Gate Burton
ENERGY PARK

Gate Burton Energy Park Environmental Statement

Volume 1, Chapter 11: Noise and Vibration
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Gate Burton Energy Park Limited

Prepared for:

Gate Burton Energy Park Limited

Prepared by:

AECOM Limited

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11. Noise and Vibration

11.1 Introduction

11.1.1 This chapter of the Environmental Statement (ES) presents the findings of an assessment of the likely significant effects from Noise and Vibration as a result of the Scheme. For more details about the Scheme, refer to **ES Volume 1, Chapter 2: The Scheme [EN010131/APP/3.1]**.

11.1.2 This chapter assesses noise and vibration effects on human receptors and does not include the assessment of noise and vibration on ecological or heritage receptors. The impacts of noise and vibration on heritage receptors are assessed in **ES Volume 1, Chapter 7: Cultural Heritage [EN010131/APP/3.1]**. The impacts of noise and vibration on ecological receptors are assessed in **Chapter 8: Ecology and Nature Conservation** of the ES **[EN010131/APP/3.1]**.

11.1.3 This chapter is supported by the following figure in **ES Volume 2 [EN010131/APP/3.2]**:

- **Figure 11-1:** Site boundary, receptor locations and noise monitoring positions;
- **Figure 11-2:** Noise Contours – Operational Phase; and
- **Figure 11-3:** Sensitivity Test using String Inverters as Noise Sources during the Operational Phase.

11.1.4 This chapter is supported by the following appendices in **ES Volume 3 [EN010131/APP/3.3]**:

- **Appendix 11-A:** Legislation and Planning Policy;
- **Appendix 11-B:** Acoustic Terminology;
- **Appendix 11-C:** Baseline Noise Surveys;
- **Appendix 11-D:** Noise Modelling; and
- **Appendix 11-E:** Summary of Non-significant Effects.

11.2 Consultation

11.2.1 A request for an EIA Scoping Opinion was sought from the Secretary of State through the Planning Inspectorate in November 2021 as part of the EIA Scoping Process. Consultation responses in relation to Noise and Vibration, to date, are presented in **ES Volume 3**: **Appendix 1-C [EN010131/APP/3.3]**.

11.2.2 Consultation has been undertaken with West Lindsey District Council as the Solar and Energy Storage Park location host authority. The following matters have been discussed:

- The Study Area;
- The approach to noise monitoring;
- The construction noise and vibration assessment methodology; and
- The operational noise assessment methodology.

11.3 Legislation and Planning Policy

11.3.1 Relevant policy documents are listed below. More detailed information regarding legislation and planning policy can be found in **ES Volume 3: Appendix 11-A [EN010131/APP/3.3]**.

11.3.2 Legislation to be considered includes:

- Control of Pollution Act 1974 (Ref 11-1); and
- Environmental Protection Act 1990 (Ref 11-2).

11.3.3 National planning policy and guidance to be considered includes:

- National Planning Policy Framework (NPPF) (2021) (Ref 11-3);
- National Policy Statement for England (NPSE) (Ref 11-4);
- National Planning Policy Statement EN-1 (2011) (Ref 11-5);
- National Planning Policy Statement EN-3 (Ref 11-6);
- Draft National Planning Policy Statement EN-1 (2021) (Ref 11-7);
- Draft National Planning Policy Statement EN-3 (Ref 11-8); and
- Planning Practice Guidance Noise (PPGN) (Ref 11-9).

11.3.4 Local planning policy and guidance to be considered includes:

- Central Lincolnshire Local Plan 2012-2036 (Ref 11-10);
- Lincolnshire Minerals and Waste Local Plan including the Core Strategy & Development Management Policies Plan adopted in June 2006 (Ref 11-11);
- Bassetlaw District Council Core Strategy and Development Management Policies Development Plan Document, adopted 22 December 2011 (Ref 11-12);
- Nottinghamshire Minerals Local Plan (Ref 11-13); and
- Nottinghamshire Waste Local Plan (Ref 11-14).

11.4 Assessment Assumptions and Limitations

11.4.1 This section provides a description of the assumptions and limitations for the noise and vibration assessment.

Baseline Assumptions and Limitations

11.4.2 The measured ambient sound levels (taken in April 2022) have been considered as representative of the future baseline scenarios, with construction anticipated to commence in 2025 with a peak in 2026, operation to commence in 2028 and decommissioning to commence in 2088. No major developments (e.g. highway or railway schemes, industrial facilities) are assumed to be proposed in the area that are likely to notably alter the local baseline noise environment.

11.4.3 Any measurement of existing ambient or background sound levels will be subject to a degree of uncertainty. Environmental sound levels vary between days, weeks, and throughout the year due to variations in source levels and conditions, meteorological effects on sound propagation and other factors. Hence, any measurement survey can only provide a sample of the ambient levels. Every effort has been made such that measurements were

undertaken in such a way as to provide a representative sample of conditions, such as avoiding periods of adverse weather conditions, and school holiday periods (which are often considered to result in atypical sound levels). However, a small degree of uncertainty will always remain in the values taken from such a measurement survey.

Construction Noise Assumptions and Limitations

11.4.4 The assessment of construction noise (and vibration) has considered construction activities that have the potential to result in significant effects on identified receptors, based on information presented in **ES Volume 1, Chapter 2: The Scheme [EN010131/APP/3.1]** and previous experience of construction sites and professional judgement. These assessments are based on a reasonable representative worst-case scenario. Construction noise predictions have been undertaken using the computer modelling software CadnaA® (v2019) (Ref 11-15), based on an example schedule of plant items that are typically used in such developments for the purposes of carrying out a quantitative assessment at this stage. Construction plants are summarised in **ES Volume 3: Appendix 11-D [EN010131/APP/3.3]**.

11.4.5 Construction noise predictions in CadnaA have been undertaken using BS 5228:2014+A1:2019 'Code of practice for noise and vibration control on construction and open sites' (Ref 11-16) methodologies and AECOM library data of sound sources associated with the proposed construction activities. These sound sources are taken to be representative of the plant and/or activities that will be used during the construction process of the Scheme. Noise predictions were carried out to represent a conservative scenario where construction plant is operational nearest to the identified receptors and does not take into account quieter periods when limited activities take place or at further distances. Consequently, noise predictions may overestimate construction noise levels and are therefore considered to be a reasonable likely worst case.

11.4.6 Piling will be required for the solar PV Mounting Structures and the Substation/ BESS construction. As a piling method has not yet been finalised, it is assumed that piling will be used to install auger piles, which is a typical approach in similar developments and is considered to represent a reasonable worst-case.

11.4.7 Noise effects during the decommissioning phase of the Scheme will be similar or less than noise effects during the construction phase. The noise assessment presented for the construction phase is therefore considered representative (or an overestimate) of the decommissioning phase. As such a separate assessment for noise from the decommissioning phase is not included.

Operational Assumptions and Limitations

11.4.8 A series of assumptions were made for the generation of the construction and operation noise models as follows:

- Digital noise modelling of the operational Scheme has been based on the maximum worst case parameters set out in the drawings, plans, and

construction and operation details as set out in **ES Volume 1, Chapter 2: The Scheme [EN010131/APP/3.1]**;

- Sound level data for operational noise-producing plant (i.e. inverters, transformers and BESS units) have been based on industry sound pressure level measurement data (see **ES Volume 3: Appendix 11-D [EN010131/APP/3.3]**);
- Surrounding ground conditions are rural farmland and have been modelled as soft (G=0.8);
- Air temperature was assumed to be 10 degrees and humidity 70%, which are considered typical annual average weather conditions;
- One order of reflection was modelled;
- Land topography has been incorporated into the noise modelling; and
- All receptor points have been set at a standard height of 1.5 m above local ground levels to calculate representative noise levels at sensitive receptors.

11.4.9 Operational noise has been predicted with all plant being in maximum operation at all times of day. BESS cooling fans will operate dependent on ambient temperatures and would not be in a full mode of operation during cooler temperatures. Consequently, noise predictions represent a reasonable worst-case.

11.4.10 Sound level data for transformers in reduced modes of operation is not available from manufacturers and therefore not available for the purposes of this assessment. Noise predictions are based on inverters and cooling fans operating at full load so are likely to be overestimated. Consequently, this is considered to represent a worst-case assessment scenario.

11.4.11 As discussed in **ES Volume 1, Chapter 2: The Scheme [EN010131/APP/3.1]**, the Scheme may utilise either a 'central inverter solution' which comprises inverters, transformers and switchgear, or a 'utility scale string inverter solution'. While there would be more string inverters (up to 1,430 string inverters) compared to centralised inverters (up to 143), the overall sound outputs of the utility scale and small-scale string inverter solutions will be substantially quieter than the centralised inverter solution. From a noise perspective it is therefore assumed that the central inverter solution is a reasonable worst-case scenario when in operation and is therefore the basis of the assessment. Sensitivity testing of a scenario with 1,430 string inverters has been carried out to ensure the centralised inverter solution is reasonable worst-case. The sensitivity test is presented in **ES Volume 3: Appendix 11-D [EN010131/APP/3.3]** and **ES Volume 2: Figure 11-3 [EN010131/APP/3.2]**.

