FENWICK SOLAR FARM

Fenwick Solar Farm

EN010152

Environmental Statement

Volume I Chapter 11: Noise and Vibration

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11.1 Introduction

11.1.1 This chapter of the Environmental Statement (ES) presents an assessment of the likely significant effects of Fenwick Solar Farm (hereafter referred to as 'the Scheme') with respect to noise and vibration. The assessment follows the methodology outlined in the Scoping Report (**ES Volume III Appendix 1-1: EIA Scoping Report [EN010152/APP/6.3]**) and is based on information obtained to date and the current Scheme design (**ES Volume II Figure 1-3: Elements of the Site [EN010152/APP/6.2]**).

11.1.2 This chapter should be read in conjunction with the Scheme description provided in **ES Volume I Chapter 2: The Scheme [EN010152/APP/6.1]**. Additionally, noise and vibration interfaces with a number of other disciplines. The impacts of noise and vibration on heritage receptors are assessed in **ES Volume I Chapter 7: Cultural Heritage [EN010152/APP/6.1]** and the impacts of noise and vibration on ecological receptors are assessed in **ES Volume I Chapter 8: Ecology [EN010152/APP/6.1]**.

11.1.3 This chapter is supported by the following figures (**ES Volume II [EN010152/APP/6.2]**) and technical appendices (**ES Volume III [EN010152/APP/6.3]**):

a. **Figure 11-1: Noise Monitoring and Receptor Locations**;

b. **Figure 11-2: Operation and Maintenance Noise Contours with Noise Monitoring and Receptor Locations**;

c. **Appendix 11-1: Legislation, Policy and Guidance (Noise and Vibration)**;

d. **Appendix 11-2: Acoustic Terminology**;

e. **Appendix 11-3: Baseline Noise Survey**; and

f. **Appendix 11-4: Construction and Operation and Maintenance Noise Modelling**.

11.2 Legislation, Policy and Guidance

11.2.1 Relevant policy documents are listed below: more detailed information regarding legislation and planning policy can be found in **ES Volume III Appendix 11-1: Legislation, Policy and Guidance (Noise and Vibration) [EN010152/APP/6.3]**.

Legislation

a. Control of Pollution Act 1974 (Ref. 11-3); and

b. Environmental Protection Act 1990 (Ref. 11-4).

National Policy

a. The Overarching National Policy Statement for Energy (EN-1) (November 2023) (Ref. 11-9);

b. The National Policy Statement for Renewable Energy (EN-3) (November 2023) (Ref. 11-10);

c. The National Policy Statement for Electricity Networks Infrastructure (EN-5) (November 2023) (Ref. 11-11);

d. The National Planning Policy Framework (NPPF) (December 2023) (Ref. 11-6); and

e. The Noise Policy Statement for England (NPSE) (2010) (Ref. 11-8).

Local Policy

a. City of Doncaster Council Local Plan (2021) – Policy 54: Pollution (Ref. 11-11).

Guidance

a. Planning Practice Guidance Noise (PPGN) (Ref. 11-7);

b. British Standard (BS) 5228-1:2009+A1:2014 – Code of practice for noise and vibration control on construction and open sites. Part 1: Noise (Ref. 11-13);

c. BS 5228-2:2009+A1:2014 – Code of practice for noise and vibration control on construction and open sites. Part 2: Vibration (Ref. 11-14);

d. BS 7445-1:2003 – Description and environment of environmental noise – Part 1: Guide to quantities and procedures (Ref. 11-15);

e. BS 4142:2014+A1:2019 – Methods for rating and assessing industrial and commercial sound (Ref. 11-16);

f. BS 8233:2014 – Guidance on sound insulation and noise reduction for buildings (Ref. 11-17);

g. World Health Organization Guidelines for Community Noise (Ref. 11-18);

h. Calculation of Road Traffic Noise (Ref. 11-19); and

i. Design Manual for Road and Bridges LA111: Noise and Vibration, Revision 2 (Ref. 11-2).

11.3 Consultation

11.3.1 This section provides a summary of the consultation undertaken to date regarding the Scheme. Further detail on the consultation can also be found in **ES Volume I Chapter 4: Consultation [EN010152/APP/6.1]**.

Scoping Opinion

11.3.2 A scoping exercise was undertaken in Spring 2023 to establish the content of the assessment and the approach and methods to be followed. The scoping exercise outcomes were presented in the Scoping Report (**ES Volume III Appendix 1-1: EIA Scoping Report [EN010152/APP/6.3]**) which was submitted to the Planning Inspectorate on 1 June 2023. The Scoping Report records the findings of the scoping exercise and details the technical guidance, standards, good industry practice, and criteria to be applied in the

assessment to identify and evaluate the likely significant effects of the Scheme on noise and vibration.

11.3.3 A Scoping Opinion was received from the Planning Inspectorate on 11 July 2023 (**ES Volume III Appendix 1-2: EIA Scoping Opinion [EN010152/APP/6.3]**).

11.3.4 A full review of all comments raised in the Scoping Opinion is provided in **ES Volume III Appendix 1-3: EIA Scoping Opinion Responses [EN010152/APP/6.3]**. This also outlines how and where the Scoping Opinion comments have been addressed within this ES.

Statutory Consultation

11.3.5 The Preliminary Environmental Information Report (PEIR) issued in Spring 2024 outlines the engagement which occurred in the early pre-application stages. The formal statutory consultation period captured further responses to the information presented in the PEIR. Responses from statutory consultation are presented in the **Consultation Report [EN010152/APP/5.1]**.

11.3.6 Statutory consultation responses relating to noise and vibration are presented in **Appendix O** of the **Consultation Report [EN010152/APP/5.1]**.

Additional Consultation

11.3.7 Separate consultation was undertaken with City of Doncaster Council on the following aspects of the noise and vibration assessment via a memo dated 17 October 2023:

a. Study Area;

b. Receptor locations;

c. Noise monitoring locations;

d. Duration of noise monitoring, and

e. Construction and operation and maintenance noise assessment criteria.

11.3.8 City of Doncaster Council commented (in its response to the memo on 9 November 2023) that an additional receptor near the village of Fenwick should be considered where there are properties closer to the Order limits. This comment is noted, and the additional receptor (R29 in Table 11-2) has been included in the assessment.

11.3.9 City of Doncaster Council also commented (in its response to the memo on 9 November 2023) that Fenwick Grange should be assessed as a receptor if the Battery Energy Storage System (BESS) Area is moved from the current proposed location, closer to the receptor. Although the BESS Area has not moved and Fenwick Grange (R30) is located outside the 500 m Study Area, it has been included as a sensitive receptor in the assessment and the results are shown in Table 11-16.

11.3.10 An additional receptor, which is a barn conversion to the south of field SE2, was identified during statutory consultation and identified as receptor R33 in Table 11-2.

11.3.11 North Yorkshire Council was also consulted and confirmed it had no objections in terms of noise in a memo dated 24 October 2023.

11.4 Assessment Methodology

11.4.1 This section sets out the scope and methodology for the assessment of the impacts of the Scheme on noise and vibration.

Study Area

11.4.2 The Study Area includes sensitive receptors likely to be at risk from direct and indirect significant effects that might arise from the Scheme during the construction, operation and maintenance, and decommissioning phases.

11.4.3 Construction and decommissioning noise effects are considered up to 300 m from the Solar PV Site, based on guidance in BS 5228-1 (Ref. 11-13) which states that construction noise predictions are generally reliable up to this distance. However, for operation and maintenance noise effects, an area up to 500 m from the Solar PV Site is considered. This distance of 500 m is based on previous experience of undertaking noise assessments for solar farm Development Consent Orders (DCO) such as Gate Burton Energy Park, Longfield Solar Farm, and East Yorkshire Solar Farm.

11.4.4 To cover both construction and operational noise effects, a 500 m Study Area for the Solar PV Site has therefore been used for the noise and vibration assessment of the construction, operation and maintenance, and decommissioning phases. It is considered that the receptors further than 500 m from the Solar PV Site would experience considerably lower levels of noise and vibration emissions as these would attenuate over distance, resulting in negligible noise and vibration effects from the Scheme.

11.4.5 The Study Area for construction noise effects associated with works in the Grid Connection Corridor (which includes the Existing National Grid Thorpe Marsh Substation) include receptors within 300 m of the Grid Connection Corridor, as per guidance in BS 5228-1 (Ref. 11-13). As the proposed cable would be buried, any noise generated by it would not be perceptible above ground so operational noise effects along the Grid Connection Corridor are scoped out.

11.4.6 A Study Area of 50 m either side of construction traffic routes has been considered, based on guidance in the Design Manual for Roads and Bridges (DMRB) LA111 (Ref. 11-2).

11.4.7 The Order limits also include a section of highway at the junction of the A19 and Station Road in the town of Askern to allow for abnormal indivisible load (AIL) vehicle access and escort. The works will be limited to banksman control for the period of AIL delivery whilst escorted to the Order limits and, based upon swept path analysis, it is not anticipated that any street furniture is required to be removed to facilitate the manoeuvre. Therefore, no impacts on noise and vibration are anticipated and this area is not assessed further.

11.4.8 The Study Area is as shown on **ES Volume II Figure 11-1: Noise Monitoring and Receptor Locations [EN01015/APP/6.2]**.

Sensitive Receptors

11.4.9 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 operation and maintenance phases of the Scheme.

11.4.10 The approach to the assessment of non-residential receptors differs from that adopted for residential receptors. This is because government policy for noise in the NPSE is based on relationships between noise and health/quality of life and noise insulation of a typical dwelling and, therefore, is not considered applicable to non-residential receptors. As such, the types of receptors that may experience significant effects due to the construction and operation and maintenance phases 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

11.4.11 The effects of noise and vibration generated during the construction and operation and maintenance phases of the Scheme are considered at nearby sensitive receptors. A number of receptors that would potentially be affected have been considered in this assessment. When considering groups of properties as a single receptor, noise and vibration is assessed at the nearest property to the Order limits (i.e. the property that would experience the highest levels of noise and vibration). Although noise and vibration may be perceivable at other properties in each identified receptor group, effects would not be significant if they are suitably controlled at the identified sensitive receptors.

11.4.12 Noise-sensitive receptors have been identified through a desktop study of aerial imagery and mapping and are presented in **ES Volume II Figure 11-1: Noise Monitoring and Receptor Locations [EN010152/APP/6.2]** and are summarised in Table 11-2. The selection of receptors presented was agreed with the Local Planning Authorities through the Scoping process and consultation with City of Doncaster Council and North Yorkshire Council as detailed in Section 11.3.

