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# Chapter 12: Noise and Vibration

Department: ERM
Project: Bowshiel Solar Farm and BESS
Document Code: 0733784

May 2025

# INDEX

# 12 NOISE AND VIBRATION

## 12.1 Introduction

12.1.1.1 This Chapter of the Environmental Impact Assessment (EIA) Report (EIAR) assesses the effects of the Proposed Development with respect to noise and vibration.

12.1.1.2 This Chapter will cover both the (short-term) effects during the construction phase and the (long-term) effects during the operational phase. Due to similar nature of the activities during construction and decommissioning, the impact during the decommissioning phase is expected to be comparable to, and not exceed, that of the construction phase. Therefore, a separate assessment of decommissioning is not included.

12.1.1.3 The Chapter provides: the policy context; scoping responses; consultation feedback; the assessment methodology and criteria; the baseline conditions currently existing at the Proposed Development site and in the surrounding area; an assessment of the likely significant effects of the Proposed Development both on its own and in combination (cumulative effects) from nearby developments, with respect to noise and vibration; the mitigation measures that the Applicant is committed to implementing; and an assessment of the residual likely significant effects of the Proposed Development with these measures adopted.

12.1.1.4 This Chapter of the EIA Report is supported by the following figures provided in Volume 2 EIAR Figures:

- **Figure 12.1**: Background Noise Survey and Assessment Locations;
- **Figure 12.2**: Unmitigated Operational Noise Modelling (Day and Night); and
- **Figure 12.3:** Mitigated Operational Noise Modelling (Day and Night).

12.1.1.5 This Chapter of the EIA Report is supported by the following Technical Appendix documents provided in Volume 3 Technical Appendices:

- **Technical Appendix 12.1:** Background Noise Survey; and
- **Technical Appendix 12.2:** Construction and Operational Noise Modelling Inputs.

## 12.2 Legislation, Policy, Guidance and Standards

12.2.1.1 The noise and vibration assessment will be carried out within the context of relevant government policy and guidance in Scotland. The assessment will consider the key legislation, planning policy, guidance and standards relevant to the Proposed Development.

### 12.2.2 Legislation

12.2.2.1 The following legislation is relevant to the Proposed Development:

- The Control of Pollution Act 1974 (CoPA 1974); and
- The Environmental Protection Act 1990 (EPA 1990).

### The Control of Pollution Act 1974

12.2.2.2 CoPA 1974 provides Local Authorities with powers to control noise and vibration from construction sites.

12.2.2.3 Section 60 of CoPA 1974 enables a Local Authority to serve a notice to persons carrying out construction work of its requirements for the control of site noise. This may specify plant or machinery that is or is not to be used; the hours during which construction work may be carried out; the level of noise or vibration that may be emitted; and provide for changes in circumstances.

12.2.2.4 Section 61 of CoPA 1974 allows for those carrying out construction work to apply to the Local Authority in advance for consent to carry out the works. This is not mandatory, but once consent is issued it provides a defence against action by the Local Authority under Section 60 of CoPA 1974 or Section 80 of the EPA 1990. The application includes detail of the works to be carried out, the methods to be used and the measures that will be taken to minimise noise and vibration.

12.2.2.5 Section 72 of CoPA defines Best Practicable Means:

- This section shall apply for the construction of references in this Part of this Act to best practicable means.
- In that expression “practicable” means reasonably practicable having regard among other things to local conditions and circumstances, to the current state of technical knowledge and to the financial implications.
- The means to be employed include the design, installation, maintenance and manner and periods of operation of plant and machinery, and the design, construction and maintenance of buildings and acoustic structures.
- The test of best practicable means is to apply only so far as compatible with any duty imposed by law, and in particular is to apply to statutory undertakers only so far as compatible with the duties imposed on them in their capacity of statutory undertakers.
- The said test is to apply only so far as compatible with safety and safe working conditions, and with the exigencies of any emergency or unforeseeable circumstances.
- Subject to the preceding provisions of this section, regard shall be had, in construing references to “best practicable means”, to any relevant provision of a code of practice approved under the preceding section.

### The Environmental Protection Act 1990 (EPA 1990)

12.2.2.6 The EPA 1990 specifies mandatory powers available to Local Authorities in respect of noise that either constitutes or is likely to cause a statutory nuisance.

12.2.2.7 Section 79 sets out matters that constitute a statutory nuisance, which include "noise emitted from premises so as to be prejudicial to health or a nuisance"; and "noise that is prejudicial to health or a nuisance and is emitted from or caused by a vehicle, machinery or equipment in a street".

12.2.2.8 A duty is imposed on Local Authorities to carry out inspections to identify statutory nuisances, and to serve abatement notices against these. Section 80 deals with summary proceedings for statutory nuisance.

12.2.2.9 The EPA refers to Best Practicable Means and part III states that it is to be interpreted by reference to the following provisions:

- "practicable" means reasonably practicable having regard among other things to local conditions and circumstances, to the current state of technical knowledge and to the financial implications;
- the means to be employed include the design, installation, maintenance and manner and periods of operation of plant and machinery, and the design, construction and maintenance of buildings and structures;
- the test is to apply only so far as compatible with any duty imposed by law; and
- the test is to apply only so far as compatible with safety and safe working conditions, and with the exigencies of any emergency or unforeseeable circumstances.

## 12.2.3 National Policy

### National Planning Framework 4 (NPF4)

12.2.3.1 Relevant national policy includes the National Planning Framework 4 (NPF4)[1]. NPF4 replaces National Planning Framework 3 (NPF3)[2] and Scottish Planning Policy (SPP), superseding the relevant policies for noise. The NPF4 is Scotland's national spatial strategy that sets out spatial principles, regional priorities, national developments, and national planning policy.

