Bowdun Offshore Wind Farm, Onshore EIA Report

Volume 2, Appendix 13.2: Construction Noise and Vibration Assessment

TWP-BOW-JCB-ONE-RPT-00010 | November 2025

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Glossary

Defined term	Definition
Decibel (dB)	The ratio of sound pressures which we can hear is a ratio of 106:1. For convenience, therefore, a logarithmic measurement scale is used. The resulting parameter is called the 'sound pressure level' (L_p) and the associated measurement unit is the decibel (dB). As the decibel is a logarithmic ratio, the laws of logarithmic addition and subtraction apply.
dB(A)	The unit used to define a weighted sound pressure level, which correlates well with the subjective response to sound. The 'A' weighting follows the frequency response of the human ear, which is less sensitive to low and very high frequencies than it is to those in the range 500Hz to 4kHz. In some statistical descriptors the 'A' weighting forms part of a subscript, such as L_{pA10}, L_{pA90}, and L for the 'A' weighted equivalent continuous noise level.
Equivalent continuous sound level	An index for assessment for overall noise exposure is the equivalent continuous sound level, L_{peq}. This is a notional steady level which would, over a given period of time, deliver the same sound energy as the actual time-varying sound over the same period. Hence fluctuating levels can be described in terms of a single figure level.
Freefield	An external sound field in which no significant sound reflections occur (apart from the ground).
L_{Aeq}	This is a notional steady level which would, over a given period of time, deliver the same sound energy as the actual time-varying sound over the same period. Hence fluctuating levels can be described in terms of a single figure level.
$L_{Aeq,T}$	A-weighted average noise level over time period, T
Sound Power Level	The Sound power level is a measure of the total acoustic energy emitted by a sound source in Watts, independent of the environment or the listener's location. It's expressed in decibels (dB) and serves as an intrinsic property of the noise-emitting object, allowing for objective comparison of different sound sources without being affected by room acoustics or distance.
On-time	In this instance 'On-time' is defined as the period of the assessment period that the equipment is operating at full operational power.
Peak Particle Velocity (PPV)	An indicator of the magnitude of ground vibration which refers to the movement of molecular particles within the ground.
Sound Pressure Level	The sound power emitted by a source result in pressure fluctuations in the air, which are heard as sound. The sound pressure level (L_p) is ten times the logarithm of the ratio of the measured sound pressure (detected by a microphone) to the reference level of 2 x 10^{-5}Pa (the threshold of hearing). Thus L_p (dB) = 10 log $(P1/P_{ref})^2$ where Pref, the lowest pressure detectable by the ear, is 0.00002 pascals (i.e. 2x10^{-5} Pa). The threshold of hearing is 0dB, while the threshold of pain is approximately 120dB. Normal speech is approximately 60dBLpA and a change of 3dB is only just detectable. A change of 10dB is subjectively twice, or half, as loud.

Acronyms

Acronym	Definition
3D	Three-dimensional
HGV	Heavy Goods Vehicle
L_{Aeq}	A-weighed average noise level
$L_{Aeq,T}$	A-weighted average noise level over time period, T
L_{WA}	Sound Power Level
MLWS	Mean Low Water Springs
PPV	Peak Particle Velocity
TWP	Thistle Wind Partners Limited

Table of Units

Units	Definition
dB	Decibel
kW	Kilowatt
m	Metre
Pa	Pascal
t	Tonne
%	Percent

1 Construction Noise and Vibration Assessment

1.1 Introduction

1.1.1 This Appendix presents the construction noise methodology and assessment for the onshore infrastructure of the Bowdun Offshore Wind Farm ('the Project'). The onshore infrastructure of the Project, landward of Mean Low Water Springs (MLWS), is referred to as the 'Proposed Development'.

1.2 Construction Noise Modelling Parameters

1.2.1 Construction noise levels have been predicted at the closest sensitive receptors using Datakustik CadnaA® noise prediction software. All predictions have been made in accordance with BS 5228-1:2009+A1:2014. The noise model includes a number of model variants, each representing a discrete construction activity. All sources have been modelled as point sources and the noise modelling settings and conditions are presented in Table 1.1.