Table 11-2: Noise-Sensitive Receptors

ID	Name	Description	Approximate Co-ordinates (Latitude, Longitude)	Distance to Solar PV Site (m) (if within Study Area)	Distance to Grid Connection Corridor (m) (if within Study Area)[1]
R1	Fenwick Hall	Residential	53°38'23.50"N, 1° 4'54.01"W	275	n/a
R2	Riddings Farm	Residential	53°38'26.55"N, 1° 5'11.25"W	135	n/a
R3	Fenwick Receptors	Residential	53°38'20.03"N, 1° 6'5.25"W	270	n/a
R4	Topham Receptors	Residential	53°38'54.27"N, 1° 3'43.74"W	235	n/a
R5	West Lane, Sykehouse Receptors	Residential	53°38'21.95"N, 1° 3'33.07"W	290	n/a
R6	Stockbridge Farm, Bale Lane	Residential	53°38'38.23"N, 1° 3'26.83"W	485	n/a
R7	Bungalow Farm, Bale Lane	Residential	53°38'15.37"N, 1° 4'0.46"W	210	n/a
R8	West End Farm, Bale Lane	Residential	53°38'8.63"N, 1° 4'11.02"W	120	n/a
R9	Fenwick Common Lane Receptors	Residential	53°37'32.15"N, 1° 6'35.87"W	250	n/a
R10	London Lane Receptors	Residential	53°37'29.24"N, 1° 6'4.62"W	70	n/a
R11	Moss Road Receptors 1	Residential	53°37'20.56"N, 1° 6'32.40"W	420	n/a
R12	Moss Road Receptors 2	Residential	53°37'22.86"N, 1° 5'32.40"W	480	35
R13	Moss Road Receptors 3	Residential	53°37'25.24"N, 1° 5'14.77"W	475	130
R14	Trumfleet Lane Receptors 1	Residential	53°37'13.36"N, 1° 5'47.19"W	n/a	200

[1] n/a in Table 11-2 indicates that receptors are not within the Study Area.

ID	Name	Description	Approximate Co-ordinates (Latitude, Longitude)	Distance to Solar PV Site (m) (if within Study Area)	Distance to Grid Connection Corridor (m) (if within Study Area)[1]
R15	Brick Kiln Lane Receptors	Residential	53°37'0.97"N, 1° 6'5.73"W	n/a	180
R16	Brick Kiln Lane/Trumfleet Lane Receptor	Residential	53°36'57.09"N, 1° 5'42.67"W	n/a	50
R17	Trumfleet Lane/Willow Bridge Lane Receptor	Residential	53°36'23.20"N, 1° 5'27.36"	n/a	85
R18	Trumfleet Lane Receptors 2	Residential	53°36'19.01"N, 1° 5'42.37"W	n/a	40
R19	Wrancarr Lane Receptors	Residential	53°36'20.86"N, 1° 5'58.47"W	n/a	250
R20	Trumfleet Lane Receptors 3	Residential	53°36'16.16"N, 1° 5'42.15"W	n/a	130
R21	Trumfleet Grange	Residential	53°36'14.23"N, 1° 5'35.34"W	n/a	140
R22	Moss Lane Receptor 1	Residential	53°36'5.15"N, 1° 5'34.56"W	n/a	180
R23	Moss Lane Receptor 2	Residential	53°36'1.75"N, 1° 5'27.96"W	n/a	100
R24	Highfield Lane Receptor	Residential	53°35'58.53"N, 1° 5'30.81"W	n/a	185
R25	March Road Receptor	Residential	53°35'34.85"N, 1° 5'25.39"	n/a	55
R26	Manor House	Residential	53°35'35.25"N, 1° 5'46.36"W	n/a	190
R27	Thorpe Lane Receptor	Residential	53°35'30.09"N, 1° 5'35.38"W	n/a	30
R28	Willow Bridge Lane Receptors	Residential	53°36'22.85"N, 1° 5'10.48"W	n/a	270
R29	Tweed Cottage	Residential	53°38'22.0"N, 1°05'57.0"W	100	n/a

ID	Name	Description	Approximate Co-ordinates (Latitude, Longitude)	Distance to Solar PV Site (m) (if within Study Area)	Distance to Grid Connection Corridor (m) (if within Study Area)[1]
R30	Fenwick Grange	Residential	53°37'42.2"N, 1°04'23.9"W	560	n/a
R31	Wilsic House Farm	Residential	53°35'39.76"N, 1° 5'25.49"W	n/a	40
R32	Haggs Farm, Lawn Lane	Residential	53°38'19.34"N, 1° 5'47.77"W	100	n/a
R33	New residential barn conversion south of field SE2	Residential	53°38'3.13"N, 1° 4'28.62"W	40	n/a

Public Right of Way Receptors

11.4.13 Noise is assessed based on the effect on health and quality of life. Noise generated by the construction, operation and maintenance, and decommissioning phases of the Scheme would only affect Public Rights of Way (PRoW) users for limited periods of time when they are in close proximity to a noise source.

11.4.14 It is acknowledged that short-term exposure to noise can cause disturbance to PRoW users and result in adverse noise effects. Planning Practice Guidance Noise (Ref. 11-7) identifies an adverse noise effect as *"Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life."* This is considered to describe the level of noise effect that may be perceived by PRoW users.

11.4.15 However, given the linear nature of PRoW, the range of noise impacts along them forming the ambient noise environment and the transient usage of a PRoW, a material change in the experience of using the PRoW as a whole as a result of noise emissions from the Scheme which could affect PRoW users' health or quality of life is not anticipated. Consequently, no significant adverse effects on PRoW users have been identified as arising from the Scheme.

11.4.16 The NPSE (Ref. 11-8) provides a means for noise effects to be identified. It allows for adverse effects on health and quality of life to occur where all reasonable steps have been taken to reduce these effects whilst taking into account sustainable development.

11.4.17 In accordance with the NPSE, all reasonable steps to minimise the effects of noise on PRoW users would be taken during the construction, operation and maintenance, and decommissioning phases of the Scheme. These measures are set out in the **Framework Construction Environmental Management Plan (CEMP) [EN010152/APP/7.7]**, **Framework Operational Environmental Management Plan (OEMP) [EN010152/APP/7.8]**, and **Framework Decommissioning Environmental Management Plan (DEMP) [EN010152/APP/7.9]**. The production of detailed versions of these documents prior to the commencement of the relevant phase of the Scheme is secured through the DCO.

Sources of Information

11.4.18 In preparation of this chapter, the following sources of published information have been referenced:

a. **ES Volume I Chapter 2: The Scheme [EN010152/APP/6.1]** and **ES Volume II Figure 2-3: Indicative Site Layout Plan [EN010152/APP/6.2]** for the noise model;

b. Aerial imagery and OS mapping of the Order limits and surrounding area to define sensitive receptors and monitoring locations;

c. Plant noise source data were referenced from specification sheets provided by the Applicant, examples from previous solar farms, and BESS noise assessments;

d. **ES Volume I Chapter 2: The Scheme [EN010152/APP/6.1]** for information on the construction, operation and maintenance, and decommissioning phases of the Scheme; and

e. **ES Volume I Chapter 13: Transport and Access [EN010152/APP/6.1]** for information on construction traffic.

Baseline Noise Monitoring Methodology

11.4.19 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. 11-15) and BS 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound' (Ref. 11-1). All noise measurements included $L_{Aeq,T}$ and $L_{A90,T}$ sound level indicators (as defined in **ES Volume III Appendix 11-2: Acoustic Terminology [EN010152/APP/6.3]**).

11.4.20 As operation of the Solar PV Site would be continuous, unattended noise monitoring was undertaken to define baseline noise levels during the daytime (07:00-19:00), evening (19:00-23:00) and night-time (23:00-07:00) periods. Unattended noise monitoring was carried out at nine locations for a period of one week in the period from 29 November 2023 to 14 December 2023. These locations provide suitably representative baseline noise data for sensitive receptors affected by the operation and maintenance of the Solar PV Site.

11.4.21 Noise from the Grid Connection Corridor would only occur during the construction phase as any noise emitted from buried cables would not be perceptible above ground. Cable laying activities would be mainly restricted to core daytime work hours so attended measurements were undertaken during the daytime only. Attended short term noise measurements were carried out at 13 other locations to define baseline noise conditions at receptors along the Grid Connection Corridor to assess the potential noise impact during the construction phase.

11.4.22 Monitoring and noise-sensitive receptor locations are shown in **ES Volume II Figure 11-1: Noise Monitoring and Receptor Locations [EN010152/APP/6.2]**. The dates of baseline noise monitoring at each location are listed in Table 11-3. The monitoring locations have been allocated as representative of the local noise environment at each of the noise-sensitive receptors (Table 11-2) within the Study Area.

11.4.23 A noise monitor was not deployed at ML4 due to unsafe ground conditions during flooding. The noise assessment at R4 is based on the minimum Lowest Observed Adverse Effect Level (LOAEL) and Significant Observed Adverse Effect Level (SOAEL) in Table 11-7,which is considered a conservative approach in the absence of baseline noise data.

11.4.24 A weather station was installed at one location during each tranche of monitoring so weather conditions could be logged during noise monitoring. This allows periods of adverse weather conditions (i.e. wind speeds exceeding 5 m/s and precipitation) to be identified and noise data for these periods to be discarded.

Table 11-3: Noise Monitoring Locations

Monitor Location	Start date	End Date	Representative of Receptors
ML1	29/11/2023	7/12/2023	R3, R29, R32
ML2	7/12/2023	14/12/2023	R2, R1
ML3	7/12/2023	14/12/2023	R5
ML4	-	-	R4
ML5	7/12/2023	14/12/2023	R7, R8, R30, R33
ML6	7/12/2023	14/12/2023	R6
ML7	29/11/2023	7/12/2023	R13, R12, R14
ML8	29/11/2023	7/12/2023	R10
ML9	29/11/2023	7/12/2023	R9, R11
ML10	6/12/2023	6/12/2023	R12
ML11	6/12/2023	6/12/2023	R17
ML12	14/12/2023	14/12/2023	R22, R23
ML13	14/12/2023	14/12/2023	R25, R31
ML14	29/11/2023	29/11/2023	R13
ML15	6/12/2023	6/12/2023	R14
ML16	6/12/2023	6/12/2023	R15
ML17	6/12/2023	6/12/2023	R28
ML18	14/12/2023	14/12/2023	R19
ML19	14/12/2023	14/12/2023	R18, R20, R21
ML20	14/12/2023	14/12/2023	R24
ML21	14/12/2023	14/12/2023	R26, R27
ML22	6/12/2023	6/12/2023	R16

Assessment Methodology

11.4.25 The NPSE (Ref. 11-8) sets definitions for ‘significant adverse effects’ and ‘adverse effects’ using the concepts:

a. LOAEL – the level above which, as an average response, adverse effects on health and quality of life can be detected; and

b. SOAEL – the average response level above which, as an average response, significant adverse effects on health and quality of life occur.

11.4.26 The NPSE (Ref. 11-8) states that:

a. *"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".*

11.4.27 Noise levels exceeding the SOAEL should be avoided as far as reasonably practicable. For noise levels exceeding the LOAEL, the NPSE (Ref. 11-8) states that:

a. *"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".*

11.4.28 All noise effects are local, only affecting nearby sensitive receptors and are direct in nature. However, defining a likely noise effect and whether it is significant or not depends on the nature of a noise source. Likely noise effects have been defined based on guidance set out in the NPSE (Ref. 11-8) and NPPG for noise (Ref. 11-7).