11.4.12 Some flexibility in the locating of plant is required. Consequently, should there be any changes in the locations of noise generating infrastructure, the Applicant commits to not exceed the predicted noise levels modelled at the sensitive receptors for the illustrative design. This may be achieved through procurement of quieter equipment than has been modelled, for example. No acoustic barriers will be introduced unless they can be incorporated within the Design Parameters set out in **Outline Design Principles [EN010131/APP/2.3]**.

11.5 Study Area

11.5.1 The Study Area was defined to include construction and operational Noise and Vibration features likely to be at risk from possible direct and indirect impacts that might arise from the Scheme, termed the Zone of Influence (ZoI).

11.5.2 For the Solar and Energy Storage Park, the potential ZoI for construction noise effects is considered to be 300m, and the potential ZoI for operational noise effects is considered to be 500m, based on professional judgement. The wider 500m operational ZoI has been used for both the construction and operational noise and vibration assessment as it is considered that receptors further than 500m will experience considerably lower levels of noise and vibration emissions as these will attenuate over distance, resulting in negligible noise and vibration effects from the Scheme; this is confirmed by the modelling output and conclusions in this chapter. This ZoI was agreed through a meeting with West Lindsey District Council on 12 April 2022.

11.5.3 The potential ZoI for construction noise effects along the Grid Connection Corridor will include receptors within 300m. This distance has been selected as construction noise predictions (based on guidance in BS 5228-1 (Ref 11-16) are generally reliable up 300m. Additionally, a study area of 50 m either side of construction traffic routes has been defined based on guidance in the Design Manual for Roads and Bridges (DMRB) LA111 (Ref 11-20).

11.6 Assessment Methodology

Sensitive Receptors

11.6.1 Potential sensitive receptors (i.e. buildings whose occupants may be disturbed by adverse noise and vibration levels, and structures that are sensitive to vibration) have been taken into consideration when assessing the effects associated with noise and vibration levels from the construction and operational phases of the Scheme.

11.6.2 The type of receptors that may experience significant effects due to the construction and operation of the Scheme are identified in Table 11-1 as residential and non-residential.

Table 11-1 Receptor Types

Receptor Group	Receptors in Group
Residential	Individual dwellings and private open spaces (e.g. gardens)
Non-residential	Non-residential community facilities such as schools, hospitals, places of worship, and noise sensitive commercial properties

11.6.3 The effect of noise and vibration generated during the construction and operational phases of the Scheme are considered at nearby sensitive receptors. A number of receptors that may potentially be affected have been considered in this assessment. The sensitive receptors considered are the nearest receptors to the Site (i.e. the receptors that will experience the highest levels of noise and vibration). Although noise and vibration may be perceivable at other receptors in the area around the Scheme, effects will not be significant if they are suitably controlled at the identified receptors.

11.6.4 Noise-sensitive sensitive receptors have been identified through a desktop study of aerial imagery and mapping and are presented in **ES Volume 2: Figure 11-1 [EN010131/APP/3.2]** and are summarised in Table 11-2. The selection of receptors presented were agreed with LPAs through the scoping process.

Table 11-2 Sensitive Receptors

Receptor Reference	Location	Description	Approximate Coordinates
R1	Knaith	Residential	53°21'13.04"N, 0°45'8.29"W
R2	Knaith Park	Residential	53°21'38.74"N, 0°44'11.30"W
R3	Kexby Lane Properties	Residential	53°21'38.69"N, 0°43'7.70"W
R4	Willingham by Stow	Residential	53°20'57.77"N, 0°41'26.87"W
R5	Stow Road Properties	Residential	53°20'37.99"N, 0°41'2.36"W
R6	Nursery House, Willingham Road	Residential	53°20'12.03"N, 0°42'31.56"W
R7	Sort Hills Farm, Willingham Road	Residential	53°19'57.09"N, 0°42'59.90"W
R8	Cedar Ridge, Willingham Road	Residential	53°19'54.95"N, 0°44'22.82"W
R9	Gate Burton	Residential	53°20'0.83"N, 0°44'33.77"W
R10	St Helen's Church, Gainsborough Road	Residential	53°20'10.93"N, 0°44'29.84"W
R11	Gate Burton Hall, Gainsborough Road	Residential	53°20'17.90"N, 0°44'37.35"W
R12	Rose Cottage, Gainsborough Road	Residential	53°20'25.59"N, 0°44'46.98"W
R13	Central Park Farm	Residential	53°21'5.22"N, 0°44'49.21"W
R14	White Hoses/ Dutch Cottage, Gainsborough Road	Residential	53°21'2.63"N, 0°45'14.21"W
R15	Sandy Barr Cottage, Marton Road	Residential	53°20'22.00"N, 0°42'13.82"W
R16	Sandybus Farm, Marton Road	Residential	53°20'13.53"N, 0°42'13.58"W
R17	Park Farm, Gainsborough Road	Residential	53°20'56.71"N, 0°42'26.26"W
R18	Clay Farm, Clay Lane	Residential	53°20'15.08"N, 0°43'26.70"W

Receptor Reference	Location	Description	Approximate Coordinates
R19	Park Farm South, Willingham Road	Residential	53°21’28.26”N, 0°43’46.35”W
R20	Marton	Residential	53°19’49.70”N, 0°44’29.37”W
R21	Keepers Cottage	Residential	53°21’3.74”N, 0°44’38.40”W
R22	Lea Fields Crematorium	Non-residential	53°21’36.29”N, 0°45’23.82”W

11.6.5 Additionally, receptors along the proposed Grid Connection Corridor study area that may be impacted during construction activities have been considered in the assessment. Receptors that may be affected by cable laying activities are identified in section Table 11-14 of Section 11.10.

11.6.6 Locations of Horizontal Directional Drilling (HDD) activities have not yet been finalised. Consequently, to provide an indication of potential noise effects due to HDD activities, noise has been calculated by taking the distance from an avoidance area boundary as shown in **ES Volume 3: Appendix 2-B [EN010131/APP/3.3]** to the nearest sensitive receptor. This distance is considered to represent the closest potential distance between HDD activities and sensitive receptors. As such, the assessment of HDD noise is considered to represent a reasonable worst-case. Avoidance area and nearest sensitive receptors are described in **ES Volume 2: Figure 11-1 EN010131/APP/3.2]**.

Table 11-3 Avoidance Area Sensitive Receptors

Avoidance Area	Nearest Receptor	Description	Approximate Coordinates
AA1, AA2	1 & 3 East End Court, Rampton	Residential	53°17'52.81"N, 0°47'46.84"W
AA3	Manor Gardens, Treswell Road, Rampton	Residential	53°18'12.50"N, 0°48'8.03"W
AA4, AA5	Ellesmere, Cottam	Residential	53°18'31.46"N, 0°46'57.33"W
AA6, AA7, AA8	Wells Lane Cottage, Cottam	Residential	53°18'46.80"N, 0°46'19.74"
AA9, AA10, AA11	The Boathouse, Trent Port Road	Residential	53°19'28.06"N, 0°44'55.04"W
AA12	Marton Grange Barn, Stow Park	Residential	53°19'30.63"N, 0°43'24.52"W
AA13	Clay Farm Lane, Clay Lane	Residential	53°20'15.08"N, 0°43'26.70"W

Baseline Noise Monitoring Methodology

11.6.7 Baseline noise monitoring has been carried out to establish the existing noise climate in the area. The monitoring procedures followed guidance from BS 7445-1:2003 'Description and environment of environmental noise – Part 1: Guide to quantities and procedures' (Ref 11-17) and BS 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound' (Ref 11-18). All noise measurements included $L_{Aeq,T}$ and $L_{A90,T}$ sound level indicators.

11.6.8 Letters were sent to residents of identified receptors to request access for noise monitoring. Where access was granted, noise monitoring was undertaken for one week from 20 to 26 April 2022. Where secure locations to safely leave noise monitoring equipment unattended could not be obtained, noise measurements were undertaken for 24-hours from 13 to 14 April 2022.

11.6.9 Monitoring locations are shown in **ES Volume 2: Figure 11-1 [EN010131/APP/3.2]** and summarised in Table 11-4. Based on their surroundings and relative distance to nearby sound sources (in particular road traffic), the monitoring locations have been allocated as representative of the local noise environment at each of the various noise-sensitive receptors (Table 11-3).