1.2.2 Section 1.3 of this Appendix sets out the construction phasing, plants and equipment used in those phases, the noise levels generated by then and the on-times of the equipment.

Table 1.1: Noise Model Settings and Conditions

Model Setting	Conditions
3D Contours	2 m ground contour data was included in the model, extending beyond the nearest noise sensitive receiver points in the model.
Receiver Points	All receiver points are positioned in either free-field (away from any reflective surfaces) or façade (1 m from building façade and include a +3 dB correction to account for reflections from the facade) positions.
Ground Conditions	OS data were used to define the ground conditions, ground (α =0.5).
Operating On-Times	Operating on-times have been set for all noise sources during general site working hours.

1.3 Assumed Construction Phases and Plant

1.3.1 Table 1.2 presents the construction phases that have been considered/assessed in Volume 1, Chapter 13: Noise and Vibration. These have been agreed with Thistle Wind Partners Limited (TWP) and are based on experience of the lead chapter author, who has in excess of 25 years' experience in the assessment of construction noise.

Table 1.2: Construction Phases

Construction Phases	
Compound and Cable Route	**Substation Work**
• A1 Compound Construction • A2 Compound Operation • A3 Cable Route Devegetation Works and Fencing • A4 Cable Route Soil Strip • A5 Cable Route Haul Route	• B1 Substation Groundworks • B2 Substation Building Foundations • B3 Substation Access Road and Car Parking

Construction Phases	
Compound and Cable Route	**Substation Work**
• A6 Cable Route Ductwork • A7 Horizontal Directional Drilling • A8 Road Access Points, Bellmouths and Surfacing • A9 Cable Route Reinstatement • A10 Cable Pulling	• B4 Substation Building and HV Plant Installation

1.3.2 The list of plant used for each phase of construction is presented in Table 1.3 to Table 1.16. As above, these have been based on the experience of the chapter lead author and agreed with Thistle Wind Partners.

Table 1.3: A1 Compound Construction

Item	No.	On-time (%)	L_{WA} (dB)
Large woodchipper	1	50%	120
Chainsaw	2	40%	117
Brushcutter	2	40%	113
Tracked excavator 25 t	2	40%	108
Bulldozer	1	40%	107
Vibratory roller 12 t	1	25%	109
80 t Mobile crane	1	30%	105
Tractor and trailer	1	25%	107

Table 1.4: A2 Compound Operation

Item	No.	On-time (%)	L_{WA} (dB)
Diesel generator	2	100%	97
Lorry (4-axle wagon)	1	10%	108
Dumper 7 t	2	25%	107
Tracked excavator 25 t	2	25%	108
Mobile crane 80 t	1	30%	105

Table 1.5: A3 Cable Route Devegetation Works and Fencing

Item	No.	On-time (%)	L_{WA} (dB)
Tractor	1	40%	107
Post rammer	1	5%	113
Nail gun	1	1%	126

Item	No.	On-time (%)	L_{WA} (dB)
Tracked excavator 25 t	1	40%	105
Large wood chipper	1	50%	120
Chainsaw	3	40%	119
Brushcutter	3	40%	115

Table 1.6: A4 Cable Route Soil Strip

Item	No.	On-time (%)	L_{WA} (dB)
Tracked excavator 25 t	2	40%	108
Dumper 12 t	4	40%	108

Table 1.7: A5 Cable Route Haul Route

Item	No.	On-time (%)	L_{WA} (dB)
Bulldozer	1	40%	107
Tracked excavator 25 t	2	40%	108
Vibratory roller 4 t	2	40%	105

Table 1.8: A6 Cable Route Ductwork

Item	No.	On-time (%)	L_{WA} (dB)
30 t Excavator	3	40%	108
18 t Wheeled excavator	2	40%	97
23 t Dumper (tipping)	2	30%	105
23 t Dumper (empty)	1	30%	109
Smooth drum vibro-roller	2	35%	112
Truck mounted crane	1	20%	105
Tractor and trailer	1	25%	107
Rough terrain forklift / telehandler	1	30%	99

