tnei

A specialist energy consultancy

# Environmental Noise Impact Assessment

## Fyrish Battery Energy Storage (BESS) Development

Field

16819-003-R1

18 February 2025

COMMERCIAL IN CONFIDENCE

FIELD

tneigroup.com

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# 1 Introduction

TNEI were commissioned by Field (henceforth referred to as 'the client') to undertake an environmental Noise Impact Assessment (NIA) in support of the Section 36 planning application for the proposed Fyrish Battery Energy Storage System (BESS) development (henceforth referred to as 'the Proposed Development').

The Proposed Development is located approximately 650 m south of Fyrish Substation, Alness, Scottish Highlands, IV17 OXH, at approximate Ordnance Survey coordinates 263003, 868964. The Proposed Development, which is currently undeveloped agricultural/pastural land, will connect to the nearby Fyrish National Grid Substation.

The local area around the site is rural in nature, predominantly consisting of agricultural and pastural land, but with a number of residential properties located nearby to the northeast, south and northwest.

The purpose of this NIA is to:

- Identify the noise sensitive receptors in the vicinity of the Proposed Development;
- Identify the dominant sound sources associated with the operation of the Proposed Development;
- Calculate the likely levels of operational noise at the identified receptors to determine the likely noise impacts associated with the Proposed Development; and,
- Indicate any requirements for mitigation measures, if required, to provide sufficient levels of protection for all noise sensitive receptors.

For clarity, this NIA considers the operational phase of the development only and does not include an assessment of construction noise. Typically, construction noise for this type of development is temporary in nature and usually dealt with at the post-consent phase via best practice mitigation measures during construction.

All work undertaken to produce this report has been carried out by members of the TNEI Environment and Engineering Team, all of whom are affiliated with the Institute of Acoustics (IOA). Specifically, the following members of staff have been involved in the project:

- [redacted], Affiliate IOA, BEng (Hons): Baseline Sound Level Survey and Noise Propagation Modelling;
- [redacted], AMIOA, BEng (Hons), IOA Postgraduate Diploma in Acoustics and Noise Control: Assessment and Reporting; and,
- [redacted], Member IOA (MIOA), BSc Information Technology, IOA Postgraduate Diploma in Acoustics and Noise Control: Quality Assurance.

## 1.1 Nomenclature

Please note the following terms and definitions, which are used throughout this report:

- **Emission** refers to the noise level emitted from a noise source, expressed as either a sound power level or a sound pressure level;
- **Immission** refers to the sound pressure level received at a specific location from a noise source;
- **SWL** indicates the sound power level in decibels (dB);
- **SPL** indicates the sound pressure level in decibels (dB);

- **NML** (Noise Monitoring Location) refers to any location where baseline noise levels have been measured;
- **NSRs** (Noise Sensitive Receptors) are all identified receptors that are sensitive to noise; and
- **NAL** (Noise Assessment Location) refers to any location where the noise immission levels are calculated and assessed.

A Glossary of Terms is also provided as Appendix A of this report.

All figures referenced within the report can be found in Appendix F.

Unless otherwise stated, all sound levels refer to free field levels i.e., sound levels without influence from any nearby reflective surfaces.

All grid coordinates refer to the Ordnance Survey grid using Eastings and Northings.

# 2 Project Description

The Proposed Development principally comprises a battery energy storage system (BESS) that will charge and discharge electricity from the adjacent Fyrish National Grid Substation. It includes a single battery compound comprising battery storage units, medium-voltage (MV) skids (each skid comprising a MV transformer and two Power Conversion System (PCS) units) and associated ancillary equipment including and auxiliary transformers; a substation compound which accommodates 132 kV grid transformers and a transmission owner substation building, as well as site-wide supporting infrastructure including an interface substation, underground cabling, internal access tracks, standby generator and acoustic fencing. It also includes a cable route to substation and access and ancillary works including landscaping and biodiversity enhancement.