12.2.3.2 NPF4 has several two policies (Policy 11 and Policy 23) which address noise and are relevant to the Proposed Development, as follows:

12.2.3.3 Policy 11 states the policy principles for energy. The intent of the policy is to encourage, promote and facilitate all forms of renewable energy development onshore and offshore. In relation to noise, the policy states:

*"e) In addition, project design and mitigation will demonstrate how the following impacts are addressed:*
*i. impacts on communities and individual dwellings, including, …noise…"*

12.2.3.4 Policy 23 states:

*"e) Development proposals that are likely to raise unacceptable noise issues will not be supported" and "A Noise Impact Assessment may be required where the nature of the proposal or its location suggests that significant effects are likely".*

[1] Scottish Government (2024). National Planning Framework 4. Available at: https://www.gov.scot/publications/national-planning-framework-4/ (Accessed 21/02/2025)
[2] Scottish Government (2024). National Planning Framework 3. Available at: https://www.gov.scot/publications/national-planning-framework-3/ (Accessed 21/02/2025)

### Local Planning Policies

12.2.3.5 The Scottish Borders Local Development Plan[3] was adopted on 22 August 2024. Policy ED9: Renewable Energy Development is relevant to the noise and vibration assessment:

12.2.3.6 The following policy is relevant to noise:

*"Development proposals for all forms of renewable, low-carbon and zero emissions technologies will be supported".*
*"Development proposals will be assessed in accordance with NPF4 Policy 11 paragraphs b) to f) and other relevant provisions of NPF4."*

## 12.2.4 Standards and Guidance

### Guidance

12.2.4.1 The following guidance documents are of particular relevance to noise generated by the Proposed Development:

- Planning Advice Note (PAN) 1/2011: Planning and Noise[4];
- Technical Advice Note (TAN): Assessment of Noise[5]; and
- The Design Manual for Roads and Bridges (DMRB) (2020)[6]

Planning Advice Note (PAN) 1/2011: Planning and Noise

12.2.4.2 PAN 1/2011 provides advice on the role of the planning system in helping to prevent and limit the adverse effects of noise, with information and advice on assessment methods provided in the associated TAN. The PAN promotes the principles of good acoustic design and the appropriate location of new noise-generating development. The selection of a site, the design of a development and conditions which may be attached to a planning permission can all play a part in preventing, controlling and mitigating the effects of noise.

Technical Advice Note (TAN): Assessment of Noise

12.2.4.3 The TAN provides guidance which may assist in the technical assessment of noise, although it is neither prescriptive nor exhaustive. It provides a summary of relevant and current (at the time of publication) technical standards, guidance and codes of practice. For a noise generating development (such as industrial, commercial or recreational

[3] Scottish Borders Council (2024). Local Development Plan. Available at: https://www.scotborders.gov.uk/downloads/download/1655/adopted-ldp2---volume-1 (Accessed 21/02/2025)
[4] Planning Advice Note 1/2011: planning and noise - gov.scot (https://www.gov.scot/publications/planning-advice-note-1-2011-planning-noise/)
[5] Assessment of noise: technical advice note - gov.scot (https://www.gov.scot/publications/technical-advice-note-assessment-noise/)
[6] National Highways (2020). Design Manual for Roads and Bridges (DMRB): LA 111 - Noise and Vibration; Standards for Highways.

developments) affecting a noise sensitive building, the TAN sets out assessment steps which broadly follow the principles described in British Standard (BS) 4142:2014.

The Design Manual for Roads and Bridges (DMRB) (2020)

12.2.4.4 DMRB provides guidance on road traffic noise effects from highways projects. Whilst no new roads are proposed, the guidance is used in assessing the significance of road traffic noise during construction and decommissioning using technical standard Calculation of Road Traffic Noise (1988)[7] (CRTN).

## Standards

12.2.4.5 The following standards are of particular relevance to noise generated by the Proposed Development:

- BS 5228:2009+A1:2014 Code of Practice for noise and vibration control on construction and open site[8];
- BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound[9]; and
- BS 8233:2014 Guidance on sound Insulation and noise Reduction for buildings[10].

British Standard 5228:2009+A1:2014

12.2.4.6 BS 5228 is of particular relevance to noise generated by the construction and decommissioning of the Proposed Development. The standard refers to the need for the protection against noise and vibration of persons living and working in the vicinity of and those working on construction and open sites. It recommends procedures for noise and vibration control in respect of construction activities.

British Standard 4142:2014+A1:2019

12.2.4.7 BS 4142 describes methods for rating and assessing industrial and commercial sound in order to provide an assessment of its likely effect upon nearby dwellings or premises used for residential purposes.

12.2.4.8 The 'specific sound level' at a Noise Sensitive Receptor (NSR) is used to derive a 'rating level' by applying appropriate corrections if acoustic features are present in the sound (i.e., tonal elements, impulsivity, intermittency and distinctiveness). This is then assessed against the existing 'background sound level' at that location to determine a likely level of effect.

12.2.4.9 Calculations of specific sound level at NSR have been carried out in accordance with methodology provided in International Organization for Standardization (ISO) 9613-2:2024

[7] Department of Transport (1988). Calculation of Road Traffic Noise
[8] BSI Group (2009). 'BS 5228:2009+A1:2014 Code of Practice for noise and vibration control on construction and open sites'
[9] BSI Group (2019). 'BS 4142:2014+A1:2019 - Methods for rating and assessing industrial and commercial sound'.
[10] BSI Group (2014). 'BS 8233: 2014 Guidance on Sound Insulation and Noise Reduction for Buildings'.

Attenuation of sound during propagation outdoors part 2: Engineering method for the prediction of sound pressure levels outdoors[11] (ISO 9613-2).

12.2.4.10 When considering the significance of the effect, BS 4142 emphasises the importance of the context in which the sound occurs.

British Standard 8233

12.2.4.11 BS 8233[12] provides benchmark noise criteria for various internal building uses, including sleeping / resting. It also provides guideline noise criteria for external areas such as gardens and patios.

### 12.2.5 Consultation

12.2.5.1 **Table 12.1** summarises consultation received on the scoping report and how the consultation has been responded to.

TABLE 12.1 CONSULTATION WITH THE ENERGY CONSENTS UNIT

| CONSULTEE | TYPE AND DATE | SUMMARY OF CONSULTATION RESPONSE | RESPONSE TO CONSULTEE |
|---|---|---|---|
| Energy Consents Unit | Scoping opinion – 4 April 2025 | Section 3.12:<br>The noise assessment should be carried out in line with relevant legislation and standards as detailed in section 11 of the scoping report. | The noise and vibration assessment has been carried out in accordance with relevant legislation and standards. **Section 12.4** sets out the assessment methodology in accordance with Section 11 of the scoping report. |

## 12.3 Basis of the Assessment

### 12.3.1 Baseline

12.3.1.1 The Proposed Development is surrounded by arable land on all sides, and some nearby residential areas. Ecclaw is the largest and closest settlement and is approximately 2km east of the Proposed Development. The A1 is located north and west of the Proposed Development boundary. Several local roads with low volumes of traffic are located close to the Proposed Development boundary.