11.4.29 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 (e.g. construction traffic changing road traffic noise levels), the assessment of the effect level due to the change in noise refers to guidance within DMRB LA111 (Ref. 11-2) and consideration of the absolute noise level based on guidance set out in the NPSE (Ref. 11-8) and PPGN (Ref. 11-7).

11.4.30 Government policy for noise in the NPSE (Ref. 11-8) 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 criteria for good internal noise levels.

Construction Noise Prediction Methodology

11.4.31 Noise predictions for the construction of the Scheme have been undertaken using CadnaA® (Ref. 11-20), which implements the calculation procedures of BS 5228 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.

11.4.32 Noise levels experienced by sensitive receptors during construction and decommissioning phases depend upon several variables, the most significant of which are:

a. The noise generated by plant or equipment used on site, generally expressed as sound power levels (Lw) or the vibration generated by the plant;

b. The periods of use of the plant on site, known as its percentage on-time;

c. The distance between the noise/vibration source and the receptor;

d. The noise attenuation due to ground absorption, air absorption, and barrier effects;

e. In some instances, the reflection of noise due to the presence of hard surfaces such as the sides of buildings; and

f. The time of day or night the works are undertaken.

Operation and Maintenance Noise Prediction Methodology

11.4.33 Noise predictions for the operation and maintenance phase of the Scheme have been undertaken using CadnaA® (Ref. 11-20) which implements the calculation procedures of ISO 9613 ‘Acoustics – Attenuation of Sound During Propagation Outdoors’ 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.

11.4.34 The modelling is based on the indicative layout of the Scheme, as shown in **ES Volume II Figure 2-3: Indicative Site Layout Plan [EN010152/APP/6.2]**. Paragraph 11.7.17 discusses the flexibility allowed by the Rochdale Envelope approach, where the Scheme parameters outlined in **ES Volume I Chapter 2: The Scheme [EN010152/APP/6.1]** differ to the illustrative layout.

11.4.35 The indicative layout of the Scheme is shown in **ES Volume II Figure 2-3: Indicative Site Layout Plan [EN010152/APP/6.2]**. The assessment assumes a worst-case scenario where all equipment will would operate at the same time continuously through the day and night. In reality, the Field Stations Units would likely only operate at maximum capacity when the irradiation levels are at the highest during sunlight hours and noise emissions would be reduced at night.

Significance Criteria

<u>Construction and Decommissioning Noise and Vibration Criteria</u>

11.4.36 The construction noise criteria were based on the Association of Noise Consultants Construction Noise Guide (ANC Guide) (Ref. 11-21). The ANC Guide was issued in 2021 and, although it is primarily aimed at providing a consistent approach to Section 61 applications, it also represents the most modern interpretation of example assessment methods in Annex E of BS5228-1 (Ref. 11-14) and the latest industry standard.

11.4.37 With reference to the NPSE (Ref. 11-5), the LOAEL, SOAEL and Unacceptable Adverse Effect Level (UAEL) thresholds have been set as detailed in Table 11-4. The ANC Guide defines the LOAEL and the SOAEL for construction noise. The UAEL for construction noise is based on the trigger level for temporary rehousing as set out in Section E.4 of BS 5228-1 (Ref. 11-14).

Table 11-4: Thresholds of Potential Effects of Construction and Decommissioning Noise at Residential Buildings

Time Period	Threshold Value ($L_{Aeq,T}$ decibels (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

11.4.38 Table 11-5 details Peak Particle Velocity (PPV) levels (a standard measure of vibration effects) and their potential effect on humans based on guidance from BS 5228-2 (Ref. 11-14).

Table 11-5: Thresholds of Potential Effects of 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 would cause complaint, but it can be tolerated if prior warning and explanation has been given to residents.

11.4.39 The temporary changes in road traffic noise levels along the local road network due to Scheme construction and decommissioning traffic is assessed based on guidance in the Institute of Environmental Management and Assessment (IEMA) Guidelines for Environmental Noise Impact Assessment (Ref. 11-22). Assessment criteria are presented in Table 11-6.

Table 11-6: Construction and Decommissioning 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

Operation and Maintenance Noise Criteria

11.4.40 Operation and maintenance noise is assessed from plant within the Solar PV Site only. No operational noise is considered from the proposed cable in the Grid Connection Corridor. As the proposed cable would be buried, any noise generated by it would not be perceptible above ground so operational noise effects along the Grid Connection Corridor are scoped out.

11.4.41 Noise from the Field Stations and BESS Area, is assessed with reference to the Doncaster Local Plan (Ref. 11-12) which provides assessment criteria based on guidance from BS 4142:2014 (Ref. 11-16). Reference has also be made to BS 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings (Ref. 11-17) and the World Health Organization (WHO) Guidelines for Community Noise (1999) (Ref. 11-18).

11.4.42 Operation and maintenance noise has been assessed following BS 4142 guidance (Ref. 11-16), whereby the rating level of noise emissions from activities are compared against the background level of the pre-development noise climate. Source data for operation and maintenance noise emissions is presented in **ES Volume III Appendix 11-4: Construction and Operation and Maintenance Noise Modelling [EN010152/APP/6.3]**. The relevant parameters in this instance are as follows:

a. 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;

b. 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

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

11.4.43 BS 4142 (Ref. 11-16) 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:

a. 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;

b. 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;

c. 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

d. 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.

11.4.44 BS 4142 (Ref. 11-16) states the following regarding the assessment of impacts, comparing the rating level of the new noise source with the existing background level:

a. *"Typically, the greater this difference, the greater the magnitude of the impact;*

b. *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context;*

c. *A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context; and*

d. *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."*

11.4.45 The lower the rating level is, relative to the measured background sound level, the less likely it is that the specific sound source would 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.

11.4.46 BS 4142 (Ref. 11-16) advises that, where rating levels and background levels are low, which is the case in rural areas surrounding the Order limits, the assessment of operation and maintenance noise should take into context the absolute noise level. The Association of Noise Consultants (ANC) Guide to BS 4142 (Ref. 11-23) provides context to this by stating:

a. *"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 $L_{Ar,Tr}$".*

11.4.47 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".*

11.4.48 A minimum rating level of 35 dB $L_{Ar,Tr}$ for the LOAEL would align with guidance in PPGN (Ref. 11-17), which defines noise below the LOAEL as follows:

a. *"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".*

11.4.49 BS 8233:2014 Guidance on sound insulation and noise reduction for buildings (Ref. 11-17) and the WHO 'Guidelines for Community Noise' (1999) (Ref. 11-19) provide guidance levels for internal noise within dwellings of 30 dB $L_{Aeq,T}$ for good sleeping conditions at night. In accordance with examples in Annex A of BS 4142, it is assumed that building envelope attenuation would be reduced to approximately 10 dB by a partially open window. Consequently, an external SOAEL of 40 dB $L_{Ar,Tr}$ has been adopted for the night-time.

11.4.50 The assessment criteria for noise from fixed plant installations are summarised in Table 11-7. The assessment is based on available information on the operating conditions and the levels of noise generated by the plant.

Table 11-7: Operation and Maintenance 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 +5d B above the typical background level ($L_{A90,T}$) – minimum of 35 dB $L_{Ar,Tr}$	Less than or equal to +5d B above 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 40 dB $L_{Ar,Tr}$

Operation and Maintenance Vibration

11.4.51 Operation and maintenance vibration is scoped out of any further assessment (as agreed with the Planning Inspectorate in the Scoping Opinion (**ES Volume III Appendix 1-2: EIA Scoping Opinion [EN010152/APP/6.3]**). There are no sources of vibration during operation and maintenance phase with the potential to cause significant effects.

Assessment of Non-Residential Receptors

11.4.52 Design criteria for good internal conditions in non-residential receptors are set in BS 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings (Ref. 11-17) and WHO Guidelines for Community Noise (Ref. 11-18). Reference to specific design criteria for non-residential receptors are undertaken when deriving assessment criteria. As no noise sensitive non-residential receptors are identified in Table 11-2, no specific assessment criteria is defined.

Rochdale Envelope

11.4.53 In order to ensure a robust assessment of the likely significance of the environmental effects of the Scheme, the assessment is being undertaken adopting the principles of the ‘Rochdale Envelope’ approach where appropriate in line with Planning Inspectorate guidance (Ref. 11-27).

11.4.54 This involves assessing the maximum (or where relevant, minimum) worst case parameters for the elements where flexibility needs to be retained (facility dimensions or operation and maintenance modes for example). In the case of this assessment, 28 Field Stations are modelled based on the illustrative layout. For the purposes of noise and vibration, up to 28 Field Stations, incorporating up to 99 Field Station Units, can be located within the Solar PV Site without triggering significant effects provided they are not within 250 m of any residential receptor. Noise from the Field Stations is assessed based on the final layout during preparation of the ES.

11.4.55 In line with Planning Inspectorate guidance, the assumptions in Section 11.5 have been made with regard to the Scheme as applicable to this noise and vibration assessment.

11.5 Assumptions, Limitations and Uncertainties

Baseline Assumptions and Limitations

11.5.1 The measured ambient sound levels (taken during November and December 2023, Table 11-3) are representative of the future baseline scenarios, anticipated to commence in 2028, operation and maintenance phase to commence in 2030, and decommissioning phase to commence in approximately 2070 (i.e. a 40 design life). No other major developments (e.g. highway or railway schemes, industrial facilities) are currently known to be proposed in the area that are likely to notably alter the local baseline noise environment.

11.5.2 Any measurement of existing ambient or background sound levels are 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 to ensure measurements were undertaken in 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.

11.5.3 The baseline noise levels for the receptor near monitor location ML4 could not be established due to the area being flooded when the noise survey was being carried out. However, the assessment at the nearest receptor location applies the lowest LOAEL and SOAEL from Table 11-7 to ensure that, in the absence of representative background noise data, the assessment is robust and conservative.

Construction Noise Assumptions and Limitations

11.5.4 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 I Chapter 2: The Scheme [EN010152/APP/6.1]**, 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® (v2023 MR1) (Ref. 11-20), 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 plant is summarised in **ES Volume III Appendix 11-4: Construction and Operation and Maintenance Noise Modelling [EN010152/APP/6.3]**.

11.5.5 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. 11-20) 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 would 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, therefore, are considered to be a reasonable likely worst case.

11.5.6 The majority of the Solar PV Mounting Structures would be installed by direct drive technique as described in **ES Volume I Chapter 2: The Scheme [EN010152/APP/6.1]**. Piling may be required for the construction of foundations for the Field Stations and BESS Area, although this is dependent upon local ground conditions and other types of foundation such as concrete blocks or plinths, ground screws, or reinforced concrete piles may be used. Concrete feet are to be used for Solar PV Mounting Structures in areas of archaeology sensitivity. However, as driven piles generate the highest levels of noise and vibration, it is assumed for the noise assessment they would be used for all solar panel mounting structure installation activities, in order to apply a conservative 'worst case' approach.