Whilst the exact specifications of the Proposed Development are subject to detailed design, the principal components described form the basis of the planning application to allow environmental assessments and mitigation to be appropriately scoped. Considering the above, the Proposed Development would introduce new sound sources to the local area Specifically, the dominant sound sources considered within the assessment are:

- Battery Storage Units (384 of);
- MV Skid Units (96 of); and
- 132 kV Grid Transformer Units (2 of).

The layout assessed is included within Appendix B of this NIA report.

The sound level output of the ancillary infrastructure (e.g. interface substation, auxiliary transformers, standby generator etc.) of the Proposed Development is considered insignificant in comparison to the primary sound sources detailed above. Accordingly, no other items of plant have been considered within the assessment.

## 2.1 Study Area

Noise Sensitive Receptors (NSRs) are properties that are sensitive to noise and, therefore, require protection from nearby noise sources. The study area for the assessment of environmental noise is usually defined through the identification of the closest NSRs to the development.

The assessment of noise attributable to the Proposed Development considers the nearest NSRs only, on the assumption that if sound levels at the closest receptors are deemed acceptable, then sound levels at NSRs at greater distances from the Proposed Development should also be within acceptable levels.

The nearest identified NSRs, which have a high level of sensitivity, are existing residential properties located to the northeast, south and northwest of the Proposed Development. The curtilage of the closest residential receptor is approximately 350 m to the northeast of the nearest noise emitting plant. Other residences are located approximately between 400 m and 1,000 m away.

Figure 1 within Appendix F details the study area and the closest NSRs considered within the assessment. For clarity, there is a dwelling located immediately to the south of the Proposed Development that, as part of the Proposed Development's inception, will cease to exist as a residential property. It has been highlighted on Figure 1 for completeness, but for the purposes of the assessment, is not considered.

# 3 Assessment Methodology

## 3.1 Legislation and Policy Context

### 3.1.1 PAN 1/2011

At a national level, the relevant policy is PAN 1/2011 (PAN) *Planning and Noise* [(1)] and the associated Technical Advice Note (TAN) *Assessment of Noise* [(2)]. With regards to the assessment of environmental noise, Appendix 1 of the TAN describes a number of standards and guidelines that may be referred to and details British Standard (BS) 4142 as appropriate for use.

## 3.2 Assessment Method

### 3.2.1 BS 4142:2014 +A1:2019

The BS 4142:2014 '*Methods for Rating and Assessing Industrial and Commercial Sound*' [(3)] form of assessment is based on a comparison of the predicted or measured levels of a sound source to the measured background sound levels, without the specific sound source present. It uses, "*outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident*".

BS4142 uses the following definitions:

- **Ambient Sound**: Totally encompassing sound in a given situation at a given time, usually composed of sound from many sources, both near and far. Described using the metric, $L_{Aeq(t)}$.
- **Specific Sound Level**: Equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, Tr. Described using the metric $L_{Aeq(t)}$. Also referred to in this report as the Immission Level.
- **Residual Sound Level**: Equivalent continuous A-weighted sound pressure level of the residual sound without the specific sound source(s) present at the assessment location over a given time interval, T. Described using the metric $L_{Aeq(t)}$.
- **Background Sound Level**: A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels. Described using the metric $L_{A90(t)}$.
- **Rating Level**: The Specific Sound Level adjusted for the characteristics of the sound. The Rating Level is calculated by adding a penalty or penalties (if required) to the Specific Sound Level when the sound source contains audible characteristics such as tonal, impulsive or intermittent components. Described using the metric, $L_{Aeq(t)}$.

BS 4142, Section 11, requires that the assessment considers the context in which the sound occurs, and as such there is no definitive pass/fail element to the standard. Rather, the assessment outcome is an indication as to the likelihood for adverse impact.

The assessment is a two-stage process; Initially, an estimate of the impact is made by subtracting the measured background sound level from the calculated or measured 'Rating Level'. The second part of the assessment is to then consider the context in which the sound occurs, which may modify the findings of the initial estimate.