Table 1.9: A7 Horizontal Directional Drilling

Item	No.	On-time (%)	L_{WA} (dB)
Diesel Generator	1	100%	97
Tracked excavator; 125 kw; 25 t	1	40%	96
Directional Drill	1	100%	1105
Mobile Crane 80 t	1	40%	105
Tractor & Trailer	1	25%	107
HGV	1	30%	108

Table 1.10: A8 Road Access Points, Bellmouths and Surfacing

Item	No.	On-time (%)	L_{WA} (dB)
Tracked excavator 25 t	1	40%	105
Backhoe loader	1	25%	96
Tarmac paver and lorry	1	50%	103
Vibratory roller 12 t	1	25%	109
Vibratory roller 4 t	2	50%	105
HGV	2	35%	111
Road sweeper	1	50%	104

Table 1.11: A9 Cable Route Reinstatement

Item	No.	On-time (%)	L_{WA} (dB)
Tracked excavator 25 t	2	40%	108
Bulldozer	1	40%	107
Dumper 12 t	3	40%	107
Tractor and trailer	1	20%	107

Table 1.12: A10 Cable Pulling

Item	No.	On-time (%)	L_{WA} (dB)
30 t Excavator	3	40%	108
Bulldozer	1	40%	107
Tractor and trailer	1	20%	107

Table 1.13: B1 Substation Groundworks

Item	No.	On-time (%)	L_{WA} (dB)
30 t Excavator	6	40%	110.8
Excavator (hydraulic breaker)	4	35%	110
Bulldozer	4	40%	113
Air compressor	4	50%	109
23 t Dumper (tipping)	2	30%	105
23 t Dumper (empty)	1	30%	109
Generator	2	100%	97
Crusher	2	50%	114
Smooth drum vibro-roller	2	35%	109

Table 1.14: B2 Substation Building Foundations

Item	No.	On-time (%)	L_{WA} (dB)
Large rotary bored piling rig	1	50%	111
Tracked drilling rig with hydraulic drifter	1	50%	110
Crane mounted auger	1	50%	107
Mini piling rig	2	50%	107
Compressor for mini piling rig	2	50%	103
23 t Dumper (tipping)	2	50%	107
23 t Dumper (empty)	1	50%	109
Truck mixer with pump	2	10%	98
22 t Excavator	3	30%	104
Generator	2	100%	97

Table 1.15: B3 Substation Access Road and Car Parking

Item	No.	On-time (%)	L_{WA} (dB)
21 t Excavator	2	40%	102
23 t Dumper (tipping)	4	30%	108
23 t Dumper (empty)	1	30%	109
Asphalt spreader with support lorry	1	40%	103

Item	No.	On-time (%)	L_{WA} (dB)
Smooth drum vibro-roller	2	35%	112
Grader	1	30%	114

Table 1.16: B4 Substation Building and HV Plant Installation

Item	No.	On-time (%)	L_{WA} (dB)
Mobile crane	1	40%	99
Lorry	3	25%	116
Mobile Elevated Work Platform	2	40%	98
Air compressor	1	60%	103
Forklift	2	40%	102
Grinder	5	50%	115
Pneumatic chipper/drill	3	50%	116

1.4 Construction Noise Results

1.4.1 Table 1.17 presents the unmitigated calculated noise level for each phase of construction at each of the identified sensitive receptors for the assumed Scenario 1, where, as described in Volume 1, Chapter 13: Noise and Vibration, the noise source is aligned with a theoretical cable route.

1.4.2 Table 1.18 presents the unmitigated calculated noise level for each phase of construction at each of the identified sensitive receptors for the assumed Scenario 2 where the receptor is assumed at the closest point to the works.

1.4.3 The agreed construction phasing, together with the proposed plant and equipment and the associated noise levels are defined in Section 1.3 above. The baseline noise levels have been inferred from Scotland's Noise Map, which was agreed to present a suitable basis for the setting of construction noise limits at this stage, with Aberdeenshire Council Environmental Health Department.