Table 11-4 Noise Monitoring Locations

Location Reference	Monitoring Period	Representative of Receptors
ML1	13/04/22 to 14/04/22	R8, R9, R10, R11, R12, R20
ML2	13/04/22 to 14/04/22	R1, R13, R14, R21, R22
ML3	20/04/22 to 26/04/22	R18
ML4	20/04/22 to 26/04/22	R6, R15, R16, R17
ML5	13/04/22 to 14/04/22	R4, R5
ML6	20/04/22 to 26/04/22	R2, R3, R19
ML7	13/04/22 to 14/04/22	R7

Sources of Information

11.6.10 The following sources of information were referenced for the noise and vibration assessment:

- Aerial imagery of the site and surrounding area to define sensitive receptors and monitoring locations;
- **ES Volume 2, Figure 2-4**: Indicative Site Layout Plan for the noise model **[EN010131/APP/3.2]**;
- Plant noise source data were referenced from previous solar farm noise assessments;
- **Chapter 2: The Scheme [EN010131/APP/3.1]** for information on the operational Scheme and construction; and
- **Chapter 13: Transport and Access [EN010131/APP/3.1]** for information on construction traffic.

Impact Assessment Methodology

11.6.11 The NPSE sets definitions for 'significant adverse effects' and 'adverse effects' using the concepts:

- Lowest Observed Adverse Effect Level (LOAEL) – the level above which, as an average response, adverse effects on health and quality of life can be detected; and
- Significant Observed Adverse Effect Level (SOAEL) – the average response level above which, as an average response, significant adverse effects on health and quality of life occur.

11.6.12 The NPSE states that:

"It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times".

11.6.13 Noise levels exceeding the SOAEL should be avoided as far as reasonably practicable. For noise levels exceeding the LOAEL, the NPSE states that:

"It requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development. This does not mean that such adverse effects cannot occur".

11.6.14 All noise effects are local, only affecting nearby sensitive receptors, and are direct in nature; however, defining a likely effect and whether it is significant or not depends on the nature of a noise source. Likely effects have been defined based on guidance set out in national policy.

11.6.15 A new source of noise is assessed through the absolute noise level it generates at sensitive receptors. Where an exceedance of the defined SOAEL for each noise source occurs, it is an indication of a likely significant effect. However, where an existing noise source is changed (i.e. construction traffic changing road traffic noise levels), the assessment of the effect level due to the change in noise refers to guidance within DMRB and consideration of the absolute noise level based on national policy guidance.

11.6.16 Government policy for noise is based on community exposure response relationships and noise insulation of a typical dwelling. Consequently, an assessment based on LOAELs and SOAELs cannot be applied to non-residential sensitive receptors. As such, the approach to the assessment of non-residential receptors differs from that adopted for residential receptors. Non-residential receptors are considered on a case-by-case basis by considering the applicable design criteria for good internal noise levels.

Construction and Decommissioning Phase

Overview of Works

11.6.17 For the purposes of assessing noise and vibration, the construction programme has been summarised into four scenarios that represent high

Noise Generating Activities (NGA). These activities are most likely to generate likely significant effects and are as follows:

- NGA1 – Construction of the BESS and on-site Substation;
- NGA2 – Construction of Inverters and Transformers;
- NGA3 – Construction of Ground mounted solar PV panel arrays;
- NGA4 – Cable installation (general works); and
- NGA5 – Cable installation (HDD activities).

11.6.18 The earliest construction could start is Q1 2025 and construction will require an estimated 24 to 36 months. The majority of works activities would be completed under core working hours as shown in Table 11-5.

Table 11-5 Working Hours

Works	Working hours
Summer	07:00 – 19:00 Monday to Friday and Saturday 09:00-13:00 with no Sunday or Bank Holiday working.
Winter	08:00 – 18:00 Monday to Friday and Saturday 09:00-13:00 with no Sunday or Bank Holiday working.

11.6.19 Some works activities may need to occur out of these hours/times due to activities requiring to be undertaken continuously (such as HDD and cable jointing – part of NGA5). Where work outside of times is necessary prior notification will be provided to the LPA.

Construction of BESS

11.6.20 The following activities will be undertaken to construct the BESS:

- Installation of electric cabling;
- Construction of foundations;
- Import of components to site;
- Installation of transformers; and
- Installation of battery, transformers, inverters and switchgear.

Installation of Inverters and Transformers

11.6.21 Solar farm infrastructure such as inverters and transformer stations will require the following steps prior to installation:

- Excavation of the base;
- Creation of concrete formwork for concrete foundation; and
- Concrete pour.

Construction of PV Modules

11.6.22 A supporting substructure of two 2.5 m piles will be required for every five PV modules installed. It is assumed that the piling method will be to install auger piles. Although the installation method of substructure for PV modules is yet to be confirmed, piling represents a reasonable worst case in terms of noise emissions.

Grid Connection Corridor

11.6.23 The Grid Connection Corridor comprises an area within which the high voltage cables will be laid within the Order limits, connecting the Solar and Energy Storage Park to Cottam Substation. It is proposed that the cables will be installed by a combination of open cut and trenchless methods. Open cut methods will be utilised more commonly across the underground cable route as it will be utilised when installing the cables within open agricultural land. Trenchless grid connection methods will be HDD and may be 24/7.

Prediction Methodology

11.6.24 Noise levels experienced by sensitive receptors during such works depend upon several variables, the most significant of which are:

- The noise generated by plant or equipment used on site, generally expressed as sound power levels (Lw) or the vibration generated by the plant;
- The periods of use of the plant on site, known as its on-time;
- The distance between the noise/vibration source and the receptor;
- The noise attenuation due to ground absorption, air absorption and barrier effects;
- In some instances, the reflection of noise due to the presence of hard surfaces such as the sides of buildings; and
- The time of day or night the works are undertaken.

Construction and Decommissioning Noise Criteria

11.6.25 Annex E of BS 5228-1 provides example methods for the assessment of the significance of construction noise effects. With reference to the NPSE, the LOAEL and SOAEL thresholds have been set in Table 11-6 below.

Table 11-6 Thresholds of Potential Effects of Construction Noise at Residential Buildings

Time Period	Threshold Value ($L_{Aeq,T}$ dB)		
	LOAEL	SOAEL	UAEL
Day (07:00 – 19:00) Saturday (07:00 – 13:00)	65	75	85
Evening (19.00 – 23.00) Weekends (13.00–23.00 Saturdays and 07.00–23.00 Sundays)	55	65	75
Night (23.00 – 07.00)	45	55	65

These effects are expected to occur if the programme of works indicates that the relevant threshold values are likely to be exceeded over a period of at least one month. The values apply to a location one metre from a residential building façade containing a window, ignoring the effect of the acoustic reflection from that façade.

11.6.26 Although there is currently a lack of evidence relating health effects to construction noise, the method for assessing construction noise effects is defined based on the current industry standard approach followed in DCOs[1].

11.6.27 In terms of sound insulation or temporary rehousing due to construction noise, BS 5228-1 states that a property would be eligible if exposed to significant levels of noise "*for a period of 10 or more days of working in any 15 consecutive days or for a total number of days exceeding 40 in any 6 consecutive months*". Consequently, although no requirement for insulation or temporary re-housing is identified (see section 11.10), these durations will be considered where a significant effect is identified.

Construction and Decommissioning Vibration

11.6.28 BS 5228-2 provides further guidance on the perception of vibration within occupied buildings. This provides a simple method of determining annoyance alongside evaluation of cosmetic damage associated with construction and decommissioning induced vibration. Table 11-7 details Peak Particle Velocity (PPV) levels (a standard measure of vibration effects) and their potential effect on humans.

Table 11-7 Criteria for Construction and Decommissioning Vibration (Human Response)

Magnitude of Impact	PPV Vibration Level	BS 5228-2 Description of Impact
LOAEL	0.3 mm/s	Vibration might be just perceptible in residential environments.
SOAEL	1.0 mm/s	It is likely that vibration of this level in residential environments will cause complaint, but it can be tolerated if prior warning and explanation has been given to residents.

11.6.29 The recommended PPV vibration limits for transient vibration, above which cosmetic damage could occur for different types of buildings are provided in BS 5228-2 and presented in Table 11-8. For these limits, 'minor damage' is possible at vibration magnitudes that are greater than twice those given in Table 11-7, and 'major damage' can occur at values greater than four times the tabulated values. Consequently, the significance of effect has been provided based on the sensitivity of a building to vibration induced cosmetic damage. Cosmetic damage would precede the onset of any structural damage.

Table 11-8 Criteria for Construction and Decommissioning Vibration (Cosmetic Building Damage)

Type of building	Peak component particle velocity in frequency range of predominant pulse, at which cosmetic damage could occur	
	4 Hz to 15 Hz	4 Hz to 15 Hz
Reinforced or framed structures, Industrial	50 mm/s at 4 Hz and above	50 mm/s at 4 Hz and above

[1] For example High Speed 2, Longfield Solar Farm, A14 Cambridge to Huntingdon and Thames Tideway

Type of building	Peak component particle velocity in frequency range of predominant pulse, at which cosmetic damage could occur	
	4 Hz to 15 Hz	4 Hz to 15 Hz
and heavy commercial buildings		
Industrial and heavy commercial buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

Note 1: A potential negligible effect (not significant) is indicated at vibration levels up to the threshold values.

