

Norfolk Vanguard Offshore Wind Farm Information from the Norfolk Boreas Examination

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



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Glossary of Acronyms

DAS	Design and Access Statement
dDCO	Draft Development Consent Order
ES	Environmental Statement
HVDC	High Voltage Direct Current
LVIA	Landscape and Visual Impact Assessment
OCoCP	Outline Code of Construction Practice
OLEMS	Outline Landscape and Ecological Management Strategy
SuDS	Sustainable Urban Drainage Systems

1 INTRODUCTION

1. This document has been created in response to the Secretary of State's requests for additional information published on 5th July 2021 which stated:

"...the Secretary of State requests that the Applicant should provide any additional information on the cumulative impacts of the proposed Norfolk Vanguard project that will assist him in considering the impacts of the proposals to locate the Norfolk Vanguard substation(s) at Necton. The additional information should include but not necessarily be limited to assessments of landscape and visual effects, construction and operational noise effects, the impacts of artificial lighting at the substation sites and any potential water run-off from the substations. That information might include any material which was produced as part of the application, or during the examination, of the Norfolk Boreas project which the Applicant considers may be relevant to the Secretary of State's consideration of the cumulative effects of the substation infrastructure (including any proposed mitigation)."

2. This document provides a summary of the information provided during the Norfolk Boreas examination for topic areas which are relevant to potential cumulative impacts at the onshore project substation. The Norfolk Boreas Examining Authority asked interested parties to provide any comment on the cumulative assessments offshore and onshore in their Written Questions Q4.0.2. As detailed in the Applicant's comments on responses to the Examining Authority's Written Questions [NB REP3-003], no comments on the onshore cumulative assessment were raised.
3. Each section below contains reference to the documents submitted into the Norfolk Boreas examination which are relevant to the Norfolk Vanguard re-determination; for which the Norfolk Boreas examination library reference is given in square brackets with the prefix NB. The Norfolk Boreas Examination Library can be accessed using the following [Link](#). The sections also contain references to documents from the Norfolk Vanguard Examination Library which are given in square brackets with the prefix NV and can be accessed using the following [Link](#).
4. A full list of all the documents from the Norfolk Boreas development consent examination process and referred to by the Applicant in response to the Secretary of State's request for additional information, with links to the documents in the Norfolk Boreas examination library, is presented in document 'Norfolk Boreas Document Index'(ExA.AS-4.D11.V1) submitted by the Applicant on the 2 August.

2 INFORMATION FROM THE NORFOLK BOREAS EXAMINATION

2.1 Landscape and Visual Effects

5. During the Norfolk Boreas examination, Norfolk Boreas Limited responded to concerns raised and provided further clarification on a number of subject areas relating to potential landscape and visual effects at the onshore project substation, including proposed mitigation, viewpoints, accuracy of the visualisations and substation design parameters. This was set out in the following documents:
 - Applicant's response to Examining Authority's Written Questions – Q9.4.3 [NB REP2-021];
 - Written Summary of the Applicant's Oral Case at Issue Specific Hearing 3 – Item 4 b) – [NB REP4-013];
 - Applicant's responses to the Examining Authority's Further Written Questions – Q2.9.1.2, Q2.5.2.2 and Q2.9.6.4 [NB REP5-045];
 - Applicant's comments on Deadline 4 submissions and additional submissions – section 1.8 [NB REP5-051];
 - Applicant's comments on Deadline 5 submissions section 1.8 [NB REP6-013];
 - Applicant's comments on Deadline 7 submissions section 1.20 [NB REP8-014];
 - Applicant's response to Examining Authority's Fourth Written Questions – Q4.9.6.7 and Q4.9.6.4 [NB REP10-034];
 - Applicant's response to Open Floor Hearing 3 – Items 2, 13, 14 [NB REP13-015].

6. A summary of the information provided relating to each of the above subject areas is presented in the sections below, which relate to both Norfolk Boreas alone and together with Norfolk Vanguard.

