

# DOGGER BANK D WIND FARM

## Preliminary Environmental Information Report

Volume 2

Appendix 25.3 Construction Noise and Vibration  
Assessment

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## Glossary

Term	Definition
Additional Mitigation	<p>Measures identified through the EIA process that are required as further action to avoid, prevent, reduce or, if possible, offset likely significant adverse effects to acceptable levels (also known as secondary (foreseeable) mitigation)</p> <p>All additional mitigation measures adopted by the Project are provided in the Commitments Register.</p>
Birkhill Wood Substation	<p>The onshore grid connection point for DBD identified through the Holistic Network Design process. Birkhill Wood Substation is being developed by National Grid Electricity Transmission and does not form part of the Project.</p>
Commitment	<p>Refers to any Embedded Mitigation and Additional Mitigation, enhancement or monitoring measures identified through the EIA process and those identified outside the EIA process such as through stakeholder engagement and design evolution.</p> <p>All commitments adopted by the Project are provided in the Commitments Register.</p>
Decibels (dB)	<p>A logarithmic ratio of two values of a variable. The decibel is not a true measurement unit nor is it exclusive to noise assessments. Decibels are used because they can represent very wide ranges of ratios (from trillionths and billionths to billions and trillions) with a small range of decibel values. Decibels can be used to represent measured values by using a known reference value in the ratio. When using decibels to measure something it is therefore important to specify what variable is being measured and what reference level has been used. This is done by adding a reference value statement in the form dB re x units, where the units indicate the variable being measured and x is the reference value.</p> <p>Decibels are used in noise assessments because the human ear responds to sound pressure in a logarithmic way and the quantities measured in acoustics vary over wide ranges.</p> <p>As the decibel is used in acoustics to represent a range of sound level parameters, there is a standardised notation system. This takes the form of an italic capital letter '<i>L</i>' (referring to 'level') and subscript characters which give specific details of what is being represented.</p> <p>Because decibels are logarithmic, they must be added, subtracted, multiplied, divided and averaged using different techniques from normal, linear, quantities.</p>
Design	<p>All of the decisions that shape a development throughout its design and pre-construction, construction / commissioning, operation and, where relevant, decommissioning phases.</p>

Term	Definition
Development Consent Order (DCO)	A consent required under Section 37 of the Planning Act 2008 to authorise the development of a Nationally Significant Infrastructure Project, which is granted by the relevant Secretary of State following an application to the Planning Inspectorate.
Effect	An effect is the consequence of an impact when considered in combination with the receptor's sensitivity / value / importance, defined in terms of significance.
Embedded Mitigation	<p>Embedded mitigation includes:</p> <ul style="list-style-type: none"> <li>Measures that form an inherent part of the project design evolution such as modifications to the location or design of the development made during the pre-application phase (also known as primary (inherent) mitigation); and</li> <li>Measures that will occur regardless of the EIA process as they are imposed by other existing legislative requirements or are considered as standard or best practice to manage commonly occurring environmental impacts (also known as tertiary (inexorable) mitigation).</li> </ul> <p>All embedded mitigation measures adopted by the Project are provided in the Commitments Register.</p>
Energy Storage and Balancing Infrastructure (ESBI)	A range of technologies such as battery banks to be co-located with the Onshore Converter Station, which provide valuable services to the electrical grid such as storing energy to meet periods of peak demand and improving overall reliability.
Environmental Impact Assessment (EIA)	A process by which certain planned projects must be assessed before a formal decision to proceed can be made. It involves the collection and consideration of environmental information and includes the publication of an Environmental Statement.
Environmental Statement (ES)	A document reporting the findings of the EIA which describes the measures proposed to mitigate any likely significant effects.
Grid Connection	The offshore and onshore electricity transmission network connection to Birkhill Wood Substation.
Haul Roads	Temporary tracks set aside to facilitate transport access during construction works.
Impact	A change resulting from an activity associated with the Project, defined in terms of magnitude.
Jointing Bays	Underground structures constructed at regular intervals along the onshore export cable corridor to facilitate the joining of discrete lengths of the installation of cables.

Term	Definition
Landfall	The area on the coastline, south-east of Skipsea, at which the offshore export cables are brought ashore, connecting to the onshore export cables at the transition joint bay above Mean High Water Springs.
Level	Values measured in decibels.
Link Boxes	Structures housing electrical equipment located alongside the jointing bays in the onshore export cable corridor and the transition joint bay at the landfall, which could be located above or below ground.
Mitigation	<p>Any action or process designed to avoid, prevent, reduce or, if possible, offset potentially significant adverse effects of a development.</p> <p>All mitigation measures adopted by the Project are provided in the Commitments Register.</p>
Monitoring	<p>Measures to ensure the systematic and ongoing collection, analysis and evaluation of data related to the implementation and performance of a development. Monitoring can be undertaken to monitor conditions in the future to verify any environmental effects identified by the EIA, the effectiveness of mitigation or enhancement measures or ensure remedial action are taken should adverse effects above a set threshold occur.</p> <p>All monitoring measures adopted by the Project are provided in the Commitments Register.</p>
Onshore Converter Station (OCS) Zone	The area within which the Onshore Converter Station and Energy Storage and Balancing Infrastructure will be located in vicinity of Birkhill Wood Substation.
Onshore Converter Station (OCS)	A compound containing electrical equipment required to stabilise and convert electricity generated by the Wind Turbines and transmitted by the export cables into a more suitable voltage for grid connection into Birkhill Wood Substation.
Onshore Development Area	The area in which all onshore infrastructure associated with the Project will be located, including any temporary works area required during construction and permanent land required for mitigation and enhancement areas, which extends landward of Mean Low Water Springs. There is an overlap with the Offshore Development Area in the intertidal zone.
Onshore Export Cable Corridor (ECC)	The area within which the onshore export cables will be located, extending from the landfall to the Onshore Converter Station zone and onwards to Birkhill Wood Substation.
Onshore Export Cables	Cables which bring electricity from the transition joint bay at landfall to the Onshore Converter Station zone (HVDC cables) and from the Onshore Converter Station zone onwards to Birkhill Wood Substation (HVAC cables).