The standard states:

*"Obtain an initial estimate of the impact of the specific sound by subtracting the measured background sound level from the rating level, and consider the following…*

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

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

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

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

For the second stage of the assessment there are many elements of context that can be considered. The following list, which is not exhaustive, gives some examples that could be relevant to the assessment:

- The absolute level of sound;
- The character and level of the residual sound compared to the character and level of the specific sound;
- Whether specific sound insulation and noise control measures have already been incorporated into a receptor (which would lower the sensitivity of the receptor);
- Former uses, at or close to the site;
- The legitimacy of the industrial use, e.g. planning permissions or environmental permits;
- Implementation of best practicable means for a given process or activity; and,
- Whether the Rating Level represents typical levels, realistic worst case, unlikely worst case etc.

Supplementary information regarding the application of BS 4142 is provided within the Association of Noise Consultants' (ANC) BS 4142 Technical Note (March 2020) [4]. The technical note provides guidance on the appropriate interpretation and application of the standard and is "*designed to assist readers with a reasonable interpretation and application of BS 4142 as a whole"*, including clarifying the methodology for the derivation of representative background sound levels. Critically, the technical note states the following with regards to the application of the standard in the event measured background sound levels and predicted Rating Levels are low:

'*… the absolute level of sound can be of significance, where the residual values are low and where they are high and should be taken into account when determining the overall impact of a particular specific sound source. The second paragraph* [of BS 4142] *notes that absolute levels may be as, or more, important than relative outcomes where background and rating levels are low. It is important to note that both background and rating levels would need to be low for this particular caveat to apply. BS 4142 does not indicate how the initial estimate of impact should be adjusted when background and rating levels are low, only that the absolute levels may be more important than the difference between the two values. It is likely that where the background and rating levels are low, the absolute levels might suggest a more acceptable outcome than would otherwise be suggested by the difference between the values. For example, a situation might be considered acceptable where a rating level of 30dB is 10dB above a background sound level of 20dB, i.e. an initial estimate of a significant adverse impact is modified by the low rating and background sound levels.'*

With regards to what constitutes 'low', the technical note goes on to state:

'*BS 4142 does not define 'low' in the context of background sound levels nor rating levels. The note to the Scope of the 1997 version of BS 4142 defined very low background sound levels as being less than about 30 dB $L_{A90}$, and low rating levels as being less than about 35 dB $L_{Ar,Tr}$. The WG suggest that similar values would not be unreasonable in the context of BS 4142, but that the assessor should make a judgement and justify it where appropriate.'*

**Extracts underlined by TNEI for emphasis.**

The additional information provided within the ANC technical note has informed TNEI's approach to the NIA assessment criteria with regards to the application of BS 4142. This is discussed further in Section 3.3.

## 3.3 EHO Consultation

To agree a set of operational noise assessment criteria as well as noise monitoring locations, TNEI undertook consultation with an Environmental Health Officer (EHO) from The Highland Council (THC). All formal EHO consultation correspondence has been included within Appendix C of this report.

TNEI issued a letter to THC dated 25th July 2024 (document reference 16819-001-R0, included within Appendix C) to provide detail of the assessment and proposed noise monitoring locations for the baseline sound level survey. THC responded via email and acknowledged the proposed methodology, but in reference to the potential use of fixed noise level limits in instances where background sound levels are low, the council stated they *"understand the arguments for set levels, where both background and specific noise levels are deemed to be low but where feasible (THC) will try to stick to a policy of not exceeding existing background levels."* However, the council also added that *"each case has to be looked at on its own merits in determining context."*

Having worked on a number of BESS developments within THC area and having consulted extensively with the council's EHO's, TNEI are familiar with the expected requirements of noise impact assessments for such developments, and note the following:

- For clarity, BS 4142 does not stipulate that Rating Levels must solely be restricted to equal or below Background Levels in order to assess the potential impact; appropriate consideration of the assessment context is as important as the initial numerical estimate of margin between Rating Level and representative background sound level.