[11] ISO (2024). 'ISO 9613-2:2024 - Attenuation of Sound during Propagation Outdoors'. BSI Standards Publication
[12] BS 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings

12.3.1.2 The NSRs nearest to the Proposed Development have been identified using Ordnance Survey data.

12.3.1.3 Baseline noise monitoring was carried out at three noise monitoring locations (NMLs) between 20th and 27th March 2025 to measure noise levels representative of the noise environment at the nearest NSRs to the Proposed Development.

TABLE 12.2 SUMMARY OF NOISE SENSITIVE RECEPTORS AND NOISE MONITORING LOCATIONS

| NSR ID | NSR LOCATIONS | REPRESENTATIVE MEASUREMENT POSITION |
|---|---|---|
| NSR1 | Tower Farm Holidays | NML1 |
| NSR2 | 5 Penmanshiel Farm Cottages | NML2 |
| NSR3 | Blackburn Rig Farmhouse | NML2 |
| NSR4 | Blackburn Farm Cottages | NML3 |
| NSR5 | 3 Bowshiel Farm Cottages | NML3 |
| NSR6 | Bowshiel Farmhouse | NML3 |

12.3.1.4 The aim of the surveys was to:

- Quantify the baseline noise environment
- Enable background noise levels to be used to inform the construction and operational impact assessments.

12.3.1.5 **Technical Appendix 12.1** presents supplementary information on the baseline noise survey, including **Figure 12.1** which presents the NMLs and NSRs.

### 12.3.2 Construction Phase

12.3.2.1 **Technical Appendix 12.2** forms the basis of the construction assessment, with most noise generating activities occurring between September 2025 and September 2026. The following phases of work would be sequential, and activities within each phases (presented in parentheses) are assumed to take place concurrently:

- Site preparation (earthworks and construction of site compounds);
- Foundations and civils (general civils, trenching, operation of site compounds, transformer bases, road construction, and mechanical installations); and
- Electrical installations (delivery of electrical systems, operation of site compounds, PV module installation, and installation of inverters and transformers).

12.3.2.2 Construction noise modelling has been carried out in accordance with BS 5228-1. The predictions assume flat ground, therefore no screening of noise from the ground topography

has been included. This is conservative given the presence of topographical features close to the Proposed Development such hills and cliffs. The predictions conservatively assume all plant is located at a point in the work area close to a given NSR. The construction noise modelling was carried out assuming mixed ground absorbency.

### 12.3.3 Operational Phase

12.3.3.1 The Proposed Development comprises the following areas:

- a substation area that contains two main noise sources, a primary transformer and an auxiliary transformer;
- a BESS (Battery Energy Storage System) area which contains up to 40 liquid-cooled battery containers, 20 power conversion systems (PCS), and 10 medium-voltage (MV) transformers; and
- a solar PV array area featuring a total of 24 central inverter transformer stations.

12.3.3.2 The noise assessment of the operational phase, including maintenance makes use of the following sources of information:

- preliminary layout and general arrangement drawings of external fixed plant provided by the Proposed Development engineering team, presented in **Technical Appendix 12.2**;
- equipment noise source data provided by the Proposed Development engineering team or, where this was not available, chosen from a review of a range of noise source data from third party reports for similar projects and confirmed to be achievable by the Proposed Development engineering team. These data are presented in **Technical Appendix 12.2**;
- assumptions regarding mitigation measures, including at-source measures and acoustic barriers, as presented in **Technical Appendix 12.2** and discussed further below; and
- preliminary layout and height information for the main on-site buildings provided by the Proposed Development engineering team presented in **Technical Appendix 12.2**.

12.3.3.3 Many of these aspects of the Proposed Development have the potential to produce noise during power generation and storage, with the exception of the solar PV panels, which do not produce significant noise. As a worst-case approach, all plant is assumed to be operating simultaneously.

12.3.3.4 The cooling equipment for the solar PV central inverter transformer stations will operate at a greatly reduced load outside of daylight hours of, but in summer will have a prolonged operation due to the longer hours of daylight. A conservative approach has been adopted in this assessment by assuming that noise from the central inverter transformer stations produces the same noise level through the night as during the day.

12.3.3.5 Preliminary noise modelling was carried out based on the use of standard items of plant and equipment. The results showed the potential for significant effects. The key items of equipment found to be contributing to the exceedances were the power conversion systems and the central inverter transformers with other equipment such as the BESS containers,

auxiliary and primary transformers, and mains voltage transformers also contributing to a lesser extent.

12.3.3.6 As a result, the plant source terms have been selected such that they reflect the lowest levels that are likely to be achievable. In addition, noise barriers have been assumed in the noise modelling, to reduce NSR noise levels further.

12.3.3.7 The assessment considers a preliminary design which may be subject to change as the design progresses. The final design will include mitigation measures to meet the modelled levels in this report.

12.3.3.8 **Table 12.3** presents the key items of noise emitting equipment during operation.

TABLE 12.3 PLANT SOURCE DATA

| PLANT | NUMBER OF UNITS | SOUND LEVEL DURING NORMAL OPERATION (INCLUDING EMBEDDED AT-SOURCE MITIGATION) |
|---|---|---|
| BESS container | 40 | 83dB Lw per unit |
| Power Conversion System | 20 | 73dB Lw per unit |
| MV Transformer | 10 | 73dB Lw per unit |
| Central Inverter Transformer | 24 | 88dB Lw per unit |
| Primary Transformer | 1 | 79dB Lw per unit |
| Auxiliary Transformer | 1 | 78dB Lw per unit |

12.3.3.9 Noise level calculations have been carried out using noise prediction software SoundPLAN 9.1, implementing the prediction method set out in ISO 9613-2. ISO 9613-2 describes a method for calculating the attenuation of sound to predict external noise levels at specific locations. The method calculates $L_{Aeq,T}$ assuming downwind propagation.

12.3.3.10 The model includes both ground topography and buildings adjacent to and within the Proposed Development. The model uses mixed ground absorbency (G = 0.6 (soft ground), 0.3 (mixed ground), 0.1 (gravel) and G = 0 (hard ground)) for grounds and roads within the Proposed Development and residential areas.