2.1.1 Proposed mitigation

7. In response to concerns raised during the Open Floor Hearing , as detailed in [NB REP13-015], Norfolk Boreas Limited confirmed that the landscape mitigation measures, embedded in the indicative plans for the onshore project substation [NB APP-492, APP-495] have been developed for the proposed High Voltage Direct Current (HVDC) infrastructure and are considered in the Landscape and Visual Impact Assessment (LVIA) to be sufficient to mitigate potential landscape and visual impacts experienced by non-residential receptors within very localised extents in proximity to the onshore project substation , albeit in some instances over a time frame of between 10 and 25 years. Under Norfolk Boreas Scenario 1 , mitigation planting associated with the Norfolk Vanguard project would already be implemented as part of this project and the mitigation planting associated with the Norfolk Boreas project would be added to this, in order to increase the overall extent

of mitigation planting relative to the increase in development. The proposed combined mitigation planting presented in the Norfolk Boreas application (ES Figure 29.9 [NB APP-492]) is consistent with the combined mitigation planting included in the Norfolk Vanguard application (Design and Access Statement Figure 4 [NV APP-027, updated Version 2 submitted 2 August]).

8. During the Norfolk Boreas examination stakeholders raised queries regarding the potential to lower the finished floor level of the onshore project substation and/or the use of bunds. As detailed in [NB REP2-021] and [NB REP5-045] the options of lowering the finished floor level and large scale bunding were considered and discounted as explained below.
9. In order to ensure a design is responsive to the unique characteristics and attributes of a local landscape, the best approach is generally to work with the landform, in order to minimise the magnitude of change. While the landform is gently undulating, it falls more steeply towards the south-east. In order to cut a level platform of 250m x 300m at a lower ground level would require a huge amount of earthworks and would fundamentally alter the character of the local landscape. Similarly, the introduction of large scale bunds would appear out of character in this traditional, rural landscape and at variance with the gently undulating landform.
10. As stated in [NB REP10-034] during the development of the landscape management scheme for the onshore project substations, the use of bunding will be given further consideration as part of the overall detailed design. There will also be consideration regarding opportunities to extend the currently proposed new areas of woodland planting, potentially into parts of those areas currently identified for species rich grassland and providing these do not compromise improvements to the provision for bio-diversity.
11. Concerns were also raised during the Norfolk Boreas examination on the proposed mitigation planting species. As stated in [NB REP14-020] the Outline Landscape and Ecological Mitigation Strategy (OLEMS) commits both projects to planting species which grow at various speeds to accelerate visual screening, while still using native species which are indigenous to the area and will improve the green network for wildlife and increase biodiversity and states *“In respect of the onshore project substation....The mitigation planting would be designed to comprise a mix of faster growing ‘nurse’ species and slower growing ‘core’ species. While mitigation planting forms part of both the Scenario 1 and Scenario 2 proposals, under Scenario 1, mitigation planting associated with the Norfolk Vanguard project would already be implemented as part of this project and the mitigation planting associated with the Norfolk Boreas project would be added to this, in order to increase the overall extent of mitigation planting relative to the increase in development.”* The commitment to

the species provenance and growth rates mirror those secured within the Norfolk Vanguard OLEMS, section 6.5 [NV REP9-014].

12. As stated in [NB REP5-051] the mitigation measures have been designed to screen the projects from the small number of locations where views to the onshore project substations would occur. With this principle aim in mind, the planting includes areas of fast growing woodland species as this would provide, most importantly the height required, as well as the density, to ensure effective screening. Other considerations for the design and layout of the planting, include the use of predominantly native species and those species indigenous to the area, to ensure that the planting integrates well with the local landscape character. Mitigation planting aims to create a landscape framework that connects with existing woodland and hedgerows to improve the wider strategic green network. This is important for the movement of animals through the area, as well as increasing biodiversity across the local landscape. A mix of species would be included in the woodland planting and hedgerows and the integration of grass strips and wider species rich grassland areas have been included to provide a diversity of habitats and food sources for wildlife. These commitments mirror those used to develop the Norfolk Vanguard mitigation.
13. Also, additional information is included in the Norfolk Boreas Design and Access Statement (DAS) [NB REP14-014], under the design review process which states that the projects *'would welcome the opportunity to share local knowledge on native species that are suited to local conditions. This would ensure that the 'palette' of species selected would present the best opportunity for successful establishment and growth.'* This same commitment has been included in the updated Norfolk Vanguard DAS (version 2) submitted on 2 August 2021.