11.5.7 A potential alternative to the cable connection via the Grid Connection Corridor is via a Grid Connection Line Drop from existing overhead power lines running north south across the east of the Solar PV Site. The On-Site Substation would connect to the existing overhead lines at one of the pylons within Field SE2 of the Solar PV Site. All cable laying works for the Grid Connection Line Drop option would be within the Order limits and would not generate additional levels of noise to those identified in the construction noise assessment. As such, noise effects from the Grid Connection Line Drop option are not considered further.

Decommissioning Noise Assumptions and Limitations

11.5.8 Noise and vibration effects during the Scheme decommissioning phase would be similar to or less than noise and vibration effects during the construction phase. The noise and vibration assessment presented for the construction phase is therefore representative (or an overestimate) of the decommissioning phase. As such, a separate assessment for noise and vibration from the decommissioning phase is not proposed.

Operation and Maintenance Noise Assumptions and Limitations

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

a. Digital noise modelling for the operation and maintenance phase of the Scheme has been based on the maximum worst-case parameters set out in the drawings, plans, and construction and operation and maintenance phase details (see **ES Volume I Chapter 2: The Scheme [EN010152/APP/6.1]**);

b. Sound level data for operation and maintenance noise-producing plant (i.e. Field Stations and BESS Containers) have been based on industry

sound pressure level measurement data (see **ES Volume III Appendix 11-4: Construction and Operation and Maintenance Noise Modelling [EN010152/APP/6.3]**);

c. Surrounding ground conditions are rural farmland and have been modelled as soft (G=0.8);

d. Air temperature was set at nine degrees Celsius and humidity 78%, which are typical annual average weather conditions in Doncaster based on historical weather data (Ref. 11-28).

e. One order of reflection was modelled; and

f. Land topography has been incorporated into the noise modelling.

11.5.10 Operation and maintenance noise has been predicted with all plant being in maximum operation at all times of day. BESS Container cooling fans would operate dependent on ambient temperatures and, therefore, not be in a full mode of operation and maintenance during cooler temperatures. Consequently, noise predictions represent a reasonable worst-case and are likely to overestimate actual impacts.

11.5.11 The operation and maintenance hours of the Scheme depend on the time of year but, for the purpose of this assessment, it is assumed that the Scheme would operate during the day, evening, and night.

11.5.12 Sound level data for transformers in reduced modes of operation is not provided by 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.

11.5.13 As discussed in **ES Volume I Chapter 2: The Scheme [EN010152/APP/6.1]**, there are three ways in which Field Stations can be delivered:

a. Transformers, a central inverter, and switchgear would be enclosed in a single container;

b. Transformers and switchgear would be packaged together in containerised units with inverters provided separately as a string arrangement collocated within the rows of Solar PV Panels; or

c. The three elements (transformers, inverters, and switchgear) provided as separate standalone units.

11.5.14 The noise assessment assumes a reasonable worst-case scenario being the first option, where the three elements are enclosed together within Field Stations. This is because overall sound outputs of the utility scale and small-scale string inverter solutions would be substantially quieter than the centralised inverter solution.

11.5.15 Some flexibility in the location 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 (refer Section 11.6 below) for the illustrative design provided with the DCO Application. For example, this could be achieved through procurement of quieter equipment than has been modelled. Any

mitigation would be incorporated in accordance with the Design Parameters set out in **ES Volume I Chapter 2: The Scheme [EN010152/APP/6.1]**.

11.6 Baseline Conditions

11.6.1 This section describes the existing and anticipated future baseline conditions for the noise and vibration assessment.

Existing Baseline

11.6.2 During the surveys, the dominant noise source at most of the locations was observed to be distant road traffic from the surrounding road network.

11.6.3 A summary of the noise monitoring results is presented in Table 11-8. Typical ambient ($L_{Aeq,T}$) sound levels are the arithmetic average of the logarithmic average and the typical background ($L_{A90,15m}$) sound levels are the arithmetic average of the mode of each time period through the week-long monitoring. The reference T in this instance is 12 hours for day, four hours for evening and eight hours for night.

Table 11-8: 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	$L_{Aeq,T}$	44	41	38
	$L_{A90,15m}$	37	34	33
ML2	$L_{Aeq,T}$	46	44	35
	$L_{A90,15m}$	39	37	30
ML3	$L_{Aeq,T}$	52	47	38
	$L_{A90,15m}$	38	35	31
ML5	$L_{Aeq,T}$	59	55	46
	$L_{A90,15m}$	44	42	37
ML6	$L_{Aeq,T}$	46	42	33
	$L_{A90,15m}$	39	39	29
ML7	$L_{Aeq,T}$	46	43	43
	$L_{A90,15m}$	38	33	32
ML8	$L_{Aeq,T}$	47	43	38
	$L_{A90,15m}$	36	31	29
ML9	$L_{Aeq,T}$	56	55	49
	$L_{A90,15m}$	38	35	33

11.6.4 Additional short-term attended measurements were also taken at locations along the Grid Connection Corridor and are presented in Table 11-9.

Table 11-9: Attended Noise Monitoring Results

Location	Date	Time	$L_{Aeq, 1h\ r}$ dB	$L_{A10, 1h\ r}$ dB	$L_{A90, 1h\ r}$ dB	$L_{AMax, 1h\ r}$ dB
ML10	06/12/2023	08:10	66	70	43	94
ML11	06/12/2023	13:35	57	61	38	82
ML12	14/12/2023	11:05	54	55	38	71
ML13	14/12/2023	13:15	56	52	36	79
ML14	29/11/2023	12:00	59	59	34	79
ML15	06/12/2023	09:15	62	62	40	84
ML16	06/12/2023	10:20	47	45	35	82
ML17	06/12/2023	12:30	58	48	38	88
ML18	14/12/2023	10:05	53	47	39	76
ML19	14/12/2023	11:15	59	60	39	77
ML20	14/12/2023	12:10	54	51	37	70
ML21	14/12/2023	12:25	53	53	36	74
ML22	06/12/2023	11:25	57	60	37	81

Future Baseline

11.6.5 This section considers changes to the baseline conditions described above that might occur in the absence of the Scheme during the time period over which the Scheme will be in place.

11.6.6 The future baseline scenarios are set out in **ES Volume I Chapter 5: Environmental Impact Assessment Methodology [EN010152/APP/6.1]** and described for noise and vibration below. The noise and vibration assessment considers a future baseline for the period 2028-2030, which are the expected Scheme construction years.

11.6.7 In the absence of the Scheme, it is likely that the future baseline noise environment would be marginally higher than represented by the November to December 2023 measurements of the ambient sound levels. This is due to natural growth of road traffic flows resulting in increased noise in the local area. However, natural growth alone is unlikely to result in perceptible changes to baseline noise and so the measured current baseline data is considered representative of future baseline conditions.

11.6.8 The assessment of construction traffic noise effects accounts for the future peak construction year which includes natural traffic growth. However, the operation and maintenance noise assessment assumes the measured

baseline data is representative (i.e. no higher) of future baseline conditions which represents a reasonable worst-case scenario.

11.7 Embedded Mitigation

11.7.1 The Scheme has been designed, as far as practicable, to avoid and reduce impacts and effects from noise and vibration through the process of design development and embedding mitigation measures into the Scheme design. In addition, the means by which the Scheme is constructed, operated and maintained, and decommissioned would be appropriately controlled in order to manage and minimise potential environmental effects (required as a result of legislative requirements and/or standard sectoral practices).

11.7.2 The delivery of embedded mitigation measures will be secured through the detailed CEMP, detailed OEMP, and detailed DEMP via Requirements in the DCO.

11.7.3 Embedded measures are taken into account prior to the assessment of effects in order to avoid considering assessment scenarios that are unrealistic in practice i.e. effects do not take account of measures, even though they are likely to be standard practice and/or form part of the Scheme design. These have been followed through into the assessment to ensure that realistic likely environmental effects have been identified.

Measures Embedded into the Scheme Design

Construction and Decommissioning

11.7.4 Measures to control noise are defined in Annex B of BS 5228-1 (Ref. 11-13) and measures to control vibration are defined in Section 8 of BS 5228-2 (Ref. 11-14). These embedded measures represent Best Practicable Means (BPM) (as defined in Section 72 of the Control of Pollution Act (Ref. 11-3)) and are secured within the **Framework CEMP [EN010152/APP/7.7]** for the construction phase and **Framework DEMP [EN010152/APP/7.9]** for the decommissioning phase. These documents are secured through DCO requirements.

11.7.5 These embedded measures include:

a. Ensuring all appropriate processes, procedures and measures are in place to minimise noise before works begin and throughout the construction programme;

b. All contractors to be made familiar with current legislation and the guidance in BS 5228 (Parts one and two) which should form a prerequisite of their appointment;

c. Ensuring that, 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;

d. Use of modern plant, complying with applicable UK noise emission requirements;

e. Hydraulic techniques for breaking concrete or rocks to be used in preference to percussive techniques, where reasonably practicable (explosives will not be used for breaking of concrete or rocks);

f. When piling, use of lower noise piling where reasonably practicable;

g. Off-site pre-fabrication where reasonably practicable;

h. Regular and effective maintenance by trained personnel to be undertaken to keep plant and equipment working to manufacturer's specifications;

i. All construction plant and equipment to be properly maintained, silenced where appropriate, operated to prevent excessive noise and switched off when not in use;

j. 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;

k. All vehicles used on-site shall incorporate broadband reversing warning devices as opposed to the typical tonal reversing alarms to minimise noise disturbance where reasonably practicable;

l. Provision of information to the relevant local authority and local residents to advise of potential noisy works that are due to take place;

m. Unnecessary revving of engines will be avoided, and equipment to be switched off when not in use;

n. Drop heights of materials to be minimised;

o. Plant and vehicles to be sequentially started up rather than all together;

p. Plant to always be used in accordance with manufacturers' instructions. Care to be taken to site equipment away from noise-sensitive areas. Where practicable, loading and unloading would also be carried out away from such areas;

q. Noise generating activities near residential properties, such as use of power tools, will be limited to the hours between 08:00 and 18:00 from Monday to Friday and between 08:00 and 13:00 on Saturday; and

r. Core working hours on-site would run from 07:00 – 19:00 Monday to Friday and 07:00 to 13:00 on Saturday, daylight hours permitting (see Section 2.6 of **ES Volume I Chapter 2: The Scheme [EN010152/APP/6.1]**).

11.7.6 Emergency working may require work to extend beyond the core working hours quoted above.

11.7.7 A construction noise monitoring scheme will be developed as per requirements of the **Framework CEMP [EN010152/APP/7.7]** following appointment of a principal contractor and prior to commencement of construction works. Requirements for monitoring during the decommissioning phase are outlined in the **Framework DEMP [EN010152/APP/7.9]**.

11.7.8 A communication strategy forms part of the **Framework CEMP [EN010152/APP/7.7]**. Prior to construction works being undertaken, liaison

would be undertaken with occupiers of sensitive receptors that may be adversely affected by construction noise and vibration.

