EAST YORKSHIRE SOLAR FARM

East Yorkshire Solar Farm
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Environmental Statement

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Environmental Statement – Appendix 11-4: Construction and Operational Noise Assessment

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1. Noise Modelling

1.1 Assumptions

1.1.1 In order to determine potential operational noise emissions from the development, noise prediction models have been prepared using the CadnaA® v2022 software package. The following assumptions were applied in noise models:

a. 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);

b. The maximum order of reflections was 1;

c. Air temperature was assumed to be 10 degrees Celsius and humidity 80%, which is typical annual average weather conditions in Yorkshire;

d. Building massing in the surrounding area outside of the Order limits has been sourced from Ordnance Survey Open Map data and modelled with a standard height of 7 m.

e. Land topography has been sourced from Ordnance Survey Open Map data;

f. No boundary fences/walls have been included in the noise model; and

g. Receiver points have been modelled as 1.5 m above local ground level (representative of ground floor windows) for daytime noise.

1.2 Construction Noise

1.2.1 CadnaA® noise mapping software was used to predict construction noise levels at the selected 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 construction activities have been calculated:

a. Noise Generating Activity (NGA) 1 – Construction of the on-site Substations, Inverters, Transformers, and Ground mounted solar PV panel arrays;

b. NGA2 – Cable installation (general works); and

c. NGA3 – Cable installation (HDD activities).

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

1.2.3 Sound power levels from BS 5228 were used to calculate the overall sound power level for NGA2 and NGA3. The distance the Lowest Observed Adverse Effect Level (LOAEL) and Significant Observed Adverse Effect

Level (SOAEL) would be reached in meters from each activity was calculated based on using information in **Table 1**.

Table 1. Construction Plant

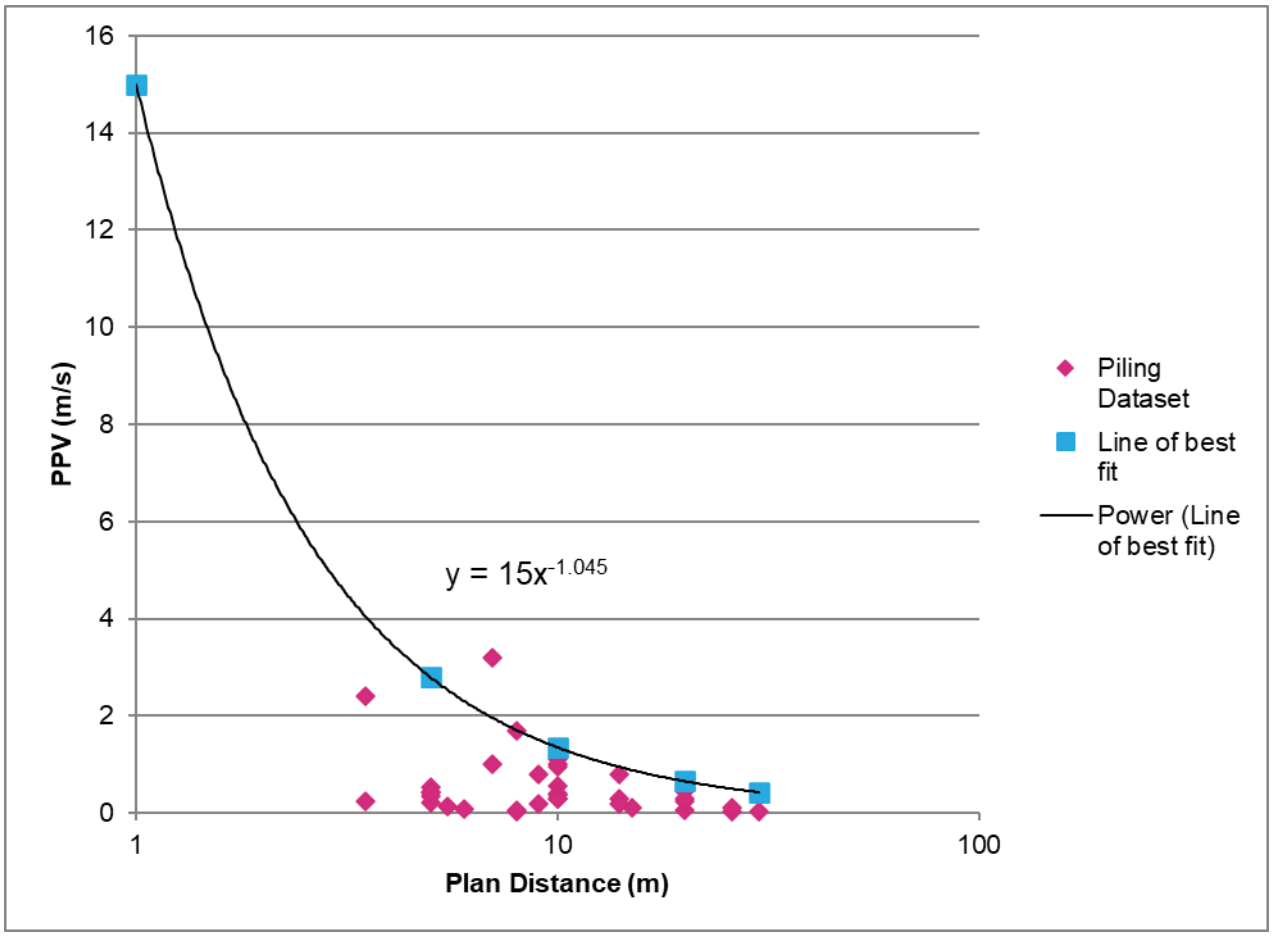
Work Package	Plant / Equipment	BS 5228 Reference	Sound Power Lw (dBA)	Quantity
Construction of inverters and transformers	Tracked excavator	C.2, Item 14	107	1
	Wheeled loader	C.2, Item 27	108	1
	Wheeled mobile telescopic crane	C.4, Item 38	112	1
	Dump truck (tipping fill)	C.2, Item 30	107	2
	Telescopic handler	C.2, Item 35	99	1
	Cement mixer truck (discharging)	C.4, Item 18	103	1
PV module construction	Articulated dump truck	C.5, Item 16	104	1
	Wheeled mobile telescopic crane	C.4, Item 38	106	1
	Diesel generator	C.4, Item 85	94	1
	Continuous flight auger piling	C.3, Item 17	104	1
	Cement mixer truck (discharging)	C.4, Item 18	103	1
	Dumper	C.4, Item 9	105	1
Construction of Grid Connection Substations	Tracked excavator	C.2, Item 14	107	2
	Lorry	C.2, Item 34	108	4
	Telescopic handler	C.2, Item 35	99	2
	Continuous flight auger piling	C.3, Item 17	104	1
	Wheeled mobile crane	C.3, Item 30	98	4
	Hand-held welder (welding piles)	C.3, Item 31	101	4
	Generator for welding	C.3, Item 32	101	4
	Gas cutter (cutting top of pile)	C.3, Item 34	96	4
	Mobile telescopic crane	C.4, Item 41	99	2
	Lifting platform	C.4, Item 57	95	4

