Meridian Solar Farm

EN010169

Volume 6

Environmental Statement

6.3 ES Appendix 13-3: Construction and Operational Noise Modelling wŜLJ2ŃŰ

APFP Regulation 5(2)(a)

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

March 2026

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1. Noise Modelling

1.1.1. In order to determine potential noise emissions during the construction and operation of the Scheme, noise prediction models have been prepared in the CadnaA® v2025 software package. The following assumptions were applied in the noise models:

- The ground acoustic absorption has been set to 0.8 (i.e. assumed soft ground conditions which is considered appropriate for predominantly open grass field and farmland);
- The maximum order of reflection was set to 2;
- Air temperature was set to 10 degrees Celsius and humidity 70%, which are typical annual average weather conditions for Lincolnshire based on historical weather data;
- Building massing in the surrounding area outside of the Scheme has been sourced from Ordnance Survey Open Map data and modelled with a standard height of 7m;
- Land topography has been sourced from Ordnance Survey Open Map data;
- No boundary fences or walls have been included in the noise model; and
- Receiver points have been modelled as 1.5 m above the local ground level (representative of ground floor windows) during the daytime and as 4 m above the local ground level (representative of bedroom windows) during the night-time.

2. Construction Noise

2.1.1. CadnaA® noise mapping software was used to predict construction noise levels at receptors. The construction noise model followed the procedures for prediction of demolition and construction noise set out in BS 5228-1. Sound power levels for each of the following Noise Generating Activity (NGA) have been calculated:

- NGA1 – Enabling works and construction of access and site tracks;
- NGA2 – Construction of BESS and substation compounds;
- NGA3 – Construction of PV module areas, including solar stations and ground mounted solar PV panel arrays;
- NGA4 – Open trench underground cable installation;
- NGA5 – Horizontal Direction Drilling (HDD) underground cable installation; and
- NGA6 – Construction of overhead line.

2.1.2. Noise source data for construction plant are presented in Table 2-1. Construction noise predictions were carried out to represent a worst-case scenario where all plant is operational on-site simultaneously. Consequently, construction noise predictions may overestimate noise levels and can therefore be considered as worst-case.

Table 2-1: Construction Plant

Activity	Plant / Equipment	Reference	Sound Power, Lw dB(A)	Quantity
NGA1	Tracked excavator	BS 5228: Tab C.2 #19	105	3
	Compactor	BS 5228: Tab C.2 #42	106	2
	Dozer	BS 5228: Tab C.2 #13	106	2
	Dumper	BS 5228: Tab C.4 #9	105	4
NGA2	Tracked excavator	BS 5228: Tab C.2 #14	107	2
	Lorry	BS 5228: Tab C.2 #34	108	2
	Telescopic handler	BS 5228: Tab C.2 #35	99	2
	Cement mixer truck (discharging)	BS 5228: Tab C.4 #18	103	1