11.7.9 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.

11.7.10 The communication strategy and noise complaint system is secured through the DCO as part of the **Framework CEMP [EN010152/APP/7.7]** and **Framework DEMP [EN010152/APP/7.9]**.

11.7.11 Prior to commencement of any construction activities, the Applicant will submit a voluntary application for prior consent to carry out noisy work under Section 61 of the Control of Pollution Act (Ref. 11-3) to demonstrate that noise and vibration has been minimised as far as reasonably practicable. The Section 61 application would 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.

11.7.12 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 [EN010152/APP/7.7]** to ensure significant noise effects do not occur due to potential night-time works:

a. 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 ground investigation survey);

b. Where HDD activities may occur within 200 m of sensitive receptors, the option for open cut cable laying would be explored as an alternative to HDD;

c. The potential for the use of quieter equipment than listed in **ES Volume III Appendix 11-4: Construction and Operation and Maintenance Noise Modelling [EN010152/APP/6.3]** would be explored by the principal contractor; and

d. Where night-time HDD activities may occur within 200 m of noise sensitive receptors, temporary acoustic fencing would be installed around HDD boundaries 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.

11.7.13 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 I Chapter 13: Transport and Access [EN010152/APP/6.1]**. Management of Heavy Goods Vehicles (HGV) on the highway network would be managed through the **Framework Construction Traffic Management Plan [EN010152/APP/7.17]** secured as part of the DCO. Appropriate routing of construction and decommissioning traffic on public

roads and along access tracks would be pursuant to the **Framework Construction Traffic Management Plan [EN010152/APP/7.17]**.

Operation and Maintenance

11.7.14 Embedded mitigation measures applied for the operation and maintenance phase of the Scheme are summarised as follows:

a. Plant selection accounting for the level of noise emissions; and

a. Design layout to minimise noise at receptors, including locating the Field Stations and BESS Area in areas away from large concentrations of receptors, such that noise emissions are less impactful.

11.7.15 The Field Stations would be located at a distance of greater than 250 m from residential properties.

11.7.16 Plant that would be used for the Scheme has not yet been finalised. Consequently, a conservative approach has been taken when defining sound data for noise sources and it is 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 Field Stations and the BESS Containers have been updated with SMA (an inverter manufacturer) and SUNGROW (a BESS manufacturer) data which represents a reasonable worst-case approach to modelling operation and maintenance noise.

11.7.17 Although the indicative Scheme layout (**ES Volume II Figure 2-3: Indicative Site Layout Plan [EN010152/APP/6.2]**) has 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 increase the number of Field Stations from the 28 that have been modelled based on the illustrative layout or to move noise generating infrastructure closer to sensitive receptors than shown in **ES Volume II Figure 11-1: Noise Monitoring and Receptor Locations [EN010152/APP/6.2]**, the Applicant commits that noise at sensitive receptors will be no higher than the levels presented in Table 11-7. The measures to achieve this are discussed in Section 11.7 and are secured in the **Framework OEMP [EN010152/APP/7.8]** as a Requirement attached to the DCO.

11.8 Assessment of Likely Significant Effects

11.8.1 This section sets out the likely noise and vibration impacts and effects, taking account of the embedded mitigation measures as detailed in Section 11.7.

Construction

Overview of Works

11.8.2 The Scheme would include the Solar PV Site, including Field Stations, BESS Area, On-Site Substation, and ground mounted Solar PV Panels, and the Grid Connection Corridor.

11.8.3 The Field Stations and BESS Area would require foundations which would require larger plant or a longer construction duration as compared to the construction of the ground mounted Solar PV Panels.

11.8.4 For this assessment, the construction programme has been broken down into three scenarios that represent high Noise Generating Activities (NGA). These activities are most likely to generate likely significant effects and are as follows:

a. NGA1 – Construction of the BESS Area, Field Stations, On-Site Substation, and ground mounted Solar PV Panels;

b. NGA2 – Cable installation (general works) at the Grid Connection Corridor; and

c. NGA3 – Cable installation (HDD activities).

11.8.5 Detailed information on construction of the Scheme is provided in **ES Volume I Chapter 2: The Scheme [EN010152/APP/6.1]**.

11.8.6 The earliest construction could start is in 2028. The construction of the Solar PV Site would require an estimated 24 months, whereas installation of the Grid Connection Cables is anticipated to require 12 months. The operation and maintenance phase is therefore anticipated to commence in 2030.

11.8.7 The core working hours are defined in Section 11.5 above.

11.8.8 Emergency working may be required where it is determined that there will be adverse health, safety, security or environmental consequences that, in the reasonable opinion of the undertaker, would outweigh the adverse effects to the public (whether individuals, classes or generally as the case may be) of taking that action. Thismay require work to extend beyond the core working hours quoted above. Where practicable, voluntary application for prior consent will be sought from the relevant local authority under Section 61 of the Control of Pollution Act 1974 (Ref. 11-3) should this be required. The Section 61 application would 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.

Construction Noise Effects

11.8.9 Construction noise predictions have been undertaken for NGA1, NGA2 and NGA3 at sensitive receptor locations identified in Table 11-2.

11.8.10 Noise effects during the Scheme decommissioning phase would be similar to or less than noise effects during the construction phase. The assessment presented for the construction phase is therefore representative (or an overestimate) of the decommissioning phase. As such, a separate assessment for noise and vibration from the decommissioning phase is not presented.

NGA1

11.8.11 NGA1 would be undertaken during core daytime working hours as defined in the **Framework CEMP [EN010152/APP/7.7]**. It is likely that construction activities would be carried out in phases, however, information on phasing is

not known at this time. Noise predictions have assumed all phases are being constructed at the same time which stipulates a worst-case scenario. The results of construction noise predictions are summarised in Table 11-10.

Table 11-10: Construction Noise Predictions for NGA1

Receptor Reference	Predicted Free-Field Construction Noise Levels During Daytime Construction Activity (dB $L_{Aeq,T}$)
Below LOAEL	
R3	64
R5	60
R6	58
R7	64
R8	64
R9	59
R10	64
R11	56
R12	60
R13	60
R30	61
Above or equal to LOAEL and below SOAEL	
R1	66
R2	67
R4	66
R29	66
R32	66
R33	69
Above or equal to SOAEL	

No exceedances of SOAEL have been predicted

11.8.12 The SOAEL is not exceeded at any of the receptor locations so construction noise effects from NGA1 are **not significant**. However, the LOAEL is exceeded at some receptors locations and adverse levels of noise are identified. The NPSE (Ref. 11-8) states 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".*

11.8.13 Reasonable steps to reduce noise are covered in Section 11.7 and have been applied in noise predictions. Consequently, although adverse levels of noise are identified at some receptors, NPSE (Ref. 11-8) requirements are met through provision of embedded mitigation.

NGA2

11.8.14 NGA2 works would be undertaken during core work hours as defined in **Framework CEMP [EN010152/APP/7.7]**. The works would extend within a 30 m wide corridor surrounding the cable route. The results of construction noise predictions are summarised in Table 11-11.

Table 11-11: Construction Noise Predictions for NGA2

Receptor Reference	Predicted Free-Field Construction Noise Levels During Daytime Construction Activity (dB LAeq,T)
Below LOAEL	
R12	61
R13	58
R14	55
R15	53
R16	59
R17	60
R18	57
R19	53
R20	55
R21	56
R22	56
R23	59
R24	57
R25	57
R26	53
R27	55
R28	52
R31	60
Above or equal to LOAEL and below SOAEL	
No exceedances of LOAEL have been predicted.	
Above or equal to SOAEL	

Receptor Reference	Predicted Free-Field Construction Noise Levels During Daytime Construction Activity (dB LAeq,T)

No exceedances of SOAEL have been predicted.

11.8.15 The LOAEL is not exceeded at any of the receptor locations so construction noise effects from NGA2 are **not significant**. However, the LOAEL is exceeded at some receptors locations and adverse levels of noise are identified. As noted in the quote provided in Paragraph 11.8.12, while reasonable steps should be taken to minimise these levels, there is no bar in the NPSE (Ref. 11-8) requirements on adverse effects.

11.8.16 Reasonable steps to reduce noise are covered in Section 11.7 and have been applied in noise predictions. Consequently, although adverse levels of noise are identified at some receptors, NPSE (Ref. 11-8) requirements are met through provision of embedded mitigation.

NGA3

11.8.17 At this stage of the Scheme, ten locations that require trenchless cable installation methods have been identified (one within the Solar PV Site and nine within the Grid Connection Corridor). NGA3 works would be undertaken during core work hours as defined in **Framework CEMP [EN010152/APP/7.7]**, however, emergency working may extend beyond these hours where, if the relevant action is not taken, there will be adverse health, safety, security or environmental consequences. Therefore, for the purposes of the noise assessment, 24-hour HDD activity has been identified as the worst-case trenchless cable installation method due to the potential requirement for night-time working. Potential HDD locations are listed in Table 11-12 and illustrated on **ES Volume II Figure 2-4: Location of Temporary Construction Compounds and Indicative HDD Areas [EN010152/APP/6.2]**.

Table 11-12: Potential HDD Locations and Distance to Nearest Receptor

ID	Potential HDD Location	Distance to Nearest Receptor
HDD1	Crossing beneath an existing high pressure fuel pipeline between Field NW1 and NW2 within the Solar PV Site.	540 m
HDD2	Crossing beneath Moss Road and London Hill Drain along the Grid Connection Corridor.	75 m
HDD3	Crossing beneath Trumfleet Lane, Brick Kiln Lane, and Moss Little Common Drain along the Grid Connection Corridor.	150 m
HDD4	Crossing beneath Hawhouse Green Dike along the Grid Connection Corridor.	240 m

ID	Potential HDD Location	Distance to Nearest Receptor
HDD5	Crossing beneath Mill Dike along the Grid Connection Corridor.	140 m
HDD6	Crossing beneath Trumfleet Lane and Wrancarr Drain along the Grid Connection Corridor.	75 m
HDD7	Crossing beneath Marsh Road and Engine Dike along the Grid Connection Corridor.	150 m
HDD8	Crossing beneath a private field with tree and hedgerow boundary along the Grid Connection Corridor.	75 m
HDD9	Crossing beneath unnamed waterbodies, trees, Thorpe Lane, Marsh Lane, Thorpe Marsh Drain (River), and Thorpe Marsh Engine Drain along the Grid Connection Corridor.	80 m
HDD10	Crossing beneath unnamed waterbodies, trees, and railway along the Grid Connection Corridor.	420 m

11.8.18 HDD activities would involve activities at drill entry and exit pits. HDD operations would only occur during the construction phase (cable installation) and not during the decommissioning phase. As the drilling activities at the entry pit would generate the highest level of noise, calculations of noise have been based on a reasonable worst-case scenario that all potential HDD are entry pits.

11.8.19 The SOAEL for night-time construction activity is defined at 55 dB $L_{Aeq,T}$ in the unlikely event that HDD works extend into the night-time period. Calculations of HDD noise (see **ES Volume III Appendix 11-4: Construction and Operation and Maintenance Noise Modelling [EN010152/APP/6.3]**) indicate that significant effects (an exceedance of SOAEL) would occur at sensitive receptors within 200 m of night-time HDD activities. Adverse levels of noise may occur at receptors farther away, however, embedded mitigation measures satisfy NPSE (Ref. 11-8) requirements that allow adverse impacts to occur providing reasonable steps have been taken to reduce these effects. Consequently, the assessment of HDD noise focuses on receptors within 200 m of a potential drill entry or exit pit location.

11.8.20 Receptors within 200 m of the Grid Connection Corridor at likely HDD locations that would be subjected to significant effects have been selected. Results of noise calculations at receptors within 200 m of the Grid Connection Corridor and On-Site Cables route boundaries are presented in Table 11-13.

Table 11-13: HDD (NGA3) Noise Levels

Receptor	Nearest HDD Locations	Distance from HDD Works	Calculated Noise Level $L_{Aeq,T}$ dB
R12	HDD2	75 m	65
R13	HDD2	130 m	60
R16	HDD3	150 m	58
R17	HDD6	75 m	65
R18	HDD5	140 m	59
	HDD6	160 m	57
R23	HDD7	150 m	58
R25	HDD9	125 m	60
R27	HDD9	170 m	57
R31	HDD8	75 m	65
	HDD9	80 m	65

11.8.21 HDD activities are not predicted to exceed the SOAEL during the daytime, weekday evening, and weekend at any receptors, however, if works extend into the night, there is the potential for the SOAEL to be exceeded. Noise calculations indicate that the SOAEL would be exceeded during HDD night works that occur within 200 m of a receptor. Consequently, HDD activities at receptors R12, R13, R16, R17, R18, R23, R25, R27, and R31 have the potential to result in significant noise effects if they extend into the night-time period.

11.8.22 The hierarchy of mitigation measures for HDD activities listed in Paragraph 11.7.12 would ensure that HDD activity noise effects are reduced as far as reasonably practicable. This hierarchy includes the use of acoustic fencing which, if required due to HDD activities at night-time, could provide 10 dB of noise attenuation. Consequently, noise from HDD activities at locations R13, R16, R18, R23, R25, and R27 would reduce to below the night-time SOAEL of 55 dB $L_{Aeq,T}$ and would **not be significant**. Noise from HDD activities at locations R12, R17, and R31 would be equivalent to the night-time SOAEL of 55 dB $L_{Aeq,T}$ and, as such, a **significant** effect is identified.

11.8.23 For all works that are undertaken outside core work periods, a Section 61 consent (Control of Pollution Act (Ref. 11-13)) would be applied for and will contain details on the methodology, mitigation, communication strategy, and monitoring. If Section 61 consent is not applied for, it would be open for the Local Authority to serve a notice pursuant to Section 60 of that Act specifying actions to control noise if it considers it appropriate to do so, in accordance

with the terms of that provision. It is not a pre-requisite for Section 61 consent to be in place at any time for the purposes of construction or operation and maintenance phases of the Scheme although it is common practice for such applications to be made in advance.

Construction Vibration Effects

NGA1

11.8.24 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. 11-25). However, it is unlikely typical construction 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 would 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.

11.8.25 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. 11-26) 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 (Table 11-6) where it is likely that vibration in residential environments would result in complaints but can be tolerated if prior warning and explanation is given to residents.

11.8.26 Driven piling vibration calculations are based on regression analysis of driven piling data from Table D.2 of BS 5228-2 (Ref. 11-14) presented in **ES Volume III Appendix 11-3: Baseline Noise Survey [EN010152/APP/6.3]**. Regression analysis is based on 'drop hammer' piling rigs that are substantially larger than the direct drive rigs used for the Solar PV Mounting Structures so vibration levels are likely to be overestimated. However, in the absence of any specific data for the direct drive rig, this approach is considered to be an appropriate proxy for assessment, even if conservative.

11.8.27 Regression analysis identifies that the SOAEL is potentially exceeded at receptors within 60 m of driven piling activities. Ground borne vibration effects are **not significant** during piling works at all receptors with the exception of R33 which is located at a distance of approximately 40 m from potential piling activities in Field SE2. The predicted vibration level from driven piling at 40 m is 1.7 mm/s which exceeds the SOAEL of 1.5 mm/s as detailed in Table 11-5.

11.8.28 Exceedances of the SOAEL may occur at R33 when piling works take place in Field SE2. This field makes up approximately 1% of the total area of the Order limits and approximately 5% of the area of Field SE2 is within 60 m of R33. Over the 2-year construction programme, assuming construction time and site area are directly proportional, the time spent working within 60 m of R33 would be less than a day.

11.8.29 The description of PPV levels of around 1.0 mms^{-1} from BS 5228-2 (Ref. 11-14) in Table 11-5 states that vibration of this level can be tolerated if prior warning and explanation has been given. A communication strategy is secured in the **Framework CEMP [EN010152/APP/7.7]** which ensures that residents of affected receptors will be notified on the timings and durations of construction activities. Given that prior warning would be provided and the exposure time to levels of vibration exceeding the SOAEL would be less than one day, it is concluded that ground-borne vibration effects at R33 would be **not significant**.

11.8.30 It is also worth noting that not all Solar PV Mounts would be driven piles as there is an option for pre-cast concrete blocks. This option would be used in areas of archaeological sensitivity and could be used as an option is there are any residual risks from piling vibration affecting nearby sensitive receptors.

NGA2

11.8.31 The highest levels of vibration that would be generated by cable laying activities would be the use of vibratory roller during reinstatement of the land post open cut trenching. Vibratory rollers may generate adverse levels of vibration (i.e. exceeding 0.3 mm/s) at receptors within 50 m and significant levels of vibration (i.e. exceeding 1.0 mm/s) at receptors within 25 m.

11.8.32 Receptors within 50m of potential vibratory roller activity are receptors R12 (35 m), R16, (50 m), R18 (40 m), R27 (30 m) and R31 (40 m) as shown in Table 11-2. These receptors may experience vibration levels exceeding the LOAEL but the SOAEL would not be exceeded. Accordingly, vibration at nearby sensitive receptors would be **not significant** for cable laying activities.

NGA3

11.8.33 HDD activities would generate similar levels of vibration to bored piling. Bored piling calculations are based on analysis of data from Table D.6 of BS 5228-2 (Ref. 11-14) which is presented in **ES Volume III Appendix 11-3: Baseline Noise Survey [EN010152/APP/6.3]**.

11.8.34 The nearest receptor (R17) to the potential HDD works is approximately 75 m away. The predicted vibration level from bored piling at this distance is 0.2 mm/s which is lower than the LOAEL of 0.3 mm/s as detailed in Table 11-5. Therefore, ground borne vibration is **not significant** during HDD activities. As such, vibration at nearby sensitive receptors from HDD activities would be **not significant**.

Construction and Decommissioning Traffic Noise Effects

11.8.35 The potential changes in road traffic noise from these roads as a result of the Scheme have been considered by calculating a Calculation of Road Traffic

Noise (CRTN) Baseline Noise Level at 10 m next to roads within CRTN's prediction range and comparing the change in noise with reference to criteria defined in Table 11-6.

11.8.36 Table 11-14 presents the results of the assessment. **ES Volume II Figure 13-2: Traffic Survey Locations [EN010152/APP/6.2]** illustrates the locations of the road links listed in Table 11-14. It is assumed that the decommissioning effects would be the same or less, given fewer trips would be expected during the decommissioning phase.

Table 11-14: Construction Traffic Noise Assessment

Link Reference	Road Link	Baseline BNL dB	Baseline with Construction Traffic BNL dB	Change in BNL dB	Effect Level
ATC1	M62 West of Junction 34	84.0	84.0	0.0	Negligible
ATC2	M62 Between J34 and J35	83.7	83.7	0.0	Negligible
ATC3	M62 East of J35	82.3	82.3	0.0	Negligible
ATC4	M18 Between M62 Junction 35 and M18 Junction 6	83.3	83.3	0.0	Negligible
ATC5	M180	83.0	83.0	0.0	Negligible
ATC6	M18 Between M18 Junction 4 and Junction 5	83.3	83.3	0.0	Negligible
ATC7	A19 Selby Road - South of Station Road A19	70.5	70.5	0.0	Negligible
ATC8	A19 Selby Road - North of Station Road A19	71.5	71.5	0.0	Negligible
ATC9	Moss Road - Askern Village	66.1	66.3	+0.2	Negligible
ATC10	Moss Road - Eastern of Askern	66.3	66.6	+0.3	Negligible
ATC12	Trumfleet Lane - South of Moss	61.9	62.1	+0.2	Negligible
ATC13	Marsh Road	60.4	60.6	+0.2	Negligible
ATC14	Thorpe Bank	62.7	62.8	+0.1	Negligible
ATC15	Fordstead Lane West	67.6	67.6	0.0	Negligible
ATC16	Fordstead Lane East	66.7	66.7	0.0	Negligible

Link Reference	Road Link	Baseline BNL dB	Baseline with Construction Traffic BNL dB	Change in BNL dB	Effect Level
ATC17	Moss Road - East of Moss	63.6	63.6	0.0	Negligible
ATC18	Kirkhouse Green Road	64.2	64.3	+0.1	Negligible
ATC21	A614	69.7	69.7	0.0	Negligible
ATC22	Sour Lane	61.7	61.8	+0.1	Negligible
ATC23	Fishlake Nab	64.1	64.1	0.0	Negligible

11.8.37 Temporary changes in road traffic noise due to construction traffic are identified as, at worst, **negligible** and **not significant**.

11.8.38 Changes in road traffic noise have only been calculated from roads with flows of greater than 1,000 Annual Average Weekday Traffic (AAWT). This is because the CRTN (Ref. 11-19) calculations are unreliable for traffic flows below an AAWT of 1,000. Consequently, a qualitative assessment of potential construction traffic noise effects has been undertaken based on average hourly construction traffic flows at the following road links:

a. ATC11 – Fenwick Common Lane (Access Point 1).

b. ATC19 – West Lane - West of Sykehouse.

c. ATC20 –Sykehouse Road - East of Sykhouse.

11.8.39 There are no heavy vehicle movements along any low traffic flow roads with additional traffic on such roads consisting of light vehicles. As additional light vehicle movements (approximately 16 per hour) do not change the type of noise already experienced at receptors along low-flow roads, the additional traffic is not considered to constitute an adverse effect. Consequently, construction traffic noise effects on low flow roads are **negligible** and **not significant.**

Table 11-15: Summary of Assessment of Effects – Noise and Vibration (Construction)

Receptor	Potential Impacts	Duration	Mitigation	Likely Significant of Effect
R3, R5 to R13, R30	Construction noise NGA1	2 years	As set out in 11.9	Not significant, below LOAEL
R1, R2, R4, R29, R32, R33	Construction noise NGA1	2 years	As set out in 11.9	Not significant, Above or equal to LOAEL and below SOAEL
R12 to R28, R31	Construction noise NGA2	2 years	As set out in 11.9	Not significant, below LOAEL
R13, R16, R18, R23, R25, R27	Construction noise NGA3 (Night time)	Up to 3 days per drill entry or exit pit	As set out in 11.9	Not significant, below SOAEL
R12, R17 and R31	Construction noise NGA3 (Night time)	Up to 3 days per drill entry or exit pit	As set out in 11.9	Significant, Above or equal to SOAEL
R33	Construction vibration NGA1	Less than one day	As set out in 11.9	Not significant (based on duration and notification of timings and duration of activities), Above or equal to SOAEL
R1 to R13, R29 R30, R32	Construction vibration NGA1	2 years	As set out in 11.9	Not significant, below SOAEL
R12 to R28, R31	Construction vibration NGA2	2 years	As set out in 11.9	Not significant, below SOAEL

Receptor	Potential Impacts	Duration	Mitigation	Likely Significant of Effect
R12, R13, R16, R17, R18, R23, R25, R27	Construction vibration NGA3	Up to 3 days per drill entry or exit pit	As set out in 11.9	Not significant, below SOAEL
All receptors	Construction traffic noise	2 years	As set out in 11.9	Negligible, not significant

Operation and Maintenance

Operation and Maintenance Noise Effects

11.8.40 Noise emissions for the operation and maintenance phase of the Scheme will be dominated by the Field Stations and BESS Area. The operation and maintenance hours of the Scheme depend on the time of year so, for the purpose of this assessment, it is assumed that the Scheme would operate during the day, evening, and night.

11.8.41 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 can have tonal features, although noise emissions from inverters 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 rating penalty to account for noise that is 'distinctive against the residual acoustic environment' has been applied in determining the rating level as per BS 4142 guidance in Paragraph 11.4.43.

11.8.42 Details of the operation and maintenance noise modelling methodology are provided in **ES Volume III Appendix 11-4: Construction and Operation and Maintenance Noise Modelling [EN010152/APP/6.3]**.

11.8.43 As the night-time period provides the most onerous assessment criteria and operation and maintenance noise is assumed to be consistent, the assessment presented in Table 11-16 considers night-time noise only.

11.8.44 As discussed in Paragraph 11.4.23, the noise logger closest to receptor R4 could not be commissioned due to ground conditions so the lowest LOAEL have been used as a worst-case assessment.

Table 11-16: Operation and Maintenance Noise Prediction

Receptor	Typical Measured Night-time Background Level, $L_{A90,\ 15m\ ins}$ dB	LOAEL/SOAEL (Night-time), dB	Predicted Rating Sound Level, $L_{Ar,Tr}$ dB
Below LOAEL			
R5	31	31/41	29
R6	29	30/40	28
R7	37	37/47	33
R8	37	37/47	35
R11	33	33/43	30
R30	37	37/47	33
Above or equal to LOAEL and below SOAEL			
R1	30	30/40	38

Receptor	Typical Measured Night-time Background Level, $L_{A90, 15m\ ins}$ dB	LOAEL/SOAEL (Night-time), dB	Predicted Rating Sound Level, $L_{Ar,Tr}$ dB
R2	30	30/40	37
R3	33	33/43	35
R4	-	30/40	32
R9	33	33/43	33
R10	29	30/40	37
R12	29	30/40	36
R13	29	30/40	35
R29	33	33/43	36
R32	33	33/43	37
R33	37	37/47	37
Above or equal to SOAEL			

No exceedances of SOAEL have been predicted.

11.8.45 The SOAEL is not exceeded at any of the receptor locations so operation and maintenance noise effects are **not significant**. However, the LOAEL is exceeded at some receptors locations and adverse levels of noise are identified. As previously noted, the NPSE (Ref. 11-8) states that:

a. *"…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".*

11.8.46 Reasonable steps to reduce noise are covered in Section 11.7 and have been applied in noise predictions. Consequently, although adverse levels of noise are identified at some receptors, NPSE requirements are met through provision of embedded mitigation.

11.8.47 Table 11-17 presents a summary of the operation and maintenance noise effects.

Table 11-17: Summary of Assessment of Effects – Noise (Operation and Maintenance)

Receptor	Potential Impacts	Duration	Mitigation	Likely Significant of Effect
R5 to R8 and R11	Operation and maintenance noise	20 years	As set out in 11.9	Not significant, below LOAEL
R1 to R4, R9, R10, R29, R30 and R32	Operation and maintenance noise	20 years	As set out in 11.9	Not significant, Above or equal to LOAEL and below SOAEL

11.9 Additional Mitigation and Enhancement Measures

Construction Phase

11.9.1 Embedded mitigation measures are sufficient to avoid significant effects with the exception of potential exceedance of the SOAEL if 24-hour HDD activities are required. The noise predictions are worst-case and represent a scenario where all plant are operating at the closest point of the HDD pits to each receptor. When finalising the locations of HDD pits, the distance to sensitive receptors will be considered and kept as large as reasonably practicable with a minimum distance of 85 m between HDD work sites and sensitive receptors.

Operational Phase

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

11.10 Residual Effects

11.10.1 This section summarises the residual significant noise effects of the Scheme following the implementation of embedded and additional mitigation.

11.10.2 Significant residual effects are defined in accordance with national noise policy as an exceedance of the SOAEL whilst taking into account duration, and frequency of exposure to noise. The SOAELs for each assessment topic are defined in Paragraph 11.4.36 (Scheme construction and decommissioning noise), Paragraph 11.4.38 (Scheme construction and decommissioning vibration) and Paragraph 11.4.50 (Scheme operation and maintenance). The exception to this is the assessment of construction traffic noise which is assessed as the magnitude of change of road traffic noise (see Paragraph 11.4.39).

11.10.3 No exceedances of the SOAEL are predicted during construction, operation and maintenance, and decommissioning phases within the Solar PV Site and therefore residual effects are **not significant.**

11.10.4 There would be no exceedances of SOAEL due to daytime HDD activities within the Grid Connection Corridor and, therefore, the residual effects are **not significant**.

11.10.5 As HDD activities may occur overnight in the event of emergencies, the modelling predicts potential for sleep disturbance constitutes a significant effect at three receptors (R12, R17 and R31). Additional mitigation measures for HDD activities, including a temporary acoustic fence around HDD boundaries would be contained in the **Framework CEMP [EN010152/APP/7.7]**. With mitigation in place, work sites would be located at least 85 m from sensitive receptors to avoid significant effects. As such, the residual effect is considered to be **not significant**.

11.10.6 Vibration effects from construction activities do not exceed the SOAEL so the vibration effects are **not significant**.

11.10.7 Residual effects due to changes in noise because of construction traffic are **not significant**.

11.10.8 To summarise residual noise and vibration effects, no significant noise or vibration effects are predicted during the construction and decommissioning phases or the operation and maintenance phase.

11.11 Cumulative Effects

11.11.1 This section assesses the potential effects of the Scheme in combination with the potential effects of other proposed and committed plans and projects including other developments (referred to as ‘cumulative developments’) within the surrounding area.

11.11.2 The cumulative developments to be considered in combination with the Scheme was prepared and shared with City of Doncaster Council, North Yorkshire Council, and East Riding of Yorkshire Council and are listed in **ES Volume I Chapter 15: Cumulative Effects and Interactions [EN010152/APP/6.1]** and presented in **ES Volume II Figure 15-3: Location of Short List Schemes [EN010152/APP/6.2]**. The assessment has been made with reference to the methodology and guidance set out in **ES Volume I Chapter 5: Environmental Impact Assessment Methodology [EN010152/APP/6.1]**.

11.11.3 Cumulative noise effects during construction and operation and maintenance phases may occur when developments are located nearby to a common receptor. Based on professional judgement, at distances of greater than 500 m, any interaction of noise emissions from multiple developments would be attenuated such that there would normally be no combined effect. The developments which are within 500 m of the Scheme is shown in Table 11-18.

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

Long List ID	Application Reference	Applicant	Description	Development Type	Distance from Scheme (approximate at closest point)	Status	Reason for Selection
1	City of Doncaster Ref. 23/00537/FULM	Thorpe Marsh Green Energy Hub Ltd	Reclamation through construction and operation of Energy Hub incorporating Battery Energy Storage, Substation, and associated Infrastructure, including earthworks to existing material and to provide development platform and construction of railhead.	Energy	0 km	Awaiting decision	Due to the nature and proximity of the development and potential for temporal overlap.
2	City of Doncaster Ref. 23/01241/FULM	Enso Green Holdings I Limited	Installation of underground cable.	Energy	0 km	Granted (19 September 2023)	Due to the nature and proximity of the development and potential for temporal overlap.
4 and 5	City of Doncaster Ref.	Miles	Demolition of Grade II listed 'Lily Hall' and	Heritage	0.2 km	Approved	Due to location in

Long List ID	Application Reference	Applicant	Description	Development Type	Distance from Scheme (approximate at closest point)	Status	Reason for Selection
	22/01536/FUL and 22/01537/LBC		erection of one replacement residential farmworker's dwelling and associated works.				conjunction the Scheme and the heritage setting.
6	City of Doncaster Ref. 23/01746/FULM	Nel Nicholson	Installation of a 180 MW battery energy facility and association works on a 3.70 ha site.	Energy	0.5 km	Approved	Due to the nature of development and possible overlap in construction phases

11.11.4 Cumulative development 22/01537/LBC and 22/01536/FUL is on the Riddings Farm site (R2) with the nearest sensitive receptor (R1) located approximately 200 m away. It is possible that there would be some crossover in construction works from the Scheme and the cumulative development that may impact on R1.

11.11.5 No significant levels of construction noise are predicted at R1. It is not expected that additional construction noise sources at a distance of 200 m would materially influence construction noise from the Scheme. As such, cumulative construction noise effects are not significant. Construction vibration would not be perceptible at a distance of 200m so cumulative vibration effects would be not significant. It is therefore considered there is very unlikely to be any cumulative construction noise effects from the development and the Scheme.

11.11.6 Further, due to the nature of the proposed cumulative development 22/01537/LBC and 22/01536/FUL (being the demolition of an existing structure and the building of a new permanent structure with no identified ongoing noise effects past construction), there will be no operational cumulative noise effects.

11.11.7 There are no sensitive receptors in Table 11-2 that were assessed in planning applications 23/00537/FULM, 23/01241/FULM or 23/01746/FULM. As such, no significant effects are identified.

11.11.8 No developments identified in **ES Volume I Chapter 15: Cumulative Effects and Interactions [EN010152/APP/6.1]** are considered in combination to impact the receptors identified in this assessment. The potential for noise and vibration impacts during the construction, operation and maintenance, and decommissioning phases of the Scheme is considered within the Order limits itself. Other developments are not likely to contribute to the effects on noise and vibration receptors identified in this chapter and therefore the cumulative effects are **not significant**.

11.12 Summary and Conclusions

11.12.1 This chapter of the ES presents the findings of the assessment of noise and vibration effects of the Scheme following the implementation of embedded mitigation.