12.3.3.11 It is likely that the solar panels will provide some noise screening from plant, which will reduce the noise levels at NSRs. However, this model has followed a conservative approach by not including this screening effect.

12.3.3.12 Other modelling parameters include (based on guidance from the Environment Agency[13]):

- Atmospheric absorption is calculated based on conditions of 10°C and 70% relative humidity;
- Receptor heights of 4 m for daytime and night-time;
- building reflection loss 0.5 dB; and
- order of reflections 3.

## 12.4 Assessment Methodology

### 12.4.1 Methodology for the Assessment of Effects

#### Construction Noise

12.4.1.1 Construction noise has been assessed in accordance with BS 5228-1 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise, using the 'ABC method' from section E.3.2. The ABC method proposes NSR categories and thresholds to determine NSR significance of effect.

12.4.1.2 The ambient baseline level for each receptor for the given period (daytime, evenings and weekends, and night-time) is rounded to the nearest 5dB and the NSR category is determined using **Table 12.4**.

TABLE 12.4 NSR ASSESSMENT CATEGORY ACCORDING TO ROUNDED AMBIENT NOISE LEVEL

| PERIOD | | ASSESSMENT CATEGORY ($L_{AEQ,T}$) | | |
|---|---|---|---|---|
| | | A | B | C |
| Daytime | T=12hr, Weekdays, 07:00-19:00; T=6hr, Saturday, 07:00-13:00 | ≤60dB | 65dB | ≥70dB |
| Evenings and weekends | T=4hr, Weekdays 19:00–23:00; T=10hr, Saturdays 13:00-23:00; T=16hr, Sundays 07:00-23:00 | ≤50dB | 55dB | ≥60dB |
| Night-time | T=8hr, Every day 23:00-07:00 | ≤40dB | 45dB | ≥50dB |

12.4.1.3 The thresholds of potentially significant effects for each period and receptor category is proposed in Table E.1 of BS 5228-1 and presented in **Table 12.5**.

[13] Environment Agency presentation to the Association of Noise Consultants (March 2022)

TABLE 12.5 NSR ASSESSMENT THRESHOLD AS A FUNCTION OF PERIOD AND ASSESSMENT CATEGORY

| PERIOD | | ASSESSMENT THRESHOLD (FAÇADE) ($L_{AEQ,T}$) | | |
|---|---|---|---|---|
| | | A | B | C[a] |
| Daytime | T=12hr, Weekdays, 07:00-19:00; T=6hr, Saturday, 07:00-13:00 | 65dB | 70dB | 75dB |
| Evenings and weekends | T=4hr, Weekdays 19:00–23:00; T=10hr, Saturdays 13:00-23:00; T=16hr, Sundays 07:00-23:00 | 55dB | 60dB | 65dB |
| Night-time | T=8hr, Every day 23:00-07:00 | 45dB | 50dB | 55dB |

a) If the ambient noise level exceeds the Category C threshold values given in the table (i.e. the ambient noise level is higher than the above table), then a potential significant effect is indicated if the total $L_{Aeq,T}$ noise level for the period increases by more than 3 dB due to site noise.

12.4.1.4 BS 5228-1 advocates that other project-specific factors, such as the number of receptors affected and the duration and character of the impact, should be considered in determination of significance. **Table 12.6** provides the adopted significance criteria in the default case.

TABLE 12.6 SIGNIFICANCE CRITERIA FOR CONSTRUCTION NOISE

| EIA SIGNIFICANCE | EXCEEDANCE OF THRESHOLD |
|---|---|
| Negligible | 5 dB or more below the threshold |
| Minor | < 5 dB below, up to the threshold |
| Moderate | Up to 5 dB above the threshold |
| Major | > 5 dB above the threshold |

12.4.1.5 Moderate significance or above would be considered a significant effect in EIA terms. Best Practicable Means will be used to minimise significant effects. Best Practicable Means are secured in the oCEMP (**Technical Appendix 3.1**).

### Construction Traffic Noise

12.4.1.6 Changes in road traffic noise levels resulting from the construction of the Proposed Development have been calculated using CRTN. Construction traffic noise has been predicted in terms of the Basic Noise Level (BNL).

12.4.1.7 The magnitude of impact from noise due to construction traffic and diversion routes is classified by considering changes in the basic noise level (BNL) to be negligible, minor, moderate or major as per DMRB LA 111 Table 3.17 as reproduced in **Table 12.7**.

TABLE 12.7 MAGNITUDE OF IMPACT AT RECEPTORS FOR CONSTRUCTION TRAFFIC

| EIA SIGNIFICANCE | EXCEEDANCE OFCRITERIA |
|---|---|
| Negligible | Less than 1.0dB |
| Minor | Greater than or equal to 1.0dB and less than 3.0dB |
| Moderate | Greater than or equal to 3.0dB and less than 5.0dB |
| Major | Greater than or equal to 5.0dB |

12.4.1.8 Construction traffic noise is determined to cause a significant effect where a moderate or major magnitude of impact will occur for a duration exceeding: 10 or more days or nights in any 15 consecutive days or nights; or a total number of days exceeding 40 in any six consecutive months as per DMRB LA 111 Section 3.19.

12.4.1.9 For roads with low existing traffic flows, or where baseline traffic flow data were not available, the absolute level of noise will be considered. DMRB uses a value of 55 dB $L_{A10,18h}$ as the Lowest Observed Adverse Effect Level (LOAEL) for daytime traffic noise. Predicted traffic noise levels below this would not be considered significant.

### Construction vibration

12.4.1.10 The primary cause of community concern relating to vibration during construction generally relates to building damage from sources of vibration. BS 5228-2 indicates that the threshold of human perception to vibration is between approximately 0.15 and 0.3 mm/s peak particle velocity (PPV).

12.4.1.11 Vibration at a criterion of 1.0 mm/s PPV level is described in BS 5228-2 as being likely to cause complaint, but that it can be tolerated if prior warning and explanation has been given to residents. Vibration is likely to be intolerable for any more than a very brief exposure to 10mm/s.