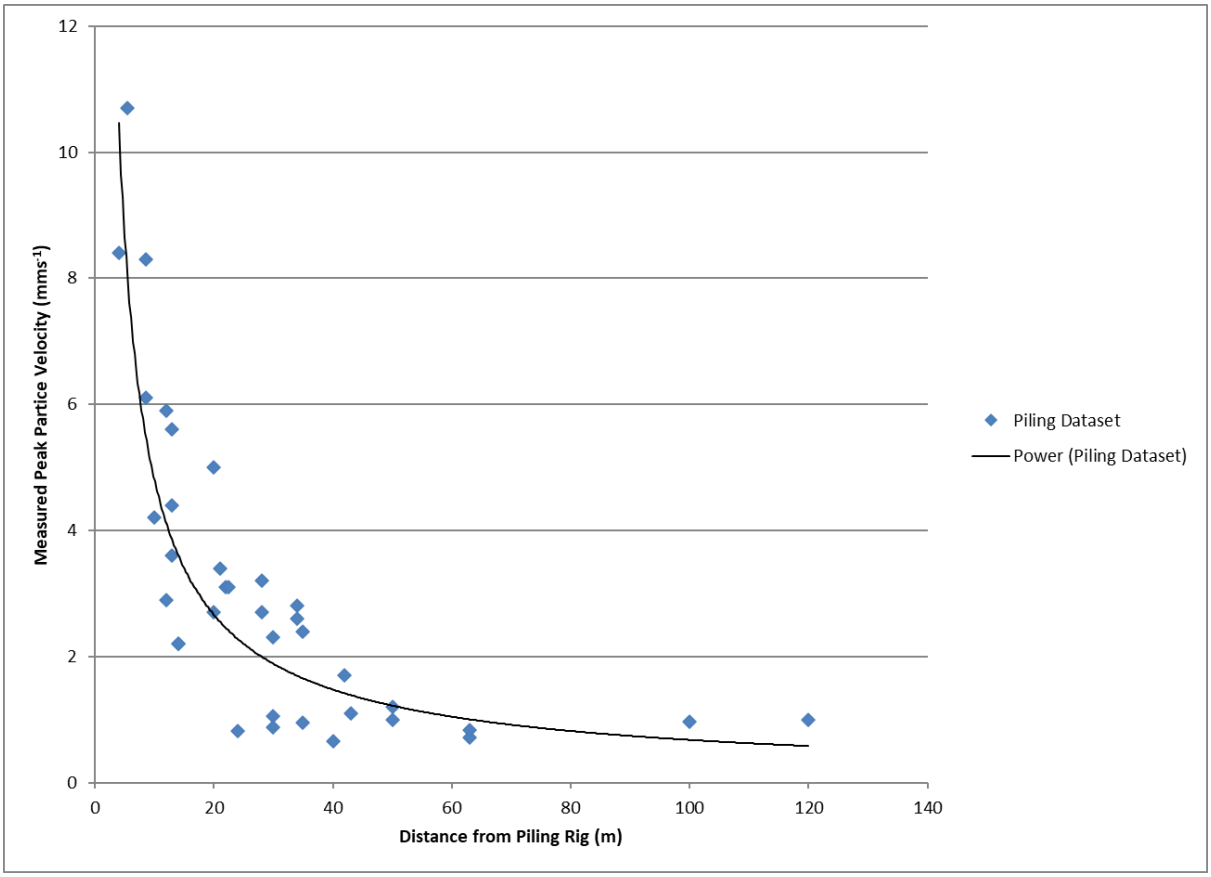
Activity	Plant / Equipment	Reference	Sound Power, Lw dB(A)	Quantity
	Piling (Driven)	BS 5228: Tab C.3 #1	117	1
	Wheeled mobile crane	BS 5228: Tab C.3 #30	98	2
	Hand-held welder (welding piles)	BS 5228: Tab C.3 #31	101	4
	Generator for welding	BS 5228: Tab C.3 #32	101	4
	Gas cutter (cutting top of pile)	BS 5228: Tab C.3 #34	96	4
	Mobile telescopic crane	BS 5228: Tab C.4 #41	99	2
	Lifting platform	BS 5228: Tab C.4 #57	95	2
	Diesel generator	BS 5228: Tab C.4 #85	94	2
NGA3	Articulated dump truck	BS 5228: Tab C.5 #16	109	1
	Wheeled mobile telescopic crane	BS 5228: Tab C.4 #38	106	1
	Diesel generator	BS 5228: Tab C.4 #85	94	1
	Piling (Driven)	BS 5228: Tab C.3 #1	117	1
	Cement mixer truck (discharging)	BS 5228: Tab C.4 #18	103	1
	Dumper	BS 5228: Tab C.4 #9	105	1
NGA4	Tracked excavator	BS 5228: Tab C.2 #19	105	1
	Wheeled backhoe loader	BS 5228: Tab C.4 #66	97	1
	Dumper	BS 5228: Tab C.4 #9	105	2
	Telescopic handler	BS 5228: Tab C.4 #55	98	1
	Vibratory roller	BS 5228: Tab C.5 #27	95	1
NGA5	Excavator	BS 5228: Tab C.2 #2	105	1

Activity	Plant / Equipment	Reference	Sound Power, Lw dB(A)	Quantity
	Generator	BS 5228: Tab C.4 #78	94	1
	Drilling rig	BS 5228: Tab C.3 #15	110	1
	Directional drill (generator)	BS 5228: Tab C.2 #44	105	1
	Bentonite mixer and pump (discharging)	Manufacturer specification	105	1
NGA6	HIAB	BS 5228: Tab C.4 #39	105	1
	Tractor	BS 5228: Tab C.4 #75	107	1
	Excavator	BS 5228: Tab C.2 #19	105	2
	MEWP	BS 5228: Tab C.4 #57	95	1
	Generator for tensioner	BS 5228: Tab C.8 #24	87	1
	Lorry	BS 5228: Tab C.2 #34	108	1
	Piling (Driven)	BS 5228: Tab C.3 #1	117	1
	Cement mixer truck (discharging)	BS 5228: Tab C.4 #18	103	1