- However, as stated above, THC prefer, where possible, to aim for a BS 4142 Rating Level below or equal to the representative background sound levels. THC also appreciate in instances where this may be unduly restrictive, alternative assessment criteria could be applied following a full BS 4142 assessment process which considers both an initial estimate and the context.

- THC have also raised concerns around potential tonal noise arising from the operation of electrical infrastructure developments, particularly within the 100 Hz 1/3 Octave Frequency Band. The council expect to be provided with sufficient evidence that the operation of any newly proposed development will not result in tonal noise effects at nearby NSRs.

## 3.4 Assessment Criteria

Considering all of the above, the assessment is made as follows:

- An assessment is undertaken at the nearest identified NSRs in accordance with BS 4142, taking into consideration the context.

- An analysis of the 1/3 Octave Band predicted noise levels (particularly within the 100 Hz band) is undertaken at the nearest NSRs in order to establish the likelihood of tonal effects from operation of the Proposed Development.

## 3.5 Calculation Method

### 3.5.1 Noise Propagation Model (ISO 9613-2)

In order to predict the noise immission levels attributable to the development, a noise propagation model was created using the propriety noise modelling software, CadnaA [5]. Within the software, complex models can be produced to simulate the propagation of noise according to a range of international calculation standards.

For this assessment noise propagation was calculated in accordance with ISO 9613-2: 2024 '*Acoustics – Attenuation of sound during propagation outdoors* [6] using the following input parameters:

- Temperature is assumed to be 10 °C and relative humidity as 70%;
- A ground attenuation factor of 1 (soft ground) has been used globally, with specific areas of 0 (hard ground) added to account for the BESS hardstanding area and Fyrish Substation; and,
- Receiver heights have been set to 4 m.

### 3.5.2 Uncertainties and Limitations

The noise propagation model is designed to give a good approximation of the specific sound level and the contribution of each individual sound source; however, it is expected that measured levels are unlikely to be matched exactly with modelled values. As such, the following limitations in the model should be considered:

- In accordance with ISO 9613, all assessment locations are modelled as downwind of all sound sources and propagation calculations are based on a moderate ground-based temperature inversion, such as commonly occurs at night. These conditions are favourable to noise propagation;
- The predicted barrier attenuation provided by local topography, embankments, walls, buildings and other structures in the intervening ground between source and receiver can only be approximated and not all barrier attenuation will have been accounted for; and,
- The model assumes all sound sources are operating continuously and simultaneously, at expected operating capacity.

# 4 Baseline Sound Level Monitoring

To inform the BS 4142 assessment, an unattended baseline sound level survey was undertaken at four Noise Monitoring Locations (NMLs) over a 7-day period between the 10th and 17th of September 2024. The noise monitoring equipment logged in 15-minute averaging intervals and measured continually for the entire survey period.

Table 4-1 details the unattended NMLs which are also shown on Figure 1 in Appendix F. The NMLs were selected to be representative of the NSRs in the vicinity of the Proposed Development.

**Table 4-1: Unattended Baseline Noise Monitoring Locations**

| NML | | Coordinates | | Comments |
|---|---|---|---|---|
| NML01 | Fyrish House | 261831 | 869003 | Location representative of NSR located to the northwest of the Proposed Development |
| NML02 | South of The Dairy House | 262395 | 868226 | Location representative of NSRs located to the southwest of the Proposed Development |
| NML03 | Lock Cottage (Clashnabuiac) | 262990 | 868582 | Location representative of NSR located to the south of the Proposed Development |
| NML04 | Wester Contullich | 263142 | 869202 | Location representative of NSR located to the northeast of the Proposed Development |

All measurements were made with the sound level meters (SLMs) mounted approximately 1.2 m above the ground and away from nearby reflective surfaces i.e. building façades, fences etc. as practically possible.

The noise monitoring equipment consisted of four Rion NL-52 SLMs fitted with appropriate environmental wind shields. All noise monitoring equipment (calibrator, SLM and microphones) used for the study is categorised as Class 1, as specified in IEC 61672-1 *'Electroacoustics. Sound level meters. Specifications'* [7]. The equipment was calibrated onsite at the beginning and end of the measurement period with no significant deviations noted. Appendix D contains the equipment and laboratory calibration details for the SLMs and Calibrator.

