



**POWER  
FOR GOOD**

# **Chapter 11: Noise and Vibration**

Preliminary Environmental Information Report

**Volume 1**

**Steeple Renewables Project**

Land at Sturton le Steeple, Nottinghamshire

## 11.1 Noise & Vibration

### 11.1 Introduction

- 11.1.1 This Chapter provides a preliminary assessment of the potential effects in respect of sound and vibration resulting from the introduction of the Proposed Development, including the inverters, transformers, substation and Battery Energy Storage System (BESS), with due regard to all relevant legislation, planning policy and guidance.
- 11.1.2 Construction sound and vibration (including traffic and transportation) has been assessed with reference to BS 5228 ‘Code of Practice for Noise and Vibration Control on Construction and Open Sites’<sup>1</sup> in terms of likely levels and assessment criteria typically applied to developments of this kind.
- 11.1.3 Operational sound, in an isolative and cumulative sense, has been assessed in accordance with BS 4142:2014 + A1:2019 ‘Methods for Rating and Assessing Industrial & Commercial Sound’<sup>2</sup>, as referenced within relevant planning policy.
- 11.1.4 Details of the lead author of this Chapter are set out in **Appendix 1.4 ‘EIA Statement of Competence’**.

### 11.2 Legislation and Planning Policy

#### Environmental Protection Act 1990

- 11.2.1 The Environmental Protection Act 1990 (the Act)<sup>3</sup> sets out a framework for the control of pollution in general and includes provisions for local authorities to act on issues in relating to sound generated by certain facilities via an abatement notice where a statutory nuisance is determined to exist.
- 11.2.2 Section 79 of the Act states at that “***(g) noise emitted from premises so as to be prejudicial to health or a nuisance***” and/or “***(ga) noise that is prejudicial to health or a nuisance and is emitted from or caused by a vehicle, machinery or equipment in a street***” would constitute a statutory nuisance. There is no set threshold level and/or character of sound that applies in practice. Nuisance actions are generally

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<sup>1</sup> The British Standards Institution (February 2014) BS 5228-1:2009 + A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites - Part 1: Noise

<sup>2</sup> The British Standards Institution (2019) BS 4142:2014+A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound

<sup>3</sup> Environmental Protection Act 1990

considered on a case-by-case basis and any necessary enforcement or remedial works are adopted in the context of the specific circumstances relating to the identified disturbance and whether ‘best practicable means’ have been used to reduce or eliminate the issue. Given the low level of operational noise anticipated and the ability to mitigate construction and decommissioning noise using standard construction good practices, no Category 3 interests, being those individuals that might suffer a nuisance as a result of the Proposed Development, have been identified and as such they are not considered further in this assessment.

#### Control of Pollution Act 1974

- 11.2.3 The Control of Pollution Act 1974<sup>4</sup> (CoPA) enables local authorities controlling powers similar to the above with regard to various pollutants, to minimise potential impacts on human health and in respect of sound generated during construction or similar activities. The act states the requirement for the use of ‘best practicable means’ to minimise sound levels.

#### National Planning Policy Framework (NPPF)

- 11.2.4 The treatment of noise is defined in the context of planning by the National Planning Policy Framework (NPPF)<sup>5</sup> which details the Government’s planning policies and how these are expected to be applied. Whilst the NPPF does not apply to Nationally Significant Infrastructure Projects (NSIPs) such as that considered here it is useful in that it provides generalised advice on the role of the planning system in helping to prevent and limit potential adverse effects of noise, setting out that planning policies and decisions should aim to avoid noise giving rise to significant adverse impacts, whilst at the same time mitigating and reducing other adverse impacts on health and quality of life to a minimum. The NPPF refers to the Noise Policy Statement for England (NPSE) which provides guidance on the categorisation of impact levels.

#### Noise Policy Statement for England (NPSE)

- 11.2.5 The Noise Policy Statement for England (NPSE)<sup>6</sup> sets out the long-term vision of Government noise policy which is to “... ***promote good health and quality of life through effective noise management within the context of sustainable***

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<sup>4</sup> Control of Pollution Act 1974

<sup>5</sup> Department for Levelling Up, Housing and Communities (December 2024) National Planning Policy Framework

<sup>6</sup> Department for Environment, Food and Rural Affairs (March 2010) Noise Policy Statement for England

**development**". In order to weigh noise impacts against the economic and social benefits of the activity under consideration, the NPSE defines three categories of effect levels:

- No Observed Effect Level (NOEL) - noise levels below this have no detectable effect on health and quality of life;
- Lowest Observed Adverse Effect Level (LOAEL) - the level above which adverse effects on health and quality of life can be detected; and,
- Significant Observed Adverse Effect Level (SOAEL) - the level above which effects on health and quality of life become significant.

### National Planning Practice Guidance (NPPG): Noise

11.2.6 National Planning Practice Guidance (NPPG)<sup>7</sup> on noise, whilst not directly applicable to NSIPs, puts the effect levels defined by the NPSE into greater context by explaining how such noise levels might be perceived, providing examples of outcomes based on likely average response, and advising on appropriate actions. These are reproduced at **Table 11.1**.

*Table 11.1 – Noise Exposure Hierarchy*

Response	Examples of Outcomes	Increasing Effect Level	Action
Not present	No Effect	No Observed Effect	No specific measures required
<b>No Observed Effect Affect Level (NOAEL)</b>			
<b>Present and not intrusive</b>	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.	No Observed Adverse Effect	No specific measures required
<b>Lowest Observed Adverse Effect Level (LOAEL)</b>			

<sup>7</sup> Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government (July 2019) National Planning Practice Guidance: Noise

Response	Examples of Outcomes	Increasing Effect Level	Action
<b>Present and intrusive</b>	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
<b>Significant Observed Adverse Effect Level (SOAEL)</b>			
<b>Present and disruptive</b>	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
<b>Present and very disruptive</b>	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

11.2.7 In addition to this guidance, which is applicable to all forms of environmental sound, specific guidance relating to NSIPs has been published by the Department for Energy Security & Net Zero (DESNZ).

### **The Overarching National Policy Statement for Energy (EN-1)**

- 11.2.8 The Overarching National Policy Statement for Energy (EN-1)<sup>8</sup> outlines the need for new electricity capacity from renewable sources as the country transitions to a low carbon electricity system. However, when referring to the NPSE in Paragraph 5.12.2, EN-1 recognises the potential for energy infrastructure to impact on health and quality of life if it results in excessive noise and goes on to state in Paragraph 5.12.9 that where noise impacts are likely to arise, they should be assessed according to the principles of the relevant British Standards. Of the examples provided, the standards BS 4142 and BS 8233<sup>9</sup> relate to operational sound and BS 5228 relates to construction sound and vibration.

### **National Policy Statement for Renewable Energy Infrastructure (EN-3)**

- 11.2.9 The National Policy Statement for Renewable Energy Infrastructure (EN-3)<sup>10</sup> refers back to EN-1 in Paragraph 2.7.40 for the purposes of addressing sound impacts from renewable energy development on sensitive residential locations and provides additional general advice throughout the document as to potential mitigation measures for additional specific instances.

### **The National Policy Statement for Electricity Networks Infrastructure (EN-5)**

- 11.2.10 The National Policy Statement for Electricity Networks Infrastructure (EN-5)<sup>11</sup>, relevant to the transmission and distribution parts of the electricity network along with any associated infrastructure, such as substations and converter stations, again points to the appropriateness of standards such as BS 4142 or similar in assessing the operational acoustic impact of such projects in Paragraph 2.9.39.

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<sup>8</sup> Department for Energy Security & Net Zero (November 2023) Overarching National Policy Statement for Energy (EN-1)

<sup>9</sup> British Standards Institution (2014) BS 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings

<sup>10</sup> Department for Energy Security & Net Zero (November 2023) National Policy Statement for Renewable Energy Infrastructure (EN-3)

<sup>11</sup> Department for Energy Security & Net Zero (November 2023) National Policy Statement for Electricity Networks Infrastructure (EN-5)

## National Policy Statements for Energy - Appraisal of Sustainability - Main Report

- 11.2.11 Appendix C of the National Policy Statements for Energy - Appraisal of Sustainability - Main Report<sup>12</sup> provides an overview of relevant planning policy, guidance and documentation applicable to the UK in general and provides an interpretation of the NPSE stating that the “... **NPSE considers that the noise levels above the SOAEL would be seen to have, by definition, significant adverse effects and would be considered unacceptable. Where the assessed levels fall between the LOAEL and the SOAEL the policy statement 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 but that efforts should be focused on minimising such effects. Where levels are below the LOAEL it is considered there will be no adverse effect. Once the levels are below the NOEL there will be no observable change. For the present guidance a numerical definition of LOAEL is given by the WHO Guidelines for Community Noise and BS 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings**”. This indicates that, where proposals can meet the requirements of BS 8233 and the guideline values provided by the WHO, adverse impacts would be avoided.