3. Construction Vibration

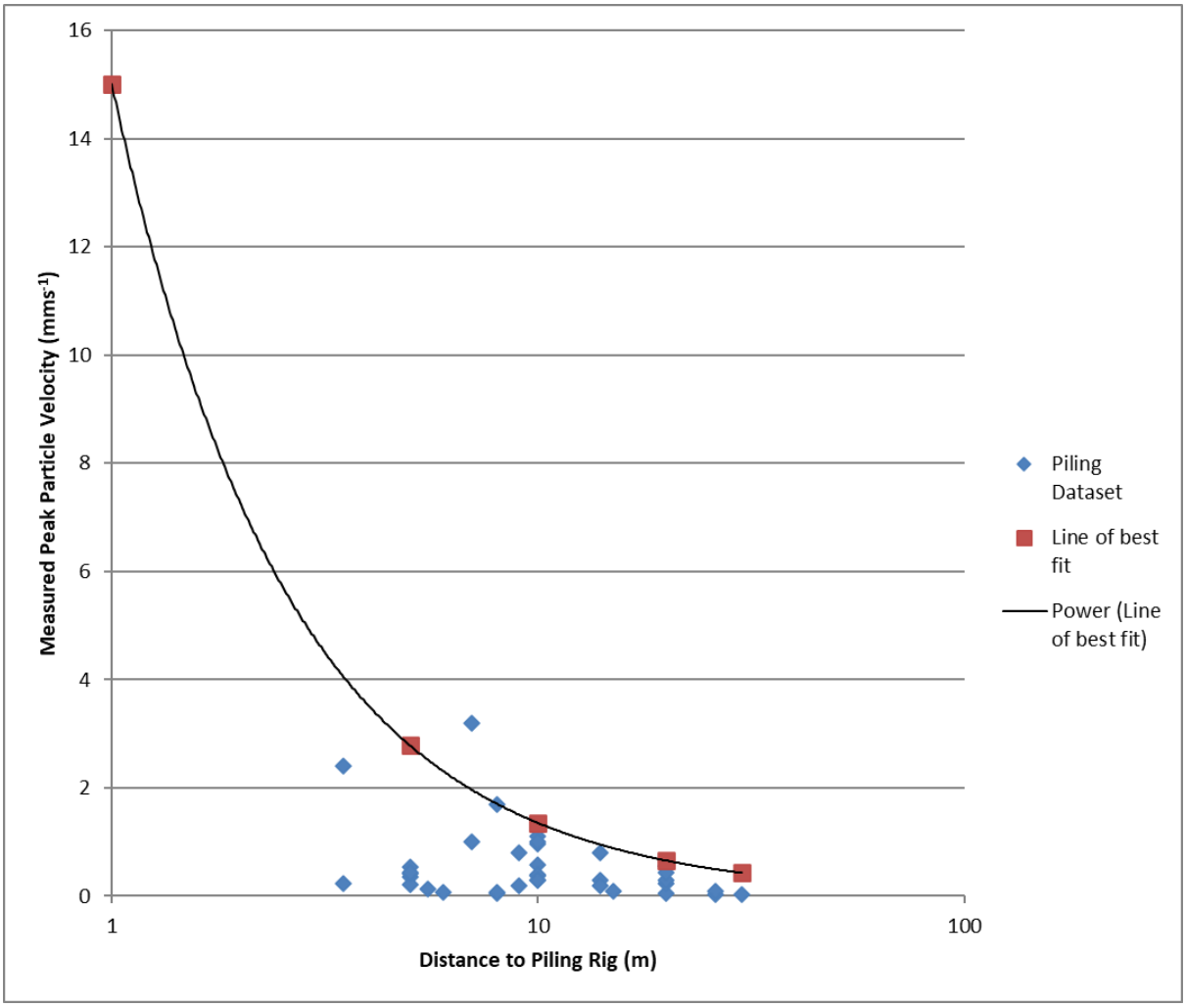
3.1.1. Data from driven piling activities has been referenced from Table D.2 of BS 5228-1 to determine the likely level of vibration that may be experienced during driven piling works. Regression analysis was undertaken to determine a formula for calculating the PPV from piling activities. This analysis is presented in Figure 3-1.