Subjective observations made during the installation and collection of the survey equipment noted the following:

- At NML01, the soundscape consisted of wind induced foliage rustle, birdsong, rain induced noise (during installation site visit only) and distant road traffic noise.
- At NML02, the soundscape consisted primarily of wind-induced vegetation and foliage rustle. Birdsong, rain induced noise (during installation site visit only) and distant road traffic noise was also noted at this location.

- At NML03, the soundscape consisted of wind induced foliage rustle, birdsong and distant road traffic noise. During the decommissioning site visit, intermittent industrial machinery noise was noted.
- At NML04, the soundscape consisted of wind induced foliage rustle, birdsong, rain induced noise (during installation site visit only) and distant road traffic noise. During the decommissioning site visit, the road traffic noise was the primary source of noise.

Meteorological data was collected onsite with a Kestrel portable weather station and a tipping bucket rain gauge, which were installed alongside the SLMs. All sound level data recorded during (as well as 20 minutes before and 60 minutes after) a recorded precipitation event was removed to reduce the potential influence of raised sound levels from rainfall. The data was also filtered for periods when wind speeds were above 5 m/s, to remove any data when noise levels could be atypically increased due to wind induced noise. In addition to this, several datapoints where atypically high $L_{Aeq}$ values were measured were removed from the dataset as this likely indicated that a noise source was present that was not representative of the typical background sound level. This manually excluded period is represented by the pink crosses seen on the time-history graphs presented within Appendix D. Table 4.2 below presents an overview of the measured baseline levels:

**Table 4.2: Overview of the Measured Baseline Sound Levels**

| NML | Mean Residual Sound $L_{Aeq\ (15\text{-}mins)}$ | | Median Residual Sound $L_{Aeq\ (15\text{-}mins)}$ | | Range of Residual Sound $L_{Aeq\ (15\text{-}mins)}$ | | Range of Background Sound Levels $L_{A90\ (15\text{-}mins)}$ | |
|---|---|---|---|---|---|---|---|---|
| | Day | Night | Day | Night | Day | Night | Day | Night |
| NML01 | 38 | 30 | 39 | 28 | 24-59 | 18-50 | 20-43 | 17-37 |
| NML02 | 42 | 34 | 42 | 33 | 31-60 | 24-52 | 26-51 | 21-48 |
| NML03 | 42 | 34 | 42 | 33 | 35-58 | 25-59 | 28-45 | 21-44 |
| NML04 | 42 | 35 | 42 | 34 | 34-54 | 24-49 | 27-48 | 21-43 |

The representative background sound level for each NML was determined with reference to the time-history charts, statistical analysis charts and distribution analysis charts included in Appendix D, following the guidance in presented within the ANC technical note and BS 4142, which states:

*'A representative level should account for the range of background sound levels and should not automatically be assumed to be either the minimum or modal value.'*

With due consideration of the above, Table 4-3 details the representative background sound levels $L_{A90\ (15mins)}$ at each of the NMLs for the daytime and night-time periods.

**Table 4-3: Representative Background Sound Level, dB $L_{A90}$, Derived Through Statistical Analysis**

| NML Id | Daytime $L_{A90\ (15\text{-}mins)}$ | Night-time $L_{A90\ (15\text{-}mins)}$ |
|---|---|---|
| NML01 | 32 | 25 |
| NML02 | 36 | 27 |
| NML03 | 36 | 27 |
| NML04 | 36 | 27 |

# 5 Operational Noise Impacts

## 5.1 Modelling of Individual Sound Sources

The noise model considers all of the sound sources detailed within Section 2 of the report. The following section describes how each sound source has been incorporated into the noise model. All items of plant have been modelled as area sources i.e. each side and top of each unit are modelled as individual sound sources and are assumed to be operating concurrently, continually and with a constant sound level output.