## BS 5228 Code of Practice for Noise and Vibration Control on Construction and Open Sites

- 11.2.12 BS 5228-1:2009 + A1:2014 Code of practice for noise and vibration control on construction and open sites - Part 1: Noise<sup>13</sup> has been identified as being the appropriate source of guidance on methods for minimising sound from construction activities and is adopted herein. The document provides guidance on construction limits, modelling techniques and best practicable measures for the reduction of sound generated during construction activities.
- 11.2.13 Annex E of BS 5228-1:2009 + A1:2014 provides guidance on setting environmental sound targets for construction activities. Several methods of assessing the significance of the expected sound levels are presented with the most applicable

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<sup>12</sup> Department for Energy Security & Net Zero (November 2023) National Policy Statements for Energy Appraisal of Sustainability - Main Report

<sup>13</sup> British Standards Institution (February 2014) BS 5228-1:2009 + A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites - Part 1: Noise

being the ABC method. This method sets threshold levels for construction activities for specific time periods based on the pre-existing ambient sound levels, subject to average lower Category A limiting values of 65, 55 and 45 dB  $L_{Aeq}$  for daytime (07:00 – 19:00 weekdays and Saturdays 07:00 – 13:00), evenings and weekends (19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays) and night-time (23:00 – 07:00) periods respectively in instances where existing ambient sound levels are low in relation to these values, which is the case for the Proposed Development.

- 11.2.14 BS 5228-2:2009 + A1:2014 ‘Code of practice for noise and vibration control on construction and open sites - Part 2: Vibration<sup>14</sup> provides a method for assessing levels of vibration. The document provides guidance on construction vibration limits, vibration modelling techniques and best practicable measures for the reduction of vibration generated during construction activities.
- 11.2.15 The generally accepted maximum satisfactory magnitude of vibration due to construction activities, at residential premises during daytime periods (08:00 – 18:00 Monday to Friday and 08:00 – 13:00 on Saturdays), is a peak particle velocity (ppv) of 6 to 10 mm.s<sup>-1</sup>. In practice, the lower satisfactory magnitude is typically used with the higher magnitude being justified on a case-by-case basis.

### **BS 4142 Methods for Rating and Assessing Industrial & Commercial Sound**

- 11.2.16 BS 4142<sup>2</sup> describes methods for rating and assessing sound of an industrial or commercial nature. Outdoor sound levels are used to assess the likely effects on people who might be inside or outside a residential property via the comparison of the pre-existing background sound levels with the predicted/modelled sound associated with the introduction of a particular development, known as the ‘rating’ level, which also accounts for any distinguishing characteristics of the emitted sound.
- 11.2.17 To determine a value for the background sound level at a specific assessment point, a series of measurements are made at a location at, or representative of, a dwelling or receptor of interest. The standard requires that that the background sound measurements (dB  $L_{A90, T}$  – the sound level exceeded for 90% of the time, or the

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<sup>14</sup> British Standards Institution (June 2014) BS 5228-2:2009 + A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites - Part 2: Vibration



lowest 10 % of sound, for the reference time-period, T) should be measured during times when the sound source in question could or will be operating and that the individual measurement intervals should not normally be less than 15-minutes in length. The objective is then to determine a justifiable representative background sound level for time periods of interest via statistical analysis and/or observations of the data set collected. The standard states that the representative background sound level “... **should not automatically be assumed to be either the minimum or modal value**”.

- 11.2.18 The ‘rating’ level is defined as the ‘specific’ sound level (dB  $L_{Aeq}$  – the average sound level) plus any adjustment for the characteristic features of the sound generated by the source in question. In instances where the source is not expected to have a specific character at the assessment location then the ‘rating’ level can be assumed to equal to the ‘specific’ sound level. Where tones are present a correction of 2 to 6 dB can be added to the ‘specific’ sound level to determine the ‘rating’ level and further adjustments may be added where the source has other applicable characteristics.
- 11.2.19 The defined representative background sound level(s) and rating level(s) are then compared to determine the possible impact but with consideration of the context in which the industrial or commercial sound source to be introduced presents itself in respect of other sound sources and the existing character of the area. **Table 11.2** provides a summary of expected impacts when comparing background and rating levels.
- 11.2.20 In accordance with BS4142, the resultant impact may need to be modified in relation to the context in which the sound occurs, particularly when either the sound level associated with the new source and the pre-existing background sound levels are considered to be low at neighbouring receptors. The previous version of BS 4142<sup>15</sup> stated that this version of the standard is not appropriate for use in instances where background and rating levels are below a certain level and that background sound levels “... **below about 30 dB and rating levels below about 35 dB are considered to be very low**”.

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<sup>15</sup> British Standards Institution (1997) BS 4142:1997 Rating Industrial Noise Affecting Mixed Residential and Industrial Areas

Table 11.2 – BS 4142 Assessment Criteria

Rating Level	BS 4142 Assessment Criteria
<b>Equal to or below background</b>	‘...an indication of the specific sound source having a low impact, depending on the context’.
<b>Approximately +5 dB greater than the background sound level</b>	‘...an indication of an adverse impact, depending on the context’.
<b>Approximately +10 dB or more greater than the background sound level</b>	‘...an indication of a significant adverse impact, depending on the context’.

### World Health Organisation (WHO)

- 11.2.21 The WHO document Guidelines for Community Noise<sup>16</sup> provides guideline values for overall desirable internal and external noise levels for a variety of situations which are intended to minimise health impacts for certain environments. The guidance informs much of the standards and guidance relating to the protection of external and internal amenity in relation to the impacts of sound on residences such as BS 8233<sup>9</sup>.
- 11.2.22 The guidelines state that overall internal night-time sound levels should not be above 30 dB  $L_{Aeq}$  within bedrooms such that people may sleep with minimal disturbance while the windows are open and it is stated that this corresponds to an external night-time noise level of 45 dB  $L_{Aeq}$ , when assuming a 15 dB attenuation in sound levels externally to internally. Furthermore, the guidance recommends that daytime external levels should not exceed 50 dB  $L_{Aeq}$  to protect the majority of people from being moderately annoyed.
- 11.2.23 The Night Noise Guidelines for Europe<sup>17</sup> are described as complementary to the Guidelines for Community Noise and recommend a limit of 40 dB  $L_{night}$ , outside. This is a yearly average night-time sound level which could potentially be exceeded on some nights of the year such that it is not necessarily inconsistent with the Guidelines for Community Noise if the sound levels do not exceed 45 dB  $L_{Aeq}$  on those nights.

<sup>16</sup> World Health Organisation (2000) Guidelines for Community Noise

<sup>17</sup> World Health Organisation (2009) Night Noise Guidelines for Europe

11.2.24 The WHO Environmental Noise Guidelines for the European Region<sup>18</sup> was published in 2018 and provides “... **recommendations for protecting human health from exposure to environmental noise originating from various sources: transportation (road traffic, railway and aircraft) noise, wind turbine noise and leisure noise**” and make a series of strong or conditional noise exposure recommendations for each based on the weight of evidence available at the time the report was being drafted. The document does not consider noise from industrial sources as the specific features of these sources are usually very localised and vary between different kinds of development.

### BS 8233 Guidance on Sound Insulation and Noise Reduction for Buildings

11.2.25 BS 8233<sup>7</sup> provides guidance on the control of noise for new buildings or those undergoing refurbishment rather than providing guidance on assessing the effect of changes in external noise levels on occupants of existing buildings. The document provides a range of desirable internal average noise levels for dwellings which may be achieved via appropriate design where necessary. The levels are provided at **Table 11.3** for reference and include additional detail as provided within the ProPG: Professional Practice Guidance on Planning & Noise document discussed below.

### ProPG: Professional Practice Guidance on Planning & Noise

11.2.26 The ProPG: Professional Practice Guidance on Planning & Noise<sup>19</sup> document, as authored by the Association of Noise Consultants (ANC), Institute of Acoustics (IOA) and Chartered Institute of Environmental Health (CIEH), similarly to BS 8233, is intended to provide guidance in terms of assessment and design of new or newly refurbished housing development in terms of pre-existing airborne sound sources impacting on them (typically from transportation) and the requirements to achieve a suitable internal sound environment for potential inhabitants. **Table 11.3** shows the desirable sound levels detailed within BS 8233 for reference and with the additional detail and notes the ProPG provides.