Term	Definition
Noise	No strict definition and is often used interchangeably with sound. However, it is usually taken to mean unwanted sound.
Project Design Envelope	<p>A range of design parameters defined where appropriate to enable the identification and assessment of likely significant effects arising from a project's worst-case scenario.</p> <p>The Project Design Envelope incorporates flexibility and addresses uncertainty in the DCO application and will be further refined during the EIA process.</p>
Sound	The physical phenomenon of the transmission of energy through gaseous, liquid or solid media via rapid periodic fluctuations in pressure.
Study Areas	A geographical area and / or temporal limit defined for each EIA topic to identify sensitive receptors and assess the relevant likely significant effects.
Temporary Construction Compounds	Areas set aside to facilitate the construction works for the onshore infrastructure, which include the landfall construction compound, main and intermediate construction compounds for onshore export cable works and OCS and ESBI construction compounds.
The Applicant	SSE Renewables and Equinor acting through 'Doggerbank Offshore wind Farm Project 4 Projco Limited'.
The Project	Dogger Bank D (DBD) Offshore Wind Farm Project, also referred to as DBD in this PEIR.
Transition Joint Bay (TJB)	An underground structure at the landfall that house the joints between the offshore and onshore export cables.
Trenching	Open cut method for cable or duct installation.
Trenchless Techniques	<p>Trenchless cable or duct installation methods used to bring offshore export cables ashore at landfall, facilitate crossing major onshore obstacles such as roads, railways and watercourses and where trenching may not be suitable.</p> <p>Trenchless techniques included in the Project Design Envelope include Horizontal Directional Drilling (HDD), auger boring, micro-tunnelling, pipe jacking / ramming and Direct Pipe.</p>

## 25.3 Construction Noise and Vibration Assessment

### 25.3.1 Introduction

1. This appendix to the Dogger Bank D Offshore Wind Farm (hereafter ‘the Project’ or ‘DBD’) Preliminary Environmental Information Report (PEIR) supports **Volume 1, Chapter 25 Noise and Vibration**. This appendix forms part of the PEIR for the onshore elements of the Project.
2. The purpose of this appendix is to detail the construction noise and vibration assessment of the Project’s onshore infrastructure. This indicative assessment – and the subsequent update to this assessment which will be undertaken to inform the Project’s Environmental Statement (ES) – has been undertaken based on a preliminary understanding of the likely construction programme, activities and plant to be used.
3. A draft **Outline Code of Construction Practice** (CoCP) (document reference: 8.9) has been prepared for the PEIR and will be further refined and submitted along with the Development Consent Order (DCO) application. The Outline CoCP will include embedded best practicable means (BPM) to mitigate construction noise and vibration and potential additional mitigation measures that may be required should exceedances of suitable thresholds be identified during post-consent monitoring / modelling. A Construction Noise and Vibration Management Plan (CNVMP) will be developed post-consent in accordance with the Outline CoCP and provided as part of the CoCP (see Commitment ID CO70 in **Table 25-4** in **Volume 1, Chapter 25 Noise and Vibration**). The CNVMP will include a detailed construction noise and vibration assessment, including predictions of construction noise and vibration levels at nearby noise and vibration sensitive receptors (NVSR) for comparison with suitable thresholds. This CNVMP will be prepared based on information provided by the Principal Contractor(s) and will identify works-specific mitigation measures to be implemented based on the Outline CoCP.



## 25.3.2 Construction Noise Calculations

### 25.3.2.1 Construction Scenarios and Plant

4. Noise modelling scenarios were derived from an indicative construction programme provided by the Applicant (see **Volume 1, Chapter 4 Project Description** for further details of onshore construction activities) and are as follows:
  - Landfall construction:
    - Site preparation activities, including vegetation and site clearance, topsoil stripping, junction and other traffic modification works, temporary fencing works, construction of the landfall construction compound and haul road; and
    - Landfall trenchless installation works.
  - Onshore export cable corridor (ECC) construction:
    - Works at the temporary construction compounds, including site preparation activities such as vegetation and site clearance, temporary fencing works and construction of the temporary construction compounds; and
    - Trench excavation, cable duct installation and trench backfilling.
  - Onshore Converter Station (OCS) and Electricity Storage and Balancing Infrastructure (ESBI) construction:
    - Site preparation and enabling works;
    - OCS construction; and
    - ESBI construction.
5. For those activities that will be undertaken after the temporary construction compounds and haul roads are constructed, the modelling scenario includes noise from ongoing activities at the temporary construction compounds and vehicle movements along the haul road. For the following activities, it was not possible to predict the noise levels at NVSR due to a lack of detailed design information. Hence, the closest distance to an NVSR at which these works can be undertaken before experiencing a significant adverse effect has been calculated:
  - Junction improvement and other traffic modification works along the onshore ECC and for the OCS zones;
  - Trenchless crossings along the onshore ECC (positions of entry and exit pits are not known); and
  - Jointing bay and associated link box construction along the onshore ECC.

6. As per **Table 25-4** in **Volume 1, Chapter 25 Noise and Vibration**, Commitment ID CO69, core working hours for onshore construction activities will be 07:00 to 19:00 Monday to Saturday. No onshore construction activities will take place outside of these hours, including Sunday and bank holidays apart from the following circumstances where extended and continuous periods of construction may be required:
- Where continuous periods (up to 24 hours a day, seven days a week) of working are required such as trenchless installation works, concrete pouring and cable pull-in and jointing operations;
  - Deliveries of abnormal indivisible loads that may otherwise cause congestions on the local road network;
  - Testing and commissioning of installed onshore electrical infrastructure;
  - Emergency works; and
  - Works as otherwise agreed in writing with the relevant local authority.
7. Vehicle movements on the public highway network and employees' arrival and departure to/from site may occur outside of the core working hours.
8. Separate calculations were undertaken to determine noise impacts during the daytime period and on Saturday afternoons, as these periods are defined in BS5228. Further details are provided in **Section 25.3.3.2.2**.
9. **Table 25.3-1** outlines the assumed construction noise sources that informed the noise predictions. Where possible, noise source levels were taken using those available in BS 5228-1 Annex C and incorporate on-time corrections as outlined in BS 5228-1:2009+A1:2014 '*Code of practice for noise and vibration control on construction and open sites – Part 1: Noise*'.