12.4.1.12 **Table 12.8** provides the proposed significance criteria in the default case. These levels provide an initial indication of potential effects, and therefore single or infrequent occurrences of these levels do not necessarily correspond to the stated effect in every case. Levels would need to be exceeded persistently rather than from a one-off occurrence which would be unlikely to cause significant disturbance.

TABLE 12.8 SIGNIFICANCE CRITERIA FOR CONSTRUCTION VIBRATION

| EIA SIGNIFICANCE | PPV VIBRATION LEVEL |
|---|---|
| Negligible | Less than 0.3 mm/s |

| EIA SIGNIFICANCE | PPV VIBRATION LEVEL |
|---|---|
| Minor | Greater than or equal to 0.3 mm/s and less than 1.0 mm/s |
| Moderate | Greater than or equal to 1.0 mm/s and less than 10 mm/s |
| Major | Greater than or equal to 10 mm/s |

12.4.1.13 Medium impacts or above would be considered a significant effect in EIA terms. Best Practicable Means will be used to minimise significant effects. Best Practicable Means are secured in the oCEMP (**Technical Appendix 3.1**).

### Operational Noise

12.4.1.14 Operational noise has been assessed according to BS 4142:2014+A1: 2019 Methods for rating and assessing industrial and commercial sound. The methods described in BS 4142 use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling used for residential purposes.

12.4.1.15 BS 4142 includes an assessment of the difference between the background sound level and the rating level at the receptor. This is referred to as the 'initial assessment'. The rating level is equal to the specific sound level (Proposed Development noise) plus any adjustment for characteristic features of the sound. BS 4142 states:

> *"Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. Where such features are present at the assessment location, add a character correction to the specific sound level to obtain the rating level."*

12.4.1.16 The following acoustic features are described in the standard:

- tonality: up to a +6 dB penalty;
- impulsivity: up to a +9 dB penalty (if necessary, this can be summed with the tonality penalty);
- intermittency: a +3 dB penalty; and
- distinctiveness: other sound characteristics (neither tonal nor impulsive but still readily distinctive): a +3 dB penalty.

12.4.1.17 BS 4142 Section 11 states the following regarding assessment of impacts:

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

*an indication of the specific sound source having a low impact, depending on the context."*

12.4.1.18 Following the initial assessment, BS 4142 requires consideration of the context in which the sound occurs when determining the significance of the effect. BS 4142 states:

*"The significance of sound of an industrial and / or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs. An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs / will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context."*

12.4.1.19 Where the initial estimate of the impact needs to be modified due to the context, various pertinent factors need to be considered, including:

- the absolute level of sound;
- the character and level of the residual sound compared to the character and level of the specific sound; and
- the sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and / or outdoor acoustic conditions.

12.4.1.20 In terms of the absolute level of sound, BS 4142 states "Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night."

12.4.1.21 In this assessment, where background sound levels are low, modelled rating levels are compared against absolute levels. As a basis for this, the recommended noise levels presented in BS 8233:2014 have been considered. Of these levels, the levels that apply inside a dwelling have been converted to equivalent external levels by accounting for the transmission losses from outside to inside assuming an open window (approximately +10dB) and applying a free-field correction (approximately -3dB). These are presented in **Table 12.9**.

TABLE 12.9 INDOOR AMBIENT NOISE LEVELS FOR DWELLINGS

| ACTIVITY | LOCATION | DESIRABLE INTERNAL LEVELS | | EQUIVALENT EXTERNAL LEVELS | |
|---|---|---|---|---|---|
| | | DAYTIME (07:00-23:00) | NIGHT-TIME (23:00-07:00) | DAYTIME (07:00-23:00) | NIGHT-TIME (23:00-07:00) |
| Resting | Living Room | 35dB $L_{Aeq,16hour}$ | N/A | 42dB $L_{Aeq,16hr}$ | N/A |
| Dining | Dining Room | 40dB $L_{Aeq,16hour}$ | N/A | 47dB $L_{Aeq,16hr}$ | N/A |
| Sleeping | Bedroom | 35dB $L_{Aeq,16hour}$ | 30dB $L_{Aeq,8hour}$ | 42dB $L_{Aeq,16hr}$ | 37dB $L_{Aeq,8hour}$ |

| ACTIVITY | LOCATION | DESIRABLE INTERNAL LEVELS | | EQUIVALENT EXTERNAL LEVELS | |
|---|---|---|---|---|---|
| | | DAYTIME (07:00-23:00) | NIGHT-TIME (23:00-07:00) | DAYTIME (07:00-23:00) | NIGHT-TIME (23:00-07:00) |
| Amenity | Outdoor | N/A | N/A | 50 to 55 dB $L_{Aeq,16hr}$ | N/A |

12.4.1.22 Based on these external levels, a daytime threshold level of 42dB $L_{Aeq,16hr}$ and a night-time threshold level of 37dB $L_{Aeq,8hr}$ have been adopted in this assessment.

12.4.1.23 To take account of the low background sound levels within the area (as required by BS 4142 in considering the context in which the sound occurs), **Table 12.10** considers the threshold levels set out in **Table 12.9**, and presents the impact significance for NSRs in the daytime and night-time respectively, assuming no other contextual factors are relevant. Significance classification depends on the time period (i.e. day or night), a comparison of the rating level with the absolute levels set out in **Table 12.9**, and the rating level exceedance of the background sound level.

TABLE 12.10 SIGNIFICANCE CRITERIA FOR OPERATIONAL NOISE

| RATING LEVEL EXCEEDANCE OF BACKGROUND, DB | EIA SIGNIFICANCE [a] | |
|---|---|---|
| | THE RATING LEVEL IS LESS THAN OR EQUAL TO THE THRESHOLD LEVEL [b]. | THE RATING LEVEL IS GREATER THAN THE THRESHOLD LEVEL. |
| ≤ 0 | Negligible | Negligible |
| > 0 & ≤ 5 | Minor | Minor |
| > 5 & < 10 | Minor | Moderate |
| ≥ 10 | Minor or Moderate [c] | Major |

a) Assumes no other contextual factors are relevant.
b) The threshold level is 42dB $L_{Aeq,16hr}$ for the daytime and 37dB $L_{Aeq,8hr}$ for the night-time – see **Table 12.9**.
c) Where the difference between the rating level and the background sound level is 10 dB or more, the significance of the effect is considered Minor if the rating level is well below the threshold value, e.g. if it is 35 dB or less at night or 40 dB or less during the day.