2.1.2 LVIA Viewpoints

14. In response to the Examining Authority's Further Written Question Q2.9.1.2 [NB REP5-045] Norfolk Boreas Limited provided further clarification on the viewpoint locations and the consideration of residential amenity in the LVIA. As stated in [NB REP5-045] as set out in the ES Chapter 29 [NB APP-242, Table 29.13, Viewpoints VP8, VP9, VP10] the assessment considers the views of residents in Necton, Ivy Todd and Holme Hale. Using the visualisations and through observations in the field, both at the specific viewpoints and surrounding areas, an assessment has been drawn based on the level of change that residents would experience as a result of these additional developments in their local area. While the viewpoints are located in publicly accessible areas, they are representative of views of residents in both public and private spaces. The viewpoint locations mirror those used in the Norfolk Vanguard ES. Further details on the selection of the viewpoints and the consideration of the villages of Necton and Ivy Todd are provided in [NB REP5-045]. The key findings of

the LVIA are that effects would be limited insofar as only localised parts of the surrounding settlements would be affected and where visibility would occur, the proportion of the onshore project substation that would be visible, would be limited.

2.1.3 LVIA Visualisations

15. In [NB REP13-015] in response to concerns over cumulative impacts Norfolk Boreas Limited confirmed that the LVIA ES Chapter 29 [NB APP-242] identifies that under Scenario 1 the Norfolk Boreas onshore project substation would be sited adjacent to the respective infrastructure for Norfolk Vanguard and the cumulative impact assessment has considered the combined effects of these developments. As such, under Scenario 1, visualisations show the Norfolk Vanguard onshore project substation in conjunction with the Norfolk Boreas infrastructure (Norfolk Boreas ES Figures 29.23 to 29.34 [NB APP-509 to APP-520]). The visualisations from the selected viewpoints presented in Norfolk Boreas ES Figures 29.23 to 29.34 [NB APP-509 to APP-520] contain visualisations to simulate the potential view of the cumulative infrastructure from likely sensitive receptors. These are consistent with the visualisations presented in Norfolk Vanguard ES Figures 29.13 to 29.24 [NV APP-613 to APP-628].
16. Full details on the development of visualisations are provided in Norfolk Boreas ES Chapter 29 [NB APP-242] section 29.5.4.2 and the Methodology Statement for Visualisations is included in ES Figure 29.23 [NB APP-509] and Norfolk Vanguard ES Figure 29.13 [NV APP-613]. However, queries were raised by stakeholders during the Norfolk Boreas examination over the visualisations. In [NB REP5-045] and [NB REP6-013] it was confirmed that all visualisations are produced to Scottish Natural Heritage guidelines as set out in 'Visual Representation of Wind Farms Version 2.2' (February 2017), which as stated in [NB REP8-014] are the appropriate standards applicable to visualisations to represent potential effects on landscape and visual amenity. These guidelines state the guidance may also be applicable to other forms of development or within other locations and are endorsed by the Landscape Institute, who strongly advise members to follow this where applicable in preference to any other guidance. Great care has been taken to conform to these standards to ensure the visualisations are as accurate as possible. Visualisations form an important part of the assessment and while their accuracy in respect of the standards can be verified, their limitations are formally recognised in guidance and in respect of this, their role in the assessment process is clearly set out. The visualisations form a key part of the assessment but as stated in [NB REP8-014] observations in field have also been used to inform the written assessment. Further details are provided in [NB REP5-045], [NB REP8-014] in response to specific concerns raised over the visualisations and the process of verification.