1.4.4 Where the name of the receptor is in **bold** the predicted noise level for one or more phases is above the noise limit of 65 dB(A). Below the level of 65 dB(A), the noise emissions from construction activity are deemed by the assessment method contained in BS5228-1:2009+A1:2014 to be not significant.

1.4.5 Volume 1, Chapter 13, Section 13.10 considers the significance of the calculated noise impacts, Section 13.9 considers the mitigation measures to be applied and Section 13.14 considers the potential significant impacts following the implementation of that mitigation.

Table 1.17: Predicted Construction Noise Levels – Scenario 1

Receptor	Inferred Baseline Noise Level from Scotland's Noise Map, dB(A)	Construction Noise Limit, Annex E.3.2, BS5228: 2009+A1:2014, $L_{Aeq,T}$ dB	Phase of Construction (set out in Section 1.3) and Predicted Noise Level, L_{Aeq} dB													
			A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4
ANNAMUICK	40	65	52	44	51	51	48	54	43	48	51	48	-	-	-	-
ANNAMUICK COTTAGES	40	65	58	50	39	40	55	43	42	55	40	37	-	-	-	-
ANNISTON FARM	45	65	3	3	43	44	49	47	32	49	44	41	-	-	-	-
BANFF CROFT	45	65	37	29	53	53	54	56	50	54	53	50	-	-	-	-
BLARERNO	42	65	37	29	60	61	61	63	54	61	61	58	-	-	-	-
BLOOMFIELD	44	65	-	-	46	46	47	49	44	47	47	43	-	-	-	-
BRENZIESHILL	43	65	43	35	53	53	53	56	52	53	53	50	-	-	-	-
BRENZIESHILL COTTAGE	42	65	43	35	54	54	53	57	52	53	55	51	-	-	-	-
BRIDGE OF MONDYNES	61	65	47	39	48	49	52	52	50	52	49	46	-	-	-	-
BROOMBANK	52	65	50	43	48	48	56	51	54	56	48	45	-	-	-	-
BROOMBANK COTTAGE	53	65	46	38	48	49	56	52	57	56	49	46	-	-	-	-
BURNSIDE COTTAGE	43	65	-	-	55	56	56	59	40	56	56	53	-	-	-	-
CANDY	63	65	52	44	45	46	51	48	47	51	46	43	-	-	-	-
CLACHANSHIELS	45	65	46	38	43	44	43	46	43	43	44	40	57	50	49	57
COTTAGES AND STEADINGS BURN OF DAY	45	65	48	40	44	45	45	48	45	45	45	42	59	53	52	59

Receptor	Inferred Baseline Noise Level from Scotland's Noise Map, dB(A)	Construction Noise Limit, Annex E.3.2, BS5228: 2009+A1:2014, $L_{Aeq,T}$ dB	Phase of Construction (set out in Section 1.3) and Predicted Noise Level, L_{Aeq} dB												
			A1	**A2**	**A3**	**A4**	**A5**	**A6**	**A7**	**A8**	**A9**	**A10**	**B1**	**B2**	**B3**	**B4**
DRUIMREE	53	65	55	47	56	57	58	60	59	58	57	54	-	-	-	-
EAST KINMONTH	45	65	44	37	51	52	52	54	40	52	52	49	-	-	-	-
EAST KINMONTH COTTAGE	45	65	44	36	58	59	56	62	42	56	59	56	-	-	-	-
EAST TILLYGRAIN	45	65	-	-	64	64	63	**67**	48	63	**65**	61	-	-	-	-
ELFSTONE COTTAGE	43	65	42	35	54	55	48	58	54	48	55	52	-	-	-	-
GOBBS	45	65	39	32	52	53	52	55	40	52	53	50	-	-	-	-
GOWANS	45	65	42	35	47	48	46	50	47	46	48	45	-	-	-	-
GOWANS COTTAGE	48	65	42	34	47	48	46	50	49	46	48	45	-	-	-	-
GOWANS STEADING	51	65	29	22	44	44	43	47	43	43	44	41	-	-	-	-
GYRATESMYRE	47	65	44	36	45	46	51	49	48	51	46	43	-	-	-	-
GYRATESMYRE BUNGALOW	47	65	46	38	47	48	51	50	49	51	48	45	-	-	-	-
HAUGHS OF BENHOLM	54	65	-	-	43	44	47	47	45	47	44	41	-	-	-	-
HILLRISE	49	65	31	24	57	57	58	60	38	58	57	54	-	-	-	-
KIRKTON HOUSE	45	65	33	27	63	64	62	**67**	50	62	64	61	-	-	-	-
KIRKTON OF ARBUTHNOTT	45	65	50	42	63	64	62	**67**	52	62	64	61	-	-	-	-
KNOXHILL HOUSE	45	65	-	-	52	52	55	55	27	55	52	49	-	-	-	-
LAES	45	65	44	36	50	51	55	53	44	55	51	48	-	-	-	-