*Table 25.3-1 Details of Assumed Construction Plant by Activity*

Activity	Plant	No.	Reference	L <sub>WA</sub> (dB)	On-time
Vegetation and Site Clearance	Telehandler with Flail Attachment	1	BS 5228-1 C.2.35	99	80%
	Excavator	1	BS 5228-1 C.2.5	104	40%
	Dump Truck	2	BS 5228-1 C.2.30	107	40%
	Strimmer	2	BS 5228-1 F.1 L>120, Stage II	105	80%
	Lawn Mower	1	BS 5228-1 F.1 L>120, Stage II	105	80%

Activity	Plant	No.	Reference	L <sub>WA</sub> (dB)	On-time
Junction and Other Traffic Modification Works	Excavator	1	BS 5228-1 C.4.12	105	50%
	Dump Truck	2	BS 5228-1 C.4.1	109	50%
	Roller	1	BS 5228-1 C.2.38	101	50%
	Whacker Plate	1	BS 5228-1 C.2.41	108	20%
	HGV Lorry Tippers	1	BS 5228-1 C.2.30	107	50%
	Asphalt Paver with Tipper Lorry	1	BS 5228-1 C.5.31	105	25%
	Cement Truck	1	BS 5228-1 C.4.18	103	10%
Temporary Fencing Works	Excavator	1	BS 5228-1 C.2.25	97	80%
	Tracked Vehicle with Fence Post Installer	1	BS 5228-1 C.2.17	104	80%
Temporary Construction Compound Establishment	Excavator	2	BS 5228-1 C.2.14	107	80%
	Dump Truck	2	BS 5228-1 C.2.30	107	80%
	Bulldozer	1	BS 5228-1 C.2.10	108	80%
	Roller (Vibratory)	1	BS 5228-1 C.2.39	102	40%
	Whacker Plate	1	BS 5228-1 C.2.41	108	20%
	Asphalt Paver with Tipper Lorry	1	BS 5228-1 C.5.30	103	20%
	Hi-Ab Crane	1	BS 5228-1 C.4.43	98	10%
	Mobile Crane	1	BS 5228-1 C.4.50	104	10%
	HGV Lorry Tippers	3	BS 5228-1 C.8.20	107	50%
	Generator	1	BS 5228-1 C.4.78	94	100%

Activity	Plant	No.	Reference	L <sub>WA</sub> (dB)	On-time
Temporary Construction Compound Ongoing Activities	Telehandler	1	BS 5228-1 C.2.35	99	50%
	HGV Deliveries	Compound dependent	BS 5228-1 C.11.5	108	50%
	Generator	3	BS 5228-1 C.4.78	94	80%
	Concrete Batching (Mixer) Cement Bound Sand	1	BS 5228-1 C.4.27	107	20%
Topsoil Removal and Haul Road Construction	Excavator	2	BS 5228-1 C.2.14	107	80%
	Dump Truck	2	BS 5228-1 C.2.30	107	60%
	Bulldozer	2	BS 5228-1 C.2.10	108	80%
	Roller (vibratory)	1	BS 5228-1 C.2.39	102	50%
	HGV Lorry Tippers	2	BS 5228-1 C.8.20	107	50%
Landfall Trenchless Installation Works	Excavator	1	BS 5228-1 C.2.14	107	20%
	Dump Truck	1	BS 5228-1 C.2.32	102	20%
	Drilling Rig (including auxiliary mud units, recovery and power pack)	2	SSE Library	110	100%
	Cement Truck	1	BS 5228-1 C.4.18	103	10%
	Generator	3	BS 5228-1 C.4.78	94	100%
	Concrete Pump	1	BS 5228-1 C.4.26	103	20%
	Water Pump	2	BS 5228-1 C.4.88	96	80%
Open Cut Trenching along Onshore ECC	Excavator	2	BS 5228-1 C.2.14	107	75%
	Bulldozer	1	BS 5228-1 C.2.10	108	50%

Activity	Plant	No.	Reference	L <sub>WA</sub> (dB)	On-time
	Wheeled Loader	1	BS 5228-1 C.2.27	108	50%
	Generator	1	BS 5228-1 C.4.78	94	100%
	Dump Truck	2	BS 5228-1 C.2.32	102	50%
Duct Installation and Trench Backfilling along Onshore ECC	Excavator	2	BS 5228-1 C.2.5	104	50%
	Dump Truck	2	BS 5228-1 C.2.30	107	50%
	Roller	1	BS 5228-1 C.2.38	101	50%
	Whacker Plate	1	BS 5228-1 C.2.41	108	50%
OCS Construction	Excavator	6	BS 5228-1 C.2.14	107	75%
	Wheeled Loader	4	BS 5228-1 C.2.27	108	75%
	Bulldozer	4	BS 5228-1 C.2.10	108	75%
	Dump Truck	8	BS 5228-1 C.2.32	102	75%
	Roller	2	BS 5228-1 C.2.38	101	75%
	Mobile Crane	4	BS 5228-1 C.4.50	104	60%
	Cement Mixer Truck	2	BS 5228-1 C.4.18	103	50%
	Cement Truck Pump and Boom Arm	2	BS 5228-1 C.4.29	108	50%
	Generator	3	BS 5228-1 C.4.84	102	100%
	Hydraulic Hammer Piling Rig	1	BS 5228-1 C.12.6	117	15%
	Asphalt Paver with Tipper Lorry	1	BS 5228-1 C.5.31	105	10%
ESBI Construction	Excavator	4	BS 5228-1 C.2.14	107	75%
	Wheeled Loader	2	BS 5228-1 C.2.27	108	75%

Activity	Plant	No.	Reference	L <sub>WA</sub> (dB)	On-time
	Bulldozer	3	BS 5228-1 C.2.10	108	75%
	Dump Truck	6	BS 5228-1 C.2.32	102	75%
	Roller	2	BS 5228-1 C.2.38	101	50%
	Mobile Crane	2	BS 5228-1 C.4.50	104	50%
	Cement Mixer Truck	3	BS 5228-1 C.4.18	103	50%
	Cement Truck Pump and Boom Arm	2	BS 5228-1 C.4.29	108	50%
	Generator	3	BS 5228-1 C.4.84	102	100%
	Hydraulic Hammer Piling Rig	1	BS 5228-1 C.12.6	117	15%
	Asphalt Paver with Tipper Lorry	1	BS 5228-1 C.5.31	105	10%
	HGV Lorry Tippers	4	BS 5228-1 C.8.20	107	60%
	Hand held power tools (e.g. angle-grinder)	2	BS 5228-1 C.4.93	108	10%

### 25.3.2.2 Modelling Procedures

10. The calculations of construction noise were undertaken using SoundPLAN (v9.1) noise modelling software. This software implements the sound propagation calculation methodology set out in BS5228-1. Calculations were undertaken for each construction activity specified in **Table 25.3-1**.