Work Package	Plant / Equipment	BS 5228 Reference	Sound Power Lw (dBA)	Quantity
	Site lift for workers	C.4, Item 62	94	4
	Diesel generator	C.4, Item 85	94	2
Cable installation	Tracked excavator	C.4, Item 63	105	1
	Wheeled backhoe loader	C.4, Item 66	97	1
	Dumper	C.4, Item 9	105	2
	Telescopic handler	C.4, Item 55	98	1
	Vibratory roller	C.5, Item 27	95	1
Horizontal directional drill (HDD)	Directional drill (generator)	C.2, Item 44	105	1
	Water pump	C.2, Item 45	93	1
	Tracked excavator	C.2, Item 14	107	1
	Drilling rig	C.3, Item 15	110	1

1.3 Construction Vibration

1.3.1 Data from bored piling activities was referenced from Table D.6 of BS 5228-2 to determine the likely level of vibration that may be experienced during piling works. Regression analysis was undertaken to determine a formula for calculating the Peak Particle Velocity from piling activities. This analysis is presented in Figure 1.

Figure 1. Bored Piling Data Regression Analysis



1.4 Construction Traffic Noise

1.4.1 Road traffic flow data used to assess construction traffic noise impacts are presented in Table 2.

Table 2. Construction Plant

Link ID	Road	2026 Baseline		2026 Baseline + Construction Traffic		85th Percentile Speed (mph)
		AAWT	HGV%	AAWT	HGV%	
ATC1	New Road	1,663	17%	1,724	17%	37
ATC2	Green Lane	195	11%	235	13%	28
ATC3	Wood Lane	262	17%	344	18%	38
ATC4	Wood Lane	152	16%	157	12%	34
ATC5	Street Lane	2,209	16%	2,475	16%	46
ATC6	Willitoft Road	141	13%	349	10%	17
ATC7	A263	4,462	14%	4,626	14%	38
ATC8	Bell Lane	195	20%	203	17%	27

Link ID	Road	2026 Baseline		2026 Baseline + Construction Traffic		85th Percentile Speed (mph)
		AAWT	HGV%	AAWT	HGV%	
ATC9	A163	2,880	15%	3,049	15%	48
ATC10	Howden Road	7,663	19%	7,983	19%	53
ATC11	Ings Lane	35	38%	37	19%	32
ATC12	Wilitoft Road	171	18%	177	17%	30
ATC13	Unnamed Road	515	19%	566	16%	42
ATC14	Thorpe Road	7,674	19%	7,982	19%	46
ATC15	Station Road	2,872	19%	3,194	17%	41
ATC16	A632	6,590	15%	6,852	15%	43
ATC17	A645	6,573	16%	6,815	16%	57
ATC18	A645	7,292	13%	7,561	13%	48
ATC19	Hull Road	6,224	14%	6,491	14%	53

1.5 Operational Noise

Modelling Methodology

1.5.1 Three assessment options have been considered for the Scheme and are detailed in **Chapter 11: Noise and Vibration, Environmental Statement (ES) Volume 1 [EN010143/APP/6.1],** paragraph 11.4.39. The worse-case scenario for operational noise has been utilised for the operational noise modelling, which comprises transformers, switchgear and inverters each provided separately and not housed in in Field Station Units (Option 3).