Note 2: A potential minor adverse effect (not significant) is indicated at vibration levels up to a magnitude of twice the threshold values.

Note 3: A potential moderate adverse effect (significant) is indicated at vibration levels up to a magnitude of four times the threshold values.

Note 4: A potential major adverse effect (significant) is indicated at vibration levels equal to or greater than a magnitude of four times the threshold values.

Determining a Construction and Decommissioning Noise and Vibration Effect

11.6.30 Although a significant effect due to construction activities may be determined through an assessment based on exceedances of the defined SOAELs for construction noise and vibration, additional consideration of the overall significance of the effect for temporary construction activities will be provided through qualitative discussion of the following:

- Duration of temporary likely effects;
- Frequency of events; and
- Sensitivity of receptor.

Construction and Decommissioning Traffic Noise

11.6.31 During the peak construction period, there will be up to 60 HGV deliveries and 30 light vehicles on the strategic road network per day. Traffic during decommissioning is expected to be similar (or lesser) to the construction phase. Construction and decommissioning traffic noise have been assessed for a representative worst-case day during the construction stage based on information in **ES Volume 1, Chapter 2: The Scheme [EN010131/APP/3.1]**. Predicted construction traffic noise levels along the main access routes have been compared to measured ambient noise levels so a potential change in noise can be derived.

11.6.32 Road traffic noise levels have been calculated with reference to methodology within the Calculation of Road Traffic Noise (CRTN) (Ref 11-19), which contains an equation for the calculation of the Basic Noise Level (BNL) from a road in terms of the 18-hour Average Annual Weekday Traffic (AAWT) flow from 06:00 to 24:00. The temporary changes in road traffic noise levels along the local road network due to construction traffic have been assessed based on short-term changes in noise from Table 3.54a of the DMRB LA111 (Ref 11-20). Assessment criteria are presented in Table 11-8.

Table 11-9 Construction Traffic Noise Assessment Criteria

Effect Level	Magnitude criteria
Negligible	≥ 0 dB and < 1 dB
Minor	≥ 1 dB and < 3 dB
Moderate	≥ 3 dB and < 5 dB
Major	≥ 5 dB

11.6.33 DMRB defines the LOAEL as 55 dB $L_{A10,18h}$ and the SOAEL as 68 dB $L_{A10,18h}$. DRMB goes on to state that:

"Where any do-something absolute noise levels are above the SOAEL, a noise change in the short term of 1.0dB or over results in a likely significant effect".

11.6.34 This implies that receptors experiencing noise levels exceeding the SOAEL are more sensitive to smaller changes in noise than receptors experiencing absolute noise levels below the SOAEL. As the CRTN method calculates the BNL at 10 m from the roadside, the absolute noise level is not considered to be representative of what nearby receptors may experience; however, it is appropriate for defining a change in noise level. Should an increase in noise of greater than 1 dB be identified from a road where the BNL exceeds the SOAEL, additional calculations are undertaken to identify the absolute noise levels at nearby receptors and the likelihood of significant effects.

Operational Noise

11.6.35 Noise predictions of the operational Scheme have been undertaken using CadnaA®, which implements the calculation procedures of ISO 9613 'Acoustics – Attenuation of Sound During Propagation Outdoors' (Ref 11-21), to predict the propagation of noise away from the Scheme in all directions and to quantify resultant noise levels at the identified noise sensitive receptor locations.

11.6.36 Operational noise has been assessed following BS 4142 guidance, whereby the rating level of noise emissions from activities are compared against the background level of the pre-development noise climate. Source data for operational noise emissions is presented in **ES Volume 3: Appendix 11-D [EN010131/APP/3.3]**. The relevant parameters in this instance are as follows:

- Background sound level – $L_{A90,T}$ – defined in the Standard as the 'A' weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels;
- Specific sound level – $L_{Aeq,Tr}$ – the equivalent continuous 'A' weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, Tr; and

- Rating level – $L_{Ar,Tr}$ – the specific sound level plus any adjustment made for the characteristic features of the noise.

11.6.37 BS 4142 recognises that certain acoustic features of a sound source can increase the impact over that expected based purely on the sound level. The standard identifies the following features to be considered:

- Tonality - a penalty of 2 dB is applied for a tone which is just perceptible at the receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible;
- Impulsivity - a penalty of 3 dB is applied for impulsivity which is just perceptible at the receptor, 4 dB where it is clearly perceptible and 6 dB where it is highly perceptible. An impulse is defined as the sudden onset of a sound;
- Intermittency - a penalty of 3 dB can be applied if the intermittency of the specific sound is readily identifiable against the residual acoustic environment at the receptor i.e. it has identifiable on/off conditions; and
- Other sound characteristics - a penalty of 3 dB can be applied where the specific sound features characteristics that are neither tonal nor impulsive but are readily distinctive against the residual acoustic environment.

11.6.38 BS 4142 states the following regarding the assessment of impacts, comparing the rating level of the new noise source with the existing background level:

- *"Typically, the greater this difference, the greater the magnitude of the impact.*
- *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
- *A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.*
- *The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."*

11.6.39 The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

11.6.40 BS 4142 advises that, where rating levels and background levels are low, which is the case in rural areas surrounding the Site, the assessment of operational noise should take into context the absolute noise level. The ANC Guide to BS 4142 (Ref 11-18) provides context to this by stating:

"BS 4142 does not define 'low' in the context of background sound levels nor rating levels. The note to the Scope of the 1997 version of BS 4142 defined very low background sound levels as being less than about 30 dB L_{A90}, and low rating levels as being less than about 35 dB $L_{Ar,Tr}$".

11.6.41 The ANC Guide suggests that: "…similar values would not be unreasonable in the context of BS 4142, but that the assessor should make a judgement and justify it where appropriate".

11.6.42 A minimum rating level of 35 dB $L_{Ar,Tr}$ for the LOAEL would align with guidance in PPGN, which defines noise below the LOAEL as follows:

"Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life".

11.6.43 BS 8233:2014 Guidance on sound insulation and noise reduction for buildings. (Ref 11-22) and the World Health Organization (WHO) 'Guidelines for Community Noise' (1999) (Ref 11-23) provide guidance levels for internal noise within dwellings of 30 dB $L_{Aeq,T}$ for good sleeping conditions at night. However, at night, residents are likely to be inside their properties. BS8233:2014 states that building envelope attenuation would be reduced to approximately 15 dB by a partially open window. Consequently, an external SOAEL of 45 dB $L_{Ar,Tr}$ has been adopted for the night-time.

11.6.44 The assessment criteria for noise from fixed plant installations are summarised in Table 11-10.

Table 11-10 Operational Noise Assessment Criteria

Effect Level	Rating Level (External) at Receptor, $L_{Ar,Tr}$	
	Daytime (07:00-19:00) and Evening (19:00-23:00)	Night-time (23:00-07:00)
LOAEL	Less than or equal to the typical background level ($L_{A90,T}$) – minimum of 35 dB $L_{Ar,Tr}$	Less than or equal to the typical background level ($L_{A90,T}$) – minimum of 30 dB $L_{Ar,Tr}$
SOAEL	Greater than 10 dB above the background noise level – minimum of 45 dB $L_{Ar,Tr}$	Greater than 10 dB above the background noise level – minimum of 45 dB $L_{Ar,Tr}$

Operational Vibration

11.6.45 Operational vibration is scoped out of any further assessment (as agreed with the Planning Inspectorate in the Scoping Opinion **ES Volume 3: Appendix 1-B [EN010131/APP/3.3]**).

Non-Residential Receptors

11.6.46 Design guides for good internal conditions in non-residential receptors are set indoors. The only non-residential receptor in this assessment is a crematorium (R22 identified in Table 11-2), which design criterion from BS 8233: 2014 for place of worship, counselling, meditation or relaxation is considered applicable. This design criterion is a range of 30-35 dB $L_{Aeq,T}$. Assuming that the crematorium may have doors or windows open at some points during the year, the maximum external noise level (assuming 15 dB attenuation for a partially open door or window) before the design criterion would be exceeded would be 50 dB $L_{Aeq,T}$. Should this level be exceeded,

additional mitigation measures may be required for the crematorium to continue to operate.

11.7 Baseline Conditions

11.7.1 This section describes the baseline environmental characteristics for the Scheme and surrounding areas with specific reference to Noise and Vibration. Further details of the methodology and results of the baseline noise surveys are presented in **ES Volume 3: Appendix 11-C [EN010131/APP/3.3]**.