11. Construction noise levels at NVSR around the landfall have been calculated by creating an area source, representing all construction plant operating simultaneously at the landfall construction compound location, a point source and a line source, representing junction and other traffic modification works and construction of the haul road respectively. As a worst-case assumption, the point source and line source were positioned at the closest approach to NVSR. An indicative landfall trenchless installation trajectory has been calculated by creating an area source, representing all plant operating simultaneously.
12. Construction noise levels due to onshore ECC works (i.e. trenching and duct installation) have been calculated using segmented line sources, each with a length equal to the distance likely to be completed by the works in one week (i.e. 300m per week). The second highest noise level (representing the second highest weekly level) has been used to represent the 10<sup>th</sup> highest day in 15 days, as per the assessment methodology identified in **Volume 1, Chapter 25 Noise and Vibration**. As a worst-case assumption, line sources were positioned at the edge of the Onshore Development Area at the closest approach to each NVSR. The calculation of onshore ECC construction noise includes operation of the temporary construction compounds and movement of vehicles along the haul road.
13. The following activities have been omitted from the modelling as their rate of progress is at least 300m/week, implying the works will be within the 300m Construction Noise Study Area identified in **Volume 1, Chapter 25 Noise and Vibration** for less than two weeks:
  - Topsoil stripping along onshore ECC;
  - Land drainage works;
  - Cable pulling and jointing; and
  - Removal of haul road and topsoil reinstatement.
14. Electrical and commissioning works were excluded from the noise modelling because their noise emissions are much lower than other construction activities associated with the Project.
15. Construction noise levels at NVSR around the OCS zones have been calculated using an area source representing all plant operating simultaneously, with the exception of the plant with the highest sound power level which has been modelled as a point source. Both noise sources (the area source and the point source) were positioned at the closest approach of the OCS zone boundary to the NVSR. The size of the area source was 25% of the anticipated total permanent footprint of the OCS and ESBI (i.e. around 37,500m<sup>2</sup>). This is considered to represent a reasonable worst-case in that it is unlikely that all construction plant will be operational within this area with, as mentioned above, the highest individual item on the boundary itself. Similarly to the onshore ECC works methodology, haul roads have been positioned at the OCS zone boundary closest to NVSR.

16. The area sources representing main construction compounds along the onshore ECC and the landfall construction compound were also assessed in line with the methodology implemented at the OCS zone (i.e. 25% of their anticipated total permanent footprint (i.e. around 5,000m<sup>2</sup>)), with the loudest plant modelled as a point source, both at the closest approach to the NVSR.
17. Intermediate construction compounds have a small total footprint (5,650m<sup>2</sup>) relative to their distance to NVSR. In addition, it is a significant worst-case to assume that the construction of intermediate compounds will take at least 10 days. Hence, the noise emissions from intermediate construction compounds were modelled using an area source over the entire compound area.

#### 25.3.2.2.1 Modelling Input Data

18. Inputs into the noise models of the landfall, onshore ECC and OCS and ESBI construction noise include ground topography, ground type, and buildings to form a 3D representation of the Construction Noise Study Area. Modelling input data for these calculations are detailed in **Table 25.3-2**.

*Table 25.3-2 Noise Model Input Data*

Data	Usage	Source File	Origin
OS mapping	Locations of buildings in the Construction Noise Study Area	DBD_OSMMpolys_Low DBD_OSMMpolys_Medium DBD_OSMMpolys_Negligible	Emapsite
LiDAR composite Digital Terrain Model	Ground topography in the Construction Noise Study Area	lidar_composite_dtm-2022-1-SE93ne lidar_composite_dtm-2022-1-SE93se lidar_composite_dtm-2022-1-SE94ne lidar_composite_dtm-2022-1-SE94se lidar_composite_dtm-2022-1-TA03ne lidar_composite_dtm-2022-1-TA03nw lidar_composite_dtm-2022-1-TA03se lidar_composite_dtm-2022-1-TA03sw lidar_composite_dtm-2022-1-TA04ne lidar_composite_dtm-2022-1-TA04nw lidar_composite_dtm-2022-1-TA04se lidar_composite_dtm-2022-1-TA04sw lidar_composite_dtm-2022-1-TA05se lidar_composite_dtm-2022-1-TA14ne lidar_composite_dtm-2022-1-TA14nw	Environment Agency (2020) LIDAR Composite DSM 2022 – 1m. Defra Data Services Platform. Available at <a href="https://environment.data.gov.uk/DefraDataDownload/Mode=survey">https://environment.data.gov.uk/DefraDataDownload/Mode=survey</a>



Data	Usage	Source File	Origin
		lidar_composite_dtm-2022-1-TA14se lidar_composite_dtm-2022-1-TA14sw lidar_composite_dtm-2022-1-TA15ne lidar_composite_dtm-2022-1-TA15nw lidar_composite_dtm-2022-1-TA15se lidar_composite_dtm-2022-1-TA15sw	
Construction plant information	Plant type, numbers, sound power levels, percentage on-time for each construction activity	Indicative Construction Programme Spreadsheet	The Applicant

#### 25.3.2.2.2 Acoustic Model Settings

19. Acoustic modelling has been undertaken using the following model settings:

- Maximum search radius of 3000m;
- Maximum number of reflections: 3;
- Daytime and evening / weekend noise predictions carried out at ground floor level (i.e. 1.5m above ground). Night-time predictions carried out at first floor level (i.e. 4m above ground);
- Side diffraction enabled;
- Building heights set to 6m; and
- Ground absorption has been set  $G = 0.9$  (90% soft ground, considered representative of the Construction Noise Study Area).

### 25.3.3 Predicted Construction Noise Levels

20. Temporary increases in noise levels at nearby receptors are expected during the construction of the Project. Calculations of these temporary noise increases were undertaken using the construction equipment assumptions shown in **Table 25.3-1** in accordance with the procedure provided in BS 5228-1.
21. Only trenchless installation works at the landfall were calculated for night-time as all other activities are assumed to be limited to either daytime, or evening and weekends working hours.
22. Results include impact magnitude as per the assessment methodology identified in **Volume 1, Chapter 25 Noise and Vibration**.
23. The locations of NVSR discussed in the sections below are provided in **Appendix 25.2 Noise and Vibration Baseline Report** and shown on **Figure 25-2** provided in **Volume 1, Chapter 25 Noise and Vibration**.

### 25.3.3.1 Landfall

24. The results of the landfall construction noise calculations, at the NVSR within 300m of the landfall construction works, are presented in **Table 25.3-3**.
25. Trenchless installation works will have the worst-case impact of the activities undertaken inside the landfall construction compound because these will occur at night. Trenchless installation works were predicted to have a negligible impact at all receptors for the daytime, evenings and weekends working period and no worse than low impact for the night-time working period. The following activities will also be undertaken inside the landfall construction compound and will have lower noise emissions than the trenchless installation works. Hence, their impacts will be no worse than low and are therefore not presented in **Table 25.3-3**:
- Transition joint bay (TJB) and associated link box construction;
  - Cable pulling;
  - TJB backfilling; and
  - Cable jointing.

Table 25.3-3 Calculated Landfall Construction Noise Levels

Activity	NVSR	Calculated Construction Noise Level (dB $L_{Aeq,T}$ )			Impact Magnitude		
		Daytime	Evenings and Weekends	Night-time	Daytime	Evenings and Weekends	Night-time
Site preparation activities (vegetation and site clearance, topsoil stripping, junction and other traffic modification works, temporary fencing works, construction of the landfall construction compound and haul road)	LF1	63	N/A	N/A	Negligible	N/A	N/A
	LF2	63			Negligible		
	LF3	61			Negligible		
	LF4	59			Negligible		
Landfall trenchless installation works	LF1	37	33	33	Negligible	Negligible	Negligible
	LF2	48	48	48	Negligible	Negligible	Low
	LF3	43	47	47	Negligible	Negligible	Low
	LF4	46	48	48	Negligible	Negligible	Low

### 25.3.3.2 Onshore Export Cable Corridor

26. As the onshore ECC connects the landfall to the OCS zone, some of the NVSR included in the modelling of landfall and OCS / ESBI construction works are also included in the modelling of the onshore export cable construction works.

#### 25.3.3.2.1 Construction of Temporary Construction Compounds

27. The results of the construction noise level calculations for construction of temporary construction compounds along the onshore ECC, at the NVSR within 300m of the works are presented in **Table 25.3-4**. The predictions account for the following activities:

- Construction of temporary construction compounds (main and intermediate);
- Temporary fencing works; and
- Vegetation and site clearance.

*Table 25.3-4 Calculated Construction Noise Levels (Daytime) for Temporary Construction Compounds for Onshore Export Cable Works*

NVSR	Calculated Daytime Construction Noise Level (dB $L_{Aeq,T}$ )			Magnitude of Impact
	Construction of Temporary Construction Compounds	Temporary Fencing Works	Vegetation and Site Clearance	
CC4	51	40	47	Negligible
CC5	48	39	44	Negligible
CC6	80	74	77	High
CC7	56	51	53	Negligible
CC11	50	33	44	Negligible
CC22	55	42	51	Negligible
CC23	58	48	54	Negligible
CC24	41	28	35	Negligible
CC25	52	34	48	Negligible
CC27	52	34	48	Negligible
CC28	54	36	50	Negligible

NVSR	Calculated Daytime Construction Noise Level (dB $L_{Aeq,T}$ )			Magnitude of Impact
	Construction of Temporary Construction Compounds	Temporary Fencing Works	Vegetation and Site Clearance	
CC33	48	30	44	Negligible
CC37	54	35	50	Negligible
CC38	52	34	48	Negligible
CC40	64	46	61	Negligible
CC41	53	34	50	Negligible
CC54	68	60	65	Low
CC55	61	46	57	Negligible
SS6	45	31	40	Negligible
SS17	49	39	45	Negligible
SS21	51	33	47	Negligible

28. The results of the evenings and weekends construction noise level calculations for construction of temporary construction compounds along the onshore ECC, at the NVSR within 300m of the works are presented in **Table 25.3-5**. The predictions account for the construction of temporary construction compounds only, as it is the only activity expected to last for a month or more at the respective locations.

*Table 25.3-5 Calculated Construction Noise Levels (Evenings and Weekends) for Temporary Construction Compounds for Onshore Export Cable Works*

NVSR	Calculated Evening and Weekends Construction Noise Level (dB $L_{Aeq,T}$ )	Magnitude of Impact
CC4	51	Negligible
CC5	48	Negligible
CC6	80	High
CC7	56	Low
CC11	50	Negligible
CC22	55	Negligible

NVSR	Calculated Evening and Weekends Construction Noise Level (dB $L_{Aeq,T}$ )	Magnitude of Impact
CC23	58	Low
CC24	41	Negligible
CC25	52	Negligible
CC27	52	Negligible
CC28	54	Negligible
CC33	48	Negligible
CC37	54	Negligible
CC38	52	Negligible
CC40	64	High
CC41	53	Negligible
CC54	68	High
CC55	61	Negligible
SS6	45	Negligible
SS17	49	Negligible
SS21	51	Negligible

### 25.3.3.2.2 Onshore Export Cable Construction

29. The results of the onshore export cable construction noise level calculation, at the NVSR within 300m of the works are presented in **Table 25.3-6**. The presented results account for the following activities:
- Trench excavation, cable duct installation and trench backfilling; and
  - Ongoing activities at the temporary construction compounds and vehicle movements along the haul road.
30. It is worth noting that the impact magnitude due to noise from haul road and temporary construction compound operations alone have been predicted to be negligible at all NVSR. Hence, the activities mentioned above have been assessed cumulatively.

*Table 25.3-6 Calculated Onshore Export Cable Construction Noise Levels (Daytime)*

<b>NVSR</b>	<b>Calculated Daytime Construction Noise Level (dB <math>L_{Aeq,T}</math>)</b>	<b>Impact Magnitude</b>
CC1	51	Negligible
CC2	54	Negligible
CC3	56	Negligible
CC4	56	Negligible
CC5	50	Negligible
CC6	62	Negligible
CC7	54	Negligible
CC8	56	Negligible
CC9	53	Negligible
CC10	61	Negligible
CC11	62	Negligible
CC12	69	Medium
CC13	58	Negligible
CC14	58	Negligible
CC15	54	Negligible
CC16	55	Negligible
CC17	61	Negligible
CC18	60	Negligible
CC19	55	Negligible
CC20	56	Negligible
CC21	55	Negligible
CC22	56	Negligible
CC23	54	Negligible
CC24	61	Negligible

NVSR	Calculated Daytime Construction Noise Level (dB $L_{Aeq,T}$ )	Impact Magnitude
CC25	59	Negligible
CC26	57	Negligible
CC27	58	Negligible
CC28	55	Negligible
CC29	60	Negligible
CC30	45	Negligible
CC31	58	Negligible
CC32	63	Negligible
CC33	49	Negligible
CC34	62	Negligible
CC35	72	High
CC36	59	Negligible
CC37	58	Negligible
CC38	57	Negligible
CC39	53	Negligible
CC40	62	Negligible
CC41	59	Negligible
CC42	60	Negligible
CC43	71	High
CC44	55	Negligible
CC45	60	Negligible
CC46	55	Negligible
CC47	57	Negligible
CC48	56	Negligible
CC49	57	Negligible



NVSR	Calculated Daytime Construction Noise Level (dB $L_{Aeq,T}$ )	Impact Magnitude
CC50	55	Negligible
CC53	50	Negligible
LF1	52	Negligible
LF2	57	Negligible
LF3	55	Negligible
LF4	54	Negligible
SS1	55	Negligible
SS4	57	Negligible
SS5	57	Negligible
SS6	63	Negligible
SS7	54	Negligible
SS8	54	Negligible
SS9	53	Negligible
SS17	54	Negligible
CC51	50	Negligible
CC52	67	Low
SS6	39	Negligible
SS21	63	Negligible
CC56	64	Negligible

31. The results of the evening and weekends onshore export cable construction noise level calculations, at the NVSR within 300m of the works, are presented in **Table 25.3-7**.

32. The presented results only account for onshore ECC sections at which there is a potential for NVSR to experience noise impacts over four consecutive Saturday afternoons, as per the assessment methodology identified in **Volume 1, Chapter 25 Noise and Vibration**. The identified corridor sections are as follow:
- Corridor section at landfall;
  - Corridor section between The Old Forge and Holderness Drain; and
  - Corridor section between Rail Crossing and Bealey's Beck.
33. The following activities were included in the modelling of Saturday afternoon impacts because they could occur consecutively at the same location and therefore result in noise impacts lasting at least one month:
- Haul road construction;
  - Land drainage works; and
  - Trench excavation, cable duct installation and trench backfilling, which includes ongoing activities at the temporary construction compounds and vehicles on the haul road.

*Table 25.3-7 Calculated Onshore Export Cable Construction Noise Levels (Evening and Weekends)*

Corridor Section	NVSR	Calculated Saturday Afternoon Construction Noise Level (dB $L_{Aeq,T}$ )	Impact Magnitude
Corridor section at landfall	LF1	54	Negligible
	LF2	61	High
	LF3	59	Medium
	LF4	56	Low
Corridor section between The Old Forge and Holderness Drain	CC13	51	Negligible
	CC14	51	Negligible
	CC15	54	Negligible
	CC33	49	Negligible
Corridor section between Rail Crossing and Bealey's Beck	CC19	55	Negligible
	CC20	56	Low
	CC21	55	Negligible
	CC22	56	Low
	CC23	54	Negligible

Corridor Section	NVSR	Calculated Afternoon Construction Noise Level (dB $L_{Aeq,T}$ )	Impact Magnitude
	CC24	61	High

### 25.3.3.3 Onshore Converter Station (Zone 4)

34. The results of the OCS and ESB construction noise calculations for Zone 4 are presented in **Table 25.3-8**. The calculated noise levels do not exceed the daytime Threshold Value (65 dB  $L_{Aeq}$ ).

*Table 25.3-8 Calculated Onshore Converter Station Zone 4 Construction Noise Levels*

Proximate Location within OCS Zone (i.e. in proximity to identified NVSR)	NVSR	Calculated Construction Noise Level (dB $L_{Aeq,T}$ )	Impact Magnitude (Daytime)	Impact Magnitude (Evenings and weekends)
SS20 (south-east of Zone 4)	CC52	41	Negligible	Negligible
	SS6	48	Negligible	Negligible
	SS7	44	Negligible	Negligible
	SS8	51	Negligible	Negligible
	SS9	51	Negligible	Negligible
	SS10	51	Negligible	Negligible
	SS11	51	Negligible	Negligible
	SS12	52	Negligible	Negligible
	SS13	52	Negligible	Negligible
	SS14	56	Negligible	Low
	SS15	53	Negligible	Negligible
	SS16	60	Negligible	Medium
	SS18	61	Negligible	High
	SS19	54	Negligible	Negligible
	SS20	65	Negligible	High
	SS21	53	Negligible	Negligible

Proximate Location within OCS Zone (i.e. in proximity to identified NVSR)	NVSR	Calculated Construction Noise Level (dB $L_{Aeq,T}$ )	Impact Magnitude (Daytime)	Impact Magnitude (Evenings and weekends)
	SS22	51	Negligible	Negligible
SS14 (north of Zone 4)	CC52	45	Negligible	Negligible
	SS6	47	Negligible	Negligible
	SS7	50	Negligible	Negligible
	SS8	51	Negligible	Negligible
	SS9	52	Negligible	Negligible
	SS10	52	Negligible	Negligible
	SS11	54	Negligible	Negligible
	SS12	54	Negligible	Negligible
	SS13	57	Negligible	Low
	SS14	65	Negligible	High
	SS15	61	Negligible	High
	SS16	65	Negligible	High
	SS18	54	Negligible	Negligible
	SS19	54	Negligible	Negligible
	SS20	54	Negligible	Negligible
	SS21	48	Negligible	Negligible
	SS22	54	Negligible	Negligible

### 25.3.3.4 Onshore Converter Station (Zone 8)

35. The results of the OCS and ESBI construction noise calculations for Zone 8 are presented in **Table 25.3-9**. The calculated noise levels do not exceed the daytime Threshold Value (65 dB  $L_{Aeq,T}$ ).

*Table 25.3-9 Calculated Onshore Converter Station Zone 8 Construction Noise Levels*

Proximate Location within OCS Zone (i.e. in proximity to identified NVSR)	NVSR	Calculated construction noise level (dB $L_{Aeq,T}$ )	Impact Magnitude (Daytime)	Impact Magnitude (Evenings and weekends)
SS3 (south of Zone 8)	CC50	48	Negligible	Negligible
	SS1	51	Negligible	Negligible
	SS2	52	Negligible	Negligible
	SS3	60	Negligible	Medium
	SS4	52	Negligible	Negligible
	SS5	33	Negligible	Negligible
	SS17	50	Negligible	Negligible
	SS23	48	Negligible	Negligible
SS4 (north of Zone 8)	CC50	51	Negligible	Negligible
	SS1	51	Negligible	Negligible
	SS2	50	Negligible	Negligible
	SS3	49	Negligible	Negligible
	SS4	65	Negligible	High
	SS5	53	Negligible	Negligible
	SS17	54	Negligible	Negligible
	SS23	51	Negligible	Negligible

### 25.3.3.5 Other Construction Activities

36. For activities which lacked sufficient detail for modelling, construction noise level calculations have been undertaken. These have determined the distance to a receptor at which the noise of the works could result in a medium or high magnitude of impact.
37. **Table 25.3-10** details distance limits without additional mitigation. A 5dB attenuation has been applied for activities which are expected to happen inside a pit (i.e. trenchless crossings and construction of joint bays and associated link boxes).
38. **Table 25.3-10** details distance limits with additional mitigation. This disregards the 5dB attenuation and applies a 10dB attenuation to all activities.

*Table 25.3-10 Impact Distance Limit Calculation – Without Additional Mitigation*

Activity	Daytime Distance Limit		Evenings and Weekends Distance Limit		Night-time Distance Limit	
	Medium	High	Medium	High	Medium	High
Trenchless crossings along the onshore ECC	32m	26m	105m	80m	325m	260m
Jointing bay and associated link box construction along the onshore ECC	25m	20m	N/A*	N/A*	N/A	N/A
Junction improvement and other traffic modification works along the onshore ECC and for the OCS zone	60m	50m	N/A*	N/A*	N/A	N/A

\* Activities are not expected to last for more than one month at any one location; hence, impacts on a Saturday afternoon are not assessed.

*Table 25.3-11 Impact Distance Limit Calculation – With Additional Mitigation*

Activity	Daytime Distance Limit		Evenings and Weekends Distance Limit		Night-time Distance Limit	
	Medium	High	Medium	High	Medium	High
Trenchless crossings along the onshore ECC	18m	15m	58m	45m	180m	150m

Activity	Daytime Distance Limit		Evenings and Weekends Distance Limit		Night-time Distance Limit	
	Medium	High	Medium	High	Medium	High
Jointing bay and associated link box construction along the onshore ECC	15m	12m	N/A*	N/A*	N/A	N/A
Junction improvement and other traffic modification works along the onshore ECC and for the OCS zone	20m	16m	N/A*	N/A*	N/A	N/A

## 25.3.4 Construction Vibration Calculations

39. The ground compaction predictions have been based on operation of a large twin drum roller which is 1.2m wide and the drum vibration amplitude is 0.5mm. This is considered representative of a reasonable worst-case.
40. The vibration predictions for trenchless crossing works along the onshore cable corridor identified the driving energy of the drill to produce a PPV of  $0.3\text{mm}\cdot\text{s}^{-1}$  at 20m (measured vibration levels in row 103, Table D.6, BS 5228-2:2009+A1:2014 ‘Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration’). This driving energy (380J) was used to calculate the distances at which the vibration criteria would be predicted.
41. Further details regarding calculation, results and impacts for the construction vibration assessment are presented in **Section 25.7.1** in **Volume 1, Chapter 25 Noise and Vibration**.

## 25.3.5 Summary

42. **Table 25.3-12**, **Table 25.3-13** and **Table 25.3-14** provide summaries of the number of NVSR for each magnitude of impact for the predicted daytime, evening and weekends, and night-time construction noise levels at the landfall.

*Table 25.3-12 Number of NVSR Locations per Magnitude of Impact Criteria – Landfall (Daytime)*

<b>Magnitude of Impact (Daytime)</b>			
<b>Negligible</b>	<b>Low</b>	<b>Medium</b>	<b>High</b>
<b>Site preparation activities (vegetation and site clearance, topsoil stripping, junction and other traffic modification works, temporary fencing works, construction of the landfall construction compound and haul road)</b>			
4	0	0	0
<b>Landfall trenchless installation works</b>			
4	0	0	0

*Table 25.3-13 Number of NVSR Locations per Magnitude of Impact Criteria – Landfall (Evenings and Weekends)*

<b>Magnitude of Impact (Evenings and Weekends)</b>			
<b>Negligible</b>	<b>Low</b>	<b>Medium</b>	<b>High</b>
<b>Landfall trenchless installation works</b>			
4	0	0	0



*Table 25.3-14 Number of NVSR Locations per Magnitude of Impact Criteria – Landfall (Night-time)*

<b>Magnitude of Impact (Night-time)</b>			
<b>Negligible</b>	<b>Low</b>	<b>Medium</b>	<b>High</b>
<b>Landfall trenchless installation works</b>			
1	3	0	0

43. **Table 25.3-15** provides a summary of the number of NVSR for each magnitude of impact for the predicted daytime noise levels for activities related to the temporary construction compounds for the onshore ECC.

*Table 25.3-15 Number of NVSR Locations per Magnitude of Impact Criteria – Temporary Construction Compounds for Onshore Export Cable Works (Daytime)*

<b>Magnitude of Impact (Daytime)</b>			
<b>Negligible</b>	<b>Low</b>	<b>Medium</b>	<b>High</b>
<b>Construction of Temporary Construction Compounds</b>			
19	1	0	1
<b>Temporary Fencing Works</b>			
20	0	0	1
<b>Vegetation and Site Clearance</b>			
20	0	0	1

44. **Table 25.3-16** provides a summary of the number of NVSR for each magnitude of impact for the predicted evenings and weekends noise levels for activities related to the temporary construction compounds for the onshore ECC.

*Table 25.3-16 Number of NVSR Locations per Magnitude of Impact Criteria – Temporary Construction Compounds for Onshore Export Cable Works (Evening and Weekends)*

<b>Magnitude of Impact (Evening and Weekends)</b>			
<b>Negligible</b>	<b>Low</b>	<b>Medium</b>	<b>High</b>
<b>Construction of Temporary Construction Compounds</b>			
16	2	0	3

46. **Table 25.3-17** provides a summary of the number of NVSR for each magnitude of impact for the predicted daytime onshore export cable construction noise levels.

*Table 25.3-17 Number of NVSR Locations per Magnitude of Impact Criteria – Onshore Export Cable Construction (Daytime)*

<b>Magnitude of Impact (Daytime)</b>			
<b>Negligible</b>	<b>Low</b>	<b>Medium</b>	<b>High</b>
<b>Trench excavation, cable duct installation, trench backfilling, and ongoing activities at the temporary construction compounds and vehicle movements along the haul road</b>			
64	1	1	2

47. **Table 25.3-18** provides a summary of the number of NVSR for each magnitude of impact for the predicted evenings and weekends onshore export cable construction noise levels.

*Table 25.3-18 Number of NVSR Locations per Magnitude of Impact Criteria – Onshore Export Cable Construction (Evenings and Weekends)*

<b>Magnitude of Impact (Evenings and Weekends)</b>			
<b>Negligible</b>	<b>Low</b>	<b>Medium</b>	<b>High</b>
<b>Trench excavation, cable duct installation, trench backfilling, and ongoing activities at the temporary construction compounds and vehicle movements along the haul road</b>			
8	3	1	2

48. **Table 25.3-19** provides a summary of the number of NVSR for each magnitude of impact for the predicted daytime OCS and ESBI construction noise levels for Zone 4.

*Table 25.3-19 Number of NVSR Locations per Magnitude of Impact Criteria – OCS Zone 4 Construction (Daytime)*

<b>Magnitude of Impact (Daytime)</b>			
<b>Negligible</b>	<b>Low</b>	<b>Medium</b>	<b>High</b>
<b>Proximate Location within OCS Zone (i.e. in proximity to identified NVSR) - SS20</b>			
17	0	0	0
<b>Proximate Location within OCS Zone (i.e. in proximity to identified NVSR) - SS14</b>			
17	0	0	0

49. **Table 25.3-20** provides a summary of the number of NVSR defined by each level of magnitude of impact for the predicted daytime OCS and ESBI construction noise levels for Zone 8.

*Table 25.3-20 Number of NVSR Locations per Magnitude of Impact Criteria - OCS Zone 8 Construction (Daytime)*

<b>Magnitude of Impact (Daytime)</b>			
<b>Negligible</b>	<b>Low</b>	<b>Medium</b>	<b>High</b>
<b>Proximate Location within OCS Zone (i.e. in proximity to identified NVSR) - SS3</b>			
8	0	0	0
<b>Proximate Location within OCS Zone (i.e. in proximity to identified NVSR) - SS4</b>			
8	0	0	0

50. **Table 25.3-21** provides a summary of the number of NVSR for each magnitude of impact for the predicted evenings and weekends OCS and ESBI construction noise levels for Zone 4.

*Table 25.3-21 Number of NVSR Locations per Magnitude of Impact Criteria – OCS Zone 4 Construction (Evenings and Weekends)*

<b>Magnitude of Impact (Evenings and Weekends)</b>			
<b>Negligible</b>	<b>Low</b>	<b>Medium</b>	<b>High</b>
<b>Proximate Location within OCS Zone (i.e. in proximity to identified NVSR) - SS20</b>			
13	1	1	2

Proximate Location within OCS Zone (i.e. in proximity to identified NVSR) - SS14			
13	1	0	3

51. **Table 25.3-22** provides a summary of the number of NVSR defined by each level of magnitude of impact for the predicted evenings and weekends OCS and ESBI construction noise levels for Zone 8.

*Table 25.3-22 Number of NVSR Locations per Magnitude of Impact Criteria - OCS Zone 8 Construction (Evenings and Weekends)*

Magnitude of Impact (Evenings and Weekends)			
Negligible	Low	Medium	High
Proximate Location within OCS Zone (i.e. in proximity to identified NVSR) - SS3			
7	0	1	0
Proximate Location within OCS Zone (i.e. in proximity to identified NVSR) - SS4			
7	0	0	1

## 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'.

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## List of Acronyms

Acronym	Definition
BPM	Best Practicable Means
CNVMP	Construction Noise and Vibration Management Plan
CoCP	Code of Construction Practice

Acronym	Definition
DBD	Dogger Bank D
DCO	Development Consent Order
ECC	Export Cable Corridor
EIA	Environmental Impact Assessment
ES	Environmental Statement
ESBI	Energy Storage and Balancing Infrastructure
NVSR	Noise and Vibration Sensitive Receptor
OCS	Onshore Converter Station
PEIR	Preliminary Environmental Information Report
PPV	Peak Particle Velocity
TJB	Transition Joint Bay