Noise modelling is based on candidate plant typical for the size and class of the Proposed Development. It should be noted that final plant specifications may vary during the final tendering process. Where possible, noise modelling data is shown within Appendix E, however, where data cannot be published due to confidentiality reasons, TNEI would be happy to discuss this data in more detail with THC (or any other relevant stakeholders), if required.

The source noise data for the candidate BESS plant assumed within the noise model has been provided directly from the manufacturer. In addition to the source noise data supplied, which has been measured in a controlled test environment, modelling recommendations have been provided by the Supplier in order to apply the data in an appropriate manner within the noise propagation model so as to reflect the expected operational parameters of the Proposed Development. [redacted]

### 5.1.1 Battery Storage Units

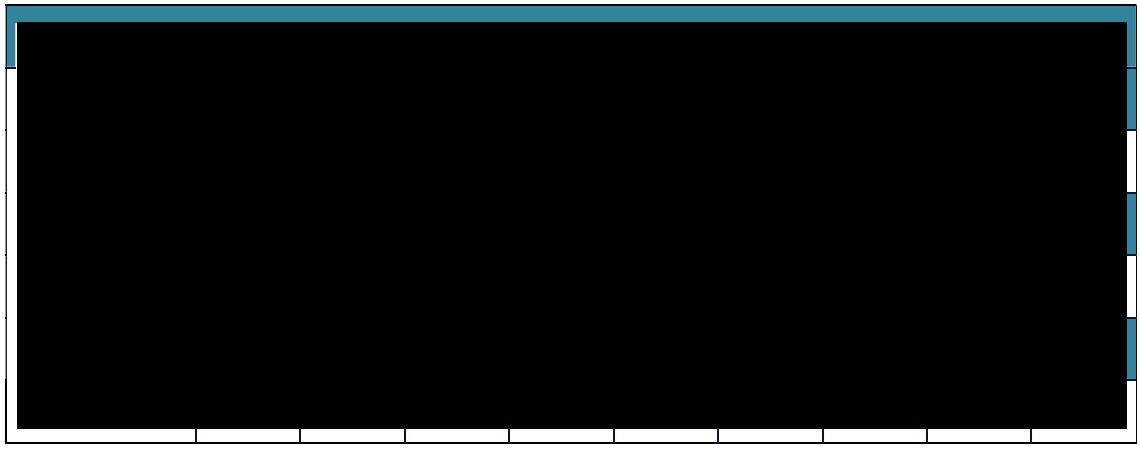
[redacted]

**Table 5-1:** [redacted]

| | |
|---|---|
| [redacted] | |

### 5.1.2 MV Skid Units

### 5.1.3 132 kV Grid Transformer Units



## 5.2 Mitigation Measures

Multiple landscaping bunds, of up to 4 m high, are included within the Proposed Development's design (as shown on the site layout drawing within Appendix B) and will provide a degree of barrier attenuation. In addition to this, an acoustic fence has been included within the design to reduce noise immission levels at the most sensitive NSRs, which are located to the northeast and south of the Proposed Development. The fencing has been modelled at a height of 4 m around the northern and southern perimeters, and at a height of 5 m around the eastern perimeter of the Proposed Development. The location of the fencing is shown within Figure 2 of Appendix F.

The fencing is assumed to be reflecting and of sufficient density to prevent sound passing through the structure. It should be sufficiently robust and maintained so as to achieve the level of attenuation required throughout the lifetime of the development. Fencing must be installed with no air gaps between the panels and floor.

## 5.3 Calculated Immission Levels

Noise immission levels have been calculated at five Noise Assessment Locations (NALs), which have been selected to represent the closest NSRs to the Proposed Development. Each NAL has been set on the side of the property facing the Proposed Development. The NALs are detailed in Table 5-3 and on Figure 2 in Appendix F.