Existing Baseline

11.7.2 During the surveys the dominant noise source at the majority of the locations was observed to be road traffic from the surrounding road network. Additionally, at ML3 and ML7, train movements had a substantial contribution to the noise environment. Local noise sources that influence noise conditions are fauna, farming activities and local resident activities.

11.7.3 A summary of the noise monitoring results is presented in Table 11-11. Typical ambient ($L_{Aeq,1h}$) and background ($L_{A90,1h}$) sound levels are presented for the daytime, evening and night for weekdays at locations that 24-hour monitoring was undertaken and both weekdays and weekends for week-long monitoring locations.

Table 11-11 Summary of Baseline Noise Monitoring Results

Location Reference	Sound Level Indicator	Day (07:00 – 19:00)	Evening (19:00 – 23:00)	Night (23:00 – 07:00)
ML1	$L_{Aeq,1h}$	47	44	46
	$L_{A90,1h}$	41	37	29
ML2	$L_{Aeq,1h}$	51	52	52
	$L_{A90,1h}$	39	35	31
ML3	$L_{Aeq,1h}$	57	55	56
	$L_{A90,1h}$	32	26	26
ML4	$L_{Aeq,1h}$	48	40	40
	$L_{A90,1h}$	37	32	32
ML5	$L_{Aeq,1h}$	54	48	44
	$L_{A90,1h}$	36	28	24
ML6	$L_{Aeq,1h}$	49	42	39
	$L_{A90,1h}$	36	27	24
ML7	$L_{Aeq,1h}$	53	49	44
	$L_{A90,1h}$	39	33	32

Future Baseline

11.7.4 The future baseline scenarios are set out in **ES Volume 1, Chapter 5: EIA Methodology [EN010131/APP/3.1]**. In the absence of the Scheme, it is considered that the future baseline noise environment will be higher than represented by the April 2021 measurement ambient sound levels. This is due to natural growth of road traffic flows resulting in increased noise in the local area.

11.7.5 The assessment of construction traffic noise effects accounts for the future peak construction year, which includes natural traffic growth. However, the operational noise assessment assumes that the measured baseline data is representative (i.e. no higher) than future baseline conditions, which represents a worst-case scenario.

11.8 Potential Impacts

11.8.1 Mitigation measures being incorporated in the design and construction of the proposed Scheme are set out below. Prior to the implementation of the mitigation, the proposed Scheme has the potential to affect noise (positively or negatively), during construction, operation and during decommissioning, in the following ways:

- Works activities associated with site preparation, plant installation, substation construction, cable laying, and construction-related vehicle movements within the Order limits and along access routes; and
- Noise from the operation of solar farm plant (e.g. inverters, transformers) and associated BESS plant (e.g. cooling units, transformers), the on-site substation (e.g. transformers), and any associated vehicle movements. Plant items such as solar PV modules, PV module mounting structures, and cabling (both on-site and via route Export Cable) will not produce any operational noise emissions.

11.9 Embedded Mitigation Measures

11.9.1 Embedded mitigation measures form an integral, committed and deliverable part of the scheme design or comprise standard construction practices. They are assumed to be implemented and are therefore factored into the determination of residual significant effects. The following embedded mitigation measures have been identified as part of the assessment.

Construction and Decommissioning

11.9.2 Measures to control noise as defined in Annex B of BS 5228-1 and measures to control vibration as defined in Section 8 of BS 5228-2 will be adopted where reasonably practicable. These embedded measures represent Best Practicable Means (BPM) and will be secured within the **Framework Construction Environmental Management Plan (CEMP) [EN010131/APP/7.3]** for the construction phase and **Framework Decommissioning Environmental Management Plan (DEMP) [EN010131/APP/7.5]** for the decommissioning phase. These documents would be secured through DCO requirements.

11.9.3 BPM that will be implemented during construction works and secured through the **Framework CEMP** and **Framework DEMP** are presented below:

- Ensuring that all appropriate processes, procedures and measures are in place to minimise noise before works begin and throughout the construction programme;
- All contractors to be made familiar with current legislation and the guidance in BS 5228 (Parts 1 and 2) which should form a prerequisite of their appointment;
- Where reasonably practicable, noise and vibration are controlled at source (e.g. the selection of inherently quiet plant and low vibration equipment), review of the construction programme and methodology to consider quieter methods, consideration of the location of equipment on-site and control of working hours;
- Use of modern plant, complying with applicable UK noise emission requirements;
- Hydraulic techniques for breaking concrete or rocks to be used in preference to percussive techniques, where reasonably practicable;
- Drop heights of materials will be minimised;
- Plant and vehicles will be sequentially started up rather than all together.
- Off-site pre-fabrication where reasonably practicable;
- Use of screening locally around significant noise producing plant and activities;
- Regular and effective maintenance by trained personnel will be undertaken to keep plant and equipment working to manufacturer's specifications;
- All construction plant and equipment to be properly maintained, silenced where appropriate, operated to prevent excessive noise and switched off when not in use;
- Loading and unloading of vehicles, dismantling of site equipment or moving equipment or materials around the Order limits to be conducted in such a manner as to minimise noise generation, as far as reasonably practicable;
- All vehicles used on-site shall incorporate reversing warning devices as opposed to the typical tonal reversing alarms to minimise noise disturbance where reasonably practicable;
- Provision of information to the relevant local authority and local residents to advise of potential noisy works that are due to take place;
- Unnecessary revving of engines will be avoided, and equipment will be switched off when not in use; and
- Plant will always be used in accordance with manufacturers' instructions. Care will be taken to site equipment away from noise-sensitive areas. Where possible, loading and unloading will also be carried out away from such areas.

11.9.4 Core working hours for construction activities are defined in Table 11-12.

Table 11-12 Core Construction Working Hours

Works	Working Hours

Summer	07:00 – 19:00 Monday to Friday and Saturday 09:00-13:00 with no Sunday or Bank Holiday working.
Winter	08:00 – 18:00 Monday to Friday and Saturday 09:00-13:00 with no Sunday or Bank Holiday working.

11.9.5 A construction noise monitoring scheme shall be developed as per requirements of the **Framework CEMP [EN010131/APP/7.3]** following appointment of a principal contractor and prior to commencement of construction works. Requirements for monitoring during the decommissioning stages will be outlined in the **Framework DEMP [EN010131/APP/7.5]**.

11.9.6 The effect of noise and vibration on nearby sensitive receptors can be minimised through a good communication strategy. Prior to construction works being undertaken, liaison will be undertaken with occupiers of sensitive receptors that may be adversely affected by construction noise and vibration.

11.9.7 Noise complaints will be monitored and reported to the Applicant for immediate investigation and action. A display board will be installed on-site, and a website will be set up. These will include contact details for the Community Liaison Officer or alternative with whom nuisance or complaints can be lodged. A logbook of complaints will be prepared and managed by the Site Manager.

11.9.8 The communication strategy and noise complaint system will be secured through the DCO as part of the **Framework CEMP [EN010131/APP/7.3]** and **DEMP [EN010131/APP/7.5]**.

11.9.9 The applicant will submit an application for prior consent to carry out noisy work under Section 61 of the CoPA to demonstrate that noise and vibration has been minimised as far as reasonably practicable. The Section 61 application will set out the specific method of working, calculations of noise levels at nearby receptors, the actual working hours required, noise monitoring locations, details of communication measures and the mitigation measures implemented to minimise noise and vibration impacts.

11.9.10 As requirements and locations for HDD activities will not be finalised until a principal contractor is appointed, a hierarchy of mitigation measures is contained in the **Framework CEMP** [**EN010131/APP/7.3]** and **DEMP [EN010131/APP/7.5]** to ensure that significant noise effects do not occur due to potential night-time works:

- Where practicable, avoid HDD works within 200 m (the distance at which significant effects are predicted at night) of residential receptors (although this will depend on the results of the GI survey);
- Where HDD activities may occur within 200 m of sensitive receptors, the option for open cut cable laying will be explored as an alternative to HDD;
- The potential for the use of quieter equipment than listed in **ES Volume 3: Appendix 11-D [EN010131/APP/3.3]** will be explored by the principal contractor; and

- Depending on the location, plant and timing of works, acoustic fencing will be installed around the HDD site boundary to screen receptors from noise emission. This mitigation could provide 10 dB of attenuation when the noise screen completely hides the sources from the receiver.

11.9.11 Consideration has been given to traffic routing, timing and access points to the Scheme to minimise noise impacts at existing receptors as detailed in **ES Volume 1, Chapter 13: Transport and Access [EN010131/APP/3.1]**. Management of Heavy Goods Vehicles (HGV) on the highway network will be managed through the Framework Construction Traffic Management Plan (CTMP) **(ES Volume 3: Appendix 13-D [EN010131/APP/3.3]**, which will be secured through the DCO. Appropriate routing of construction and decommissioning traffic on public roads and along access tracks will be pursuant to the CTMP.