Receptor	Inferred Baseline Noise Level from Scotland's Noise Map, dB(A)	Construction Noise Limit, Annex E.3.2, BS5228: 2009+A1:2014, $L_{Aeq,T}$ dB	Phase of Construction (set out in Section 1.3) and Predicted Noise Level, L_{Aeq} dB												
			A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4
LITTLE BOGBURN	51	65	19	13	59	60	55	62	48	55	60	57	-	-	-	-
LITTLE WAIRDS	45	65	40	32	60	60	61	63	61	61	60	57	-	-	-	-
MID KINMONTH	45	65	48	40	57	57	57	60	46	57	58	54	-	-	-	-
MIDDLE KNOX	45	65	-	-	52	52	54	55	27	54	52	49	-	-	-	-
MIDDLE KNOX	45	65	-	-	52	52	56	55	35	56	53	49	-	-	-	-
NETHER BENHOLM	45	65	-	-	50	51	54	54	50	54	51	48	-	-	-	-
NETHER BENHOLM COTTAGES	43	65	-	-	62	63	62	**66**	49	62	63	60	-	-	-	-
NETHER BUCKIESMILL	40	65	20	13	59	59	56	62	55	56	60	56	-	-	-	-
NETHER CRAIGHILL	45	65	-	-	47	48	50	51	45	50	48	45	-	-	-	-
NETHER KNOX COTTAGE	43	65	-	-	55	56	55	58	57	55	56	53	-	-	-	-
NETHER QUITHEL COTTAGE	45	65	48	40	54	54	60	57	54	60	54	51	-	-	-	-
PEATTIE	45	65	39	31	61	61	60	64	45	60	61	58	-	-	-	-
PEATTIE COTTAGES	45	65	38	30	59	60	60	63	43	60	60	57	-	-	-	-
PITCARLES	45	65	51	43	53	53	52	56	54	52	54	50	-	-	-	-
PITCARLES COTTAGES	48	65	53	45	56	57	53	60	58	53	57	54	-	-	-	-
QUITHEL COTTAGE	40	65	43	36	50	51	53	53	50	53	51	48	-	-	-	-
RIVERDALE CROFT	45	65	44	37	43	44	47	46	44	47	44	41	-	-	-	-

Receptor	Inferred Baseline Noise Level from Scotland's Noise Map, dB(A)	Construction Noise Limit, Annex E.3.2, BS5228: 2009+A1:2014, $L_{Aeq,T}$ dB	Phase of Construction (set out in Section 1.3) and Predicted Noise Level, L_{Aeq} dB												
			A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4
SEAFIELD HOUSE	41	65	42	34	50	51	52	53	53	52	51	48	-	-	-	-
SMIDDY COTTAGE	45	65	46	38	43	43	43	46	43	43	43	40	57	50	49	57
SPRINGWOOD	40	65	-	43	53	53	55	56	52	55	53	50	-	-	-	-
THREEWELLS COTTAGE	53	65	-	-	60	61	59	63	55	59	61	58	-	-	-	-
TOLL OF MONDYNES	63	70	47	39	48	49	52	51	50	52	49	46	-	-	-	-
UPPER BAULK	47	65	40	33	43	44	45	47	42	45	44	41	50	43	42	50
UPPER CRAIGHILL	45	65	-	-	48	49	49	51	43	49	49	46	-	-	-	-
UPPER KNOX FARM	45	65	-	-	57	58	58	61	32	58	58	55	-	-	-	-
WAIRDS OF ALPITY	45	65	19	12	45	46	45	48	46	45	46	43	-	-	-	-
WHITEHILL	45	65	43	35	40	41	40	43	40	40	41	37	54	47	46	54
WEST NEWBIGGING COTTAGE	51	65	51	43	49	49	52	52	48	52	50	46	-	-	-	-
WESTFIELD HOUSE	47	65	60	53	62	63	62	**65**	62	62	63	60	-	-	-	-