12.4.1.24 Impacts of Moderate and above are reported as significant in this EIA. However, it is noted that this a precautionary approach as BS 4142 describes significant impacts as starting when rating noise levels exceed background noise by around 10dB.

12.4.1.25 Impacts of Moderate significance or above would be considered for mitigation. Best Practicable Means (BPM) will be used to minimise impacts of Minor significance or above, noting only simple measures are likely to be practicable for Minor impacts. Mitigation will be secured as part of the engineering design which has accounted for BPM.

### Cumulative effects

12.4.1.26 The Cumulative Effect Assessment (CEA) has identified relevant developments for assessing cumulative effects. Full details of the approach are presented in Chapter 16: In-Combination Effects.

12.4.1.27 A conservative assumption has been made that unmitigated construction and operational noise impacts could be experienced up to 1 km from the Proposed Development. Vibration is only likely to be impactful within 200 m of activities such as driven piling or use of vibratory compactors.

12.4.1.28 There are no developments within 1km of the Proposed Development with the potential to give rise to cumulative noise effects.

## 12.4.2 Elements Scoped Out of Assessment

12.4.2.1 No significant vibration generating equipment will be required during operation. Therefore, operational vibration assessment is scoped out of further assessment.

12.4.2.2 Due to similar nature of the activities during construction and decommissioning, noise and vibration effects during decommissioning are expected to be no greater than those generated during the construction phase. As such, a separate assessment of decommissioning noise and vibration has not been included.

## 12.4.3 Assessment Limitations

12.4.3.1 **Table 12.11** presents uncertainties which are common to the assessment of noise and vibration as well as ways in which this assessment has sought to mitigate the uncertainty.

TABLE 12.11 ASSESSMENT OF UNCERTAINTY

| SOURCE OF UNCERTAINTY | MITIGATION OF UNCERTAINTY |
|---|---|
| Measuring baseline sound levels | Use of calibrated Class A sound level meter to accurately measure sound pressure level. Use of long measurement period (approximately seven days). Statistical analysis of the measured levels to reduce the effect of extraneous events on the adopted representative background sound level. Filtering data for adverse weather conditions. See **Technical Appendix 12.1** for more details. |
| Reliability of sound source data | Where supplier noise source data for equipment were not available, data have been taken from a literature review of noise assessments for similar applications. Noise source level values have conservatively been adopted from the upper end of the range of values identified in the review. |

| SOURCE OF UNCERTAINTY | MITIGATION OF UNCERTAINTY |
|---|---|
| Robustness of prediction method | Use of ISO 9613-2. The ISO 9613-2 prediction method assumes downwind propagation to all NSRs (or equivalently, for average propagation under a well-developed moderate ground-based temperature inversion).<br>A number of conservatisms have been included in the modelling, e.g.<br>• the solar PV equipment is assumed to generate noise throughout the night;<br>• no allowance for screening from the PV panels has been included<br>Construction noise modelling assumes all plant is located at a point in the work area close to NSRs |

## 12.5 Assessment of Effects

### 12.5.1 Construction

#### Construction of the Proposed Development

12.5.1.1 Construction activities are scheduled to take place during the weekday daytime only between 07:00 and 19:00, therefore the assessment of construction noise is limited to the daytime period only. Night-time construction work is not expected to be required. In exceptional circumstances, some work may be required in the evening and night should works fall behind schedule. This will be limited to works that are not major sources of noise so that levels at NSRs are kept below the relevant criteria.

12.5.1.2 **Table 12.12** presents the daytime ABC category (determined using **Table 12.4**), predicted worst-month construction noise levels during each phase of construction (highlighted in **Section 12.3.2**), and the associated EIA significance of effect (determined using **Table 12.5** and **Table 12.6**) for all NSRs.

TABLE 12.12 MODELLED CONSTRUCTION NOISE LEVELS AT NOISE SENSITIVE RECEPTORS

| NSR ID | NSR LOCATION | DAYTIME ABC CATEGORY | MODELLED DAYTIME CONSTRUCTION FACADE NOISE LEVELS (WORST-MONTH[a]) ($L_{AEQ,T}$) | | | EIA SIGNIFICANCE | | |
|---|---|---|---|---|---|---|---|---|
| | | | SITE PREPARATION | FOUNDATIONS AND CIVILS | ELECTRICAL INSTALLATIONS | SITE PREPARATION | FOUNDATIONS AND CIVILS | ELECTRICAL INSTALLATIONS |
| NSR1 | Tower Farm Holidays | A (≤60dB) | 48dB | 50dB | 46dB | Negligible | Negligible | Negligible |
| NSR2 | 5 Penmanshiel Farm Cottages | A (≤60dB) | 51dB | 53dB | 49dB | Negligible | Negligible | Negligible |
| NSR3 | Blackburn Rig Farmhouse | A (≤60dB) | 47dB | 50dB | 45dB | Negligible | Negligible | Negligible |
| NSR4 | Blackburn Farm Cottages | A (≤60dB) | 50dB | 50dB | 47dB | Negligible | Negligible | Negligible |
| NSR5 | 3 Bowshiel Farm Cottages | A (≤60dB) | 57dB | 63dB | 60dB | Negligible | Minor | Negligible |
| NSR6 | Bowshiel Farmhouse | A (≤60dB) | 54dB | 65dB | 60dB | Negligible | Minor | Negligible |

a) Modelling represents typical plant locations for a worst-case month. There may be periods where noise levels would exceed those stated, however they are likely to be brief and therefore not significant.

12.5.1.3 In general, predicted construction noise effects are negligible with the exception of NSR5 and NSR6 where the modelling results show minor adverse effects (i.e. not in exceedance of the criterion) during the foundations and civils phase of construction. Therefore, there are no residual significant effects for construction noise.

12.5.1.4 BPM is secured in the oCEMP (**Technical Appendix 3.1**) and will be employed to minimise construction noise and vibration as far as is reasonably practicable. As part of BPM, mitigation measures will be applied in the order listed below.

- Control at the source, for example, through:
  - the selection of quiet and low vibration equipment;
  - review of construction methodology to consider quieter methods;
  - direct control of noisy equipment, e.g. use of acoustic enclosures, retrofitting controls, regular inspection and maintenance of noise control measures; and
  - the use of less intrusive alarms, such as broadband vehicle reversing warnings.
- Control of noise across the proposed development, for example, by:
  - screening, e.g. local screening of equipment, perimeter hoardings or the use of temporary stockpiles;
  - the location of equipment on-site; and
  - control of working hours.