Operation

11.9.12 Embedded mitigation measures that will be applied are summarised as follows:

- Plant selection;
- Design layout to minimise noise at receptors, including:
  - Locating the BESS compound in an area away from large concentrations of receptors such that noise emissions from the BESS are less impactful; and
  - Location and orientation of inverters and transformers.
- Transformers may be standalone units or pre-assembled with inverters and switchgear to form a single contained unit (i.e. enclosed).

11.9.13 Plant that will be used in the Scheme has not yet been finalised. Consequently, a conservative approach has been taken when defining sound data for noise sources and it may be possible that quieter plant can be incorporated into the final design. Quieter plant would be the most effective way of controlling noise emissions. Noise source data from inverters and the BESS have been updated with SUNGROW (an inverter manufacturer) data, which is lower than data used in the PEI Report, but still represents a conservative worst-case assessment in terms of SUNGROW equipment.

11.9.14 The iterative layout has been optimised from the layout in the PEI Report to locate inverters as far as possible from sensitive receptors where the highest levels of noise were predicted.

11.9.15 Although the **Works Plans [EN010131/APP/2.4]** and indicative layout have been optimised to minimise noise levels at sensitive receptors, there is a requirement to retain some flexibility on where infrastructure will be located on-site. Consequently, if there is a decision in the future to move noise generating infrastructure closer to sensitive receptors than shown in **ES Volume 2: Figure 2-4 [EN010131/APP/3.2]**, the Applicant has made a commitment that noise at sensitive receptors will be no higher than the levels presented in Section 11.10 (specifically Table 11-17). The measures to achieve this are discussed in Section 11.9 and secured in the **Framework Outline Environmental Management Plan (OEMP) [EN010131/APP/7.4]**.

11.9.16 Low frequency noise can be very difficult to predict with a high level of certainty and similarly hard to identify and resolve if present. This is because it can be generated by the unexpected interactions between system components and can be amplified by the geometry of the site and receptor buildings. The issue of low frequency noise will be considered throughout the Front-End Engineering Design for the substation and eliminated through design, or appropriately mitigated (isolation and attenuation measures) where appropriate and is secured through the **Outline Design Principles [EN010131/APP/2.3]**.

11.10 Assessment of Likely Impacts and Effects

11.10.1 Taking into account the embedded mitigation measures as detailed in Section 11.9 above, the potential for the Scheme to generate effects was assessed using the methodology as detailed in Section 11.6 of this Chapter.

Construction (assumed to be 2025 to 2027) and Decommissioning (assumed to be 2088)

Construction Noise Effects

11.10.2 This section discusses the potential noise and vibration effects on sensitive receptors arising during the construction phase of the Scheme. The indicative programme and duration of likely installation methods are described in **ES Volume 1, Chapter 2: The Scheme [EN010131/APP/3.1]**.

11.10.3 For NGA1, NGA2 and NGA3, as described in paragraph 11.6.17, construction noise predictions were undertaken at sensitive receptor locations identified in Table 11-2. For NGA 4 and NGA5, the potential distance from grid connection activities at which the LOAEL and SOAEL are calculated to occur were used to screen receptors in the Grid Connection Corridor study area for adverse levels of noise and likely significant effects.

11.10.4 Noise predictions have been undertaken for NGA1, NGA2 and NGA3, which will be undertaken during core daytime working hours. The results of construction noise predictions are summarised in Table 11-13.

Table 11-13 Construction Noise Prediction

Receptor Reference	Indicative Free-Field Construction Noise Levels During Daytime Construction Activity (dB $L_{Aeq,12h}$)		
	NGA1	NGA2	NGA3
R1	42	38	56
R2	41	41	64
R3	40	43	65
R4	38	41	60
R5	36	38	55
R6	43	43	68
R7	43	43	66

Receptor Reference	Indicative Free-Field Construction Noise Levels During Daytime Construction Activity (dB $L_{Aeq,12h}$)		
	NGA1	NGA2	NGA3
R8	45	40	63
R9	46	39	58
R10	48	42	60
R11	49	43	63
R12	49	42	64
R13	45	40	59
R14	43	36	56
R15	42	46	66
R16	41	44	66
R17	42	44	68
R18	50	46	71
R19	43	43	63
R20	40	35	53
R21	46	43	64
R22	39	34	49

11.10.5 For NGA1 and NGA2, noise predictions at sensitive receptors indicate that the LOAEL will not be exceeded.

11.10.6 For NGA3, construction activities will take place in close proximity to sensitive receptors, so the LOAEL is predicted to be exceeded at R6, R7, R15, R16, R17 and R18. As the SOAEL is not predicted to be exceeded at any receptor, no significant construction noise effects are identified.

11.10.7 Predicted noise levels at R22 (crematorium) are below the threshold for 50 dB $L_{Aeq,T}$, which is considered to represent the level for potential disturbance. Consequently, no additional mitigation measures are required.

11.10.8 For NGA4, noise predictions indicate that receptors within approximately 45 m of the Grid Connection Corridor may experience noise levels exceeding the LOAEL and receptors within 15 m may experience noise levels exceeding the SOAEL. Receptors within these distances are identified in the Table 11-14.

Table 11-14 Grid Connection Corridor Construction Effects

Effect Level	Receptor Locations
Between LOAEL and SOAEL	Spafford Close, Marton The Hawthorns/ Fieldway/ Barnfield/ Chestnut View High, Street, Marton 63/ 70, High Street, Marton
Above SOAEL	66 igh Street, Marton

11.10.9 There is potential for significant noise effects due to cable laying activities if they occur within 15 m of a sensitive receptor where exceedances of the SOAEL may occur. The only receptor identified as potentially experiencing significant noise effects is 66 High Street, Marton.

11.10.10 NGA4 will only take place during core daytime working hours. Occupants of nearby receptors are likely to be more tolerable of high noise events if they are regularly communicated to and kept informed of timings and duration of high noise generating events. Paragraph 6.3 of BS 5228-1 states that:

"Local residents might be willing to accept higher levels of noise if they know that such levels will only last for a short time".

11.10.11 Consequently, the communication strategy secured through the **Framework CEMP [EN010131/APP/7.3]** and **Framework DEMP [EN010131/APP/7.5]**, which will be secured through the DCO process, will ensure that occupants of affected properties will be notified of the timings and duration of works. As cable laying works are unlikely to occur for a period of 10 or more days in close proximity to sensitive receptors, noise effects due to construction and decommissioning activities are considered to be **not significant**.

11.10.12 For NGA 5, HDD activities involve a drill site and a reception pit. As the drill site will generate the highest level of noise, calculations of noise have been based on drill site activities. Results of noise calculations at the nearest receptors to avoidance areas boundaries are presented in Table 11-15. Details on noise calculations are provided in **ES Volume 3**: **Appendix 1-D [EN010131/APP/3.3]**.

Table 11-15 Grid Connection Corridor Construction Effects

Avoidance Area	Receptor	Approximate Distance	Calculated Noise Level $L_{Aeq,T}$ dB
AA1	1 & 3 East End Court, Rampton	600 m	44
AA2	1 & 3 East End Court, Rampton	510 m	45
AA3	Manor Gardens, Treswell Road, Rampton	600 m	44
AA4	Ellesmere, Cottam	430 m	47
AA5	Ellesmere, Cottam	570 m	44
AA6	Wells Lane Cottage, Cottam	510 m	45
AA7	Wells Lane Cottage, Cottam	375 m	48
AA8	Wells Lane Cottage, Cottam	940 m	39
AA9	The Boathouse, Trent Port Road	580 m	44
AA10	The Boathouse, Trent Port Road	425 m	47
AA11	The Boathouse, Trent Port Road	625 m	52
AA12	Marton Grange Barn, Stow Park	110 m	61
AA13	Clay Farm Lane, Clay Lane	600 m	44

11.10.13 It should be noted that calculations were undertaken using the methodology within BS 5228-1, which states caution should be applied for calculations at distances over 300 m because of the increasing importance of meteorological effects. Additionally, the HDD locations are likely to be at further distances than identified in the worst-case assumptions. Consequently, the noise calculations presented in Table 11-15 are considered illustrative to identify likely significant effects.

11.10.14 HDD activities are not predicted to exceed the SOAEL during daytime, weekday evening and weekend at any receptors; however, if works extend into the night, the SOAEL may be exceeded. Noise calculations indicate that the SOAEL would be exceeded during night works that occur within 200 m of a receptor. Consequently, HDD activities at AA12 have the potential to result in significant noise effects if they extend into the night-time period.

11.10.15 For all works that are undertaken outside of core work periods, a Section 61 consent will need to be obtained by the principal contractor. This will be agreed with the local planning authority and contain details on the methodology, mitigation, communication strategy and monitoring.