2.1.4 Substation Design Parameters

17. During Issue Specific Hearing 3 on onshore effects on 21 January 2020, as detailed in [NB REP4-013] Item 4 b), Norfolk Boreas Limited provided clarification on the height controls on Requirement 16 of the dDCO, particularly in respect to the converter buildings. Subsequently the Design and Access Statement was updated to provide additional clarity and commitments on the maximum parameters. The same maximum parameters apply to Norfolk Vanguard and these updates have been included in the updated Norfolk Vanguard DAS, version 2 (submitted 2 August 2021).
18. In [NB REP4-013] Norfolk Boreas Limited also provided clarification on the Design Process and Design Guide included as part of the DAS and the location of the onshore project substation buildings, which are also applicable to Norfolk Vanguard. [NB REP4-013] stated that the layout of the onshore project substation will be finalised once contractors are appointed. The exact landscape management measures will then be tailored around the final design of the onshore project substation. Therefore as stated in [NB REP13-015] during the detailed design stage consideration will be given to the design of the onshore project substation as well as landscaping proposals to mitigate visual impacts. Norfolk Boreas DAS [NB REP14-014] section 5.3.6 details the design process which will be followed including development of the Design Guide which will set out the design approach and mitigation to be applied to the onshore project substation.
19. As stated in [NB REP4-013] although there are differences between the layouts being offered by different contractors, all options show the converter buildings being located to the northern end of the site (further away from Ivy Todd) with the outdoor electrical equipment located to the south of the site. Norfolk Boreas subsequently updated the DAS to include a commitment to this zoning.
20. The Norfolk Vanguard DAS (version 2, submitted 2 August 2021) has been updated to include a commitment to the Design Review Process and zoning, and the Norfolk Vanguard Onshore Project Masterplan (NV document 8.27, submitted 2 August 2021) also commits to developing a holistic masterplan approach to the design and landscape approach across both projects

2.2 Operational Noise Effects

21. During the Norfolk Boreas examination, Norfolk Boreas Limited responded to concerns raised and provided further clarification on the operational noise of the onshore project substation, including on the baseline noise survey, the operational noise limits, monitoring of noise levels and cumulative impacts with Norfolk Vanguard, in the following documents:

- Applicant's responses to the Examining Authority's Written Questions – Q12.2.6 [NB REP2-021]
 - Applicant's responses to Examining Authority's Further Written Questions - Q2.12.2.4. [NB REP5-045]
 - Applicant's comments on Deadline 5 Submissions - Table 1.8 [NB REP6-013]
 - Applicant's comments on Deadline 6 Submissions and Other Submissions- Section 1.1, comments on Breckland Council's response to Q2.12.2.4. [NB REP7-016]
 - Applicant's comments on Deadline 8 submissions - Table 1.4 [NB REP9-011]
 - Applicant's comments on Deadline 10 submissions and Other Submissions– Table 1.9 [NB REP11-008]
22. The operational noise limits are secured by Requirement 27 of the Norfolk Vanguard and Norfolk Boreas dDCOs along with the need for a scheme of monitoring compliance which will demonstrate conformity with the noise limits. The findings of the impact assessment presented in Norfolk Boreas ES Chapter 25 Noise and Vibration [NB APP-238] are consistent with the findings and commitments of the Norfolk Vanguard cumulative assessment. Further clarifications were made during the Norfolk Boreas examination, as detailed below, however no amendments were made to the assessment or the findings and commitments made by Norfolk Boreas, which remained the same as those proposed by Norfolk Vanguard.
23. In [NB REP6-013] Norfolk Boreas Limited confirmed that to provide a conservative assessment in the Norfolk Boreas ES Chapter 25 Noise and Vibration [NB APP-238], all operational phase impacts assessed the cumulative impact of Norfolk Boreas and Norfolk Vanguard being fully operational against the prevailing baseline soundscape i.e. with Dudgeon operational. In response to concerns raised [NB REP6-013] provided further clarification on the baseline survey undertaken, the approach and dataset of which was presented and agreed with local authorities as part of the Expert Topic Group meetings.
24. As referenced in [NB REP11-008] the Norfolk Boreas ES Chapter 25 [NB APP-238] provides full details of how the operational noise criteria have been derived and assessed in accordance with the British Standard 4142. The operational noise limits were conditions set by Breckland Council (secured through Requirement 27 of the dDCO) as not exceeding 35 dB LAeq (5minutes) at any time at a free field location immediately adjacent to any noise sensitive location. A further limit of 32 dB Leq (15minutes) also applies to the 100Hz third octave band. As clarified in Section 1.4 of [NB REP9-011], these operational noise limits are cumulative for both projects and with the existing onshore infrastructure, to ensure the soundscape at the identified and agreed receptors does not change beyond the existing Dudgeon noise condition

from the operation of Norfolk Boreas and / or Norfolk Vanguard onshore project substation.