### Construction Traffic

12.5.1.5 Existing roads which are part of the public highway will be used to transfer plant and material to site.

12.5.1.6 **).**

12.5.1.7 Table 12.13 presents the daytime basic noise levels of each road section for normal use and use with haul traffic, including the resultant EIA significance (determined using **Table 12.7**).

TABLE 12.13 CONSTRUCTION TRAFFIC NOISE LEVELS

| ROAD LINK | BASIC NOISE LEVEL – NORMAL USAGE ($L_{A10,18HR}$) | BASIC NOISE LEVEL – WITH HAUL TRAFFIC ($L_{A10,18HR}$) | EIA SIGNIFICANCE |
|---|---|---|---|
| A1 | 69.2dB | 69.2dB | Negligible |

12.5.1.8 The modelled effects of construction traffic noise are negligible for all affected roads, and therefore, there are no residual significant effects for construction traffic noise.

### Construction vibration

12.5.1.9 The foundations and civils construction phase will involve use of plant that has the potential to produce construction vibration, including vibratory piling and vibratory compaction. Activities of this nature which are likely to produce construction vibration will impact receptors which are within 100m of plant. For this assessment that includes NSR5 (3 Bowshiel Farm Cottages) and NSR6 (Bowshiel Farmhouse). **Table 12.14** presents the predicted construction vibration levels which may be experienced during these activities.

TABLE 12.14 CONSTRUCTION VIBRATION LEVELS AT RECEPTORS

| NSR ID | NSR ADDRESS | CONSTRUCTION VIBRATION LEVELS (PPV) | | EIA SIGNIFICANCE | |
|---|---|---|---|---|---|
| | | VIBRATORY PILING | VIBRATORY COMPACTION | VIBRATORY PILING | VIBRATORY COMPACTION |
| NSR5 | 3 Bowshiel Farm Cottages | 0.3 mm/s | 0.5 mm/s | Minor | Minor |
| NSR6 | Bowshiel Farmhouse | 0.3 mm/s | 0.5 mm/s | Minor | Minor |

12.5.1.10 NSR5 and NSR6 are predicted to experience minor adverse effects due to construction vibration, which is not significant. Therefore, there are no residual significant effects for construction vibration.

## 12.5.2 Operational Noise

12.5.2.1 As described in **Section 12.4.1**, BS 4142 follows a two-step approach. An 'initial assessment' considers the difference between the background sound level and the rating level at the receptor. Following the initial assessment, BS 4142 requires consideration of the context in which the sound occurs when determining the significance of the effect.

12.5.2.2 **Section 12.3.3** highlights how this assessment has included Best Practicable Means (as defined by the EPA 1990) to minimise noise at NSRs.

12.5.2.3 **Table 12.15** and **Table 12.15** Assessment of EIA Significance of Effect Operational Noise (with Source Terms Listed in **Table 12.3**) at Noise Sensitive Receptors

| NSR ID | NSR LOCATION | PREDICTED SPECIFIC LEVEL, LS | PREDICTED RATING LEVEL, $LAR_{,TR}$ [a] | BACKGROUND SOUND LEVEL (LA90,T) | | RATING LEVEL EXCEEDANCE OF BACKGROUND | | EIA SIGNIFICANCE | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | DAY | NIGHT | DAY | NIGHT | DAY | NIGHT |
| NSR1 | Tower Farm Holidays | 27 dB | 30 dB | 34 dB | 30 dB | -4 dB | 0 dB | Negligible | Minor |
| NSR2 | 5 Penmanshiel Farm Cottages | 29 dB | 32 dB | 32 dB | 27 dB | 0 dB | +5 dB | Minor | Minor |
| NSR3 | Blackburn Rig Farmhouse | 28 dB | 31 dB | 32 dB | 27 dB | -1 dB | +4 dB | Negligible | Minor |
| NSR4 | Blackburn Farm Cottages | 30 dB | 33 dB | 29 dB | 22 dB | +4 dB | +11 dB | Minor | Minor[b] |
| NSR5 | 3 Bowshiel Farm Cottages | 38 dB | 41 dB | 29 dB | 22 dB | +12 dB | +19 dB | Major | Major |

| NSR ID | NSR LOCATION | PREDICTED SPECIFIC LEVEL, LS | PREDICTED RATING LEVEL, $LAR_{,TR}$ [a] | BACKGROUND SOUND LEVEL (LA90,T) | | RATING LEVEL EXCEEDANCE OF BACKGROUND | | EIA SIGNIFICANCE | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | DAY | NIGHT | DAY | NIGHT | DAY | NIGHT |
| NSR6 | Bowshiel Farmhouse | 38 dB | 41 dB | 29 dB | 22 dB | +12 dB | +19 dB | Major | Major |

a) An acoustic feature correction of +3 dB has been applied at this stage to account for the possibility that the noise from the Proposed Development is distinctive against the residual acoustic environment and / or perceptible tonality.
b) The significance of the sound is considered to be Minor in accordance with the significance criteria set out in **Table 12.10.**

12.5.2.4 Table 12.16 present the initial assessment according to BS 4142 with and without mitigation included. Mitigation assumes 4.5m acoustic barrier with cantilever surrounding each Central Inverter Transformer and 3.5m acoustic barriers surrounding groups of BESS container, Power Conversion Systems, and MV Transformers, as presented in **Figure 3.14**. These noise barriers are assumed to be required and have been included in the noise modelling of residual noise from the Proposed Development.

12.5.2.5 Following this, the context in which the sound occurs, and an assessment of significance is presented. Subjective observations carried out during the baseline survey noted that the existing noise environment is mostly rural, dominated by anthrophonic sounds in the form of road traffic noise and biophonic sounds, such as wind, trees rustling and birdsong. Therefore, as noise from the Proposed Development may potentially be audible at the nearest NSRs and could have a different acoustic characteristic to the existing noise environment, an acoustic feature correction of 3 dB has been applied for distinctiveness.