11.12.2 In summary, it is predicted that there would be no significant noise or vibration effects as a result of the Scheme, following the implementation of embedded mitigation and additional mitigation for HDD night-time activities.

11.13 References

Ref. 11-1 British Standards Institute (2014). BS 4142 – Methods for rating and assessing industrial and commercial sound. London: BSI. Available at: https://knowledge.bsigroup.com/products/methods-for-rating-and-assessing-industrial-and-commercial-sound/standard. [Accessed 08 January 2024].

Ref. 11-2 National Highways (2020). Design Manual for Roads and Bridges (DMRB) LA111 Noise and vibration. Available at: https://www.standardsforhighways.co.uk/search/cc8cfcf7-c235-4052-8d32-d5398796b364. [Accessed 08 January 2024].

Ref. 11-3 HMSO (1974). Control of Pollution Act 1974. Available at: https://www.legislation.gov.uk/ukpga/1974/40. [Accessed 08 January 2024].

Ref. 11-4 HMSO (1990). Environmental Protection Act 1990. Available at: https://www.legislation.gov.uk/ukpga/1990/43/contents. [Accessed 08 January 2024].

Ref. 11-5 Ministry of Housing, Communities and Local Government (MHCLG) (2022). Planning Practice Guidance: Historic Environment. Available at: https://www.gov.uk/guidance/conserving-and-enhancing-the-historic-environment. [Accessed 08 January 2024].

Ref. 11-6 MHCLG (2023). National Planning Policy Framework. Available at: National Planning Policy Framework (publishing.service.gov.uk). [Accessed 08 January 2024].

Ref. 11-7 MHCLG (2014). Planning Practice Guidance: Noise. Available at: https://www.gov.uk/guidance/noise--2. [Accessed 08 January 2024].

Ref. 11-8 Defra (2010). Noise Policy Statement for England (NPSE). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69533/pb13750-noise-policy.pdf. [Accessed 08 January 2024].

Ref. 11-9 Department for Energy Security and Net Zero (2023). Overarching National Policy Statement for Energy (EN-1) (November 2023). Available at: https://assets.publishing.service.gov.uk/media/65bbfbdc709fe1000f637052/overarching-nps-for-energy-en1.pdf [Accessed 08 January 2024].

Ref. 11-10 Department for Energy Security and Net Zero (2023). National Policy Statement for Renewable Energy (EN-3) (November 2023). Available at: https://assets.publishing.service.gov.uk/media/65a7889996a5ec000d731aba/nps-renewable-energy-infrastructure-en3.pdf. [Accessed 08 January 2024].

Ref. 11-11 Department for Energy Security and Net Zero (2023). National Policy Statement for Electricity Networks Infrastructure (EN-5) (November 2023). Available at: https://assets.publishing.service.gov.uk/media/65a78a5496a5ec000d731abb/nps-electricity-networks-infrastructure-en5.pdf. [Accessed 08 January 2024].

Ref. 11-12 City of Doncaster Council (2021). Doncaster Local Plan 2015 – 2035. Available at: https://www.doncaster.gov.uk/services/planning/local-plan. [Accessed 08 January 2024].

Ref. 11-13 British Standards Institute (BSI) (2014). BS 5228:2009+A1:2014 – Code of practice for noise and vibration control on construction and open sites - Noise. London: BSI. Available at: https://knowledge.bsigroup.com/products/code-of-practice-for-noise-and-vibration-control-on-construction-and-open-sites-noise/standard. [Accessed 08 January 2024].

Ref. 11-14 BSI (2014). BS 5228:2009+A1:2014 – Code of practice for noise and vibration control on construction and open sites –Vibration. London: BSI. Available at: https://knowledge.bsigroup.com/products/code-of-practice-for-noise-and-vibration-control-on-construction-and-open-sites-vibration/standard. [Accessed 08 January 2024].

Ref. 11-15 BSI (2003). BS 7445 – Description and environment of environmental noise – Part 1: Guide to quantities and procedures. London: BSI. Available at: https://knowledge.bsigroup.com/products/description-and-measurement-of-environmental-noise-guide-to-quantities-and-procedures/standard. [Accessed 08 January 2024].

Ref. 11-16 BSI (2014). BS 4142 – Methods for rating and assessing industrial and commercial sound. London: BSI. Available at: https://knowledge.bsigroup.com/products/methods-for-rating-and-assessing-industrial-and-commercial-sound/standard. [Accessed 08 January 2024].

Ref. 11-17 BSI (2014). BS 8233 – Guidance on sound insulation and noise reduction for buildings, BSI, London. Available at: https://knowledge.bsigroup.com/products/guidance-on-sound-insulation-and-noise-reduction-for-buildings/standard. [Accessed 08 January 2024].

Ref. 11-18 World Health Organization (WHO) (1999). Guidelines for Community Noise. Available at: https://www.who.int/publications/i/item/a68672. [Accessed 08 January 2024].

Ref. 11-19 Department of Transport/Welsh Office (1988). Calculation of Road Traffic Noise. Available at: https://www.wkcgroup.com/wp-content/uploads/2022/10/Calculation-of-Road-Traffic-Noise.pdf. [Accessed 04 January 2024].

Ref. 11-20 CadnaA®, registered trademark of Datakustik GmbH (Munich, Germany). [Accessed 04 January 2024].

Ref. 11-21 Association of Noise Consultants (2021). Construction Noise - A good practice guide to the preparation, submission and management of Section 61 consents. Available at: https://www.association-of-noise-consultants.co.uk/wp-content/uploads/2021/05/ANC-Construction-Noise-Guide-March-2021.pdf

Ref. 11-22 Institute of Environmental Management and Assessment (IEMA) (2014). Guidelines for Environmental Noise Impact Assessment. Available at: https://www.iema.net/download-document/236678. [Accessed 04 January 2024].

Ref. 11-23 Association of Noise Consultants (2020). BS4142:2014+A1:2019 Technical Note, Version 1.0. Available at: https://www.association-of-noise-consultants.co.uk/wp-content/uploads/2020/07/ANC-BS-4142-Guide-March-2020.pdf. [Accessed 04 January 2024].

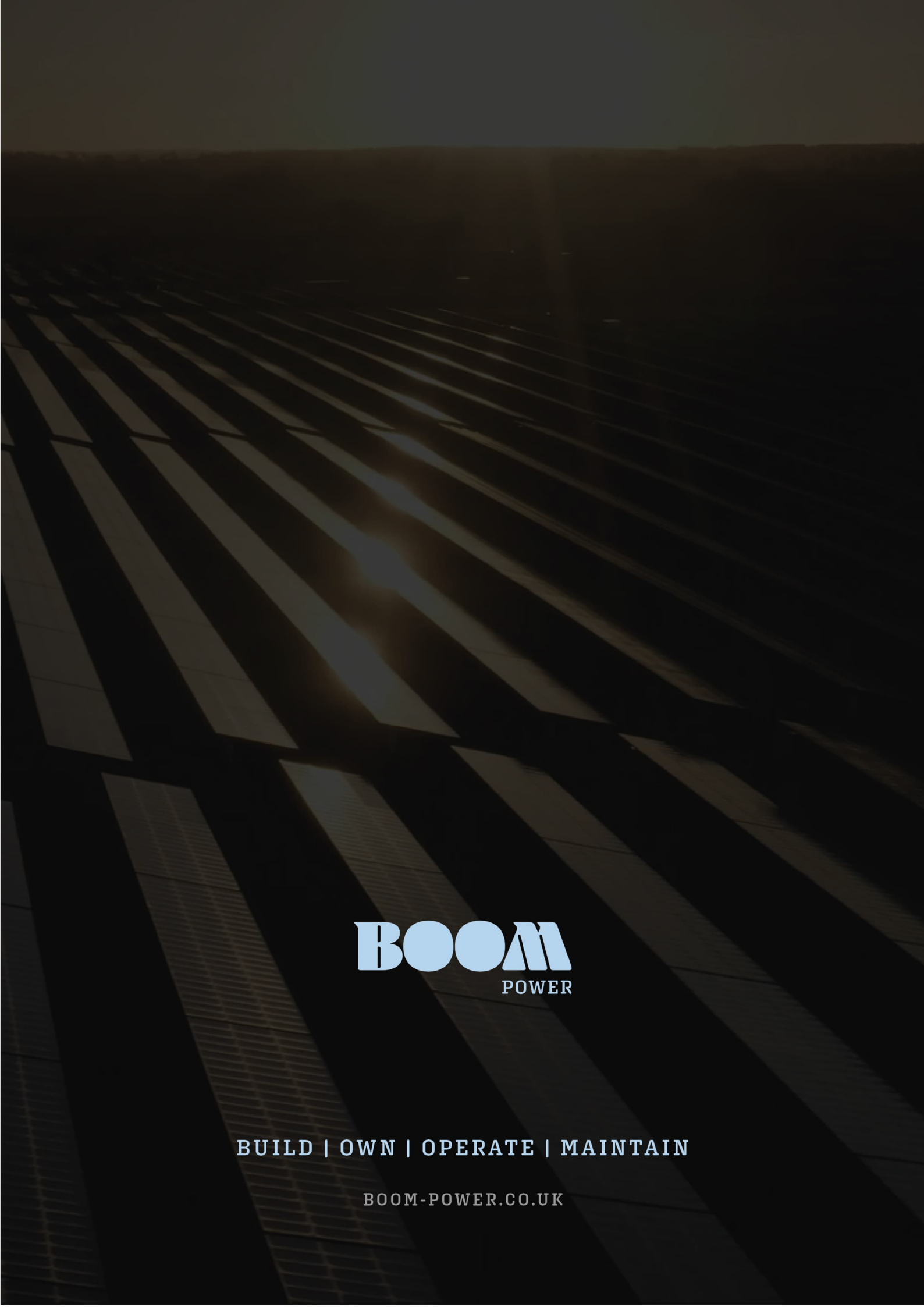
Ref. 11-24 International Organisation for Standardisation (ISO) (1996). ISO 9613 Attenuation of Sound during Propagation Outdoors – Part 2: General Method of Calculation. Switzerland: ISO. Available at: https://www.iso.org/standard/20649.html. [Accessed 08 January 2024].

Ref. 11-25 Hiller, D.M. and G.I., Crabb (2000). Groundborne Vibration Caused by Mechanised Construction Works. TRL Report 429. Available at: https://trl.co.uk/uploads/trl/documents/TRL429.pdf. [Accessed 08 January 2024].

Ref. 11-26 Selby, A.R. (1997). Control of vibration and noise during piling. Brochure publication, British Steel, UK. [Accessed 04 January 2024].

Ref. 11-27 Planning Inspectorate (2018). Advice Note Nine: Rochdale Envelope. Available at: https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/advice-note-nine-rochdale-envelope/. [Accessed 08 January 2024].

Ref. 11-28 Time and Date.com (2024). Climate and Weather Averages in Doncaster, England, United Kingdom. Available at: https://www.timeanddate.com/weather/uk/doncaster/climate. [Accessed 08 January 2024].



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