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<sup>18</sup> World Health Organisation (2018) Environmental Noise Guidelines for the European Region

<sup>19</sup> Association of Noise Consultants, Institute of Acoustics & Chartered Institute of Environmental Health (2017) ProPG: Planning & Noise: Professional Practice Guidance on Planning & Noise: New Residential Development

Table 11.3 – Internal Noise Criteria

Activity	Location	Daytime	Night-time
		07:00 – 23:00 hrs	23:00 – 07:00 hrs
Resting	Living room	35 dB L <sub>Aeq, 16 hr</sub>	-
Dining	Dining room/area	40 dB L <sub>Aeq, 16 hr</sub>	-
Sleeping	Bedroom	35 dB L <sub>Aeq, 16 hr</sub>	30 dB L <sub>Aeq, 8 hr</sub> 45 dB L <sub>Amax,F</sub> (Note 4)

**NOTE 4: Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or L<sub>Amax,F</sub>, depending on the character and number of events per night. Sporadic noise events could require separate values. In most circumstances in noise sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45 dB L<sub>Amax,F</sub> more than 10 times a night. However, where it is not reasonably practicable to achieve this guideline then the judgement of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number, distribution, predictability and regularity of noise events (see Appendix A of the ProPG: Professional Practice Guidance on Planning & Noise).**

## 11.3 Assessment Methodology

### Construction and Decommissioning

- 11.3.1 Sound and vibration generated during the various activities required to construct and decommission the Proposed Development may well be perceptible to residents in the vicinity. However, the resultant levels are unlikely to breach typical construction sound and vibration limiting requirements with standard mitigation measures in place as most construction and decommissioning activities would occur at distances greater than 200 m from neighbouring properties and all potential impacts would be temporary in any case. This topic will be kept under review as the design of the Proposed Development progresses.
- 11.3.2 Vibration resulting from the most potentially impactful construction plant (e.g. piling activities, horizontal directional drilling and the use of vibratory rollers) could only be considered significant in close proximity and given the large setback distances to dwellings and sensitive structures, it is highly unlikely to cause issues in terms of perceptibility and certainly of no concern in terms of potential cosmetic damage to buildings or otherwise.

- 11.3.3 Nevertheless, construction and decommissioning sound and vibration emissions are discussed and assessed with reference to BS 5228 ‘Code of Practice for Noise and Vibration Control on Construction and Open Sites’.
- 11.3.4 The most appropriate method for assessing the sound impacts is the ABC Method which sets threshold levels for specific periods based on the pre-existing ambient levels, subject to average lower Category A limiting values of 65, 55 and 45 dB  $L_{Aeq}$  for daytime (07:00 - 19:00 weekdays and Saturdays 07:00 – 13:00), evenings and weekends (19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays) and night-time (23:00 – 07:00) periods respectively, for instances where existing ambient sound levels are relatively low, which is the case for the Proposed Development.
- 11.3.5 The magnitude of impact is described as ‘negligible’ if the expected sound levels are 10 dB below the respective limits, ‘low’ if they are at the limits, ‘medium’ if up to 10 dB over limits and ‘high’ if more than 10 dB above.
- 11.3.6 The significance of a potential effect is determined using the matrix in **Table 11.4** and deemed not significant if major/moderate and major effects are avoided.

*Table 11.4 – Significance of Effects Matrix*

Magnitude	Sensitivity		
	High	Medium	Low
High	Major	Major/Moderate	Moderate
Medium	Major/Moderate	Moderate	Moderate/Minor
Low	Moderate/Minor	Moderate/Minor	Minor
Negligible	Minor	Minor	Negligible

- 11.3.7 Residential locations, including schools and hospitals are regarded as having high sensitivity, commercial offices and workspaces a medium sensitivity and buildings/premises of an industrial nature and public rights of way (PROWs) considered to have a low sensitivity.
- 11.3.8 BS 5228 Parts 1 & 2 provides various means of predicting construction sound and vibration levels from a wide selection of plant and supplies a range of generic plant source levels for this purpose. A detailed construction plan for the Proposed

Development is not yet available and qualitative construction sound and vibration assessment has been undertaken as a result.

- 11.3.9 Sound and vibration effects on the users of PROWs is not considered within current planning guidance. However, a discussion of the potential construction and decommissioning effects is provided in each of the relevant sections below.
- 11.3.10 The assessment as to the construction impacts in respect of sound and vibration is provided in the **Assessment of Likely Significant Effects** section.

### Operation

- 11.3.11 The operational assessment methodology, both in isolative (see the **Assessment of Likely Significant Effects** section) and cumulative terms (see the **Cumulative and In-Combination Effects** section), follows the procedures described within BS 4142 via the comparison of the existing background sound levels with the predicted levels associated with the introduction of the Proposed Development, accounting for any potential character in the sound, and the sound associated with other relevant neighbouring developments of a similar nature. The assessment also incorporates the potential limitations associated with the BS 4142 standard where background sound and operational rating levels are considered low.
- 11.3.12 Existing background and ambient sound levels for a variety of residences neighbouring the Proposed Development have been taken from publicly available information relating to other neighbouring development in the area as described in the **Baseline Conditions** section of this Chapter.
- 11.3.13 The magnitude of impact at residences is described as ‘negligible’ if the rating level associated with the introduction of the Proposed Development is 10 dB or more below the background sound level; ‘low’ if less than or equal to the background sound level plus 5 dB; ‘medium’ if not more than 10 dB above the background level and ‘high’ if more than 10 dB above, all subject to a lower limiting value of 35 dB  $L_{Ar}$ , where the magnitude of impact is considered ‘low’ regardless.
- 11.3.14 These criteria compare to the categories defined by the NPSE (see the **Legislation and Planning Policy** section), with rating levels less than or equal to 5 dB above background sound level representing the NOEL, between 5 and 10 dB above background representing the LOAEL and 10 dB or more above background the SOAEL, notwithstanding the lower limiting value for which impacts are described as low regardless (i.e. in instances where existing background and rating levels are low,

the corresponding impact may need to be modified as result and an assessment in relation to absolute levels could be considered more appropriate).

11.3.15 The significance of a potential effect is, similarly to the construction assessment, determined using the matrix in **Table 11.4** with the effects deemed not significant if major/moderate and major effects are avoided.

11.3.16 A model of the Proposed Development, neighbouring West Burton C Battery Storage Project and consented Wood Lane Solar Farm has been developed using CadnaA<sup>20</sup> software. The ISO 9613-2<sup>21</sup> propagation methodology has been employed to predict the sound levels resulting from the Proposed Development and cumulative schemes at nearby residential properties, incorporating various assumptions and factors which are considered appropriate for use here:

- The various plant to be installed as part of the Proposed Development and that associated with neighbouring solar sites has been modelled as point sources with a height of 2 m;
- The neighbouring West Burton C Battery Storage Project has been modelled using an 8 m source height (as described within the planning application for that scheme);
- Soft ground conditions, as defined within ISO 9613-2, have been assumed (i.e. G=1) as representative of the farmland surrounding the Proposed Development. The ISO 9613-2 standard allows for a range of ground conditions to be applied, from porous ground conditions (G=1), which includes surfaces suitable for the growth of vegetation (i.e. farmland), to hard ground (G=0), such as paving, water and concrete;
- All receptors have been assigned a height of 1.5 m;
- Atmospheric attenuation corresponding to a temperature and relative humidity of 10 °C and 70 % respectively, as defined within ISO 9613-1<sup>22</sup>, which represents relatively low levels of sound absorption in the atmosphere;

<sup>20</sup> <https://www.datakustik.com/>

<sup>21</sup> International Organisation for Standardisation (December 1996) ISO 9613-2:1996 Acoustics - Attenuation of Sound During Propagation Outdoors - Part 2: General Method of Calculation

<sup>22</sup> International Organisation for Standardisation (June 1993) ISO 9613-1:1993 Acoustics - Attenuation of Sound During Propagation Outdoors - Part 1: Calculation of the Absorption of Sound by the Atmosphere

- A 4 m high barrier of suitable mass and density surrounding the BESS facility to be installed as part of the Proposed Development as an embedded mitigation measure;
- The inclusion of the topography of the site and surroundings within the model; and,
- The photovoltaic panels to be introduced as part of the consented Wood Lane Solar Farm (Application No. 20/00117/FUL), have also been incorporated into the prediction model as ‘floating barriers’ 0.75 m from the ground and with an overall height of 3 m. This provides some shielding of sound generated by the equipment to be installed, where certain panels are located directly between residences and the respective plant. The panels to be introduced as part of the Proposed Development for the purposes of this preliminary assessment have not been included. However, they may be incorporated as part of further prediction iterations and assessments, serving to further reduce expected noise levels associated with the Proposed Development.

11.3.17 Furthermore, ISO 9613-2 is a downwind propagation model. Where conditions less favourable to sound propagation occur, such as when the assessment locations are upwind of the Proposed Development, the levels would be expected to be less and the downwind predictions presented as part of this report would be regarded as conservative, i.e. greater than those likely to be experienced in practice.

11.3.18 Based on the parameter plans showing the Proposed Development at its current design stage the predominant sources of sound to be introduced as part of the Proposed Development would be the inverters/power conversion system (PCS) units and linked transformers associated with the solar facilities; further inverters, transformers and battery storage containers forming the proposed BESS; and, a number of substation transformers located at the northern extent of the site.

11.3.19 The source levels associated with the BESS and the solar inverter/transformer combinations forming part of the Proposed Development are based on the expected maximum sound output for anticipatory units, as advised as appropriate by candidate manufacturers.

11.3.20 The predominant sources of sound to be associated with the consented Wood Lane Solar Farm are the ancillary inverters and transformers attached to the photovoltaic



- panels, as located at several positions across that site. The Wood Lane Solar Farm site was considered to have such a low impact in terms of operational sound levels that a noise assessment was not submitted in support of the associated planning application and no controls were imposed as conditions of consent. The consented Wood Land Solar Farm is at far more advanced stage of development and may have higher source noise levels for the installed equipment. As a result, higher assumed source noise levels have been assumed for the inverter to be installed at that site as compared with that for the Proposed Development.
- 11.3.21 Similarly to the BESS aspect of the Proposed Development, the proposed West Burton C Battery Storage Project is expected to have sound sources of a similar nature. The expected sound levels associated with the potential introduction of the West Burton C Battery Storage Project are based on information supporting the associated planning application which indicates that, as a maximum, approximately 2200 BESS units, 550 inverter/transformer combinations and 2 main transformers could be installed. The source noise levels stated within the noise assessment have been summed together to provide an overall representative sound power level for the West Burton C Battery Storage Project development as a whole and are modelled as an 8 m high noise source at the centre of the developable area. This approach represents a suitable basis of assessment given the large distances between the site and the residential locations relevant to the Proposed Development and results in sound pressure levels that are similar to that presented within the noise assessment supporting the West Burton C Battery Storage Project planning application.
- 11.3.22 The inverters (PCS units) associated with the solar aspect of the Proposed Development and consented neighbouring Wood Lane Solar Farm are assumed not to be operational during night-time periods. However, these sites may start becoming operational in early hours of the morning during particularly bright summer months, although this will occur very rarely and this equipment will be operating under a much-reduced electrical load during these periods, substantially reducing the expected sound levels as compared with the daytime scenario.
- 11.3.23 The BESS aspects of the Proposed Development and the neighbouring proposed West Burton C BESS facility are assumed to be operating at their typical maximum output continuously.

- 11.3.24 A number of other development proposals, including Sturton le Steeple Quarry (Planning Reference. 1/22/00047/CDM), Gate Burton Energy Park (Planning Reference. EN010133) and the West Burton Solar Project (Planning Reference. EN010132), have been reviewed to determine whether any cumulative operational noise impacts of any significance would arise. In these instances, the sites have been determined to be located sufficiently far from dwellings potentially affected by the Proposed Development or have a different nature of sound generated (i.e. in the case of Sturton-le-Steeple Quarry), such that cumulative effects of any potential significance would be avoided. These sites have been omitted from the combined/cumulative sound impact assessment in the **Cumulative and In-Combination Effects** section as a result.
- 11.3.25 The assumed sound power data for the assessment are provided in **Table 11.5**. The overall levels correspond to the expected maximum sound output for each of the respective plant, as advised by the candidate manufacturers, taken from historical source information or extracted from documentation supporting the cumulative schemes considered here, where appropriate. The propagation modelling therefore represents a conservative scenario and the actual sound levels would be less when the respective sites are not operating at their maximum expected capacity.

*Table 11.5 – Overall Sound Power Levels, dB L<sub>WA</sub>*

Equipment & ID	Sound Power Level, dB L <sub>WA</sub>
Power Conversion System (PCS)	80
Battery Energy Storage System (BESS)	68
Transformer (TRA)	76
Substation (SUB)	90
Wood Lane Power Conversion System (WLPCS)	88
West Burton C BESS (WBC) Overall Total	113

- 11.3.26 The combination of assumptions detailed above are considered to provide a conservative prediction/modelling basis overall. The various equipment has been located at the associated hard standings relating to each inverter/transformer combination and BESS location for all the sites considered.

- 11.3.27 The sound emitted by the various equipment to be introduced as part of the Proposed Development can have distinctive tonal character (i.e. a whine, whistle or hum). Under the subjective method described in BS 4142, a correction of 2 dB has been applied to account for this feature. However, the assessed specific and rating sound levels detailed in the **Assessment of Likely Significant Effects** section are particularly low and, in most instances, potential tonal component in the sound emitted from the various plant may well be masked by existing sources of background/ambient sound in the area.
- 11.3.28 Traffic generated for the maintenance and general operational requirements of the Proposed Development will be light, resulting in small increases in traffic along local roads, notwithstanding exceptional circumstances where increased vehicle movements could be expected in emergency or critical situations. **Chapter 13: Transport & Access** confirms the expected light levels of operational traffic and an initial review indicates that the total road traffic volumes for all access routes, would not increase by more than ~30 % during the most intensive period(s) of construction, substantially less during operation. This increase corresponds to a very minimal difference in sound due to traffic of a maximum of around one decibel (dB) and will have a negligible effect on the outcomes of the construction, decommissioning and operational assessments.
- 11.3.29 Similarly to sound and vibration effects associated with construction and decommissioning, the effect of operational sound and vibration on the users of PROWs is not considered within current planning guidance. However, a discussion of the potential operational effects is provided in each of the relevant sections below.

## 11.4 Assessment Assumptions and Limitations

### Construction and Decommissioning

- 11.4.1 A qualitative construction and decommissioning sound assessment has been undertaken. Due to the generic nature of the impacts, the well-known and well-tested mitigation measures that may be applied and the lack of detail as to the exact timing of construction activities at this stage in the potential development of the Site, specific predicted construction sound and vibration levels have not been provided here. However, this aspect will be kept under review as the design of the Proposed Development progresses.

11.4.2 Further details can be found in the other sections of this Chapter.

### Operation

11.4.3 The operational sound assessment has been undertaken on a basis that is considered realistic-to-conservative as detailed within the **Assessment Methodology** and **Baseline Conditions** sections of this Chapter. The subsequent results provided within the **Assessment of Likely Significant Effects, Residual Effects** and **Cumulative and In-Combination Effects** sections of this Chapter can be considered to provide a suitable basis for decision making as a result.

## 11.5 Stakeholder Engagement

11.5.1 A Scoping Report<sup>23</sup> for the Proposed Development was submitted to the Planning Inspectorate (PINS) in April 2024 (**see Appendix 1.1**). This provides details as to the general proposed assessment approach to operational and construction sound and vibration resulting from the introduction of the site, as presented here, amongst the proposed approach to the assessment of many other topics/disciplines considered.

11.5.2 The EIA Scoping Report provided details as to the extent of assessment provided within this Chapter and no direct response was received as to the suitability of the proposals in the Scoping Opinion. However, PINS requested that sound and vibration impacts were considered in relation to receptors associated with landscape and visual impacts, cultural heritage assets and potential ecological receptors via the cross-referencing of relevant Chapters, depending on the discipline, where considered appropriate and on a basis to be agreed with certain consultees (PINS Response ID 3.6.2).

11.5.3 A summary of further points raised in the Scoping Opinion are provided in **Table 11.6**.

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<sup>23</sup> RES/Pegasus Group (April 2024) DT I P22-1144 - Steeple Renewables Project - Environmental Impact Assessment Scoping Report - Land at Sturton le Steeple, Nottinghamshire

*Table 11.6: EIA Scoping Responses and Actions Taken*

<b>PINS Response ID</b>	<b>Key Points Discussed</b>	<b>Action Taken / Response</b>
3.6.3	The study area is defined, with a plan of relevant sensitive receptors provided and that these are also agreed with relevant consultees.	A plan of the relevant sensitive receptors for assessment for the operation and construction of the Proposed Development was provided with the Scoping Report and an updated version (reflecting the up-to-date Draft Order Limits) is provided in <b>Figure 11.1.</b>
3.6.4	Sound from operational and construction traffic is considered in combination with the sound resulting from the equipment to be installed as ancillary to the Proposed Development.	Traffic and industrial noise sources are very different in character and separate assessment processes apply due to the general stable and consistent levels of sound generated by industrial equipment and the sporadic nature of sound generated by vehicle movements. As a result, it is not considered appropriate or necessary to provide an assessment of the in-combination overall levels. However, reference is made to the expected generation of traffic in relation to construction and operation detailed within <b>Chapter 13: Transport &amp; Access</b> and the expected relevant/relative impacts as a result.
3.6.5	The impact of noise and vibration during construction on ecology should be considered.	The sound and vibration generated by construction in relation to ecological receptors can generally be considered secondary to the far more direct impacts from these activities such that, if the direct impacts can be timed and/or controlled appropriately, sound and vibration impacts would also be mitigated sufficiently to result in impacts that are considered not significant. <b>Chapter 7: Ecology &amp; Biodiversity</b> indicates that there are no species at the Site that would be considered particularly sensitive to sound and vibration generated by the introduction and operation of the Proposed Development.
3.6.5	Potential sources of operational vibration from the introduction of the	There is no evidence to suggest that the ancillary equipment to be installed as part of the Proposed Development (including the proposed BESS and

PINS Response ID	Key Points Discussed	Action Taken / Response
	substation and battery storage aspects of the Proposed Development should be considered.	transformers forming the substation) would generate any substantial/perceptible ground-borne vibration close to each piece of equipment, certainly not at residential distances, and this aspect is not considered further as a result.
3.7.2	The potential for higher sound levels from the equipment to be installed as part of the Proposed Development is considered due to the potential for increased cooling requirements as a result of increased temperatures associated with climate change.	Despite the upward trend in temperatures in the UK and globally as a result of climate change, it is not expected that these increases would be so substantial as to significantly affect equipment cooling requirements and the corresponding sound output of the equipment to be installed at the Proposed Development. Temperatures in the UK will remain relatively mild and indicative manufacturers data indicates that normal operational modes for a wide range of ambient temperatures would still apply in practice.

11.5.4 The further specifics of the assessment have been agreed with a representative of Bassetlaw District Council (BDC) via the provision of a letter broadly outlining the assessment approach taken here and with some subsequent minor clarifications.

## 11.6 Baseline Conditions

11.6.1 The existing environment at the majority of properties neighbouring the Proposed Development is expected to be typical of a relatively rural area and to consist of sound generated by vehicle movements along the local and more distant wider road network, birds and wildlife, farm machinery, localised human activities and aircraft overhead with some industrial sound from existing industry located to the north of the proposals.

11.6.2 Existing sources of vibration are expected to primarily emanate from traffic movements in the area, from Heavy Goods Vehicles (HGVs) in particular. Some existing vibration may also result from the very occasional tremor and as a result of demolition works at the West Burton Power Plant, potentially when using explosives to remove the existing infrastructure.

11.6.3 A representative selection of properties, which surround and are located closest to the Proposed Development are shown in **Figure 11.1** and listed out in **Table 11.7**. The locations of relevant PROWs are also shown in **Figure 11.1**.

*Table 11.7 – Residential Assessment Locations*

ID	Name	Co-Ordinates (OSGB)	
		Easting	Northing
H1	Sturton High House	475790	383281
H2	Clarborough Grange	474900	383834
H3	Whinleys House Farm	475035	382889
H4	Caddow Wood Farm	477078	381990
H5	Caddow Farm	475960	381679
H6	North Leverton Windmill	477508	382012
H7	Mill Close	478096	382171
H8	Manor Grove	478274	382195
H9	Sturton Road Farm	478488	382328
H10	Dwelling	478593	382437
H11	Dwelling	478552	382610
H12	Dwelling	478677	382616
H13	Leverton Road (Dwelling)	478590	382946
H14	Northside Lane	479336	382319
H15	Northfield Road	479637	382287
H16	Field House Farm	480265	382277
H17	Toll Bar Cottage	481479	383068
H18	Littleborough	482280	382540
H19	Fingle Street	478853	382337
H20	Fenton Lane	479438	383013
H21	Three Leys Lane	479291	383023
H22	30 Leverton Road	478725	383635
H23	Springs Lane	478466	383850
H24	Low Holland Lane	479333	383955

ID	Name	Co-Ordinates (OSGB)	
		Easting	Northing
H25	Manor Farm	479119	383981
H26	West End Farm	478242	384042
H27	Caddow View	478544	384332
H28	4 Brickings Way	478761	384044
H29	North Street	479008	384514
H30	Watkins Lane	478618	384650
H31	Gainsborough Road	478495	384717
H32	Station Road (Dwelling)	478271	384527
H33	Station Road (Dwelling)	478324	384596
H34	St Ives	478670	385073
H35	Woodland Farm	477892	384665
H36	Dwelling	478220	384857
H37	Dwelling	478140	384805
H38	Dwelling	477865	384813
H39	Dwelling	477801	384825
H40	Dwelling	477512	384984
H41	Dwelling	476762	385353
H42	Wheatley Road (Dwelling)	477098	385234
H43	South Wheatley	476753	385447
H44	Dwelling	476570	385427
H45	Mudsplit Lane	476285	385405

11.6.4 All residential assessment locations are considered to have a high sensitivity, as defined in the **Assessment Methodology** section.

11.6.5 The background sound levels for a variety of residences neighbouring the Proposed Development have been taken from publicly available information<sup>24</sup> relating to the

<sup>24</sup> AECOM Limited (December 2022) Document Ref: PA-005 - West Burton C Battery Energy Storage System - Land to the north of the West Burton B Power Station, Nottinghamshire - Operational Noise Assessment



neighbouring West Burton C 500 MW Battery Energy Storage System development (Planning Reference. 22/01713/FUL) and applied to relevant dwellings located closest to the Proposed Development. This information is considered suitable for use here due to its acceptance in regard of the assessment of other schemes in the area and the confirmation that the levels remain consistent with information supporting previous planning applications in the area, as discussed within the reporting. Nevertheless, the levels may be supplemented by further survey information, where deemed necessary, and in consultation with the Environmental Health Officer (EHO) dealing with the Proposed Development, representing BDC.

11.6.6 **Table 11.8** shows the determined background and ambient sound levels at each of the measurement locations, as marked in **Figure 11.1**.

*Table 11.8 – Existing Background & Ambient Sound Levels*

ID	Co-Ordinates (OSGB)		Background Sound Level, dB L <sub>A90</sub>		Ambient Sound Level, dB L <sub>Aeq</sub>	
	Easting	Northing	Day	Night	Day	Night
L1	478870	384505	31	26	50	46
L2	478603	385406	34	33	55	51
L3	478791	386454	37	34	50	43
L4	479505	387048	37	34	49	45
L5	482143	387850	36	29	49	41
L6	482491	387018	35	29	49	43
L7	482924	384669	36	24	50	42

11.6.7 The levels from L1 & L2 have been used to represent the properties located to the north of the Proposed Development (i.e. H34 – St Ives and the H29, H30 & H31 dwellings located on North Street, Watkins Road and Gainsborough Road respectively) as both these survey locations are in close proximity to these residences.

11.6.8 A 31 dB L<sub>A90</sub> daytime and 24 dB L<sub>A90</sub> night-time background sound level with a 49 dB L<sub>Aeq</sub> daytime and 41 dB L<sub>Aeq</sub> night-time ambient sound level has been used to represent the remainder of the assessment locations. These levels are representative of the lowest measured at all the survey positions and therefore

represent an approach that can be considered conservative in the absence of any further information on which to base the preliminary assessment presented here.

## **11.7 Assessment of Likely Significant Effects**

### **Construction and Decommissioning**

- 11.7.1 The main activities which have the potential to generate sound and vibration during construction and decommissioning are the formation or removal of the access tracks; piling/removal of the solar panel frame supports; construction/break-up of hard-standings; Horizontal Directional Drilling (HDD), cable trenching and landscaping (including the removal and reinstatement of the land) when occurring in proximity to neighbouring residences; the subsequent construction of the battery storage and any ancillary solar equipment; installation of transmission connection; and, the installation of any necessary ecological and landscape mitigation measures. However, the majority of works will be undertaken at substantial distances (> 200 m) from neighbouring properties and corresponding levels of sound and vibration generated would be unlikely to breach normal limiting requirements during standard working hours. A similar rationale can be applied to the decommissioning of the Proposed Development and effects pertaining to both construction and decommissioning activities can be considered to be non-significant as a result.
- 11.7.2 Other activities will either occur at distances which are very unlikely to result in levels that would breach typical construction sound limits or involve relatively light construction methods/techniques that would equally result in the generation of comparably low temporary levels of sound and vibration.
- 11.7.3 Additional traffic movements generated during the construction phase, along existing local roads and access tracks, also have the potential to have sporadic sound and vibration impacts at residences adjacent to these. However, this only tends to result in a relatively minor increase over the existing average sound levels from pre-existing roads, with the most noticeable sound and perceptible vibration effects resulting from the sporadic and increased number of HGVs passing by residences along the access routes, with resulting levels for individual events being similar to that created by existing HGV movements. In the case of the use of the introduced access tracks, overall levels are highly unlikely to breach typical construction sound limits.

- 11.7.4 **Chapter 13: Transport & Access** provides details as to the expected number of vehicle movements expected along local roads during the construction of the Proposed Development and a review of the traffic volumes indicates that these would not increase by more than ~30 % during the most intensive period(s) of the construction phase. This increase corresponds to a very minimal difference in sound due to traffic of a maximum of around one decibel (dB) and a detailed assessment of this aspect is not considered to be required as this will have a negligible effect on the outcomes of the construction/decommissioning assessments.
- 11.7.5 Where relatively intense construction activities are to be undertaken near neighbouring residences, particularly during the construction of the Site access routes, HDD works, piling and trenching, specific attention to potential for enhanced mitigation measures to reduce the level of sound and vibration from these activities will be considered, in instances such as the reserve site access corridor next to the west of North Leverton (see **Figures 2.1** and **2.2**).
- 11.7.6 Overall, it is expected that the maximum potential impacts due to the construction of the Proposed Development, without typical mitigation measures in potentially sensitive areas (for example, a selection of those listed in the **Mitigation and Enhancement** section), may temporarily exceed typical planning requirements and could be considered to have a medium impact with the corresponding significance of effects being major/moderate (see **Table 11.4**) and therefore significant.
- 11.7.7 Occasional temporary sound and vibration generated during the construction phase may well be perceptible to users of the PROWs passing through and surrounding the Site and could be considered medium with a corresponding significance of effects being major/moderate and therefore significant without typical/standard mitigation measures in place.

### Operation

- 11.7.8 The predicted daytime and night-time specific and corresponding sound rating levels (i.e. including a 2 dB penalty for tones) at the properties located nearest to the Proposed Development are shown in **Table 11.9**. The rating level is compared to the adopted background levels for daytime and night-time periods to provide the associated impact at each residential location.
- 11.7.9 The background levels, as taken from the assessment provided in support of the West Burton C BESS Development, have been used to represent each residential

location referenced herein and is considered to provide a conservative basis of assessment (see the **Baseline Conditions** section).

*Table 11.9 – BS 4142 Assessment*

House ID	Specific Level, dB L <sub>Aeq</sub>	Rating Level, dB L <sub>Ar</sub>	Background Level, dB L <sub>A90</sub>	L <sub>Ar</sub> – L <sub>A90</sub> , dB	Potential Impact
<b>Daytime</b>					
H1	13	15	31	-16	Negligible
H2	7	9	31	-22	Negligible
H3	8	10	31	-21	Negligible
H4	15	17	31	-14	Negligible
H5	9	11	31	-20	Negligible
H6	17	19	31	-12	Negligible
H7	20	22	31	-9	Low
H8	19	21	31	-10	Negligible
H9	18	20	31	-11	Negligible
H10	18	20	31	-11	Negligible
H11	20	22	31	-9	Low
H12	19	21	31	-10	Negligible
H13	22	24	31	-7	Low
H14	18	20	31	-11	Negligible
H15	19	21	31	-10	Negligible
H16	18	20	31	-11	Negligible
H17	22	24	31	-7	Low
H18	16	18	31	-13	Negligible
H19	16	18	31	-13	Negligible
H20	25	27	31	-4	Low
H21	23	25	31	-6	Low
H22	20	22	31	-9	Low
H23	21	23	31	-8	Low

House ID	Specific Level, dB L <sub>Aeq</sub>	Rating Level, dB L <sub>Ar</sub>	Background Level, dB L <sub>A90</sub>	L <sub>Ar</sub> - L <sub>A90</sub> , dB	Potential Impact
H24	24	26	31	-5	Low
H25	23	25	31	-6	Low
H26	22	24	31	-7	Low
H27	23	25	31	-6	Low
H28	22	24	31	-7	Low
H29	29	31	31	0	Low
H30	28	30	31	-1	Low
H31	26	28	31	-3	Low
H32	24	26	31	-5	Low
H33	24	26	31	-5	Low
H34	30	32	34	-2	Low
H35	23	25	31	-6	Low
H36	23	25	31	-6	Low
H37	23	25	31	-6	Low
H38	22	24	31	-7	Low
H39	22	24	31	-7	Low
H40	21	23	31	-8	Low
H41	16	18	31	-13	Negligible
H42	22	24	31	-7	Low
H43	15	17	31	-14	Negligible
H44	14	16	31	-15	Negligible
H45	12	14	31	-17	Negligible
<b>Night-time</b>					
H1	9	11	24	-13	Negligible
H2	4	6	24	-18	Negligible
H3	5	7	24	-17	Negligible
H4	11	13	24	-11	Negligible

House ID	Specific Level, dB L <sub>Aeq</sub>	Rating Level, dB L <sub>Ar</sub>	Background Level, dB L <sub>A90</sub>	L <sub>Ar</sub> - L <sub>A90</sub> , dB	Potential Impact
H5	5	7	24	-17	Negligible
H6	12	14	24	-10	Negligible
H7	14	16	24	-8	Low
H8	13	15	24	-9	Low
H9	13	15	24	-9	Low
H10	13	15	24	-9	Low
H11	15	17	24	-7	Low
H12	14	16	24	-8	Low
H13	17	19	24	-5	Low
H14	13	15	24	-9	Low
H15	13	15	24	-9	Low
H16	13	15	24	-9	Low
H17	16	18	24	-6	Low
H18	10	12	24	-12	Negligible
H19	12	14	24	-10	Negligible
H20	19	21	24	-3	Low
H21	17	19	24	-5	Low
H22	18	20	24	-4	Low
H23	19	21	24	-3	Low
H24	21	23	24	-1	Low
H25	21	23	24	-1	Low
H26	19	21	24	-3	Low
H27	23	25	24	1	Low
H28	21	23	24	-1	Low
H29	29	31	26	5	Low
H30	27	29	26	3	Low
H31	26	28	26	2	Low

House ID	Specific Level, dB L <sub>Aeq</sub>	Rating Level, dB L <sub>Ar</sub>	Background Level, dB L <sub>A90</sub>	L <sub>Ar</sub> - L <sub>A90</sub> , dB	Potential Impact
H32	22	24	24	0	Low
H33	23	25	24	1	Low
H34	30	32	33	-1	Low
H35	20	22	24	-2	Low
H36	22	24	24	0	Low
H37	21	23	24	-1	Low
H38	19	21	24	-3	Low
H39	19	21	24	-3	Low
H40	17	19	24	-5	Low
H41	13	15	24	-9	Low
H42	17	19	24	-5	Low
H43	12	14	24	-10	Negligible
H44	11	13	24	-11	Negligible
H45	10	12	24	-12	Negligible

- 11.7.10 The assessment indicates that the predicted magnitude of impacts from the Proposed Development at the nearest neighbouring residences are negligible-to-low for both daytime and night-time periods. Furthermore, the predicted sound levels are below 35 dB L<sub>Ar</sub>, the point at which the magnitude of impacts are considered to be low regardless of the background noise level considered.
- 11.7.11 Further to the above, the introduction of the Proposed Development is not predicted to make any appreciable difference to the existing levels of ambient sound in the area (i.e. an increase of 1 dB or less) during operation and the generalised levels to minimise health effects, as set out within WHO guidance and which BS 8233 also references, would not be exceeded (see the **Legislation and Planning Policy** section) unless existing levels are already at or above the suggested thresholds.

11.7.12 The Significance of Effects Matrix provided in **Table 11.4** identifies the maximum assessed levels at residential locations as minor/moderate and therefore not significant. Furthermore, the sound emitted by the Proposed Development can also be considered ‘present and not intrusive’ in terms of government policy and guidance provided within the NPSE (see the **Legislation and Planning Policy** section). This corresponds to the ‘No Observed Effect Level’ (NOEL) and no specific action is therefore required to further mitigate operational sound associated with the introduction of the Proposed Development.

11.7.13 The effects arising from the Proposed Development, upon users of the various PROWs during the operational phase, will be entirely subjective. However, an indication of the expected varying levels of operational sound generated by the Proposed Development on the PROWs crossing and near to the Site will be shown in the subsequent ES supporting the application for development consent. The operational noise generated by the Proposed Development will be at a level for which it would be easy to hold a conversation, even when positioned directly adjacent to any electrical equipment installed as ancillary to the panels comprising the Proposed Development. Furthermore, there is no evidence these typical acoustic levels of onsite operational sound would result in any potential health impacts. The resultant effects can be described as minor/moderate and the overall impact is therefore considered not significant.

## 11.8 Mitigation and Enhancement

### Construction and Decommissioning

11.8.1 For all activities, measures will be taken to reduce sound levels with due regard to practicality and cost as per the concept of ‘best practicable means’ as defined for example in Section 72 of the CoPA, which BS 5228-1 makes reference to. The BS 5228 standards state that community relations are important in minimising the likelihood of complaints and therefore liaison with the local authority and members of the public will take place to ensure that residents are informed of the intended activities.

11.8.2 Activities that have the potential to generate the highest levels of sound and vibration will occur during normal working hours (07:00 - 19:00 weekdays and Saturdays 07:00 – 13:00) with less intensive activities potentially occurring outside these hours depending on the location and sensitivity of the works.



11.8.3 The following construction sound and vibration mitigation measures will be implemented where appropriate and proportionate, facilitated via the CEMP:

- Consideration shall be given to sound and vibration emissions when selecting or modifying the plant and equipment to be used on the Site, with quieter variants given preference;
- All plant and equipment will be used in accordance with manufacturers' instructions, maintained in good working order and fitted with the appropriate silencers, mufflers or acoustic covers where applicable;
- Where sound generated from a specific activity is expected to be directional, steps will be taken to orientate the equipment such that sound is directed away from any sensitive areas;
- Stationary sound sources shall be sited as far away as reasonably possible from residential properties and consideration given as to whether it is necessary to install acoustic barriers to provide screening;
- The movement of vehicles to and from the Site shall be controlled and employees instructed to ensure compliance with the sound control measures adopted;
- Reducing the number of construction activities occurring simultaneously;
- The re-routing and/or temporary closure of relevant PROWs;
- Restricting activities being performed within a certain distance of sensitive locations; and,
- Minimising the level of construction traffic associated with the Proposed Development.

### **Operation**

11.8.4 The Proposed Development is being designed on an iterative basis with a view to minimising, as far as practicably possible, the projected operational sound levels with due regard to the relative sensitivity of neighbouring premises, PROWs and all other site constraints.

11.8.5 Furthermore, it is assumed that an acoustic barrier has been included in the design of the BESS aspect of the Proposed Development, with the intention of minimising operational sound as far as reasonably practicable.

- 11.8.6 The **Assessment of Likely Significant Effects** section for operational sound indicates that predicted sound levels resulting from the introduction of the Proposed Development are negligible-to-low during both daytime and night-time periods, meeting the typical requirements of BS 4142 and other relevant planning policy and no specific mitigation is required to further reduce operational noise levels as a result. However, further mitigation measures may be incorporated into the Proposed Development at the detailed design stage depending on the specific equipment/plant to be installed in order to ensure that any potential operational sound impacts remain low.

## 11.9 Residual Effects

### Construction and Decommissioning

- 11.9.1 Noise and vibration during the construction of the Proposed Development may well be audible and/or perceptible to people residing in the area and the users of PROWs, but the levels would be below established noise limits and planning requirements in this respect due to the large distances between the Proposed Development and the surrounding dwellings and the low sensitivity of PROW users considered here. Where construction noise relating to the provision of access to the Site, including the upgrade of local roads and their use thereof, is expected to occur in close proximity to residences, enhanced mitigation measures, such as those set out in the **Mitigation and Enhancement** section, would be adopted to reduce noise and vibration where necessary. The expected maximum sound and vibration levels due to the construction of the Proposed Development, with the application of appropriate and applicable mitigation measures in potentially sensitive areas, will not exceed typical planning requirements and can be considered to have a low impact with the corresponding significance of effects being minor/moderate (see **Table 11.4**) and therefore not significant.

### Operation

- 11.9.2 The operational assessment demonstrates that predicted noise levels from the Proposed Development at residential properties and PROW users would be low and the sound emitted by the Proposed Development can also be considered 'present and not intrusive' in terms of Government policy and guidance provided within the NPSE (see the **Legislation and Planning Policy** section). This corresponds to the 'No Observed Effect Level' (NOEL) and no specific action is therefore required to

further mitigate operational sound associated with the introduction of the Proposed Development. Therefore, no significant impacts with respect to the operational phase are expected.

## 11.10 Cumulative and In-Combination Effects

### Construction and Decommissioning

11.10.1 The construction and/or decommissioning of other developments in the area, including the decommissioning of the West Burton Power Station, is unlikely to result in any substantial cumulative impacts when considered to be occurring at the same time as the construction of the Proposed Development and standard controls on construction sound and vibration will likely apply in any case. As a result, it is considered that this aspect is not required to be considered in any specific detail, with the expected maximum resultant impacts expected to be low and significance of effect being considered minor/moderate, similarly to the isolative assessment, and therefore not significant.

11.10.2 In-combination effects such as sound (including vibration) and visual impacts during the construction of the Proposed Development, at local residences and on users of PROWs, are not expected to be greater than that provided for each individual technical aspect considered in isolation. Where the highest and most direct effects on visual amenity are predicted, noise and vibration effects would typically be expected to be similar or lower depending on the situation and an increase in the overall magnitude of effects would not be expected.

### Operation

11.10.3 A further assessment has been undertaken to establish the overall impact of the Proposed Development operating at the same time as other neighbouring development of a similar industrial nature (i.e. cumulatively or in-combination). The sound levels from the neighbouring consented Wood Lane Solar Farm and West Burton C BESS facility have been established by incorporating those sites into the prediction model (see the **Assessment Methodology** section).

11.10.4 The predicted specific sound levels from each of those sites have been added logarithmically, an overall 2 dB penalty has been applied and the overall rating level is compared with the adopted background sound levels in the same manner as for the isolative assessment.

11.10.5 **Table 11.10** shows the assessment of the combined impact from the Proposed Development, the neighbouring consented Wood Lane Solar Farm and the West Burton C BESS facility.

*Table 11.10 – Cumulative BS 4142 Assessment*

House ID	Specific Level, dB L <sub>Aeq</sub>	Rating Level, dB L <sub>Ar</sub>	Background Level, dB L <sub>A90</sub>	L <sub>Ar</sub> - L <sub>A90</sub> , dB	Potential Impact
<b>Daytime</b>					
H1	19	21	31	-10	Negligible
H2	15	17	31	-14	Negligible
H3	14	16	31	-15	Negligible
H4	17	19	31	-12	Negligible
H5	12	14	31	-17	Negligible
H6	19	21	31	-10	Negligible
H7	21	23	31	-8	Low
H8	20	22	31	-9	Low
H9	20	22	31	-9	Low
H10	20	22	31	-9	Low
H11	22	24	31	-7	Low
H12	20	22	31	-9	Low
H13	23	25	31	-6	Low
H14	20	22	31	-9	Low
H15	20	22	31	-9	Low
H16	20	22	31	-9	Low
H17	23	25	31	-6	Low
H18	18	20	31	-11	Negligible
H19	18	20	31	-11	Negligible
H20	26	28	31	-3	Low
H21	24	26	31	-5	Low
H22	23	25	31	-6	Low

House ID	Specific Level, dB L <sub>Aeq</sub>	Rating Level, dB L <sub>Ar</sub>	Background Level, dB L <sub>A90</sub>	L <sub>Ar</sub> - L <sub>A90</sub> , dB	Potential Impact
H23	23	25	31	-6	Low
H24	26	28	31	-3	Low
H25	25	27	31	-4	Low
H26	23	25	31	-6	Low
H27	25	27	31	-4	Low
H28	24	26	31	-5	Low
H29	30	32	31	1	Low
H30	29	31	31	0	Low
H31	28	30	31	-1	Low
H32	26	28	31	-3	Low
H33	26	28	31	-3	Low
H34	31	33	34	-1	Low
H35	25	27	31	-4	Low
H36	25	27	31	-4	Low
H37	25	27	31	-4	Low
H38	24	26	31	-5	Low
H39	24	26	31	-5	Low
H40	24	26	31	-5	Low
H41	21	23	31	-8	Low
H42	25	27	31	-4	Low
H43	21	23	31	-8	Low
H44	20	22	31	-9	Low
H45	19	21	31	-10	Negligible
<b>Night-time</b>					
H1	13	15	24	-9	Low
H2	10	12	24	-12	Negligible
H3	9	11	24	-13	Negligible

House ID	Specific Level, dB L <sub>Aeq</sub>	Rating Level, dB L <sub>Ar</sub>	Background Level, dB L <sub>A90</sub>	L <sub>Ar</sub> - L <sub>A90</sub> , dB	Potential Impact
H4	14	16	24	-8	Low
H5	9	11	24	-13	Negligible
H6	15	17	24	-7	Low
H7	16	18	24	-6	Low
H8	16	18	24	-6	Low
H9	16	18	24	-6	Low
H10	16	18	24	-6	Low
H11	18	20	24	-4	Low
H12	17	19	24	-5	Low
H13	19	21	24	-3	Low
H14	17	19	24	-5	Low
H15	17	19	24	-5	Low
H16	17	19	24	-5	Low
H17	19	21	24	-3	Low
H18	15	17	24	-7	Low
H19	16	18	24	-6	Low
H20	21	23	24	-1	Low
H21	20	22	24	-2	Low
H22	21	23	24	-1	Low
H23	22	24	24	0	Low
H24	24	26	24	2	Low
H25	24	26	24	2	Low
H26	21	23	24	-1	Low
H27	24	26	24	2	Low
H28	24	26	24	2	Low
H29	30	32	26	6	Low
H30	28	30	26	4	Low

House ID	Specific Level, dB L <sub>Aeq</sub>	Rating Level, dB L <sub>Ar</sub>	Background Level, dB L <sub>A90</sub>	L <sub>Ar</sub> - L <sub>A90</sub> , dB	Potential Impact
H31	27	29	24	5	Low
H32	24	26	24	2	Low
H33	25	27	24	3	Low
H34	31	33	33	0	Low
H35	22	24	24	0	Low
H36	24	26	24	2	Low
H37	23	25	24	1	Low
H38	22	24	24	0	Low
H39	21	23	24	-1	Low
H40	20	22	24	-2	Low
H41	18	20	24	-4	Low
H42	20	22	24	-2	Low
H43	18	20	24	-4	Low
H44	17	19	24	-5	Low
H45	15	17	24	-7	Low

11.10.6 The cumulative assessment indicates that the predicted magnitude of impacts at the nearest neighbouring residences are, similarly to the isolative assessment, negligible-to-low for both daytime and night-time periods with overall sound levels being lower than the point at which the magnitude of impacts are considered low regardless (i.e. 35 dB L<sub>Ar</sub>).

11.10.7 The operation of the Proposed Development at the same time as the other schemes considered for the cumulative assessment is not predicted to make any appreciable difference to the existing levels ambient of ambient sound in the area (i.e. an increase less than 1 dB). These levels would not be above the generalised limits to minimise health effects specified within WHO guidance which BS 8233 also references (see the **Legislation and Planning Policy** section) unless existing levels are already at or above the suggested thresholds, in which case the contribution from the Proposed Development could be considered negligible.

- 11.10.8 The Significance of Effects Matrix provided in **Table 11.4** identifies the maximum cumulative sound levels at residential locations as minor/moderate and therefore not significant. Furthermore, the sound emitted by the Proposed Development can also be considered ‘present and not intrusive’ in terms of Government policy and guidance provided within the NPSE (see the **Legislation and Planning Policy** section). This corresponds to the ‘No Observed Effect Level’ (NOEL) and no specific action is therefore required to further mitigate operational sound associated with the introduction of the site.
- 11.10.9 The combined operational impact of the Proposed Development and other cumulative schemes on the users of PROWs is not expected to result in any material change to that considered for the isolative assessment and this aspect is therefore considered not significant.
- 11.10.10 In-combination effects due to noise/vibration and visual impacts during the operation of the Proposed Development are, similarly to construction effects, not expected to be greater than that provided for each individual technical aspect considered in isolation. Where the highest and most direct visual effects are predicted, noise and vibration effects would typically be expected to be similar or lower in overall effect depending on the specific situation.

## **11.11 Summary**

- 11.11.1 An operational and construction assessment of the Proposed Development relating to sound and vibration resulting from introduction of the Proposed Development on nearby residential properties has been undertaken in accordance with BS 4142:2014 + A1:2019 ‘Methods for Rating and Assessing Industrial and Commercial Sound’ and BS 5228 ‘Code of Practice for Noise and Vibration Control on Construction and Open Sites’ respectively, as recommended for use by relevant planning policy, or as typically applied in practice.
- 11.11.2 Relevant assessment criteria for the associated impacts and significance of effects associated with the introduction of the Proposed Development have been derived with reference to the above documents and an assessment for the relevant isolative and cumulative scenarios has been provided. The predicted operational impacts and effects have been determined using an appropriate recommended prediction methodology and construction impacts have been assessed and discussed in relation to relevant applicable sound and vibration limits.



- 11.11.3 Baseline conditions have been taken from information in the public domain which relates to a neighbouring development, for which the derived levels have been shown to be representative, especially for receptors considered most sensitive to sound and vibration from the introduction of the Proposed Development.
- 11.11.4 The impact of the predicted sound levels associated with operation of the Proposed Development at residences and PROWs, in isolation and cumulatively, can be considered low as compared with the existing background noise levels and/or low in respect of the absolute level and the associated significance of effect can be considered to be minor/moderate. Furthermore, the operational impacts can be considered ‘present and not intrusive’ in terms of government policy and guidance provided within the NPSE, which corresponds to the ‘No Observed Effect Level’ (NOEL) and no specific action is therefore required to further mitigate operational sound associated with the introduction of the site. Therefore, overall operational impacts are considered not significant.
- 11.11.5 Construction and decommissioning sound and vibration from the introduction and removal of the Proposed Development could be significant in the absence of standard mitigation measures which would incorporate the adoption of a CEMP and the use of ‘best practicable means’ to reduce and mitigate construction noise and vibration levels as far as reasonably possible. However, provided that the appropriate mitigation measures are adopted as a matter of due course and that particular attention is paid to potentially sensitive locations, levels are unlikely to exceed typical limiting noise criteria at nearby properties. This aspect is therefore considered to consequently have a low overall impact, with the corresponding significance of effect being minor/moderate. Therefore, construction and decommissioning impacts are also considered not significant.
- 11.11.6 Similarly to the above, the effects of operational, construction and decommissioning noise on PROW users is considered to be not significant with all relevant mitigation measures being applied.
- 11.11.7 In-combination effects at local residences and on users of PROWs due to noise/vibration and visual impacts during the construction/decommissioning and operation of the Proposed Development are not expected to be greater than that provided for each individual technical topic considered in isolation. Where the highest and most direct effects on visual amenity are predicted, noise and vibration

effects would typically be expected to be proportional or lower in effect level depending on the situation and the overall magnitude of effects is not expected to increase as a result.

Table 11.11 - Summary and Residual Effects

Receptor/ Receiving Environment	Description of Effect	Nature of Effect	Sensitivity Value	Magnitude of Effect	Geographical Importance	Significance of Effects	Mitigation/ Enhancement Measures	Residual Effects
<b>Construction</b>								
Residences	Sound & Vibration	Temporary	High	Low	Local	Major/Moderate Adverse	Best practicable means, enhanced mitigation where necessary and via a CEMP.	Minor/Moderate Adverse
PROWs	Sound & Vibration	Temporary	Low	Low	Local	Major/Moderate Adverse		Minor/Moderate Adverse
<b>Operation</b>								
Residences	Sound & Vibration	Permanent	High	Low	Local	Minor/Moderate Adverse	Embedded in site design.	Minor/Moderate Adverse
PROWs	Sound & Vibration	Permanent	Low	Low	Local	Minor/Moderate Adverse		Minor/Moderate Adverse
<b>Cumulative and In Combination Construction</b>								
Residences	Sound & Vibration	Temporary	High	Low	Local	Minor/Moderate Adverse	Best practicable	Minor/Moderate Adverse

Receptor/ Receiving Environment	Description of Effect	Nature of Effect	Sensitivity Value	Magnitude of Effect	Geographical Importance	Significance of Effects	Mitigation/ Enhancement Measures	Residual Effects
PROWs	Sound & Vibration	Temporary	Low	Low	Local	Minor/Moderate Adverse	means, enhanced mitigation where necessary and via a CEMP.	Minor/Moderate Adverse
<b>Cumulative and In Combination Operation</b>								
Residences	Sound & Vibration	Permanent	High	Low	Local	Minor/Moderate Adverse	Embedded in site design.	Minor/Moderate Adverse
PROWs	Sound & Vibration	Permanent	Low	Low	Local	Minor/Moderate Adverse		Minor/Moderate Adverse