11.10.16 The hierarchy of mitigation measures for HDD activities listed in paragraph 11.9.10 will ensure that HDD activity noise effects will be reduced as far as reasonably practicable. This hierarchy includes the use of acoustic fencing which, if required, could provide 10 dB of noise attenuation. Consequently, noise from HDD activities at AA12 would reduce to 51 dB $L_{Aeq,T}$ at worst, which is below the SOAEL. As such, noise effects due to HDD activities are considered to be **not significant**.

Construction and Decommissioning Vibration Effects

11.10.17 It is generally accepted that, without a highly detailed understanding of the media, waveform, and frequency distribution, ground-borne vibration prediction methods are “beset with complexities and uncertainties” (Ref 11-24). However, it is unlikely that typical construction and decommissioning working routines would generate levels of vibration at local receptors at a level where cosmetic damage would be expected to be sustained or cause adverse effects for local residents. The level of impact at different receptors will be dependent upon a number of factors including distance between the works, ground conditions and the specific activities being undertaken. Consequently, vibration effects are defined with reference to information in guidance documents identified in the following paragraph.

11.10.18 Surface plant, such as cranes, compressors and generators, are not recognised as sources of high levels of ground-borne vibration. Reference to Figure C2 of ‘Control of Vibration and Noise During Piling’ (Ref 11-25) confirms that PPVs significantly less than 5 mm/s are generated by such machinery, even at distances of only 10 m. For example, the indication is that a bulldozer would generate a PPV of approximately 0.6 mm/s and a ‘heavy lorry on [a] poor road surface’ would generate a PPV of less than 0.1 mm/s at 10 m. These values are well below levels at which cosmetic building damage are predicted to occur; the lower levels being 15 mm/s for predominantly transient vibrations and 7.5 mm/s for continuous vibrations at the base of residential or lighter framed commercial buildings. The

aforementioned values are also below the 1.0 mm/s SOAEL (see Table 11-7) where it is likely that vibration in residential environments will result in complaints but can be tolerated if prior warning and explanation is given to residents.

11.10.19 Piling is proposed to be used for construction of PV Modules. The minimum distance between any piling works for the construction of PV modules and the nearest receptor is approximately 200 m and, therefore, ground borne vibration is unlikely to be an issue during piling works.

11.10.20 Similar levels of vibration to piling may be generated by HDD activities. As the nearest receptor to the boundary of an avoidance area is approximately 75 m away ground borne vibration is unlikely to be an issue during HDD activities.

11.10.21 The highest levels of vibration that would be generated by cable laying activities would be the use of vibratory roller during reinstatement. Whilst vibratory rollers may generate significant levels of vibration (i.e. exceeding 1.0 mm/s) at receptors within 20 m, the duration of exposure will be suitably short (less than a day) that:

"It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents".

11.10.22 For PPV vibration levels exceeding 1.0 mm/s, prior warning will be provided on the timings and duration of vibration generating activities. This will be secured through the **Framework CEMP [EN010131/APP/7.3]** and **Framework DEMP [EN010131/APP/7.5]**, which will be secured through the DCO. Given the short duration of these activities affecting individual receptors, prior warning is considered sufficient to offset significant effects.

11.10.23 Accordingly, at this stage, it is anticipated that vibration at nearby sensitive receptors would be **not significant** for all construction and decommissioning activities.

Construction and Decommissioning Traffic Noise Effects

11.10.24 The potential changes in road traffic noise from these roads as a result of the Scheme have been considered by calculating the CRTN BNL and comparing the change. Table 11-16 presents the results of the assessment.

Table 11-16 Construction Traffic Noise Assessment

Road Link	Baseline BNL dB	Baseline with Construction Traffic BNL dB	Change in BNL dB	Effect Level
A156 Gainsborough Road (south of Kexby Lane)	72.0	72.2	+0.2	Negligible
A156 Gainsborough Road (north of A1500 Stow Park Road)	70.7	71.0	+0.3	Negligible
Clay Lane (east of A156)	40.5	40.5	0.0	Negligible

Road Link	Baseline BNL dB	Baseline with Construction Traffic BNL dB	Change in BNL dB	Effect Level
Willingham Road (east of A156)	53.1	53.1	0.0	Negligible
A1500 Stow Park Road (east of A156)	68.7	68.9	+0.2	Negligible
A156 Gainsborough Road (south of A1500 Stow Park Road)	69.4	69.8	+0.4	Negligible
High Street (east of Marton Road)	62.1	62.1	0.0	Negligible
B1241 Gainsborough Road (south of Kexby Lane)	65.1	65.3	+0.2	Negligible
Marton Road (south of B1241 Gainsborough Road)	52.5	53.9	+1.4	Minor Adverse
B1241 Kexby Lane (east of Upton Road)	62.3	63.2	+0.9	Negligible
A156 Gainsborough Road (north of Kexby Lane)	70.1	70.4	+0.3	Negligible
Cottam Road (west of Cow Pasture Lane)	61.5	62.3	+0.8	Negligible
Headstead Bank (north of Cottam Road)	52.1	55.3	+3.2	Moderate Adverse
B1241 High Street (north of A1500 Tillbridge Road)	64.3	64.3	+1.0	Minor Adverse
A1500 Tillbridge Road (east of Saxilby Road)	67.1	67.1	0.0	Negligible
Saxilby Road (south of A1500 Tillbridge Road)	65.0	65.0	0.0	Negligible

11.10.25 Noise calculations indicate that construction traffic will result in a Negligible noise effect on all road links with the exception of Marton Road, B1241 High Street and Headstead Bank. At Headstead Bank, changes in traffic noise are equivalent to a Moderate Adverse effect; however, there are no sensitive receptors along this road to be affected by changes in noise, so this effect on receptors is **not significant**. On Marton Road and B1241 High Street construction traffic is calculated to result in a **minor adverse** noise effect. Consequently, changes in noise due to construction traffic on all assessed road links are **not significant**.

Additional Mitigation

11.10.26 No additional mitigation measures are proposed for the construction phase following the above embedded measures, given that there are not expected to be any significant effects as a result of the Scheme.

Operation (assumed to be 2028 to 2087)

Operational Noise Effects

11.10.27 For the assessment of operational noise during the daytime (07:00 to 19:00 hours in the summer and 08:00 to 18:00 in the winter), the typical background level has been defined from a Sunday daytime period with lower noise levels compared to a weekday or Saturday, as to provide a worst-case assessment scenario. It has been assumed that all plant is in operation continuously during the daytime.

11.10.28 Plant will operate continuously so there will not be any noticeable impulsive or intermittent characteristics from plant noise emissions experienced at the surrounding receptors. Transformers within the BESS compound can have tonal features, although noise emissions from the BESS will be dominated by the cooling fans such that any tonal features of the transformers will not be noticeable. However, overall plant noise emissions will likely be experienced at receptors as a distinctive continuous and steady hum; therefore a 3 dB correction to account for noise that is 'distinctive against the residual acoustic environment' has been applied in determining the rating level.

11.10.29 Details of the calculations are provided in ES Volume 3: **Appendix 11-D [EN010131/APP/3.3]**. A noise contour plan is included in ES Volume 2: **Figure 11-2 [EN010131/APP/3.2]**.

11.10.30 As the night-time period provides the most onerous assessment criteria and operational noise is assumed to be consistent, the assessment presented in Table 11-17 consider night-time noise only.

Table 11-17 Operational Noise Effects

Receptor Reference	Lowest Measured Background Level $L_{A90,1h}$ dB	LOAEL/ SOAEL	Predicted Rating Level $L_{Ar,Tr}$ dB	Effect Level	Significance
R1	31	31 / 45	34	Between LOAEL and SOAEL	Not significant
R2	24	30 / 45	38	Between LOAEL and SOAEL	Not significant
R3	24	30 / 45	39	Between LOAEL and SOAEL	Not significant
R4	24	30 / 45	38	Between LOAEL and SOAEL	Not significant
R5	24	30 / 45	33	Between LOAEL and SOAEL	Not significant
R6	32	32 / 45	41	Between LOAEL and SOAEL	Not significant
R7	32	32 / 45	40	Between LOAEL and SOAEL	Not significant
R8	29	30 / 45	37	Between LOAEL and SOAEL	Not significant

Receptor Reference	Lowest Measured Background Level $L_{A90,1h}$ dB	LOAEL/ SOAEL	Predicted Rating Level $L_{Ar,Tr}$ dB	Effect Level	Significance
R9	29	30 / 45	36	Between LOAEL and SOAEL	Not significant
R10	29	30 / 45	39	Between LOAEL and SOAEL	Not significant
R11	29	30 / 45	40	Between LOAEL and SOAEL	Not significant
R12	29	30 / 45	40	Between LOAEL and SOAEL	Not significant
R13	31	31 / 45	38	Between LOAEL and SOAEL	Not significant
R14	31	31 / 45	33	Between LOAEL and SOAEL	Not significant
R15	32	32 / 45	44	Between LOAEL and SOAEL	Not significant
R16	32	32 / 45	40	Between LOAEL and SOAEL	Not significant
R17	32	32 / 45	41	Between LOAEL and SOAEL	Not significant
R18	26	30 / 45	44	Between LOAEL and SOAEL	Not significant
R19	24	30 / 45	39	Between LOAEL and SOAEL	Not significant
R20	29	30 / 45	33	Between LOAEL and SOAEL	Not significant
R21	31	31 / 45	40	Between LOAEL and SOAEL	Not significant
R22	31	-	29	-	-

11.10.31 At all receptors, the LOAEL is exceeded but the SOAEL is not. The NPSE states…

"…all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development. This does not mean that such adverse effects cannot occur".

11.10.32 Reasonable steps to reduce noise are covered in the embedded mitigation section and have been applied in noise predictions. Consequently, NPSE requirements are complied with through provision of embedded mitigation.

11.10.33 As stated in paragraph 11.9.15, some flexibility in the locating of plant is required. Consequently, should there be any changes in the locations of plant, the Applicant commits to not to exceed predicted rating noise levels in Table 11-17 and secured in the **Framework OEMP [EN010131/APP/7.4].**

This may be achieved through selection/procurement of quieter equipment, for example, than the worst-case sound power levels that have been assessed. No acoustic barriers will be introduced unless they can be incorporated within the Design Parameters set out in **Outline Design Principles [EN010131/APP/2.3]**.

11.10.34 At R22 (crematorium) the predicted rating level of 29 dB $L_{Ar,Tr}$ does not exceed the threshold that may cause disturbance.

Additional Mitigation

11.10.35 No additional mitigation measures are proposed for the operational phase following the above embedded measures, given that there are not expected to be any significant effects as a result of the Scheme.

11.11 Enhancement Measures

11.11.1 No enhancement measures are proposed during construction, operation or decommissioning following the incorporation of the embedded measures described above.

11.12 Residual Effects and Conclusions

11.12.1 This section summarises the residual significant noise effects of the Scheme following the implementation of embedded and additional mitigation. Significant residual effects are defined in accordance with national noise policy as an exceedance of the SOAEL. The SOAELs for each assessment topic are defined in Table 11-6 (Scheme construction and decommissioning noise), Table 11-7 (Scheme construction and decommissioning vibration) and Table 11-10 (Scheme operation). The exception to this is the assessment of construction traffic noise, is assessed as the magnitude of change of road traffic noise (see Table 11-9).

11.12.2 No significant noise or vibration effects are predicted during the construction phase or the operational phase. Please see **ES Volume 3: Appendix 11-E [EN010131/APP/3.3]** for a summary of non-significant residual effects.

11.13 Cumulative Assessment

11.13.1 Cumulative noise effects during construction and operation phases may occur when developments are located nearby to a common receptor. Based on professional judgement, at distances of greater than 500m any interaction of noise emissions from multiple developments would be attenuated such that there would normally be no combined effect.

11.13.2 A list of relevant developments is presented in **ES Volume 3: Appendix 16-A [EN010131/APP/3.3]**, and cumulative assessment methodology discussed within **Chapter 5: EIA Methodology** of the ES **[EN010131/APP/3.1]**. The following developments in Table 11-18 have been identified to be within 500m of the Scheme.

Table 11-18 Cumulative Developments within 500m of the Scheme

Scheme ID	Name	Location Description	Development Summary
6	Cottam Power Station demolition	Adjacent to site at southern section of Grid Connection Corridor	Demolition of Power Station
9.3	West Burton Solar Project	Adjacent to southeast of Grid Connection Corridor at closest point	Solar PV Development
10	Cottam Solar Project	Shared Grid Connection Corridor	Solar PV Development
11	Cottam Power Station Redevelopment	Within and adjacent to Grid Connection Corridor	Local Plan – Priority Regeneration Area
12	Stow Park Road Residential Development	Adjacent to south west section of the Solar and Energy Storage Park	Application for approval of reserved matters for 39 dwellings

11.13.3 The precise scale of additional noise effects will be dependent on the exact works taking place at each location at any one time; however, compliance with the mitigation measures detailed within the **Framework CEMP [EN010131/APP/7.3]** and **Framework DEMP [EN010131/APP/7.5]** will reduce these effects as far as possible. It has been assumed that the other developments will also be required to adopt BPM as standard working practices during their construction phases and that noise and vibration levels will comply with set limits in accordance with guidance in BS 5228-1 and BS 5228-2.

11.13.4 Based on the distances from key project components to cumulative developments and requirements to implement BPM, it is considered that any overlapping of construction phases between the Scheme and the other nearby development schemes would not result in any in-combination cumulative effects at common noise-sensitive receptors. Predicted construction and decommissioning noise effects from the Scheme are below the LOAEL, and it is considered that cumulative effects of construction noise will remain unchanged from the residual effects and, therefore, remain not significant.

11.13.5 The Grid Connection Corridor has the potential to be shared with West Burton Solar Project and Cottam Solar projects as detailed in **ES Volume 1, Chapter 2: The Scheme [EN010118/APP/3.1]**. There is the possibility that either all three projects' ducts and cables are installed within the same construction programme of 24 to 36 months or works on the three projects will be built sequentially over a six-year period. If the projects are built sequentially, there will be no cumulative effects greater than those identified in the residual effects, although the effect would occur for longer. If the works are undertaken concurrently, then cumulative effects may occur.

11.13.6 The assessment of noise due to grid connection activities was based on a worst-case scenario where works were assumed to be undertaken at the closest boundary to residential receptors. Consequently, the residual effects

identified for grid connection activities would be unchanged if the installation of the grid connection for the three schemes occurred concurrently. However, the duration of these works is likely to be extended and, hence, the duration that receptors may be exposed to noisy works out of core hours. This extended exposure may affect the level of mitigation required for out-of-hours HDD activities in which case the Section 61 process will be followed. Consequently, cumulative grid connection activity noise will remain unchanged from the residual effects and, therefore, remains not significant.

11.13.7 There is not expected to be any overlap between construction traffic routes with the exception of West Burton Solar Project and Cottam Solar Project. Any overlaps between the construction vehicle trips associated with the Scheme and West Burton Solar Project and Cottam Solar Project are likely to be primarily confined to wider strategic routes, which have high density traffic flows and are not sensitive to changes in noise as a result of construction traffic. There is not expected to be any noticeable change in vehicle numbers along with grid connection corridor attributed to the cumulative schemes when considered alongside the Scheme. Consequently, cumulative construction traffic noise will remain unchanged from the residual effects and, therefore, remain not significant.

11.13.8 Operational noise emissions from nearby developments will be subject to the EIA Regulations and therefore designed to achieve appropriate operational noise limits that do not contribute to additional noise to the area (i.e. 'background creep', which could avoid any adverse effects to noise-sensitive receptors in the area). The control and mitigation of noise effects from surrounding development will be the responsibility of the developer. Given the requirement for new developments to achieve operational noise standards and the relative distance between cumulative developments and the Scheme, operational noise effects from the Scheme will remain unchanged from the residual effects stated previously and therefore remain **negligible** to **minor adverse** and **not significant**.

References

Ref 11-1 Her Majesty's Stationery Office (1974); Control of Pollution Act.
Ref 11-2 Her Majesty's Stationery Office (1995); Environmental Protection Act.
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Ref 11-4 Department for Environment Food and Rural Affairs (2010); Noise Policy Statement for England.
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Ref 11-6 Department of Energy and Climate Change (2011) National Policy Statement for Renewable Energy Infrastructure (EN-3).
Ref 11-7 Department for Business, Energy & Industrial Strategy (2021) Draft overarching National Policy Statement for energy (EN-1).
Ref 11-8 Department for Business, Energy & Industrial Strategy (2021) Draft National Policy Statement for renewable energy infrastructure (EN-3).
Ref 11-9 Ministry of Housing, Communities & Local Government (2019); Planning Practice Guidance - Noise.
Ref 11-10 Lincolnshire County Council, “Central Lincolnshire Local Plan 2012-2036,” Lincolnshire County Council, Lincoln, 2017.
Ref 11-11 Lincolnshire Minerals and Waste Local Plan including the Core Strategy & Development Management Policies Plan adopted in June 2006 and the Site Locations Plan adopted in December 2017.
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Ref 11-13 Nottinghamshire Minerals Local Plan, adopted March 2021.
Ref 11-14 Nottinghamshire Waste Local Plan, adopted 2002.
Ref 11-15 CadnaA®, registered trademark of Datakustik GmbH (Munich, Germany).
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Ref 11-23 World Health Organization (1999); Guidelines for Community Noise.
Ref 11-24 Hiller, D. M., and G. I. Crabb, (2000); Groundborne Vibration Caused by Mechanised Construction Works. TRL Report 429.
Ref 11-25 Selby, A.R. (1997). “Control of vibration and noise during piling.” Brochure publication, British Steel, UK