Figure 3-1: Driven Piling Data Regression Analysis



3.1.2. Data from bored piling activities has been referenced from Table D.6 of BS 5228-2 to determine the likely level of vibration that may be experienced during HDD activities. Regression analysis was undertaken to determine a formula for calculating the PPV from bored piling activities which have been used to represent HDD activities as they will generate similar levels of vibration. This analysis is presented in Figure 3-2.

Figure 3-2: Bored Piling Data Regression Analysis



4. Construction Traffic Data

4.1.1. Data used in the calculation of construction traffic noise effects are presented in Table 4-1. Data used for the cumulative development traffic noise assessment is presented in Table 4-2 and the results of the cumulative development traffic noise assessment are presented in Table 4-3.

Table 4-1: Construction Traffic Noise Assessment Data

Ref	Road	2031 Baseline		2031 Baseline with Construction Traffic	
		Total	HGV%	Total	HGV%
L1	A16 Spalding Bypass (North-East of Spalding)	24,736	15	24,991	15
L2	Cross Gate	165	11	165	11
L3	A151 Holbeach Road	18,008	7	18,181	7
L4	A151 Weston Bypass	16,011	8	16,156	8
L5	A151 High Road	15,795	7	15,849	8
L6	Stone Gate	183	9	183	9
L7	A16 Spalding Bypass (East of Spalding)	23,051	14	23,390	14
L8	Broadgate	751	4	751	4
L9	Delgate Bank (North)	117	6	117	6
L10	Long Lane	1,028	8	1,028	8
L11	B1165 Austendike Road	2,728	8	2,788	8
L12	Delgate Bank (Central)	200	7	200	7
L13	West Gate	221	7	221	7
L14	A16 Spalding Bypass (South-East of Spalding)	15,456	19	15,745	19
L15	A16 Cowbit Road	22,289	12	22,654	12
L16	B1357 Moulton Chapel Road	4,052	8	4,076	8
L17	Delgate Bank (South)	107	7	107	7

Ref	Road	2031 Baseline		2031 Baseline with Construction Traffic	
		Total	HGV%	Total	HGV%
L18	A16 Crowland Bypass (Near Crowland Airfield)	20,513	12	20,913	13
L19	Queen's Bank	162	11	162	11
L20	Cloot Drove	93	3	93	3
L21	Barrier Bank	2,145	6	2,335	7
L22	James Road	2,577	6	2,767	7
L23	Hull's Drove (West)	5,915	5	6,279	7
L24	Martins Road	230	7	580	24
L25	Hull's Drove (East)	4,904	4	5,153	6
L26	Eaugate Road	326	10	339	11
L27	Chapel Hill	312	12	325	13
L28	Chapel Gate	119	5	119	5
L29	Dog Drove North	87	10	87	10
L30	Holbeach Drove Gate	3,949	6	3,962	6
L31	B1166 Long Lane	2,132	5	2,368	8
L32	Langary Gate Road	97	6	333	27
L33	A16 Crowland Bypass (East of Crowland)	23,211	12	23,562	12
L34	A16 (South of Crowland)	22,298	12	22,594	13
L35	A16 (North of Peterborough)	21,439	12	21,734	12

Table 4-2: Cumulative Development Construction Traffic Noise Assessment Data

Ref	Road	Cumulative Development Flows (Excluding the Scheme)	
		Total Vehicles	Number of HGVs
L1	A16 Spalding Bypass (North-East of Spalding)	981	375
L2	Cross Gate	0	0
L3	A151 Holbeach Road	509	346
L4	A151 Weston Bypass	298	291
L5	A151 High Road	87	0
L6	Stone Gate	0	0
L7	A16 Spalding Bypass (East of Spalding)	1152	422
L8	Broadgate	0	0
L9	Delgate Bank (North)	0	0
L10	Long Lane	0	0
L11	B1165 Austendike Road	655	219
L12	Delgate Bank (Central)	0	0
L13	West Gate	0	0
L14	A16 Spalding Bypass (South-East of Spalding)	1547	779
L15	A16 Cowbit Road	1127	683
L16	B1357 Moulton Chapel Road	0	0
L17	Delgate Bank (South)	0	0
L18	A16 Crowland Bypass (Near Crowland Airfield)	1144	691
L19	Queen's Bank	0	0
L20	Cloot Drove	0	0
L21	Barrier Bank	0	0