TABLE 12.15 ASSESSMENT OF EIA SIGNIFICANCE OF EFFECT OPERATIONAL NOISE (WITH SOURCE TERMS LISTED IN **TABLE 12.3**) AT NOISE SENSITIVE RECEPTORS

| NSR ID | NSR LOCATION | PREDICTED SPECIFIC LEVEL, $L_S$ | PREDICTED RATING LEVEL, $L_{AR,TR}$ (a) | BACKGROUND SOUND LEVEL ($L_{A90,T}$) | | RATING LEVEL EXCEEDANCE OF BACKGROUND | | EIA SIGNIFICANCE | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | DAY | NIGHT | DAY | NIGHT | DAY | NIGHT |
| NSR1 | Tower Farm Holidays | 27 dB | 30 dB | 34 dB | 30 dB | -4 dB | 0 dB | Negligible | Minor |
| NSR2 | 5 Penmanshiel Farm Cottages | 29 dB | 32 dB | 32 dB | 27 dB | 0 dB | +5 dB | Minor | Minor |
| NSR3 | Blackburn Rig Farmhouse | 28 dB | 31 dB | 32 dB | 27 dB | -1 dB | +4 dB | Negligible | Minor |
| NSR4 | Blackburn Farm Cottages | 30 dB | 33 dB | 29 dB | 22 dB | +4 dB | +11 dB | Minor | Minor[(b)] |
| NSR5 | 3 Bowshiel Farm Cottages | 38 dB | 41 dB | 29 dB | 22 dB | +12 dB | +19 dB | Major | Major |
| NSR6 | Bowshiel Farmhouse | 38 dB | 41 dB | 29 dB | 22 dB | +12 dB | +19 dB | Major | Major |

c) An acoustic feature correction of +3 dB has been applied at this stage to account for the possibility that the noise from the Proposed Development is distinctive against the residual acoustic environment and / or perceptible tonality.
d) The significance of the sound is considered to be Minor in accordance with the significance criteria set out in **Table 12.10**.

TABLE 12.16 ASSESSMENT OF EIA RESIDUAL SIGNIFICANCE OF EFFECT FOR OPERATIONAL NOISE (WITH SOURCE TERMS LISTED IN **TABLE 12.3** AND NOISE BARRIERS) AT NOISE SENSITIVE RECEPTORS

| NSR ID | NSR LOCATION | PREDICTED SPECIFIC LEVEL, $L_S$ | PREDICTED RATING LEVEL, $L_{AR,TR}$ (a) | BACKGROUND SOUND LEVEL ($L_{A90,T}$) | | RATING LEVEL EXCEEDANCE OF BACKGROUND | | EIA SIGNIFICANCE | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | DAY | NIGHT | DAY | NIGHT | DAY | NIGHT |
| NSR1 | Tower Farm Holidays | 19 dB | 22 dB | 34 dB | 30 dB | -12 dB | -8 dB | Negligible | Negligible |
| NSR2 | 5 Penmanhiel Farm Cottages | 24 dB | 27 dB | 32 dB | 27 dB | -5 dB | 0 dB | Negligible | Negligible |
| NSR3 | Blackburn Rig Farmhouse | 24 dB | 27 dB | 32 dB | 27 dB | -5 dB | 0 dB | Negligible | Negligible |
| NSR4 | Blackburn Farm Cottages | 27 dB | 30 dB | 29 dB | 22 dB | +1 dB | +8 dB | Minor | Minor (b) |
| NSR5 | 3 Bowshiel Farm Cottages | 32 dB | 35 dB | 29 dB | 22 dB | +6 dB | +13 dB | Minor (b) | Minor (b) |
| NSR6 | Bowshiel Farmhouse | 32 dB | 35 dB | 29 dB | 22 dB | +6 dB | +13 dB | Minor (b) | Minor (b) |

a) An acoustic feature correction of +3 dB has been applied at this stage to account for the possibility that the noise from the Proposed Development is distinctive against the residual acoustic environment and / or perceptible tonality.
b) The significance of the sound is considered to be Minor in accordance with the significance criteria set out in **Table 12.10**.

12.5.2.6 In general, mitigated residual operational noise effects are predicted to be negligible with the exception of NSR4, NSR5, and NSR6 where minor adverse effects are predicted. Therefore, there are no residual significant effects for operational noise.

12.5.2.7 Despite background sound level exceedances greater than 5dB for NSR4, NSR5, and NSR6, the modelled rating noise level is well below the recommended design levels set out in BS 8233, and is therefore considered a Minor significant effect in accordance with the significance criteria set out in **Table 12.10**. Furthermore, the applicant demonstrates best practicable means in mitigating noise as far as reasonably practicable by selecting the low noise plant and including barriers in the design around the noisiest plant.

### 12.5.3 Decommissioning phase

12.5.3.1 The noise impact during the decommissioning phase is expected to be comparable to, and not exceed, that of the construction phase. The assessment and conclusions of the construction phase is in **Section 12.5.1**.

### 12.5.4 Cumulative Effects

12.5.4.1 Based on the CEA methodology outlined in **Chapter 4: EIA Methodology**, there are no developments close enough to potentially give rise to significant cumulative noise effects during construction and operation.

## 12.6 Summary and Conclusions

12.6.1.1 This Chapter has considered potential temporary and permanent noise and vibration impacts arising as a result of the Proposed Development during construction and operation.

12.6.1.2 An assessment of the potential construction noise impacts has been undertaken in accordance with BS 5228. In general construction noise effects are negligible with the exception of NSR5 and NSR6 where there would be minor adverse effects (below the construction criterion) during the foundations and civils phase of construction. Therefore, **No Significant** effects are predicted for construction noise.

12.6.1.3 Minor adverse effects due to construction vibration are predicted at NSR5 and NSR6 only, therefore **No Significant** effects are predicted for construction vibration.

12.6.1.4 The modelled effects of construction traffic noise are negligible for all affected roads, therefore **No Significant** effects are predicted for construction traffic noise.

12.6.1.5 An assessment of the potential operational noise impacts has been undertaken in accordance with BS 4142. In general, operational noise effects are predicted to be negligible with the exception of NSR4, NSR5, and NSR6 where the results of noise modelling show minor adverse effects. Therefore, **No Significant** effects are predicted for operational noise.

12.6.1.6 The potential for cumulative noise effects has been considered, however, there are no developments close enough to potentially give rise to significant cumulative noise effects during construction and operation.