25. As detailed in [NB REP5-045], [NB REP7-016] and [NB REP11-008], the results of noise modelling and assessment at the substation sites as set out in ES Chapter 25 Noise and Vibration [NB APP-238], show that the onshore project substations for Norfolk Boreas and Norfolk Vanguard operating with additional noise mitigation (i.e. proven noise reduction technology or procurement of low noise emitting equipment) can readily achieve the operational noise requirements, and no impacts will occur.
26. As detailed in [NB REP2-021] at the detailed design stage it will be necessary to assess predicted compliance of the equipment at the onshore project substation during the operational phase to ensure this would meet the restrictions in dDCO Requirement 27 on Operational Noise. This would therefore form part of the procurement process. Noise modelling would be undertaken to demonstrate conformity with dDCO Requirement 27 and specific mitigation measures would be identified to ensure the operational noise levels remain within the dDCO requirements. Where, during operational compliance monitoring, an exceedance of Requirement 27 is demonstrated, then the projects would be required to implement a mitigation strategy. The mitigation measures may include for example, partial/full enclosure, or enhanced sound insulation of buildings.
27. Furthermore, Requirement 27 of the dDCOs states that the onshore project substations must not commence operation until a scheme for monitoring compliance with the operational noise limits has been submitted to and approved by the relevant planning authority. The scheme must detail the monitoring to be undertaken to demonstrate that the noise levels have been achieved after both initial commencement of operations and six months after operation, for each project. The scheme will also detail any remedial works and a programme of implementation should the emissions exceed the stated levels.
28. As stated in [NB REP6-013] the predicted noise levels reported in the ES Chapter 25 [NB APP-238] at each receptor for the Norfolk Boreas scheme and cumulatively with the Norfolk Vanguard scheme (with mitigation), demonstrate compliance at each receptor with the operational noise limits and no impact at identified receptor locations in accordance with BS 4142:2014 derived impact magnitudes. The operational noise limits are considered appropriate to ensure the soundscape at the identified and agreed receptors does not change beyond the existing Dudgeon condition noise levels from the operation of the Norfolk Boreas and / or Norfolk Vanguard onshore project substations.

29. The operational noise assessment undertaken for Norfolk Boreas and Norfolk Vanguard both conclude that with both onshore project substations in operation, including the application of mitigation to comply with the secured operational noise limits, the residual impacts would be negligible. Furthermore, Requirement 27 of the dDCOs secures that post operational monitoring will be undertaken to demonstrate compliance with the operational noise limits, after initial commencement and six months of operation for each project, which would include the projects operating together.

2.3 Artificial Lighting Effects

30. During the Norfolk Boreas examination, Norfolk Boreas Limited responded to the queries regarding light pollution and substation lighting, which are detailed in the following document:
- Comments on Relevant Representations – Table 24 [NB AS-024];
 - Applicant’s responses to Examining Authority’s Further Written Questions - Q2.9.0.1. [NB REP5-045]
31. The queries raised were not specific to cumulative effects however, the clarification and the mitigation detailed in the response is relevant to both the Norfolk Boreas and Norfolk Vanguard onshore project substations separately and together and therefore is relevant when considering the cumulative impacts.
32. As stated in [NB AS-024] issues relating to lighting have been considered in ES Chapter 29 Landscape and Visual Impact Assessment [NB APP-242] and ES Chapter 30 Tourism and Recreation [NB APP-243], which addresses the issue related to dark skies (section 30.6.4.7) and clarifies that there are no International Dark Sky Association or Dark Sky Discovery Partnership recognised dark sky sites in the vicinity of the onshore project substations. The fact that *‘The onshore project substation has been designed so that it does not require permanent lighting’* forms part of the embedded mitigation measures for both of these assessments.
33. In [NB REP5-045] Norfolk Boreas Limited clarified that during construction at the onshore project substations site lighting would be required during working hours in the winter months and a lower level of lighting would remain overnight for security purposes. The impacts of construction lighting are also considered within the ES Chapter 29 Landscape and Visual Impact Assessment [NB APP-242] and matches that presented in the Norfolk Vanguard ES [NV APP-353].
34. As referenced in [NB REP5-045], in Section 3.7 of the Outline Code of Construction Practice (OCocP), Document 8.1 [NB REP14-013], Norfolk Boreas Limited is committed to the preparation of an Artificial Light Emissions Management Plan in accordance with Requirement 20(2)(c) of the dDCO, which will be submitted to the