Table 1.18: Predicted Construction Noise Levels – Scenario 2

Receptor	Inferred Baseline Noise Level	Construction Noise Limit, Annex E.3.2, BS5228: 2009+A1:2014, $L_{Aeq,T}$ dB	Phase of Construction (set out in Section 1.3) and Predicted Noise Level, L_{Aeq} dB												
			A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4
ANNAMUICK	40	65	52	44	52	52	48	55	43	48	53	48	-	-	-	-
ANNAMUICK COTTAGES	40	65	58	50	40	40	55	43	42	55	41	37	-	-	-	-

Receptor	Inferred Baseline Noise Level	Construction Noise Limit, Annex E.3.2, BS5228: 2009+A1:2014, $L_{Aeq,T}$ dB	Phase of Construction (set out in Section 1.3) and Predicted Noise Level, L_{Aeq} dB												
			A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4
ANNISTON FARM	45	65	3	3	45	45	49	48	32	49	46	41	-	-	-	-
BANFF CROFT	45	65	37	29	55	56	54	59	50	54	57	50	-	-	-	-
BLARERNO	42	65	37	29	64	**65**	61	**68**	54	61	**66**	58	-	-	-	-
BLOOMFIELD	44	65	-	-	47	47	47	50	44	47	48	43	-	-	-	-
BRENZIESHILL	43	65	43	35	53	53	53	56	52	53	54	50	-	-	-	-
BRENZIESHILL COTTAGE	42	65	43	35	54	54	53	57	52	53	55	51	-	-	-	-
BRIDGE OF MONDYNES	61	65	47	39	50	51	52	53	50	52	51	46	-	-	-	-
BROOMBANK	52	65	50	43	55	56	56	58	54	56	56	45	-	-	-	-
BROOMBANK COTTAGE	53	65	46	38	56	57	56	60	57	56	58	46	-	-	-	-
BURNSIDE COTTAGE	43	65	-	-	60	60	56	63	40	56	61	53	-	-	-	-
CANDY	63	65	52	44	45	46	51	49	47	51	47	43	-	-	-	-
CLACHANSHIELS	45	65	46	38	43	44	43	46	43	43	44	40	57	50	49	57
COTTAGES AND STEADINGS BURN OF DAY	45	65	48	40	46	47	45	49	45	45	47	42	59	53	52	59
DRUIMREE	53	65	55	47	56	57	58	60	59	58	58	54	-	-	-	-
EAST KINMONTH	45	65	44	37	51	52	52	54	40	52	52	49	-	-	-	-
EAST KINMONTH COTTAGE	45	65	44	36	58	59	56	62	42	56	60	56	-	-	-	-
EAST TILLYGRAIN	45	65	-	-	**66**	**67**	63	**70**	48	63	**68**	61	-	-	-	-

Receptor	Inferred Baseline Noise Level	Construction Noise Limit, Annex E.3.2, BS5228: 2009+A1:2014, $L_{Aeq,T}$ dB	Phase of Construction (set out in Section 1.3) and Predicted Noise Level, L_{Aeq} dB												
			A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4
ELFSTONE COTTAGE	43	65	42	35	54	55	48	58	54	48	56	52	-	-	-	-
GOBBS	45	65	39	32	55	56	52	59	40	52	57	50	-	-	-	-
GOWANS	45	65	42	35	48	48	46	51	47	46	49	45	-	-	-	-
GOWANS COTTAGE	48	65	42	34	48	48	46	51	49	46	49	45	-	-	-	-
GOWANS STEADING	51	65	29	22	44	44	43	47	43	43	45	41	-	-	-	-
GYRATESMYRE	47	65	44	36	47	47	51	50	48	51	48	43	-	-	-	-
GYRATESMYRE BUNGALOW	47	65	46	38	49	50	51	53	49	51	51	45	-	-	-	-
HAUGHS OF BENHOLM	54	65	-	-	45	46	47	49	45	47	47	41	-	-	-	-
HILLRISE	49	65	31	24	55	55	58	58	38	58	56	54	-	-	-	-
KIRKTON HOUSE	45	65	33	27	**69**	**70**	62	**72**	50	62	**70**	61	-	-	-	-
KIRKTON OF ARBUTHNOTT	45	65	50	42	**68**	**69**	62	**72**	52	62	**70**	61	-	-	-	-
KNOXHILL HOUSE	45	65	-	-	53	54	55	57	27	55	55	49	-	-	-	-
LAES	45	65	44	36	53	53	55	56	44	55	54	48	-	-	-	-
LITTLE BOGBURN	51	65	19	13	59	60	55	62	48	55	60	57	-	-	-	-
LITTLE WAIRDS	45	65	40	32	**66**	**66**	61	**69**	61	61	**67**	57	-	-	-	-
MID KINMONTH	45	65	48	40	57	57	57	60	46	57	58	54	-	-	-	-
MIDDLE KNOX	45	65	-	-	53	54	54	57	27	54	55	49	-	-	-	-
MIDDLE KNOX	45	65	-	-	54	54	56	57	35	56	55	49	-	-	-	-

Receptor	Inferred Baseline Noise Level	Construction Noise Limit, Annex E.3.2, BS5228: 2009+A1:2014, $L_{Aeq,T}$ dB	Phase of Construction (set out in Section 1.3) and Predicted Noise Level, L_{Aeq} dB													
			A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	B1	B2	B3	B4
NETHER BENHOLM	45	65	-	-	52	52	54	55	50	54	53	48	-	-	-	-
NETHER BENHOLM COTTAGES	43	65	-	-	**65**	**66**	62	**69**	49	62	**67**	60	-	-	-	-
NETHER BUCKIESMILL	40	65	20	13	59	59	56	62	55	56	60	56	-	-	-	-
NETHER CRAIGHILL	45	65	-	-	49	50	50	53	45	50	51	45	-	-	-	-
NETHER KNOX COTTAGE	43	65	-	-	58	58	55	61	57	55	59	53	-	-	-	-
NETHER QUITHEL COTTAGE	45	65	48	40	54	54	60	57	54	60	55	51	-	-	-	-
PEATTIE	45	65	39	31	**66**	**67**	60	**70**	45	60	**68**	58	-	-	-	-
PEATTIE COTTAGES	45	65	38	30	**65**	**66**	60	**68**	43	60	**66**	57	-	-	-	-
PITCARLES	45	65	51	43	53	54	52	57	54	52	55	50	-	-	-	-
PITCARLES COTTAGES	48	65	53	45	59	59	53	62	58	53	60	54	-	-	-	-
QUITHEL COTTAGE	40	65	43	36	50	51	53	53	50	53	51	48	-	-	-	-
RIVERDALE CROFT	45	65	44	37	43	43	47	46	44	47	44	41	-	-	-	-
SEAFIELD HOUSE	41	65	42	34	51	51	52	54	53	52	52	48	-	-	-	-
SMIDDY COTTAGE	45	65	46	38	43	44	43	46	43	43	44	40	57	50	49	57
SPRINGWOOD	40	65	-	43	51	52	55	54	52	55	52	50	-	-	-	-
THREEWELLS COTTAGE	53	65	-	-	**67**	**68**	59	**70**	55	59	**68**	58	-	-	-	-
TOLL OF MONDYNES	63	70	47	39	49	50	52	53	50	52	51	46	-	-	-	-