**Table 5-3: Noise Assessment Locations**

| Noise Assessment Location | | OS Grid Reference | |
|---|---|---|---|
| **NAL ID** | **NAL Descriptor** | **Eastings** | **Northings** |
| NAL01 | Culcraggie Lodge | 263258 | 869262 |
| NAL02 | Clashnabuiac | 262996 | 868586 |
| NAL03 | Deer Park Cottages | 262553 | 868072 |
| NAL04 | Dairy Bungalow | 262457 | 868278 |
| NAL05 | Fyrish House | 261860 | 869023 |

The immission levels (Specific Sound Level) were calculated assuming all plant is operating continuously and concurrently. The model assumes, as a worst case, that noise levels do not fluctuate and remain the same for both daytime and night-time periods. The noise immission levels at the NALs are detailed in Table 5-4 below. The immission levels are also illustrated as a noise contour plot shown in Figure 2 of Appendix F.

**Table 5-4: Predicted Immission Levels, dB $L_{Aeq(t)}$**

| Noise Assessment Location | | Immission Level, dB $L_{Aeq(t)}$ |
|---|---|---|
| **NAL ID** | **NAL Descriptor** | |
| NAL01 | Culcraggie Lodge | 33 |

| Noise Assessment Location | | Immission Level, dB $L_{Aeq(t)}$ |
|---|---|---|
| NAL ID | NAL Descriptor | |
| NAL02 | Clashnabuiac | 31 |
| NAL03 | Deer Park Cottages | 25 |
| NAL04 | Dairy Bungalow | 27 |
| NAL05 | Fyrish House | 25 |

## 5.4 Embedded Mitigation Through Design Evolution

It should be noted that the final design of the Proposed Development is a result of several design iterations influenced by various environmental considerations. However, much of the changes in design have been implemented with a focus on lessening potential noise impacts on nearby NSRs. Through evolution of site design and the refinement/improvement of both source noise data and on-site mitigation measures, predicted noise levels have been reduced at the worst affected receptor (NAL01) from approximately 40 dB $L_{Aeq(t)}$ to the values presented above.

# 6 Noise Impact Assessment

## 6.1 BS 4142 Rating Level

To assess the immission levels against the agreed criteria, the Specific Sound Level must be converted into a Rating Level. The Rating Level allows for character corrections to be added to account for particular characteristics of the sound that may be perceived as more annoying. In particular, the Rating Level considers tonality, impulsivity and intermittency of the sound, as well other sound characteristics that are neither tonal, impulsive, or intermittent, but are otherwise readily distinctive against the residual acoustic environment.

### 6.1.1 Tonality

With regards to tonality, BS 4142 states:

*'For sound ranging from not tonal to prominently tonal the Joint Nordic Method gives a correction of between 0 dB and +6 dB for tonality. Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible and 6 dB where it is highly perceptible.'*

Electrical plant, such as power transformers, are often tonal at source, typically in the 100 Hz frequency band. BS 4142 corrections, however, are only applied if the noise characteristics are present at the receptor location, not at the source location.

Consideration of the predicted one-third octave band levels at the identified receptors against the assessment criteria presented in BS 4142's informative 'One-Third Octave Band Objective Method of Assessment' indicates that no tonality is likely to be present. Details of the informative tonal analysis is presented in Appendix G. As such, given the results of the informative analysis and TNEI's experience of noise assessments for BESS sites, no tonal character correction has been applied.

### 6.1.2 Impulsivity

With regards to impulsivity, BS 4142 states:

*'A correction of up to +9dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively this can be converted to a penalty of 3dB for impulsivity which is just perceptible at the noise receptor, 6dB where it is clearly perceptible, and 9dB where it is highly perceptible.'*

Impulsivity is not considered to be a relevant sound characteristic of a BESS as when operational, the noise level will be predictable and consistent.

### 6.1.3 Intermittency

The intermittency of the sound source needs to be considered when it has identifiable on/off conditions with regards to intermittency, BS 4142 states:

*'If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.'*

As with impulsivity, intermittency is not considered to be a relevant sound characteristic in this case. Once operational, noise levels may fluctuate by a small amount over long periods of time, but no step changes in noise level are anticipated.

### 6.1.4 Other Sound Characteristics

With regards to other sound characteristics, BS 4142 states: