
- Consolidating HGV and employee movements at mobilisation areas to reduce vehicle movements along more sensitive local routes; and
- Committing to the development of a Construction Traffic Management Plan (CTMP) to manage employee and HGV movements to avoid sensitive times, use of only defined routes, compliance with maximum HGV 'caps' and strategies to continually monitor and enforce.

4.2 Potential Impacts

4.2.1 Potential Impacts during Construction

105. The construction phase will result in a requirement for the import of materials and plant to the onshore cable route, substation and cable relay station. At this stage, initial material quantities and workforce numbers have been provided by the appointed project engineers and it is envisaged that daily traffic demand is likely to be significant with a large component being HGV deliveries. The requirement for abnormal loads will also be considered.

106. A review of the baseline situation outlined in **Section 3** indicates potential impacts resulting from additional traffic fall in to the following two broad categories:

- Increasing traffic congestion impacting upon commuters and seasonal tourist traffic with associated effects including:
  - Driver delay;
  - Severance;
  - Impacts on pedestrians, cycle amenity (E.g. PRoW and cycle networks: and
  - Impacts on air quality, noise and vibration (considered separately)

- Road safety
  - Construction traffic impacting sites with a history of existing road safety issues;
  - Introducing new risks with the formation of new construction accesses; and
  - Suitability of delivery routes for HGVs, plants and abnormal loads.

107. Further detail on these potential impacts is set out below.

4.2.1.1 Impact: Driver Delay

108. GEART recommends the use of proprietary software packages to model junction delay and therefore estimate increased vehicle delays. However, it is noted that

vehicle delays are only likely to be significant when the surrounding highway network is at, or close to, capacity.

109. During consultation with the highway authorities, sensitive junctions will be identified that require an assessment of potential delays for drivers during peak hours.

110. The assessment will seek to disaggregate the peak hour traffic movements on to these junctions to facilitate an assessment of the potential significance of any driver delays.

4.2.1.2 Impact: Severance

111. Severance is the perceived division that can occur within a community when it becomes separated by a major traffic artery. The term is used to describe a complex series of factors that separate people from places and other people. Severance may result from the difficulty of crossing a heavily trafficked road or a physical barrier created by the road itself. It can also relate to quite minor traffic flows if they impede pedestrian access to essential facilities. Severance effects could equally be applied to residents, motorists, cyclists or pedestrians.

112. GEART suggests that changes in total traffic flow of 30%, 60% and 90% are considered to be slight, moderate and substantial respectively. The GEART criteria will be used in the impact assessment.

4.2.1.3 Impact: Pedestrian/Cycle Amenity

113. Pedestrian amenity is broadly defined as the relative pleasantness of a journey, and is considered to be affected by traffic flow, traffic composition and pavement width and separation from traffic. This definition also includes pedestrian fear and intimidation, and can be considered to be a much broader category including consideration of the exposure to noise and air pollution, and the overall relationship between pedestrians and traffic.

114. GEART suggests that a threshold of a doubling of total traffic flow or the HGV component may lead to a negative impact upon pedestrian amenity. The GEART criteria will be used in the impact assessment.

4.2.1.4 Impact: Road Safety

115. The salient GEART guidance on road safety is a follows:

"Where a development is expected to produce a change in the character of traffic (e.g. HGV movements on rural roads), then data on existing accident levels may not be sufficient. Professional judgement will be needed to assess the implications of

local circumstances, or factors which may elevate or lessen the risk of accidents, e.g. junction conflicts."

116. An examination of the existing collisions occurring on the roads contained within the initial study area will be undertaken to identify any areas of the highway with concentrations of collisions. These areas are considered to be sensitive to changes in traffic flows (sensitive receptors) and therefore a more detailed analysis of significance will be undertaken by a qualified Road Safety Auditor.

4.2.1.4.1 Primary Base Port

117. In addition to considering the onshore impacts there is also the potential for impacts associated with employee and HGVs movements for the offshore construction phase via the primary base port.

118. At this stage no final decision has been made upon which port will be used, however it is noted that this may be a facility on the Norfolk coast. The traffic impacts of the primary base port will be assessed when the actual site has been announced in context with any port operating permissions.

4.2.2 Potential Impacts during O&M

119. During the operational phase, traffic movements would be limited to those generated by the daily operation and periodic maintenance at the cable relay station and onshore substation and at link boxes/test pits along the onshore cable route.

120. Along the onshore cable route, periodic access to installed link boxes and test pits may be required for inspection, estimated to be annually. These test pits will be accessible from ground level and will be located close to existing access routes where possible. Access to the cable easement will be required to conduct emergency repairs if necessary.

121. The cable relay station and onshore substation will not be manned; however access will be required periodically for routine maintenance activities, estimated at an average of one visit per week for each of the cable relay station and substation.

122. Considering the discussed activities above, no significant traffic impacts are anticipated during the operational phase.

4.2.3 Potential Impacts during Decommissioning

123. With regard to heading 2.2.5, it is anticipated that the decommissioning impacts will be similar or less in nature to those of construction.

4.2.4 Potential Cumulative Impacts

124. The projects identified under heading 2.2.6 (Cumulative impact scenarios) have the potential to increase the project's impacts.

125. In order to quantify the potential impact from these projects their respective Transport assessments (TA) or Environmental Statements (ES) will be reviewed to understand their proposed traffic demand and associated implementation dates. This traffic demand will then be assigned to the highway network as appropriate to facilitate an assessment of cumulative impacts.

5 REFERENCES

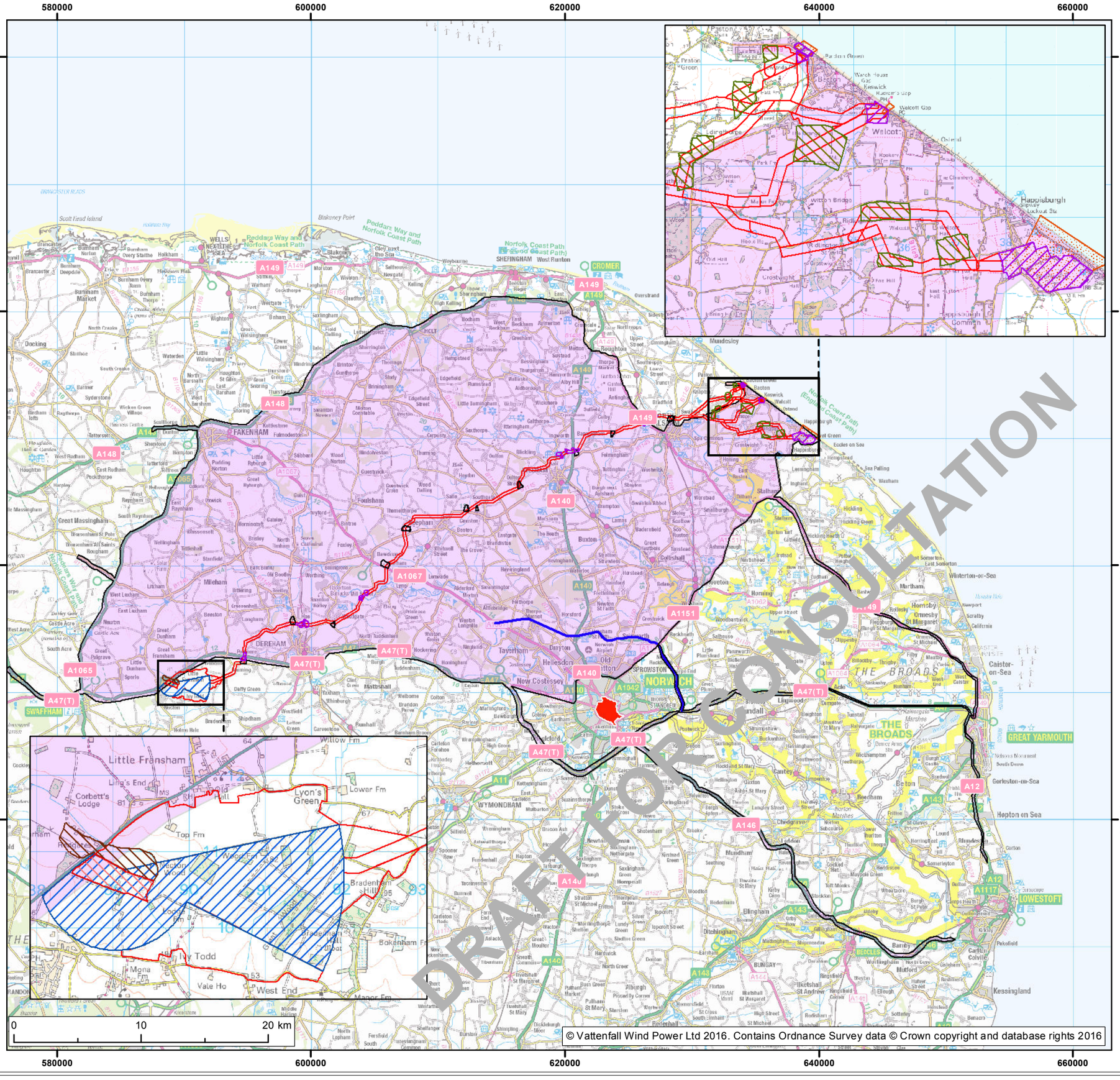
Department for Transport (DfT) (2011); Design Manual for Roads and Bridges, Volume 11, Section 3, Part 7: Noise and Vibration. London (DfT)

IAQM & Environmental Protection UK (EPUK) (2015) Land-use Planning & Development Control: Planning for Air Quality

Institute of Environmental Assessment (IEA) (1993). Guidelines for the Environmental Assessment of Road Traffic, Horncastle: (IEA).
Royal HaskoningDHV (2016) Norfolk Vanguard Offshore Wind Farm: Environmental Impact Assessment Scoping Report. Document reference PB4476-102-001. October 2016.

Royal HaskoningDHV (2016). Norfolk Vanguard Offshore Wind Farm Environmental Impact Assessment Scoping Report

Royal HaskoningDHV (2017) Norfolk Vanguard Offshore Wind Farm: Evidence Plan Terms of Reference. Document Reference PB4476.001.004. Unpublished – Live Document



Legend:

Norfolk Vanguard Onshore Works

- Zone 1 - National Grid Substation Extension
- Zone 2 - Overhead Line Modification
- Zone 3 - Substation Search Zone
- Zone 4 - Onshore Cable Corridor
- Zone 5 - HDD Areas
- Zone 6 - Mobilisation Areas
- Zone 7 - Cable Relay Station Search Zones
- Zone 8 - Landfall HDD Corridors
- Traffic and Transport Study Area
- Norwich Air Quality Management Area
- Northern Distributor Road (Due for completion early 2018)

Project:	Report:
Norfolk Vanguard	Traffic and Transport Method Statement

Title: Traffic and Transport Study Area

Figure: 1 | Drawing No: PB4476-003-MS-003

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
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