Receptor	Inferred Baseline Noise Level	Construction Noise Limit, Annex E.3.2, BS5228: 2009+A1:2014, $L_{Aeq,T}$ dB	Phase of Construction (set out in Section 1.3) and Predicted Noise Level, L_{Aeq} dB												
			A1	**A2**	**A3**	**A4**	**A5**	**A6**	**A7**	**A8**	**A9**	**A10**	**B1**	**B2**	**B3**	**B4**
UPPER BAULK	47	65	40	33	44	45	45	48	42	45	46	41	50	43	42	50
UPPER CRAIGHILL	45	65	-	-	51	51	49	54	43	49	52	46	-	-	-	-
UPPER KNOX FARM	45	65	-	-	63	64	58	**67**	32	58	**65**	55	-	-	-	-
WAIRDS OF ALPITY	45	65	19	12	44	45	45	48	46	45	46	43	-	-	-	-
WHITEHILL	45	65	43	35	40	41	40	43	40	40	41	37	54	47	46	54
WEST NEWBIGGING COTTAGE	51	65	51	43	48	49	52	52	48	52	50	46	-	-	-	-
WESTFIELD HOUSE	47	65	60	53	**69**	**69**	62	**72**	62	62	**70**	60	-	-	-	-

1.5 Construction Vibration Calculations

1.5.1 The construction vibration calculations are based on the plant and equipment information contained in Section 1.3 of this Appendix.

1.5.2 The predicted construction vibration levels during the A6 Cable Route Ductwork phase are summarised in Table 1.19 for those receptors within 100 m of the assumed Proposed Development works. The item of plant that is assumed to be causing the vibration is the vibratory roller.

1.5.3 Where the name of the receptor is in **bold,** the predicted vibration level for the A6 Cable Route Ductwork activities are above 1mm/s PPV. Below the level of 1mm/s PPV, the vibration emissions from construction activity are deemed by the assessment method contained in BS5228-2:2009+A1:2014 to be not significant.

Table 1.19: Predicted Construction Vibration

Receptor	mm/s PPV
BLARERNO	0.2
BROOMBANK	0.1
BROOMBANK COTTAGE	0.3
BURNSIDE COTTAGE	0.1
CANDY	**2.6**
DRUIMREE	0.3
EAST TILLYGRAIN	1.5
ELFSTONE COTTAGE	1.5
GOBBS	0.2
GOWANS	0.3
GOWANS STEADING	0.1
GYRATESMYRE	**2.6**
HILLRISE	0.2
KIRKTON HOUSE	**2.6**
KIRKTON OF ARBUTHNOTT	0.2
LITTLE WAIRDS	0.3
NETHER BENHOLM COTTAGES	0.2
NETHER KNOX COTTAGE	0.1
NETHER QUITHEL COTTAGE	0.2
PEATTIE	**2.6**
PEATTIE COTTAGES	0.2

Receptor	mm/s PPV
PITCARLES	0.1
PITCARLES COTTAGES	0.1
QUITHEL COTTAGE	0.8
SEAFIELD HOUSE	0.3
THREEWELLS COTTAGE	**2.6**
UPPER KNOX FARM	0.2
WESTFIELD HOUSE	0.3

1.6 References

British Standards Institution (2014a). BS 5228-1:2009+A1:2014: Code of practice for noise and vibration control on construction and open sites. Part 1: Noise.

British Standards Institution (2014b). BS 5228-2:2009+A1:2014: Code of practice for noise and vibration control on construction and open sites. Part 2: Vibration.

Highways England (2020). Design Manual for Roads and Bridges, LA111 Noise and Vibration. Revision 2. Available at: LA 111 - Noise and vibration (Accessed 22/10/2025)

Thistle Wind Partners Limited, Bowdun Offshore Wind Farm Onshore Scoping Report (2024) Available at: Bowdun Offshore Wind Farm (Accessed 17/10/2025)