local authorities for approval prior to construction commencing. The plan will detail the mitigation measures to be taken to manage emissions from artificial light, such as the use of directional beams, non-reflective surfaces and barriers and screens, to avoid light nuisance whilst maintaining safety and security obligations. Site lighting will be positioned and directed to minimise skyglow so far as reasonably practicable. The same mitigation measures are detailed in Section 3.7 of the Norfolk Vanguard OCoCP and secured in dDCO Requirement 20(2)(c).

35. As stated in [NB REP5-045] and secured in the Design and Access Statement for both projects, during operation the onshore project substations would not be manned. Normal operating conditions would not require lighting at the onshore project substations, although low level movement detecting security lighting may be utilised for health and safety purposes. Temporary lighting during working hours will be provided during maintenance activities only.

2.4 Surface Water Management

36. During the Norfolk Boreas examination, Norfolk Boreas Limited responded to concerns raised relating to any increased risk of flooding in the surrounding area linked to the substation operational drainage. This is detailed in the following documents:
- Comments on Relevant Representations – Table 15 [NB AS-024];
 - Applicant’s Comments on Deadline 10 Submission and Other Submission – Table 1.9 [NB REP11-008]
37. The concern was not raised specifically in relation to cumulative effects however, the clarification and the mitigation detailed in the response is relevant to both the Norfolk Boreas and Norfolk Vanguard onshore project substations separately and together and therefore is relevant when considering the cumulative impacts.
38. In [NB AS-024] and [NB REP11-008] Norfolk Boreas limited confirmed that appropriate flood mitigation has been allowed for in the design of the onshore project substation site to ensure that there will be no negative impacts on existing flood risk to the site, or surrounding areas. The same mitigation has been allowed for the Norfolk Vanguard onshore project substation. The onshore project substations (both Norfolk Boreas and Norfolk Vanguard) drainage strategy will be guided by the principles of Sustainable Urban Drainage Systems (SuDS). The strategy will limit development site surface water run-off to the existing greenfield rate, with sufficient attenuation for rainfall events up to 1 in 100-year probability plus allowance for climate change over the lifetime of the projects. This is captured in the Outline Operational Drainage Plan for both Norfolk Boreas [NB APP-712] and Norfolk Vanguard [NV REP8-054] secured through dDCO Requirement 32 for both projects.

39. The potential impacts associated with water resources and flood risk have been assessed in section 20.7 of Chapter 20 Water Resources and Flood Risk [NB APP-233], and potential cumulative impacts in section 20.8, including with Norfolk Vanguard. The cumulative assessment identifies that the operation of the Norfolk Boreas and Norfolk Vanguard onshore project substations could potentially alter surface runoff and groundwater flows. However, each project would adopt best practice mitigation measures which would avoid, reduce or offset the effects of increased surface runoff and altered groundwater flows including restricting runoff at the onshore project substations to greenfield rates. These measures reduce any potential cumulative impacts to not significant.

3 CONCLUSION

40. Potential cumulative impacts have been fully considered as part of the Norfolk Boreas examination including any potential cumulative impacts at the onshore project substation with Norfolk Vanguard. During the examination Norfolk Boreas Limited provided clarifications in a number of documents, as summarised in sections 2.1 to 2.4 above, for topic areas relevant to the onshore project substation.
41. The conclusions of the assessment of cumulative impacts presented in the Norfolk Boreas ES and during the Norfolk Boreas examination remain the same as those presented in the Norfolk Vanguard ES with the only significant cumulative adverse effect relating to localised and reversible effects on landscape and visual amenity in select locations around the substation area and are identified for the projects alone.