1.5.2 Operational noise was modelled in CadnaA®, which employs the noise prediction routines commonly used in the UK (e.g., ISO 9613 Acoustics – Attenuation of Sound during Propagation Outdoors – Part 1: Calculation of the absorption of sound by the atmosphere (1993) and Part 2: General Method of Calculation (1996). The following assumptions and parameters have been used to prepare the noise model:

a. Sound source heights for inverters and transformers have been based on information specification sheets provided by the Applicant;

b. The central inverter option was modelled, which is considered to be the worst-case option in terms of noise at most receptors (note, sensitivity modelling is presented in section 1.6 of this appendix);

c. The layout of the central inverters assumes the central inverters closest to the sensitive receptor as worst case;

d. In the absence of specific sound data for the substation, sound data has been used based on previous assessments;

e. 100 units have been assumed for the central inverters;

f. Modelling assumes the site is continuously operational during daytime and night-time; and

g. Tracker systems that orient the solar PV modules towards the sun have not been included in the model as their noise levels are unlikely to cause disturbance (see paragraph 1.5.7).

Sound Level Data – Central Inverters and Standalone Transformers

1.5.3 The proposed inverters that have been modelled are SMA central inverters (model Sunny Central Up). Manufacturer noise data for these inverters quotes provides a sound pressure level of 63 dB(A) 10 m from the unit. These are considered to represent a worst-case and it is likely that actual plant selected for the final design will produce lower levels of noise.

1.5.4 Central inverters have been modelled as vertical area sources with a source height of 2 m.

1.5.5 Standalone transformers associated with the inverters will have noise emissions approximately 10 dB(A) below that of the inverters. Noise from standalone transformers will not be audible above noise from the inverters and have not been included in the modelling.

Sound Level Data – Grid Connection Substation Transformers

1.5.6 Sound level data of Grid Connection Substation transformers at the Scheme are based on similar rated transformers for solar plant developments from AECOM's library data. An assumed sound power level of 95 dB(A) has been applied for transformers within the substation areas. Substation transformers have been modelled as vertical and horizontal area sources with a source height of 7 m.

Tracker Motor Noise

1.5.7 A tracker system will be used on the solar PV modules to maximise their efficiency by keeping them oriented towards the sun. Manufacturers data from NEXTracker indicate that tracker motors have a sound power level of approximately 50 dB, which is equivalent to a sound power level of approximately 22 dB at 10 m. As this level of noise would be unlikely to cause disturbance, noise emissions from tracker motors have not been considered in the operational noise assessment.

1.6 String Inverter Sensitivity Testing

1.6.1 Noise modelling of an option with 1,334 small scale string inverters has been undertaken as a sensitivity test to confirm that the central inverter option represents a reasonable worst-case. This number of string inverters is roughly the equivalent to the 100 central inverters. The units were applied with sound data equivalent to a sound pressure level of 68 dB at 1 m.

1.6.2 The 1,334 string inverters were placed at arbitrary locations around the boundary of each PV area. As such, there is no optimisation of string inverter locations based on the nearest sensitive receptors, which has been applied when defining central inverter locations.

1.6.3 A comparison of predicted noise level from the string inverter option compared with the central inverter option results are presented in Table 3. The results of the sensitivity test show that there is not a material difference between the central inverter and string inverter scenarios. At receptors where the string inverter option shows an increase in noise, the increase is not sufficient to result in a change in effects identified in the central inverter scenario.

Table 3. String Inverter Sensitivity Test

Receptor	Predicted rating level LAr,Tr dB		Difference dB
	Central Inverter Option	String Inverter Option	
R1	31	29	-2
R2	32	32	0
R3	30	29	-1
R4	31	31	0
R5	25	25	0
R6	24	24	0
R7	31	31	0
R8	35	36	+1
R9	35	35	0
R10	32	31	-1
R11	27	28	+1
R12	27	29	+2
R13	32	29	-3
R14	23	23	0
R15	24	24	0
R16	24	27	+3
R17	26	27	+1
R18	25	24	-1
R19	26	25	-1
R20	27	26	-1
R21	32	31	-1
R22	31	31	0
R23	28	28	0

Receptor	Predicted rating level LAr,Tr dB		Difference dB
	Central Inverter Option	String Inverter Option	
R24	28	29	+1
R25	30	31	+1
R26	28	30	+2
R27	28	31	+3
R28	31	30	-1
R29	26	26	0
R30	28	29	+1
R31	24	24	0
R32	24	24	0
R33	24	24	0
R34	23	20	-3
R35	20	21	-1
R36	21	18	-3
R49	23	24	+1
R50	23	24	+1
R51	18	19	+1
R52	23	23	0
R53	27	27	0
R54	32	31	-1
R55	20	20	0