Ref	Road	Cumulative Development Flows (Excluding the Scheme)	
		Total Vehicles	Number of HGVs
L22	James Road	0	0
L23	Hull's Drove (West)	36	36
L24	Martins Road	0	0
L25	Hull's Drove (East)	36	36
L26	Eaugate Road	0	0
L27	Chapel Hill	0	0
L28	Chapel Gate	0	0
L29	Dog Drove North	0	0
L30	Holbeach Drove Gate	36	36
L31	B1166 Long Lane	0	0
L32	Langary Gate Road	0	0
L33	A16 Crowland Bypass (East of Crowland)	1127	683
L34	A16 (South of Crowland)	1127	683
L35	A16 (North of Peterborough)	1116	696

Table 4-3: Cumulative Development Construction Traffic Noise Assessment Results

Ref	Road Link	2031 Baseline BNL (dB)	2031 Baseline + Cumulative Development + Scheme BNL (dB)	Change in BNL (dB)	Effect Level
L1	A16 Spalding Bypass (North-East of Spalding)	74.8	75.3	0.4	Negligible
L2	Cross Gate	51.0	51.0	0.0	Negligible
L3	A151 Holbeach Road	70.5	71.1	0.6	Negligible

Ref	Road Link	2031 Baseline BNL (dB)	2031 Baseline + Cumulative Development + Scheme BNL (dB)	Change in BNL (dB)	Effect Level
L4	A151 Weston Bypass	71.6	72.2	0.6	Negligible
L5	A151 High Road	70.7	70.9	0.2	Negligible
L6	Stone Gate	51.1	51.1	0.0	Negligible
L7	A16 Spalding Bypass (East of Spalding)	74.4	74.9	0.5	Negligible
L8	Broadgate	55.8	55.8	0.0	Negligible
L9	Delgate Bank (North)	48.1	48.1	0.0	Negligible
L10	Long Lane	58.4	58.4	0.0	Negligible
L11	B1165 Austendike Road	62.9	65.5	2.5	Minor Adverse
L12	Delgate Bank (Central)	51.2	51.2	0.0	Negligible
L13	West Gate	51.1	51.1	0.0	Negligible
L14	A16 Spalding Bypass (South-East of Spalding)	73.4	74.3	0.9	Negligible
L15	A16 Cowbit Road	73.9	74.6	0.7	Negligible
L16	B1357 Moulton Chapel Road	65.3	65.4	0.1	Negligible
L17	Delgate Bank (South)	48.3	48.5	0.1	Negligible
L18	A16 Crowland Bypass (Near Crowland Airfield)	73.7	74.5	0.8	Negligible
L19	Queen's Bank	50.9	50.9	0.0	Negligible

Ref	Road Link	2031 Baseline BNL (dB)	2031 Baseline + Cumulative Development + Scheme BNL (dB)	Change in BNL (dB)	Effect Level
L20	Cloot Drove	45.8	45.8	0.0	Negligible
L21	Barrier Bank	62.8	63.3	0.5	Negligible
L22	James Road	62.4	63.0	0.6	Negligible
L23	Hull's Drove (West)	66.6	67.6	1.0	Minor Adverse
L25	Hull's Drove (East)	64.8	65.7	0.9	Negligible
L28	Chapel Gate	47.9	47.9	0.0	Negligible
L29	Dog Drove North	48.1	48.0	0.0	Negligible
L30	Holbeach Drove Gate	64.8	65.0	0.3	Negligible
L31	B1166 Long Lane	60.7	61.9	1.2	Minor Adverse
L33	A16 Crowland Bypass (East of Crowland)	74.1	74.8	0.7	Negligible
L34	A16 (South of Crowland)	74.0	74.8	0.8	Negligible
L35	A16 (North of Peterborough)	73.7	74.5	0.8	Negligible

5. Operational Noise

5.1. Fixed Plant Modelling Methodology

5.1.1. Operational noise was modelled in CadnaA®, which employs the noise prediction routines commonly used in the UK (e.g. ISO 9613:2024). The following assumptions and parameters have been used to prepare the noise model:

- Sound source heights for items of plant have been based on information provided by the Scheme design team;
- In lack of specific sound data for the substation transformers, BESS inverter units and solar station converter units, sound data has been used based on previous assessments of solar development schemes; and
- Modelling assumes the site is continuously operational during the daytime and night-time.

5.1.2. It should be noted that the quantity of each item of plant are indicative, based on current information of the Scheme, and may be refined during detailed design.

5.1.3. Operational sound power levels are summarised in Table 5-1. Full octave band spectral data is presented for each item of plant in Table 5-2.

Table 5-1: Operational Plant Sound Power Levels

Source	Quantity	Height	Sound Power Level. L_{WA}, dB	Sound Power Level. L_{WA} with Mitigation, dB
60 MVA Substation Transformer	4	4.5 m	91	N/A
95 MVA Substation Transformer	2	5.5 m	94	N/A
150 MVA Substation Transformer	2	4.5 m	96	N/A
220 MVA Substation Transformer	4	4.5 m	99	91
390 MVA Substation Transformer	1	4.5 m	102	94

Source	Quantity	Height	Sound Power Level. L_{WA}, dB	Sound Power Level. L_{WA} with Mitigation, dB
BESS Inverter Unit	78	2.5 m	86	N/A
BESS Container Unit (GE FLEX Reservoir Storage Unit (RSU))	156	3.5 m	88	80
Solar Station Conversion Unit	128	4.9 m in land parcels B, C and D; 5.4 m in land parcel A	88	N/A

Table 5-2: Operational Plant Spectral Sound Power Data

Source	Sound Power Level, L_{WA} dB	Un-Weighted Octave Band Data, L_{WZ} dB							
		63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
60 MVA Substation Transformer	91	91	97	96	89	83	65	63	57
95 MVA Substation Transformer	94	94	100	99	92	86	68	66	60
150 MVA Substation Transformer	96	96	102	101	94	88	70	68	62
220 MVA Substation Transformer	99	99	105	104	97	91	73	71	65
220 MVA Substation Transformer with mitigation	91	91	97	96	89	83	65	63	57
390 MVA Substation Transformer	102	102	108	107	100	94	76	74	68
390 MVA Substation Transformer with mitigation	94	94	100	99	92	86	68	66	60
BESS Inverter Unit	86	82	83	83	83	78	75	81	79
BESS Container Unit	88	94	91	87	85	83	79	75	70
BESS Container Unit with Heat Exchanger	80	86	83	79	77	75	71	67	62

Source	Sound Power Level, L_{WA} dB	Un-Weighted Octave Band Data, L_{WZ} dB							
		63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
Solar Station Conversion Unit	88	79	80	81	80	78	75	84	82

5.2. Overhead Line Noise Prediction

5.2.1. Overhead line noise predictions have been calculated according to the methodology presented in the EPRI AC Transmission Line Reference Book[1]. The overhead line configuration modelled represents a single-circuit, three-phase 400 kV transmission line. Each phase comprises of a twin 400 mm^2 ACSR Zebra, with 400 mm spacing. Conductors are arranged across three cross-arm levels with heights of approximately 25 m, 33 m and 42 m above ground level, based on current information of the lattice tower geometries (see Plate 2-10 of **Chapter 2 The Scheme** (Doc Ref. 6.1)).

5.2.2. Final conductor type, bundle arrangement, phase spacing, tower design and alignment will be confirmed at detailed design stage. A commitment to a Tier 3 assessment is secured in the **Outline Operational Environmental Management Plan** (OOEMP) (Doc Ref. 7.11).

5.2.3. A chart presenting the noise emissions from the 400 kV overhead line plotted over distance is presented in Figure 5-1. Detailed prediction results at receptors within 200 m of the indicative 400 kV overhead line alignment are presented in Table 5-3.

5.2.4. In determining the predicted combined wet/dry noise level at the façade of nearby sensitive receptors, the duration of wet and dry weather conditions in the vicinity of the Scheme must be taken into account as the level of annual rainfall varies across the UK. Annual average wet hours have been sourced from Met Office rainfall data presented in TGN(E)332[2] and are reproduced in Figure 5-2.

[1] EPRI AC Transmission Line Reference Book—200 kV and Above, Third Edition. EPRI, Palo Alto, CA: 2005. 1011974.
[2] National Grid (2021) Technical Guidance Note TGN(E) 322. Appendix 14H to EN020024-000178, National Infrastructure Planning, UK. Available at: https://nsip-documents.planninginspectorate.gov.uk/published-documents/EN020024-000178-5.3.14H%20Appendix%2014H%20National%20Grid%20Technical%20Guidance%20Note%20TGN(E)322%20(2021).pdf [Accessed 23 February 2026]

Figure 5-1: Overhead Line Noise Emissions Over Distance

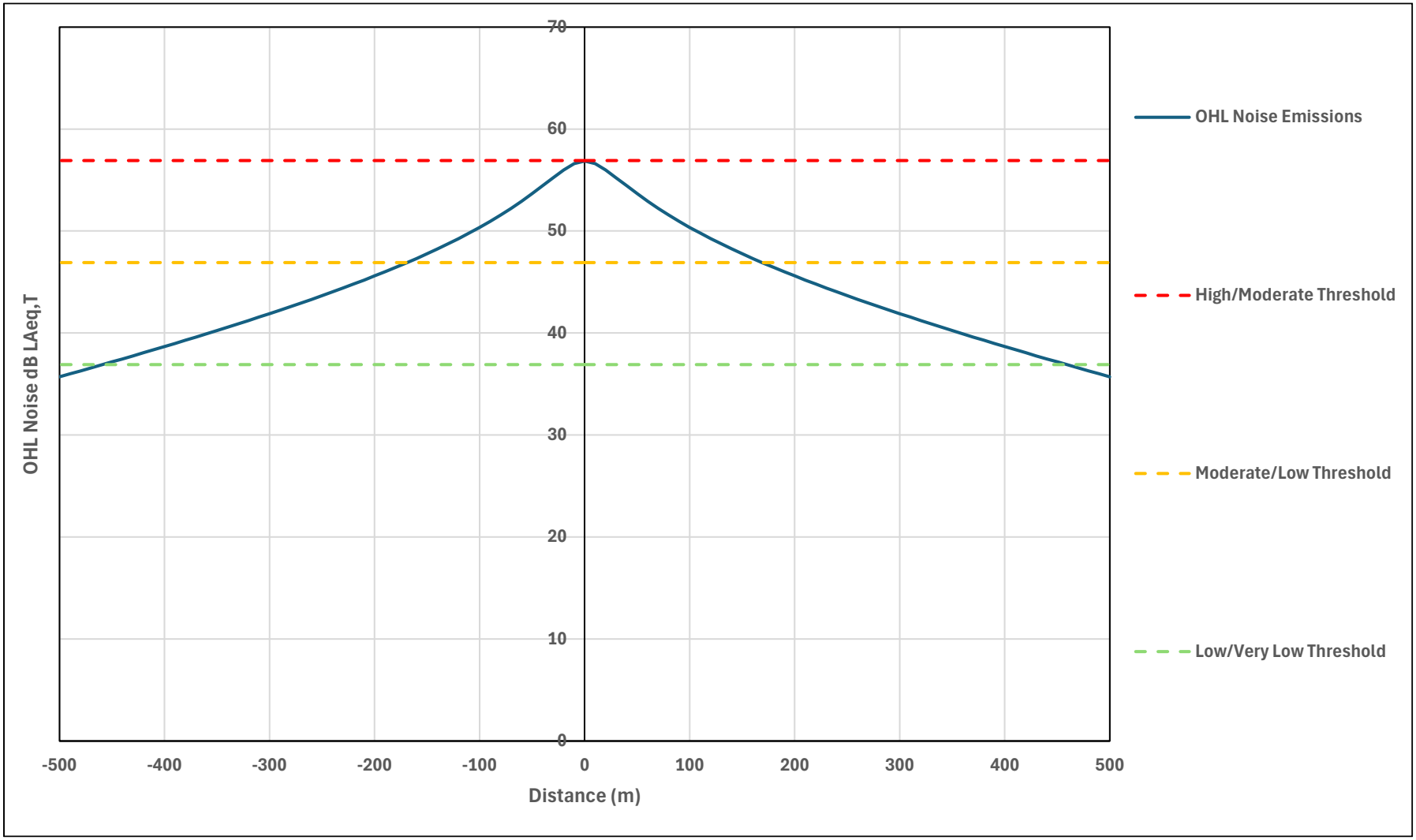


Figure 5-2: Annual Average Wet Hours (above 0.2 mm/h), 2001-2010

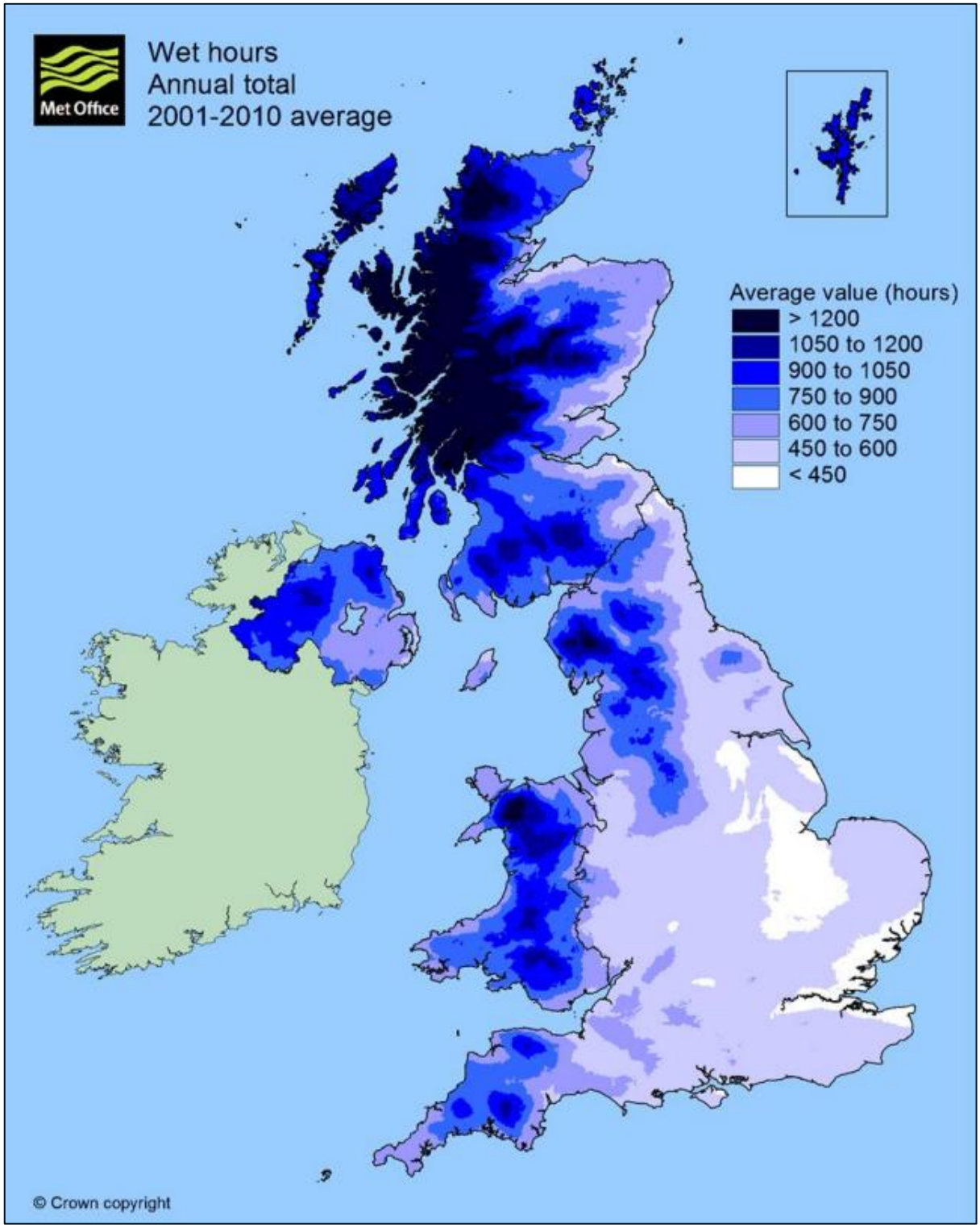


Table 5-3: Detailed Overhead Line Prediction Results

Receptor ID	Receptor Address	Distance from OHL	Predicted Noise Level, $L_{Aeq,T}$, dB
RG40	Trenee, Broadgate Drove, Moulton Chapel	190	46
RG40	165 Moulton Chapel Road, Moulton Chapel	150	48
RG42	Ostler Cottage, Delgate Bank, Weston Hills	120	49
RG42	Delgate Lodge, Delgate Bank, Weston Hills	185	46
RG45	The Cottage. Westgate, Moulton Chape;	105	50
RG45	Orchard House, Westgate, Moulton Chapel	165	47
RG44	Mereside, Westgate, Moulton Chapel	170	45
RG44	Trinity Cottage, Westgate, Weston Hills	90	51
RG48	Burnt House Cotttage, Austendyke Road, Weston Hills	130	49
RG54	New England Farm, Delgate Bank, Weston Hills	160	47
RG53	669 Broadgate, Weston Hills	110	50
RG53	663 Broadgate, Weston Hills	160	47
RG53	652 Broadgate, Weston Hills	155	48