

Norfolk Vanguard Offshore Wind Farm

Appendix 25.2

Construction Phase Assessment

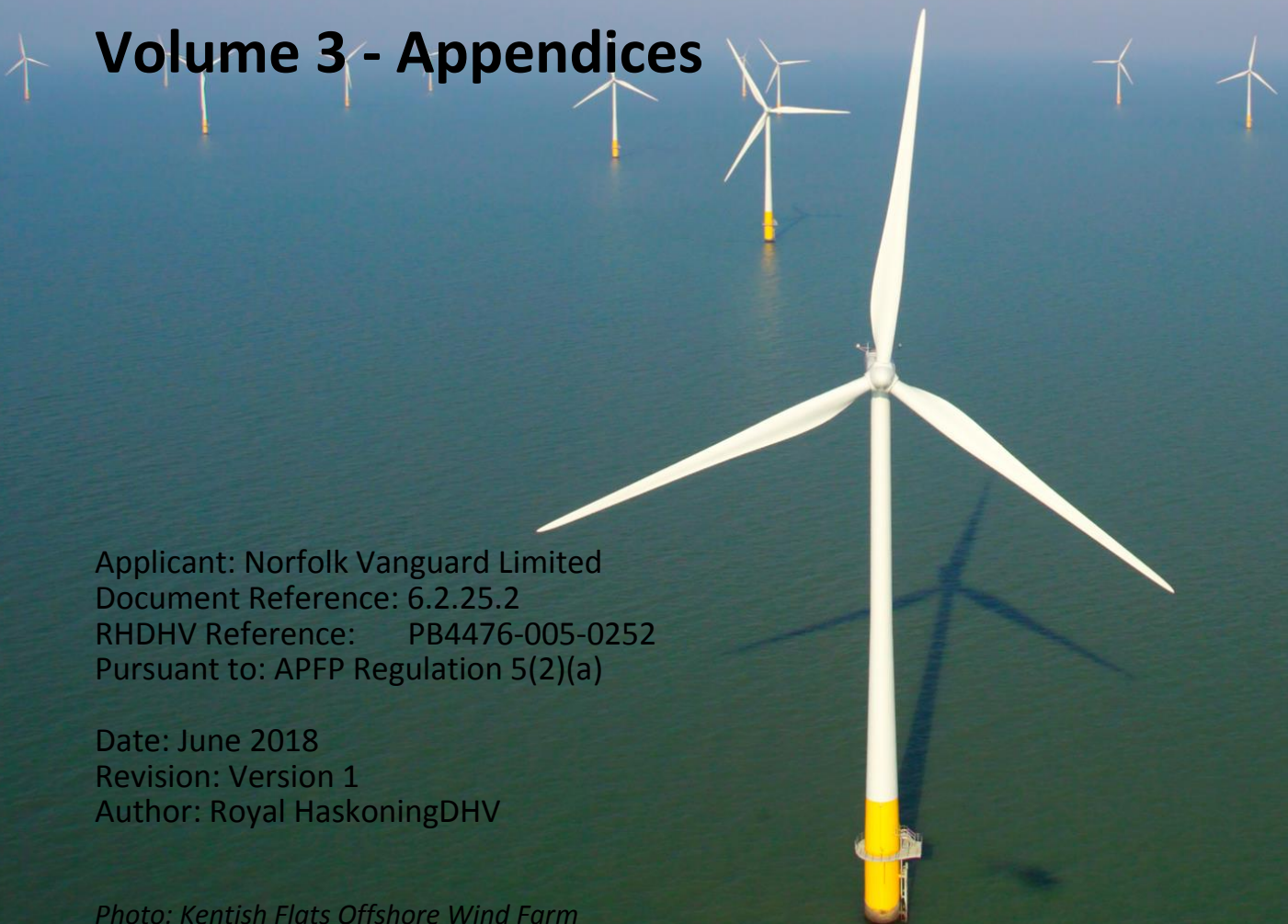
Environmental Statement

Volume 3 - Appendices

Applicant: Norfolk Vanguard Limited
Document Reference: 6.2.25.2
RHDHV Reference: PB4476-005-0252
Pursuant to: APFP Regulation 5(2)(a)

Date: June 2018
Revision: Version 1
Author: Royal HaskoningDHV

Photo: Kentish Flats Offshore Wind Farm



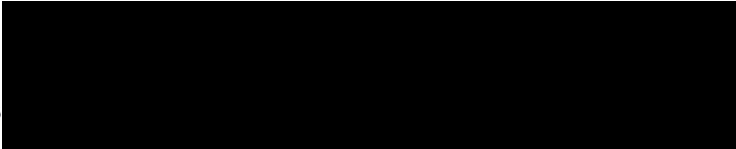
Environmental Impact Assessment Environmental Statement

Document Reference: PB4476-005-0252

June 2018

For and on behalf of Norfolk Vanguard Limited

Approved by: Ruari Lean, Rebecca Sherwood

Signed: 

Date: 8th June 2018

For and on behalf of Royal HaskoningDHV

Drafted by: Mark Smith / Dean Curtis

Approved by: Jon Allen

Signed: 

Date: 25th May 2018



Date	Issue No.	Remarks / Reason for Issue	Author	Checked	Approved
26/03/18	01D	First draft for Norfolk Vanguard Limited review	MS/DC	ST	AD
02/05/18	02D	Second draft for Norfolk Vanguard Limited review	DC	ST/RH	AH
25/05/18	01F	Final for ES submission	DC	ST	JA

Table of Contents

25	Construction Phase assessment	6
25.1	Introduction	6
25.2	Construction Phase Noise Modelling	6
25.3	Construction Phase Road Traffic Emissions	19
25.4	Conclusion.....	27
25.5	References	28

Tables

Table 25.1 Construction phasing	6
Table 25.2 Landfall – Preconstruction daytime	7
Table 25.3 Landfall – Duct installation daytime	7
Table 25.4 Landfall – Cable pull, joint and commission daytime	8
Table 25.5 Landfall – Preconstruction evening and weekends	8
Table 25.6 Landfall – Duct installation evening and weekends	8
Table 25.7 Landfall – Cable pull, joint and commission evening and weekends	9
Table 25.8 Landfall – Preconstruction night-time	9
Table 25.9 Landfall – Duct installation night-time	9
Table 25.10 Landfall – Cable pull, joint and commission night-time	9
Table 25.11 Onshore cable corridor – Preconstruction daytime	10
Table 25.12 Onshore cable corridor – Duct installation daytime	11
Table 25.13 Onshore cable corridor – Cable pull, joint and commission daytime	12
Table 25.14 CRS – Preconstruction daytime	13
Table 25.15 CRS - Duct installation daytime	14
Table 25.16 CRS - Cable pull, joint and commission daytime	14
Table 25.17 Onshore project substation – Preconstruction	15
Table 25.18 Onshore project substation – Duct installation and primary works	16
Table 25.19 Onshore project substation – Cable pull, joint and commission	16
Table 25.20 Cumulative - Preconstruction	17
Table 25.21 Cumulative – Duct installation and primary works	17
Table 25.22 Cumulative – Cable pull, joint and commission	18
Table 25.23 Assessment link classification and survey detail	19
Table 25.24 Construction phase road traffic noise emissions assessment 2022	21
Table 25.25 Construction phase road traffic noise emissions assessment 2023	24

Glossary

BPM	Best Practicable Means
BS	British Standard
CoCP	Code of Construction Practice
CRS	Cable Relay Station
DMRB	Design Manual for Roads and Bridges
EPA	Environmental Protection Act
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
ISO	International Standards Organisation
OAE	Observed Adverse Effect

Terminology

C	<p>The spectrum adaptation terms C and C_{tr} are used to take into account different source spectra as indicated in the standard.</p> <p>C : A-weighted Pink Noise spectrum. C_{tr} : A-weighted urban traffic noise spectrum.</p> <p>C and C_{tr} corrections can also be added to R_w (see below)</p>
C_{tr}	
Cable Relay Station	
dB(A)	<p>Primarily comprised of an outdoor compound containing reactors (also called inductors, or coils) and switchgear to increase the power transfer capability of the cables under the High Voltage Alternating Current (HVAC) technology scenario as considered in the PEIR. This is no longer required for the project as the HVDC technology has been selected.</p> <p>Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise level in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).</p>
Decibel (dB)	<p>A unit of noise level derived from the logarithm of the ratio between the value of a quantity and a reference value. It is used to describe the level of many different quantities. For sound pressure level the reference quantity is 20 μPa, the threshold of normal hearing is 0dB, and 140dB is the threshold of pain. A change of 1dB is only perceptible under controlled conditions. Under normal conditions a change in noise level of 3dB(A) is the smallest perceptible change.</p>
Landfall	Where the offshore cables come ashore at Happisburgh South.
National Grid substation extension	The permanent footprint of the National Grid substation extension
Onshore cable corridor	200m wide onshore corridor within which the onshore cable route would be located as submitted for PEIR.
Onshore cable route	The 45m easement which will contain the buried export cables as well as the

	temporary running track, topsoil storage and excavated material during construction.
Onshore project substation	A compound containing electrical equipment to enable connection to the National Grid. The substation will convert the exported power from HVDC to HVAC, to 400kV (grid voltage). This also contains equipment to help maintain stable grid voltage.
R _w	The weighted sound reduction index, R _w , is a single figure description of sound reduction index which is defined in BS EN ISO 717-1: 1997. The R _w is calculated from measurements in an acoustic laboratory to BS EN ISO 140-3:1997 and ratings to BS EN ISO 717-1:1997. Sound insulation ratings derived from site (which are invariably lower than the laboratory figures) are referred to as the R' _w ratings (apparent weighted sound reduction index) and measured to BS EN ISO 140-4:1998
The project	Norfolk Vanguard Offshore Wind Farm, including the onshore and offshore infrastructure.

This page is intentionally blank.

25 CONSTRUCTION PHASE ASSESSMENT

25.1 Introduction

1. This document is Appendix 25.2 to Chapter 25 Noise and Vibration, and details the results of the Norfolk Vanguard construction noise impact assessment modelling and the construction phase road traffic emissions assessment.
2. The following section presents an unmitigated worst-case overview of potential noise and vibration impacts associated with construction of the onshore electrical infrastructure.
3. Chapter 25 Noise and Vibration details the methodology, assessment criteria and assumptions relevant to the assessment of construction phase noise impacts.

25.2 Construction Phase Noise Modelling

4. The construction phase was modelled using SoundPLAN noise modelling software. This package directly implements the calculation methods outlined in BS 5228 and other nationally and internationally recognised acoustic standards.
5. The assessment has been broken down into the following phases within each study area, detailed in Table 25.1 and shown on Figure 25.2 in Chapter 25 Noise and Vibration.
6. Although no cable relay station (CRS) is required for the HVDC export system, the measurement locations are still considered representative of the sensitive receptors in the vicinity of the onshore cable route which passes through the area previously identified for the CRS location and therefore remains in the assessment.

Table 25.1 Construction phasing

Study area	Construction phase
Landfall	Duct Installation
	Cable Pull, joint and Commission
Onshore cable corridor*	Preconstruction Works
	Duct Installation
	Cable Pull, joint and Commission
Cable Relay Station (CRS)	Preconstruction Works
	Duct Installation
	Cable Pull, joint and Commission
Onshore project substation	Preconstruction Works
	Duct Installation and Primary Works
	Cable Pull, joint and Commission

*Since this assessment, the onshore cable corridor has been refined to a narrower 45m onshore cable route.

7. BS 5228 receptor categories have been derived from the measured baseline noise levels (Appendix 25.1) using the 'ABC' assessment method (detailed in section 25.4 of Chapter 25 Noise and Vibration. All receptors are classified within Category A with the exception of CRR2, CRR8 and CRR30 which fall within Category B thresholds (explanations of which are provided in Chapter 25 Noise and Vibration).
8. Construction noise mitigation techniques which could be applied in order to reduce impacts by between 5dB(A) up to 10dB(A) are detailed within section 25.8.3.4 of the ES chapter. In line with the conservative approach taken in the assessment, a 5dB(A) reduction only was applied to represent the effect of incorporating these mitigation measures (these would be delivered through the Code of Construction Practice (CoCP) (DCO requirement 20)).
9. Where a residual impact remains after standard mitigation (outlined in the CoCP) (DCO requirement 20) based on the worst-case construction phase assumptions, enhanced mitigation measures will only be required at these receptors (details of which are contained within section 25.8.3.5 of Chapter 25 Noise and Vibration).
10. The asterisk (*) in the results tables i.e. CRR17, represents where a receptor has been identified as having a façade/receiver position closer/orientated towards the noise source as the project has evolved due to changes, for example, re-alignment of the onshore cable export route. The original location was also included for continuity and for completeness.

25.2.1 Landfall Study Area

11. Table 25.2 to Table 25.4 detail the results of the daytime preconstruction and construction phase noise modelling at the landfall.

Table 25.2 Landfall – Preconstruction daytime

Receptor	Predicted CoCP mitigated noise impact $L_{Aeq, 12hour}$ (dB)	Impact magnitude	Impact significance
LFR1H	42.0	No Impact	No Impact
LFR2H	50.5	No Impact	No Impact
LFR3H	36.8	No Impact	No Impact
LFR4H	34.9	No Impact	No Impact

Table 25.3 Landfall – Duct installation daytime

Receptor	Predicted CoCP mitigated noise impact $L_{Aeq, 12hour}$ (dB)	Impact magnitude	Impact significance
----------	---	------------------	---------------------

Receptor	Predicted CoCP mitigated noise impact $L_{Aeq, 12hour}$ (dB)	Impact magnitude	Impact significance
LFR1H	44.3	No Impact	No Impact
LFR2H	47.8	No Impact	No Impact
LFR3H	44.8	No Impact	No Impact
LFR4H	44.6	No Impact	No Impact

Table 25.4 Landfall – Cable pull, joint and commission daytime

Receptor	Predicted CoCP mitigated noise impact $L_{Aeq, 12hour}$ (dB)	Impact magnitude	Impact significance
LFR1H	41.0	No Impact	No Impact
LFR2H	49.3	No Impact	No Impact
LFR3H	35.9	No Impact	No Impact
LFR4H	34.1	No Impact	No Impact

12. Table 25.5 to Table 25.7 detail the results of the evening and weekend construction phase noise modelling at the landfall.

Table 25.5 Landfall – Preconstruction evening and weekends

Receptor	Predicted CoCP mitigated noise impact $L_{Aeq, 12hour}$ (dB)	Impact magnitude	Impact significance
LFR1H	42.0	No Impact	No Impact
LFR2H	50.5	No Impact	No Impact
LFR3H	36.8	No Impact	No Impact
LFR4H	34.9	No Impact	No Impact

Table 25.6 Landfall – Duct installation evening and weekends

Receptor	Predicted CoCP mitigated noise impact $L_{Aeq, 12hour}$ (dB)	Impact magnitude	Impact significance
LFR1H	44.3	No Impact	No Impact
LFR2H	47.8	No Impact	No Impact
LFR3H	44.8	No Impact	No Impact
LFR4H	44.6	No Impact	No Impact

Table 25.7 Landfall – Cable pull, joint and commission evening and weekends

Receptor	Predicted CoCP mitigated noise impact $L_{Aeq, 12hour}$ (dB)	Impact magnitude	Impact significance
LFR1H	41.0	No Impact	No Impact
LFR2H	49.3	No Impact	No Impact
LFR3H	35.9	No Impact	No Impact
LFR4H	34.1	No Impact	No Impact

13. Table 25.8 to Table 25.10 detail the results of the evening and weekend construction phase noise modelling at the landfall.

Table 25.8 Landfall – Preconstruction night-time

Receptor	Predicted CoCP mitigated noise impact $L_{Aeq, 12hour}$ (dB)	Impact magnitude	Impact significance
LFR1H	42.0	No Impact	No Impact
LFR2H	50.5	Major Impact	Major
LFR3H	36.8	No Impact	No Impact
LFR4H	34.9	No Impact	No Impact

Table 25.9 Landfall – Duct installation night-time

Receptor	Predicted CoCP mitigated noise impact $L_{Aeq, 12hour}$ (dB)	Impact magnitude	Impact significance
LFR1H	44.3	No Impact	No Impact
LFR2H	47.8	Minor Impact	Minor
LFR3H	44.8	No Impact	No Impact
LFR4H	44.6	No Impact	No Impact

Table 25.10 Landfall – Cable pull, joint and commission night-time

Receptor	Predicted CoCP mitigated noise impact $L_{Aeq, 12hour}$ (dB)	Impact magnitude	Impact significance
LFR1H	41.0	No Impact	No Impact
LFR2H	49.3	Moderate Impact	Moderate
LFR3H	35.9	No Impact	No Impact
LFR4H	34.1	No Impact	No Impact

25.2.2 Onshore Cable Corridor Study Area

14. Table 25.11, Table 25.12 and Table 25.13 detail the results of the daytime construction phase noise modelling within the onshore cable corridor.

Table 25.11 Onshore cable corridor – Preconstruction daytime

Receptor	Predicted CoCP mitigated noise impact $L_{Aeq, 12hour}$ (dB)	Impact magnitude	Impact significance
CRR1	58.6	No Impact	No Impact
CRR2	64.4	No Impact	Moderate
CRR3	53.9	No Impact	No Impact
CRR4	48.8	No Impact	No Impact
CRR5	49.1	No Impact	No Impact
CRR6	51.3	No Impact	No Impact
CRR7	47.1	No Impact	No Impact
CRR8	47.1	No Impact	No Impact
CRR9	47.4	No Impact	No Impact
CRR10	76.6	Major Adverse	Major
CRR11	64.5	No Impact	No Impact
CRR12	51.2	No Impact	No Impact
CRR13	59.2	No Impact	No Impact
CRR14	51.9	No Impact	No Impact
CRR15	57.9	No Impact	No Impact
CRR16	50.7	No Impact	No Impact
CRR17	29.9	No Impact	No Impact
CRR17*	37.2	No Impact	No Impact
CRR18	34.6	No Impact	No Impact
CRR18*	57.2	No Impact	No Impact
CRR19	51.0	No Impact	No Impact
CRR20	56.0	No Impact	No Impact
CRR21	43.1	No Impact	No Impact
CRR22	45.9	No Impact	No Impact
CRR23	51.4	No Impact	No Impact
CRR24	42.8	No Impact	No Impact
CRR25	56.3	No Impact	No Impact
CRR26	58.0	No Impact	No Impact
CRR27	39.7	No Impact	No Impact

Receptor	Predicted CoCP mitigated noise impact $L_{Aeq, 12hour}$ (dB)	Impact magnitude	Impact significance
CRR27*	48.2	No Impact	No Impact
CRR28	41.8	No Impact	No Impact
CRR29	53.5	No Impact	No Impact
CRR30	57.5	No Impact	No Impact
CRR31	53.2	No Impact	No Impact
CRR32	47.2	No Impact	No Impact
CRR33	41.3	No Impact	No Impact

Table 25.12 Onshore cable corridor – Duct installation daytime

Receptor	Predicted CoCP mitigated noise impact $L_{Aeq, 12hour}$ (dB)	Impact magnitude	Impact significance
CRR1	61.2	No Impact	No Impact
CRR2	65.6	Negligible Impact	Negligible
CRR3	58.2	No Impact	No Impact
CRR4	49.0	No Impact	No Impact
CRR5	53.7	No Impact	No Impact
CRR6	53.4	No Impact	No Impact
CRR7	49.5	No Impact	No Impact
CRR8	50.2	No Impact	No Impact
CRR9	51.2	No Impact	No Impact
CRR10	72.3	Major Adverse	Major
CRR11	64.5	No Impact	No Impact
CRR12	53.4	No Impact	No Impact
CRR13	57.3	No Impact	No Impact
CRR14	53.0	No Impact	No Impact
CRR15	58.8	No Impact	No Impact
CRR16	52.6	No Impact	No Impact
CRR17	36.4	No Impact	No Impact
CRR17*	42.4	No Impact	No Impact
CRR18	39.2	No Impact	No Impact
CRR18*	58.9	No Impact	No Impact
CRR19	52.8	No Impact	No Impact
CRR20	57.2	No Impact	No Impact

Receptor	Predicted CoCP mitigated noise impact $L_{Aeq, 12hour}$ (dB)	Impact magnitude	Impact significance
CRR21	48.5	No Impact	No Impact
CRR22	50.7	No Impact	No Impact
CRR23	53.0	No Impact	No Impact
CRR24	45.5	No Impact	No Impact
CRR25	57.4	No Impact	No Impact
CRR26	61.9	No Impact	No Impact
CRR27	44.8	No Impact	No Impact
CRR27*	52.0	No Impact	No Impact
CRR28	48.7	No Impact	No Impact
CRR29	54.8	No Impact	No Impact
CRR30	58.9	No Impact	No Impact
CRR31	56.8	No Impact	No Impact
CRR32	50.2	No Impact	No Impact
CRR33	45.2	No Impact	No Impact

Table 25.13 Onshore cable corridor – Cable pull, joint and commission daytime

Receptor	Predicted CoCP mitigated noise impact $L_{Aeq, 12hour}$ (dB)	Impact magnitude	Impact significance
CRR1	57.6	No Impact	No Impact
CRR2	63.6	No Impact	No Impact
CRR3	53.0	No Impact	No Impact
CRR4	49.9	No Impact	No Impact
CRR5	48.0	No Impact	No Impact
CRR6	51.0	No Impact	No Impact
CRR7	46.0	No Impact	No Impact
CRR8	44.9	No Impact	No Impact
CRR9	39.6	No Impact	No Impact
CRR10	75.0	Major Adverse	Major
CRR11	64.2	No Impact	No Impact
CRR12	49.9	No Impact	No Impact
CRR13	58.2	No Impact	No Impact
CRR14	50.7	No Impact	No Impact
CRR15	57.0	No Impact	No Impact

Receptor	Predicted CoCP mitigated noise impact $L_{Aeq, 12hour}$ (dB)	Impact magnitude	Impact significance
CRR16	50.0	No Impact	No Impact
CRR17	28.6	No Impact	No Impact
CRR17*	36.0	No Impact	No Impact
CRR18	33.6	No Impact	No Impact
CRR18*	57.9	No Impact	No Impact
CRR19	49.6	No Impact	No Impact
CRR20	54.1	No Impact	No Impact
CRR21	42.1	No Impact	No Impact
CRR22	44.0	No Impact	No Impact
CRR23	50.0	No Impact	No Impact
CRR24	41.6	No Impact	No Impact
CRR25	55.4	No Impact	No Impact
CRR26	57.0	No Impact	No Impact
CRR27	39.3	No Impact	No Impact
CRR27*	47.6	No Impact	No Impact
CRR28	40.1	No Impact	No Impact
CRR29	52.5	No Impact	No Impact
CRR30	47.4	No Impact	No Impact
CRR31	52.0	No Impact	No Impact
CRR32	45.7	No Impact	No Impact
CRR33	40.0	No Impact	No Impact

25.2.3 Cable Relay Station Study Area

15. Table 25.14, Table 25.15 and Table 25.16 detail the results of the daytime construction noise modelling for construction of the onshore cable corridor which passes through the zones previously identified for the CRS location.

Table 25.14 CRS – Preconstruction daytime

Receptor	Predicted CoCP mitigated noise impact $L_{Aeq, 12hour}$ (dB)	Impact magnitude	Impact significance
CRR1E	74.8	Major	Major
CRR1F	42.4	No Impact	No Impact
CRR1G	36.4	No Impact	No Impact

Receptor	Predicted CoCP mitigated noise impact $L_{Aeq, 12hour}$ (dB)	Impact magnitude	Impact significance
CRR2E	43.9	No Impact	No Impact
CRR2E*	43.5	No Impact	No Impact
CRR2F	41.5	No Impact	No Impact
CRR2G	39.0	No Impact	No Impact
CRR3E	43.1	No Impact	No Impact
CRR3F	72.0	Major Adverse	Major
CRR3G	37.2	No Impact	No Impact
CRR4E	52.7	No Impact	No Impact
CRR4G	38.5	No Impact	No Impact

Table 25.15 CRS - Duct installation daytime

Receptor	Predicted CoCP mitigated noise impact $L_{Aeq, 12hour}$ (dB)	Impact magnitude	Impact significance
CRR1E	72.1	Major Adverse	Major
CRR1F	44.2	No Impact	No Impact
CRR1G	37.9	No Impact	No Impact
CRR2E	48.9	No Impact	No Impact
CRR2E*	46.8	No Impact	No Impact
CRR2F	43.0	No Impact	No Impact
CRR2G	40.2	No Impact	No Impact
CRR3E	44.3	No Impact	No Impact
CRR3F	67.2	Minor Adverse	Minor
CRR3G	39.9	No Impact	No Impact
CRR4E	51.5	No Impact	No Impact
CRR4G	39.2	No Impact	No Impact

Table 25.16 CRS - Cable pull, joint and commission daytime

Receptor	Predicted CoCP mitigated noise impact $L_{Aeq, 12hour}$ (dB)	Impact magnitude	Impact significance
CRR1E	70.9	Major Adverse	Major
CRR1F	40.1	No Impact	No Impact
CRR1G	33.2	No Impact	No Impact
CRR2E	45.2	No Impact	No Impact

Receptor	Predicted CoCP mitigated noise impact $L_{Aeq, 12hour}$ (dB)	Impact magnitude	Impact significance
CRR2E*	43.0	No Impact	No Impact
CRR2F	38.2	No Impact	No Impact
CRR2G	36.7	No Impact	No Impact
CRR3E	39.6	No Impact	No Impact
CRR3F	68.0	Moderate Adverse	Moderate
CRR3G	35.3	No Impact	No Impact
CRR4E	48.3	No Impact	No Impact
CRR4G	34.7	No Impact	No Impact

25.2.4 Onshore Project Substation Study Area

16. Table 25.17 and Table 25.18 detail the results of the construction phase noise modelling at the onshore project substation.

Table 25.17 Onshore project substation – Preconstruction

Receptor	Predicted CoCP mitigated noise impact $L_{Aeq, 12hour}$ (dB)	Impact magnitude	Impact significance
SSR1	34.0	No Impact	No Impact
SSR2	37.2	No Impact	No Impact
SSR3	38.7	No Impact	No Impact
SSR3*	38.9	No Impact	No Impact
SSR4	65.1	Negligible Impact	Negligible
SSR4*	47.4	No Impact	No Impact
SSR5	39.8	No Impact	No Impact
SSR6	38.2	No Impact	No Impact
SSR6*	41.6	No Impact	No Impact
SSR7	57.6	No Impact	No Impact
SSR8	39.3	No Impact	No Impact
SSR9	39.8	No Impact	No Impact
SSR10	36.1	No Impact	No Impact
SSR11	36.0	No Impact	No Impact

Table 25.18 Onshore project substation – Duct installation and primary works

Receptor	Predicted CoCP mitigated noise impact $L_{Aeq, 12hour}$ (dB)	Impact magnitude	Impact significance
SSR1	43.8	No Impact	No Impact
SSR2	40.7	No Impact	No Impact
SSR3	42.1	No Impact	No Impact
SSR3*	42.1	No Impact	No Impact
SSR4	66.2	Minor Impact	Minor
SSR4*	51.2	No Impact	No Impact
SSR5	41.6	No Impact	No Impact
SSR6	42.7	No Impact	No Impact
SSR6*	45.0	No Impact	No Impact
SSR7	43.8	No Impact	No Impact
SSR8	42.3	No Impact	No Impact
SSR9	43.4	No Impact	No Impact
SSR10	41.9	No Impact	No Impact
SSR11	47.5	No Impact	No Impact

Table 25.19 Onshore project substation – Cable pull, joint and commission

Receptor	Predicted CoCP mitigated noise impact $L_{Aeq, 12hour}$ (dB)	Impact magnitude	Impact significance
SSR1	40.6	No Impact	No Impact
SSR2	38.8	No Impact	No Impact
SSR3	37.6	No Impact	No Impact
SSR3*	37.9	No Impact	No Impact
SSR4	64.3	No Impact	No Impact
SSR4*	46.7	No Impact	No Impact
SSR5	36.9	No Impact	No Impact
SSR6	37.6	No Impact	No Impact
SSR6*	40.7	No Impact	No Impact
SSR7	37.6	No Impact	No Impact
SSR8	37.1	No Impact	No Impact
SSR9	39.0	No Impact	No Impact
SSR10	34.4	No Impact	No Impact
SSR11	44.9	No Impact	No Impact

25.2.5 Cumulative Construction Noise Modelling

17. The cumulative construction phase noise impacts associated with the extension of the National Grid substation (included as part of the Norfolk Vanguard DCO application) are considered within this assessment. In order to present a conservative assessment for the purposes of this ES it has been assumed that the extension to the National Grid substation will be conducted during the same time as the construction of the onshore project substation and with the same plant requirements. Table 25.20, Table 25.21 and Table 25.22 detail the results of the cumulative construction noise modelling inclusive of the National Grid substation extension and Norfolk Boreas onshore project substation.

Table 25.20 Cumulative - Preconstruction

Receptor	Predicted CoCP mitigated noise impact $L_{Aeq, 12hour}$ (dB)	Impact magnitude	Impact significance
SSR1	38.4	No Impact	No Impact
SSR2	40.2	No Impact	No Impact
SSR3	39.4	No Impact	No Impact
SSR3*	39.2	No Impact	No Impact
SSR4	65.1	Negligible Impact	Negligible
SSR4*	47.7	No Impact	No Impact
SSR5	42.6	No Impact	No Impact
SSR6	38.7	No Impact	No Impact
SSR6*	41.9	No Impact	No Impact
SSR7	57.6	No Impact	No Impact
SSR8	40.4	No Impact	No Impact
SSR9	40.4	No Impact	No Impact
SSR10	39.4	No Impact	No Impact
SSR11	54.2	No Impact	No Impact

Table 25.21 Cumulative – Duct installation and primary works

Receptor	Predicted CoCP mitigated noise impact $L_{Aeq, 12hour}$ (dB)	Impact magnitude	Impact significance
SSR1	46.4	No Impact	No Impact
SSR2	45.8	No Impact	No Impact
SSR3	43.7	No Impact	No Impact

Receptor	Predicted CoCP mitigated noise impact $L_{Aeq, 12hour}$ (dB)	Impact magnitude	Impact significance
SSR3*	42.7	No Impact	No Impact
SSR4	66.2	Minor Impact	Minor
SSR4*	52.0	No Impact	No Impact
SSR5	53.4	No Impact	No Impact
SSR6	43.7	No Impact	No Impact
SSR6*	45.8	No Impact	No Impact
SSR7	47.8	No Impact	No Impact
SSR8	45.1	No Impact	No Impact
SSR9	44.6	No Impact	No Impact
SSR10	46.1	No Impact	No Impact
SSR11	55.4	No Impact	No Impact

Table 25.22 Cumulative – Cable pull, joint and commission

Receptor	Predicted CoCP mitigated noise impact $L_{Aeq, 12hour}$ (dB)	Impact magnitude	Impact significance
SSR1	41.3	No Impact	No Impact
SSR2	40.4	No Impact	No Impact
SSR3	37.8	No Impact	No Impact
SSR3*	37.9	No Impact	No Impact
SSR4	64.3	No Impact	No Impact
SSR4*	46.8	No Impact	No Impact
SSR5	40.4	No Impact	No Impact
SSR6	37.7	No Impact	No Impact
SSR6*	40.9	No Impact	No Impact
SSR7	39.3	No Impact	No Impact
SSR8	37.8	No Impact	No Impact
SSR9	39.1	No Impact	No Impact
SSR10	35.6	No Impact	No Impact
SSR11	45.1	No Impact	No Impact

25.3 Construction Phase Road Traffic Emissions

18. Table 25.23 details the road links assessed (further information is provided in Chapter 24 Traffic and Transport).

Table 25.23 Assessment link classification and survey detail

Link No.	Road	Survey type	Survey year
1a	A47	DfT - AADT	2015
1b	A47	DfT - AADT	2015
2	A47	DfT - AADT	2015
3	A47	DfT - AADT	2015
4	A47	DfT - AADT	2015
5	A47	NDR Data	2015
6	A47	DfT - AADT	2015
7	A47	DfT - AADT	2015
8	A146	DfT - AADT	2015
9	A47	DfT - AADT	2015
10	A47	DfT - AADT	2015
11	A1065	DfT - AADT	2015
12	A1065	DfT - AADT	2015
13a	A148	DfT - AADT	2015
13b	A148	DfT - AADT	2015
14	A148	DfT - AADT	2015
15	B1145 - Litcham	7-day ATC	2017
16	B1110/B1146 - Holt Road	7-day ATC	2017
17	B1145 - Billingford Road	7-day ATC	2017
18	A1067	DfT - AADT	2015
19	A148	DfT - AADT	2015
20	Mill Common Road	7-day ATC	2017
21	B1147 - Etling Green (Hoe Road South)	7-day ATC	2017
22	B1147 - Dereham Road	7-day ATC	2017
23	Northgate - from junction with B1146	7-day ATC	2017
24	A1067	DfT - AADT	2015
25	Elsing Lane	7-day ATC	2017
26	A1074	DfT - AADT	2015

Link No.	Road	Survey type	Survey year
27	A140	DfT - AADT	2015
28	A140	NDR Data	2015
29	A1067	DfT - AADT	2015
30	A1067	DfT - AADT	2015
31	A1067	NDR Data	2015
32	B1149 - Norwich Road	7-day ATC	2017
33	B1149 - Holt Road	7-day ATC	2017
34	B1145 - west of Cawston	7-day ATC	2017
35a	B1159 - Cost Road	7-day ATC	2017
35b	B1159 - Cost Road	7-day ATC	2017
36	B1149 - Holt Road	7-day ATC	2017
37	B1145 - Cawston road	7-day ATC	2017
38	A140 - Cromer Road	NDR Data	2015
39	A140 - Hevingham	NDR Data	2015
40a	A140 - Roughton	DfT - AADT	2015
40b	A140 - Roughton	DfT - AADT	2015
41	B1436 - Felbrigg	7-day ATC	2017
42	B1145 - Reepham Road	7-day ATC	2017
43	Cromer Road - Ingworth	7-day ATC	2017
44a	A149	DfT - AADT	2015
44b	A149	DfT - AADT	2015
45	A149	DfT - AADT	2015
46	B1145 - Lyngate Road	7-day ATC	2017
47a	North Walsham Road - Edingthorpe Green	7-day ATC	2017
47b	North Walsham Road - Edingthorpe Green	7-day ATC	2017
47c	North Walsham Road - Edingthorpe Green	7-day ATC	2017
48	B1159 - Bacton Road	7-day ATC	2017
49	B1159	7-day ATC	2017
50	A1151	DfT - AADT	2015
51	A1151	NDR Data	2015
52	A149 - Wayford Road	7-day ATC	2017
53	A149	DfT - AADT	2015

Link No.	Road	Survey type	Survey year
54	A149	DfT - AADT	2015
55	A149	DfT - AADT	2015
56	A149	DfT - AADT	2015
57	A149	DfT - AADT	2015
58	NDR - Link a	NDR Data	2015
59	NDR - Link b	NDR Data	2015
60	NDR - Link c	NDR Data	2015
61	B1436 - Roughton Road	7-day ATC	2017
62	A1042	NDR Data	2015
63	A1151	NDR Data	2015
64	A12	DfT - AADT	2015
65	A47	DfT - AADT	2015

19. Table 25.24 and Table 25.25 detail the results of the construction phase noise road traffic emissions calculations for 2022 and 2023 respectively.

Table 25.24 Construction phase road traffic noise emissions assessment 2022

Link No.	dB Change LA _{10, 18hr}	Speed (mph)	Impact magnitude	Impact significance
1a	0.4	70	Negligible Adverse	Negligible
1b	0.4	70	Negligible Adverse	Negligible
2	0.2	70	Negligible Adverse	Negligible
3	0.1	70	Negligible Adverse	Negligible
4	0.1	70	Negligible Adverse	Negligible
5	0.3	70	Negligible Adverse	Negligible
6	0.5	70	Negligible Adverse	Negligible
7	0.3	70	Negligible Adverse	Negligible
8	0.5	40	Negligible Adverse	Negligible
9	0.4	50	Negligible Adverse	Negligible
10	0.8	40	Negligible Adverse	Negligible
11	0.0	60	No Impact	No Impact
12	0.0	40	No Impact	No Impact
13a	1.2	30	Minor Adverse	Minor
13b	1.2	30	Minor Adverse	Minor
14	0.9	30	Negligible Adverse	Negligible

Link No.	dB Change LA _{10, 18hr}	Speed (mph)	Impact magnitude	Impact significance
15	0.0	54.5	No Impact	No Impact
16	0.8	48.8	Negligible Adverse	Negligible
17	1.9	44.9	Minor Adverse	Minor
18	0.9	30	Negligible Adverse	Negligible
19	0.9	50	Negligible Adverse	Negligible
20	0.0	32.1	No Impact	No Impact
21	3.2	46.6	Moderate Adverse	Moderate
22	2.7	38.5	Minor Adverse	Minor
23	0.0	54.5	No Impact	No Impact
24	0.8	60	Negligible Adverse	Negligible
25	3.5	35.1	Moderate Adverse	Moderate
26	0.0	40	No Impact	No Impact
27	0.0	40	No Impact	No Impact
28	0.5	60	Negligible Adverse	Negligible
29	0.6	50	Negligible Adverse	Negligible
30	0.0	40	No Impact	No Impact
31	1.4	40.1	Minor Adverse	Minor
32	1.0	46.7	Minor Adverse	Minor
33	2.1	43.3	Minor Adverse	Minor
34	2.5	43.6	Minor Adverse	Minor
35a	2.1	43.6	Minor Adverse	Minor
35b	0.8	44.9	Negligible Adverse	Negligible
36	0.7	43.3	Negligible Adverse	Negligible
37	0.0	30	No Impact	No Impact
38	0.3	50	Negligible Adverse	Negligible
39	1.2	30	Minor Adverse	Minor
40a	0.5	30	Negligible Adverse	Negligible
40b	1.9	36.2	Minor Adverse	Minor
41	2.0	43	Minor Adverse	Minor
42	0.1	35.9	No Impact	No Impact
43	1.0	30	Negligible Adverse	Negligible
44a	0.9	30	Negligible Adverse	Negligible
44b	0.9	30	Negligible Adverse	Negligible
45	1.2	42.5	Minor Adverse	Minor

Link No.	dB Change LA _{10, 18hr}	Speed (mph)	Impact magnitude	Impact significance
46	0.3	41.6	Negligible Adverse	Negligible
47a	1.2	41.6	Minor Adverse	Minor
47b	2.3	41.6	Minor Adverse	Minor
47c	0.0	45.8	No Impact	No Impact
48	1.6	32.1	Minor Adverse	Minor
49	0.1	30	No Impact	No Impact
50	0.0	30	No Impact	No Impact
51	0.5	45.2	Negligible Adverse	Negligible
52	0.7	30	Negligible Adverse	Negligible
53	0.3	30	Negligible Adverse	Negligible
54	0.3	60	Negligible Adverse	Negligible
55	0.9	30	Negligible Adverse	Negligible
56	0.6	50	Negligible Adverse	Negligible
57	0.3	60	Negligible Adverse	Negligible
58	0.4	60	Negligible Adverse	Negligible
59	0.4	60	Negligible Adverse	Negligible
60	0.1	42.9	No Impact	No Impact
61	0.0	40	No Impact	No Impact
62	0.0	40	No Impact	No Impact
63	0.8	30	Negligible Adverse	Negligible
64	1.3	30	Minor Adverse	Minor
65	0.4	70	Negligible Adverse	Negligible
10	0.7	50	Negligible Adverse	Negligible
12	0.0	60	No Impact	No Impact
13a	1.0	40	Minor Adverse	Minor
13b	1.1	40	Minor Adverse	Minor
14	0.7	60	Negligible Adverse	Negligible
18	0.7	60	Negligible Adverse	Negligible
38	0.0	40	No Impact	No Impact
39	0.2	60	Negligible Adverse	Negligible
40a	0.7	60	Negligible Adverse	Negligible
40b	0.3	60	Negligible Adverse	Negligible
44a	0.9	40	Negligible Adverse	Negligible
44b	0.8	40	Negligible Adverse	Negligible

Link No.	dB Change LA _{10, 18hr}	Speed (mph)	Impact magnitude	Impact significance
45	0.7	60	Negligible Adverse	Negligible
51	0.0	40	No Impact	No Impact
56	0.6	60	Negligible Adverse	Negligible
64	0.7	40	Negligible Adverse	Negligible
65	1.1	40	Minor Adverse	Minor
13a	0.8	60	Negligible Adverse	Negligible
13b	0.9	60	Negligible Adverse	Negligible
44a	0.7	60	Negligible Adverse	Negligible
44b	0.7	60	Negligible Adverse	Negligible
51	0.0	60	No Impact	No Impact
65	0.8	60	Negligible Adverse	Negligible

Table 25.25 Construction phase road traffic noise emissions assessment 2023

Link No.	dB Change LA _{10, 18hr}	Speed (mph)	Impact magnitude	Impact significance
1a	0.4	70	Negligible Adverse	Negligible
1b	0.4	70	Negligible Adverse	Negligible
2	0.2	70	Negligible Adverse	Negligible
3	0.1	70	Negligible Adverse	Negligible
4	0.1	70	Negligible Adverse	Negligible
5	0.3	70	Negligible Adverse	Negligible
6	0.5	70	Negligible Adverse	Negligible
7	0.3	70	Negligible Adverse	Negligible
8	0.5	40	Negligible Adverse	Negligible
9	0.4	50	Negligible Adverse	Negligible
10	0.7	40	Negligible Adverse	Negligible
11	0.0	60	No Impact	No Impact
12	0.0	40	No Impact	No Impact
13a	1.1	30	Minor Adverse	Minor
13b	1.2	30	Minor Adverse	Minor
14	0.9	30	Negligible Adverse	Negligible
15	0.0	54.5	No Impact	No Impact
16	0.8	48.8	Negligible Adverse	Negligible
17	1.8	44.9	Minor Adverse	Minor
18	0.9	30	Negligible Adverse	Negligible

Link No.	dB Change LA _{10, 18hr}	Speed (mph)	Impact magnitude	Impact significance
19	0.9	50	Negligible Adverse	Negligible
20	0.0	32.1	No Impact	No Impact
21	3.2	46.6	Moderate Adverse	Moderate
22	2.6	38.5	Minor Adverse	Minor
23	0.0	54.5	No Impact	No Impact
24	0.8	60	Negligible Adverse	Negligible
25	3.4	35.1	Moderate Adverse	Moderate
26	0.0	40	No Impact	No Impact
27	0.0	40	No Impact	No Impact
28	0.0	60	No Impact	No Impact
29	0.5	50	Negligible Adverse	Negligible
30	0.6	40	Negligible Adverse	Negligible
31	0.0	40.1	No Impact	No Impact
32	1.4	46.7	Minor Adverse	Minor
33	1.0	43.3	Negligible Adverse	Negligible
34	2.1	43.6	Minor Adverse	Minor
35a	2.4	43.6	Minor Adverse	Minor
35b	2.0	44.9	Minor Adverse	Minor
36	0.8	43.3	Negligible Adverse	Negligible
37	0.7	30	Negligible Adverse	Negligible
38	0.0	50	No Impact	No Impact
39	0.3	30	Negligible Adverse	Negligible
40a	1.1	30	Minor Adverse	Minor
40b	0.5	36.2	Negligible Adverse	Negligible
41	1.8	43	Minor Adverse	Minor
42	2.0	35.9	Minor Adverse	Minor
43	0.1	30	No Impact	No Impact
44a	1.0	30	Negligible Adverse	Negligible
44b	0.9	30	Negligible Adverse	Negligible
45	0.9	42.5	Negligible Adverse	Negligible
46	1.1	41.6	Minor Adverse	Minor
47a	0.3	41.6	Negligible Adverse	Negligible
47b	1.2	41.6	Minor Adverse	Minor
47c	2.3	45.8	Minor Adverse	Minor

Link No.	dB Change LA _{10, 18hr}	Speed (mph)	Impact magnitude	Impact significance
48	0.0	32.1	No Impact	No Impact
49	1.6	30	Minor Adverse	Minor
50	0.1	30	No Impact	No Impact
51	0.0	45.2	No Impact	No Impact
52	0.5	30	Negligible Adverse	Negligible
53	0.7	30	Negligible Adverse	Negligible
54	0.3	60	Negligible Adverse	Negligible
55	0.3	30	Negligible Adverse	Negligible
56	0.9	50	Negligible Adverse	Negligible
57	0.6	60	Negligible Adverse	Negligible
58	0.3	60	Negligible Adverse	Negligible
59	0.4	60	Negligible Adverse	Negligible
60	0.3	42.9	Negligible Adverse	Negligible
61	0.0	40	No Impact	No Impact
62	0.0	40	No Impact	No Impact
63	0.0	30	No Impact	No Impact
64	0.7	30	Negligible Adverse	Negligible
65	1.2	70	Minor Adverse	Minor
10	0.6	50	Negligible Adverse	Negligible
12	0.0	60	No Impact	No Impact
13a	1.0	40	Negligible Adverse	Negligible
13b	1.0	40	Minor Adverse	Minor
14	0.6	60	Negligible Adverse	Negligible
18	0.7	60	Negligible Adverse	Negligible
38	0.0	40	No Impact	No Impact
39	0.2	60	Negligible Adverse	Negligible
40a	0.7	60	Negligible Adverse	Negligible
40b	0.3	60	Negligible Adverse	Negligible
44a	0.9	40	Negligible Adverse	Negligible
44b	0.8	40	Negligible Adverse	Negligible
45	0.7	60	Negligible Adverse	Negligible
51	0.0	40	No Impact	No Impact
56	0.6	60	Negligible Adverse	Negligible
64	0.6	40	Negligible Adverse	Negligible

Link No.	dB Change LA _{10, 18hr}	Speed (mph)	Impact magnitude	Impact significance
65	1.0	40	Minor Adverse	Minor
13a	0.8	60	Negligible Adverse	Negligible
13b	0.9	60	Negligible Adverse	Negligible
44a	0.7	60	Negligible Adverse	Negligible
44b	0.7	60	Negligible Adverse	Negligible
51	0.0	60	No Impact	No Impact
65	0.8	60	Negligible Adverse	Negligible

25.4 Conclusion

20. For the assessed construction phases, impacts are predicted to range from no impact to major adverse. However, with the adoption of standard mitigation (outlined in the CoCP (DCO requirement 20)), enhanced mitigation measures and BPM, no residual impact is anticipated.

25.5 References

BSI, (2014); British Standards Institution [BS] 5228-1:2009+A1:2014 “Code of practice for noise and vibration control on construction and open sites – Part 1: Noise”.

BSI, (2014); British Standards Institution [BS] 5228-2: 2009+A1:2014 “Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration”.

Department of Transport, Welsh Office (1988); Calculation of Road Traffic Noise HMSO, London.

Highways Agency (2011); Design Manual for Roads and Bridges, Volume 11, Section 3, Part 7: Noise and Vibration. The Highways Agency.

This page is intentionally blank.