# Corshellach Energy Storage Project

## Acoustic Impact Assessment

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## Revision History

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# 1 Introduction

This report provides an acoustic assessment of the proposed Corshellach Energy Storage Project, referred to as 'the Proposed Development' herein, in terms of operational and potential construction impacts. Three Members of the Institute of Acoustics have been involved in its production and details of their experience and qualifications can be found in **Appendix A**.

An assessment of the sound generated by the equipment to be installed has been undertaken in accordance with BS 4142:2014 + A1:2019 'BS 4142 Methods for Rating and Assessing Industrial & Commercial Sound'.

A discussion of the potential impacts resulting from the construction of the Proposed Development has been provided with reference to BS 5228-1:2009 'Code of Practice for Noise and Vibration Control on Construction and Open Sites - Parts 1 & 2'.

# 2 Planning Policy, Guidance & Standards

## 2.1 Planning Advice Note 1/2011: Planning and Noise

Within Scotland, the treatment of noise is defined in the planning context by 'Planning Advice Note (PAN) 1/2011: Planning and Noise' [1]. This document details the Government's planning policies and how these are expected to be applied. The PAN provides advice on the role of the planning system in helping to prevent and limit the adverse effects of noise, stating 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.

## 2.2 Technical Advice Note: Assessment of Noise

The online documentation 'Technical Advice Note (TAN): Assessment of Noise' [2] provides guidance to assist in the technical evaluation of noise assessments and aims to assist in assessing the significance of impacts associated with various development. The guidance refers to a since superseded version of BS 4142 in terms of assessing the impact of new sound generating development on neighbouring residences (the latest and previous version of which are discussed herein) and provides various matrices as to the significance and sensitivity of residences resulting from the introduction of certain facilities. The document states, at Paragraph 3.20, that '… the Scottish Government consider impacts are normally not significant (in a quantitative sense only) [if] the difference between the Rating and background noise levels is less than 5 dB(A), and that usually the threshold of minor significant impacts is when the difference between the Rating and background noise levels is at least 5 dB(A); and commonly do not become sufficiently significant to warrant mitigation until the difference between the Rating and background noise levels is more than 10 dB(A)'. The documentation also refers to publications released by the World Health Organisation (WHO) in terms of general internal and external absolute noise criteria for the protection of health, amenity and sleep disturbance.

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

BS 4142 [3] 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.

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 the background sound measurements (dB $L_{A90,\,T}$ – the sound level exceeded for 90% of the time, or the 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'.

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 unlikely 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.

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 2** provides a summary of expected impacts when comparing background and rating levels.

**Table 1 – BS 4142 Assessment Criteria**

| Rating Level | BS 4142 Assessment Criteria |
|---|---|
| Equal to or below background | '…an indication of the specific sound source having a low impact, depending on the context'. |
| Approximately +5 dB greater than the background sound level | '…an indication of an adverse impact, depending on the context'. |
| Approximately +10 dB or more greater than the background sound level | '…an indication of a significant adverse impact, depending on the context'. |

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

BS 5228-1:2009 'Code of practice for noise and vibration control on construction and open sites - Part 1: Noise' [4] has been identified as being the appropriate source of guidance on appropriate 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.

Annex E of BS 5228-1:2009 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 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 here.

BS 5228-2:2009 'Code of practice for noise and vibration control on construction and open sites - Part 2: Vibration' [5], provides a method for predicting 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.

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 $mm.s^{-1}$. In practice, the lower satisfactory magnitude is typically used with the higher magnitude being justified on a case-by-case basis.

# 3 Baseline Environment

A list of the residential assessment locations considered representative of those located closest to the Proposed Development is provided in **Table 2**, as also shown in **Figure 1, Section 5**.

**Table 2 – Assessment Locations**

| House Name | ID | Co-ordinates | |
|---|---|---|---|
| | | Easting | Northing |
| DALLASBROUGHTY | H01 | 303365 | 846233 |
| LURG | H02 | 303976 | 845671 |
| KNOCKYFIN | H03 | 302999 | 846435 |
| BEACHENS COTTAGE CATTERY | H04 | 302747 | 846548 |
| TOMCORK | H05 | 304339 | 846452 |
| SRUTHAN | H06 | 302837 | 846537 |
| BEACHENS TWO | H07 | 302758 | 846505 |

| House Name | ID | Co-ordinates | |
|---|---|---|---|
| | | Easting | Northing |
| BEACHANS COTTAGES | H08 | 302749 | 846503 |
| JOHNSTRIPE | H09 | 304932 | 847897 |
| BANTRACH | H10 | 302548 | 845737 |
| BENALA | H11 | 303082 | 846354 |
| BEACHANS | H12 | 302550 | 846423 |
| CHAPELHILL | H13 | 303069 | 847067 |
| NEWTON | H14 | 302906 | 845786 |

The current sound environment at properties surrounding the site is considered typical of a rural environment, sources of which include farm stock, the sound of water emanating from streams and burns, localised human and animal activities, birdsong, occasional aircraft passing overhead and traffic passing along local roads.

Existing background and ambient sound levels have been taken from extensive measurements undertaken by Atmos Consulting during August and September 2012 for the purpose of informing the impact assessment submitted in support of the planning application for Hill of Glaschyle Wind Farm [6], which is now operational. Details of the survey including the methodology, results and equipment used are provided within that report.

The survey included measurements of the pre-existing background sound levels at five locations during quiet daytime (18:00 - 23:00 every day, plus 13:00 - 18:00 on Saturdays and 07:00 to 18:00 on Sundays) and night-time (23:00 – 07:00 every day) periods. The two measurement locations relevant to this assessment are Knockyfin (H03) & Johnstripe (H09), as marked in red in **Figure 1, Section 5**.

The background sound levels adopted for the BS 4142 assessment provided within this report are taken from the levels derived as part of the Hill of Glaschyle Wind Farm noise assessment, for standardised 10 m height wind speeds below 4 $m.s^{-1}$. In the experience of RES, these levels tend to closely correlate with that determined as part of the BS4142 methodology. In the absence of information showing the existing ambient (dB $L_{Aeq}$) levels, these have been assumed to be 2 dB higher than the derived background sound levels (dB $L_{A90}$) for both measurement locations.

The adopted daytime and night-time background and ambient sound levels used for the purposes of assessing the impact of the Proposed Development are shown in **Table 3**.

**Table 3 - Existing Background & Ambient Sound Levels**

| Name | ID | Background Sound Level, dB $L_{A90}$ | | Ambient Sound Level, dB $L_{Aeq}$ | |
|---|---|---|---|---|---|
| | | Daytime | Night-time | Daytime | Night-time |
| KNOCKYFIN | H03 | 29 | 28 | 31 | 30 |
| JOHNSTRIPE | H09 | 30 | 30 | 32 | 32 |

# 4 Predictions

## 4.1 Operation

A model of the proposed battery storage facilities and the surroundings has been developed using CadnaA[1] software. The ISO 9613-2 [7] propagation/prediction methodology has been employed to predict the sound levels resulting from the development at nearby residential properties, incorporating various assumptions and factors which are considered appropriate for use here:

- The plant to be installed as part of the development has been modelled as point sources with a height of 2 m and these are assumed to be operating at their maximum potential output for all time periods as a conservative basis of assessment;
- Soft ground conditions 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;
- The 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 [8], which represents relatively low levels of sound absorption in the atmosphere;
- A 4 m high barrier of suitable mass and density, surrounding the battery storage facilities; and,
- The topography of the site and surroundings has been included within the model.

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 resultant 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.

The predominant sources of sound to be introduced as part of the Proposed Development are the 16 inverters (PCS units), 16 transformers and 32 battery storage containers.

The assumed sound power data for the equipment to be installed as part of the Proposed Development are provided in **Table 4**. The overall levels correspond to the maximum anticipated sound output for each of the respective plant, as advised by a candidate manufacturer. The propagation modelling therefore represents a relatively conservative scenario and actual sound levels would be expected to be less when the site is not operating at this capacity.

[1] https://www.datakustik.com/

Table 4 - Overall Sound Power Levels, dB $L_{WA}$

| Equipment & ID | Sound Power Level, dB $L_{WA}$ |
|---|---|
| Battery Energy Storage System (BESS) | 80 |
| Power Conversion System (PCS) | 68 |
| Transformer (TRA) | 76 |

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 levels detailed in **Section 5** are particularly low and potential tonal character in the sound emitted from the various plant may well be masked by existing sources of sound in the area.

The combination of assumptions detailed above are considered to provide a conservative prediction/modelling basis overall. The results of the predictions at the various residences surrounding the Proposed Development are shown in **Section 5**.

The site has been 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 and all other site constraints.

## 4.2 Construction

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. However, a detailed construction plan for the Proposed Development is not yet available and specific construction sound modelling has not been undertaken as a result.

A discursive assessment as to the generic construction impacts associated with developments of this kind in respect of sound and vibration is provided in **Section 5.2**.

# 5 Assessment

## 5.1 Operation

The predicted specific sound and corresponding rating levels (i.e. including for a 2 dB penalty for tonal character) at the most sensitive properties located nearest to the Proposed Development are shown in **Table 5** for daytime and night-time periods. The rating level is compared to the background sound levels detailed in **Section 3** to provide the associated impact at each assessment location.

The results of the survey data recorded at Knockyfin (H03) is assumed to be representative of that house only and the remaining residences being represented by the data collected at Johnstripe (H09), see **Table 3**.

The resultant impact is described as 'negligible' if more the rating level is 10 dB or more below the background sound level; 'low' if less than or equal to the background level; 'minor' if not more than 5 dB above; 'moderate' if not more than 10 dB above and 'major' if more than 10 dB above.

**Table 5 - BS4142 Assessment**

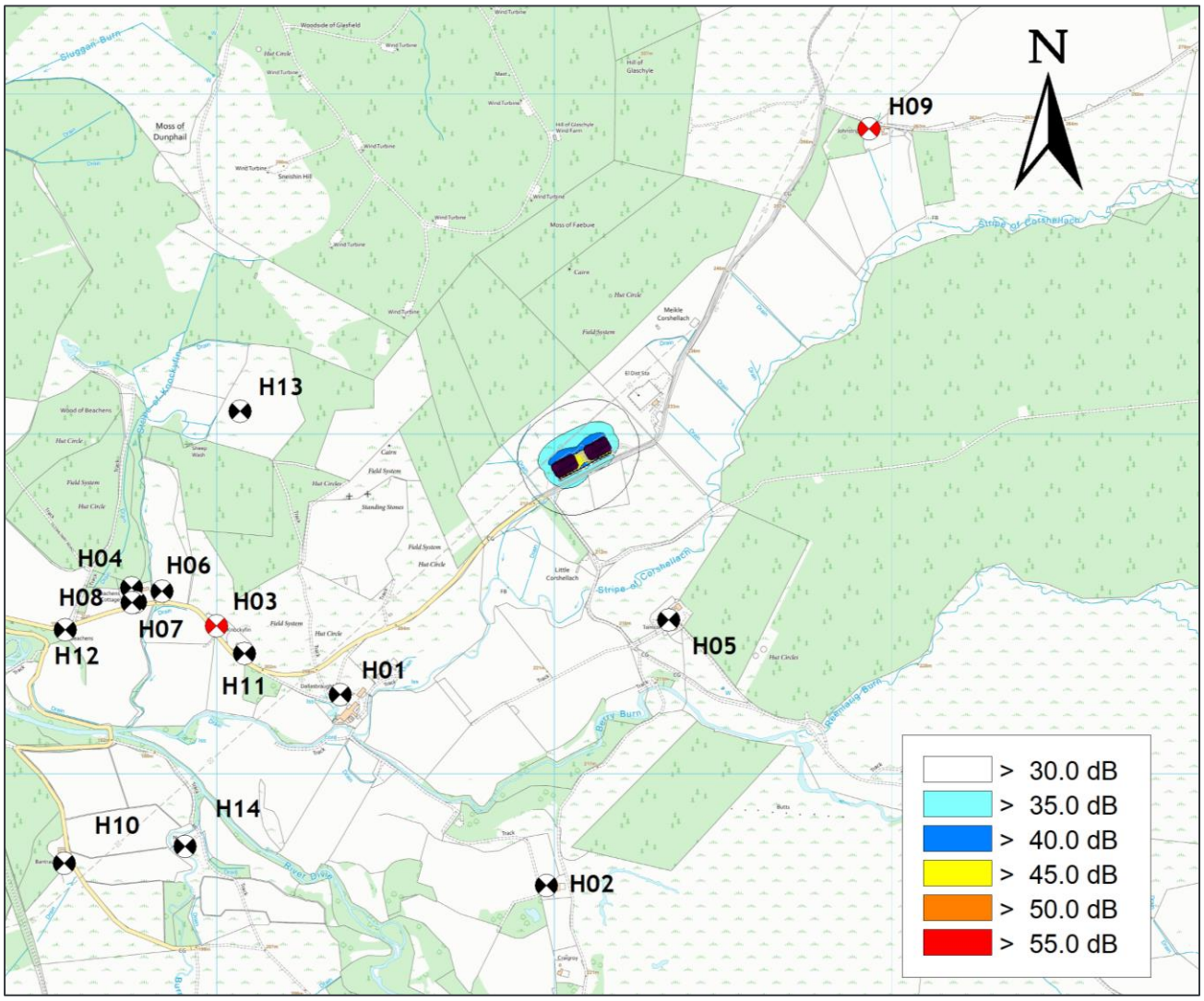
| House ID | Specific Level, dB $L_{Aeq}$ | Rating Level, dB $L_{Ar}$ | Background Level, dB $L_{A90}$ | $L_{Ar}$ - $L_{A90}$, dB | Potential Impact |
|---|---|---|---|---|---|
| | | | Daytime | | |
| H01 | 12 | 14 | 29 | -15 | Negligible |
| H02 | 10 | 12 | 29 | -17 | Negligible |
| H03 | 6 | 8 | 29 | -21 | Negligible |
| H04 | 7 | 9 | 29 | -20 | Negligible |
| H05 | 19 | 21 | 29 | -8 | Low |
| H06 | 6 | 8 | 29 | -21 | Negligible |
| H07 | 7 | 9 | 29 | -20 | Negligible |
| H08 | 7 | 9 | 29 | -20 | Negligible |
| H09 | 9 | 11 | 30 | -19 | Negligible |
| H10 | 5 | 7 | 29 | -22 | Negligible |
| H11 | 9 | 11 | 29 | -18 | Negligible |
| H12 | 5 | 7 | 29 | -22 | Negligible |
| H13 | 7 | 9 | 29 | -20 | Negligible |
| H14 | 7 | 9 | 29 | -20 | Negligible |
| | | | Night-time | | |
| H01 | 12 | 14 | 28 | -14 | Negligible |
| H02 | 10 | 12 | 28 | -16 | Negligible |
| H03 | 6 | 8 | 28 | -20 | Negligible |
| H04 | 7 | 9 | 28 | -19 | Negligible |
| H05 | 19 | 21 | 28 | -7 | Low |
| H06 | 6 | 8 | 28 | -20 | Negligible |
| H07 | 7 | 9 | 28 | -19 | Negligible |
| H08 | 7 | 9 | 28 | -19 | Negligible |
| H09 | 9 | 11 | 30 | -19 | Negligible |
| H10 | 5 | 7 | 28 | -21 | Negligible |
| H11 | 9 | 11 | 28 | -17 | Negligible |
| H12 | 5 | 7 | 28 | -21 | Negligible |
| H13 | 7 | 9 | 28 | -19 | Negligible |
| H14 | 7 | 9 | 28 | -19 | Negligible |

The assessment indicates that the predicted sound impact resulting from the introduction of the Proposed Development, at the nearest neighbouring residences, is negligible-to-low in all instances. This level would

be considered not significant in terms of the guidance provided within the Technical Advice Note (TAN) detailed at **Section 2.2**, as outlined by the Scottish Government.

An illustrative sound footprint for the proposed development showing the predicted specific sound level (dB $L_{Aeq}$) is provided in **Figure 1**.

**Figure 1 – Sound Contour Plot, dB $L_{Ar}$**




Further to the above, the Hill of Glaschyle Wind Farm assessment [6] shows that the Tomcork (H05) residence is located between the operational Hill of Glaschyle and Berryburn wind farms. The sound generated by wind farm developments and other industrial sources are different in nature and assessed on a very different basis for planning purposes. As a result, it is not strictly possible to assess the combined impact of the various development operating cumulatively/simultaneously. However, Table 8-14 of the Hill of Glaschyle Wind Farm assessment indicates that the maximum sound levels resulting from the combined operation of the wind farms is 41 dB $L_{Aeq}$ at H05 (assuming that the provided $L_{A90}$ values are 2 dB lower than the $L_{Aeq}$, as per typical requirements for wind farm assessments). This level is over 10 dB higher than the projected levels generated by the introduction of the Proposed Development and the storage facility would result in a negligible increase in sound level. Additionally, the sound generated by the existing turbines could be considered to provide

additional masking of the sound generated by the Proposed Development and/or be considered part of the existing background noise level. As a result, the impact resulting from the combined/simultaneous operation of the Proposed Development with the neighbouring wind farms can, similar to the isolative assessment discussed above, be considered not significant on this basis.

The wording for a suggested planning condition that would restrict sound associated with the introduction of the Proposed Development, should the site gain planning consent, is provided in **Appendix B**.

## 5.2 Construction

Construction sound is discussed with reference to the 'ABC Method' daytime, evening/weekend and night-time limits of 65, 55 and 45 dB $L_{Aeq}$ respectively, for instances where existing ambient levels are relatively low, which is the case here, and vibration is discussed in terms of the typical peak particle velocity (ppv) limits of 6 to 10 $mm.s^{-1}$ (see **Section 2.4**).

The construction of battery storage facilities is typically undertaken in phases starting with the formation of access tracks such that the main site construction activities can begin, following with the installation of security fencing; the introduction of a concrete base and the subsequent construction of the battery storage and ancillary equipment; installation of transmission connection and installation of any necessary ecological and landscape mitigation measures.

The main activities which have the potential to generate sound and vibration are the formation of the access tracks, concrete works and landscaping when occurring relatively close to neighbouring residences. The other activities either occur at distances which are very unlikely to result in levels that would breach typical construction limits or involve relatively light construction methods/techniques that would equally result in comparably low temporary levels of sound and vibration.

Additional traffic movements generated during the construction process, 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 essentially only tends to result in a minor increase in the average sound levels from existing roads, with the most noticeable sound and perceptible vibration effects resulting from the sporadic and increased number of HGV pass-bys at 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 limits.

Where relatively intense construction activities are to be undertaken near neighbouring residences, particularly during the construction of the site access routes, 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.

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 Control of Pollution Act 1974 [9], which BS 5228-1 makes refence to. BS 5228-1 states 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. Non-acoustic factors

which influence the overall level of complaints, such as mud on roads and dust generation, shall also be controlled.

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.

The following construction sound and vibration mitigation measures could be implemented where appropriate and proportionate:

- Consideration shall be given to sound and vibration emissions when selecting or modifying the plant and equipment to be used on site, with quieter variants given preference;
- All plant and equipment should 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 should 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;
- Restricting activities being performed within a certain distance of sensitive locations; and,
- Reducing construction traffic.

Any strategy that would reasonably be expected to reduce the level of construction sound and vibration by the desired amount will be considered.

# 6 Conclusions

An acoustic impact assessment of the proposed Corshellach Energy Storage Project has been undertaken. The results show that sound levels resulting from the operation of the site will generally be low in the context of relevant assessment criteria (i.e. BS 4142, BS 8233 and that provided by the World Health Organisation) and can be considered insignificant in terms of technical advice provided by the Scottish Government.

Sound and vibration resulting from the construction of the site are unlikely to breach typical limits at neighbouring dwellings. However, appropriate sound reduction measures via the use of 'best practicable means' will be implemented to mitigate levels in any case.

# 7 References


[1] Scottish Government (March 2011) Planning Advice Notice 1/2011: Planning and Noise

[2] Scottish Government (March 2011) Technical Advice Note: Assessment of Noise

[3] British Standards Institution (2019) BS 4142:2014 + A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound

[4] 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

[5] 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

[6] Atmos Consulting/Muirden Energy LLP (June 2015) Hill of Glaschyle Wind Farm - Assessment of Noise Impacts for Revised Enercon E82 Wind Turbine Model

[7] International Organisation for Standardisation (December 1996) ISO 9613-2:1996 Acoustics - Attenuation of Sound During Propagation Outdoors - Part 2: General Method of Calculation

[8] 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

[9] Her Majesty's Stationery Office (July 1974) The Control of Pollution Act (CoPA)

## Appendix A – Experience & Qualifications

**Table A.1 - Author**

| Name | Mike Craven |
|---|---|
| Experience | Senior Acoustic Specialist, Renewable Energy Systems (RES), 2023-Present<br>Principal Acoustic Consultant, Hayes McKenzie Partnership Limited (HMPL), 2019-2022<br>Senior Acoustic Consultant, HMPL, 2013-2019<br>Acoustic Consultant, HMPL, 2011-2013<br>Acoustic Consultant, URS/Scott Wilson, 2008-2011<br>Acoustic Consultant, HMPL, 2004-2008 |
| Qualifications | MIOA, Member of the Institute of Acoustics<br>BSc Audio Technology, University of Salford |

**Table A.2 - Checker**

| Name | Stuart Hill |
|---|---|
| Experience | Senior Acoustic Specialist, RES, 2024-Present<br>Senior Acoustic Consultant, Mabbett, 2022-2024<br>Senior Environmentalist (Acoustics), Amey, 2021-2022<br>Associate Consultant – Acoustics, Noise & Vibration, SLR Consulting, 2017-2020<br>Technical Analyst/Senior Acoustic Analyst, RES, 2013-2017 |
| Qualifications | AMIOA, Associate Member of the Institute of Acoustics<br>MInstP, Member of the Institute of Physics<br>MSc Principles and Applications of Radiation in Industry, the Environment and Medicine, University of St Andrews<br>BEng Electronics Engineering, University of Aberdeen |

**Table A.3 - Approver**

| Name | Dr Jeremy Bass |
|---|---|
| Experience | Head of Specialist Services/Senior Technical Manager, RES, 2000-Present<br>Technical Analyst/Senior Technical Analyst, RES, 1990-2000<br>Foreign Exchange Researcher, Mechanical Engineering Laboratory, Tsukuba, Japan, 1989-1990<br>Research Associate, Energy Research Unit, Rutherford Appleton Laboratory, 1986-1989 |
| Qualifications | MIOA, Member of the Institute of Acoustics<br>MInstP, Member of the Institute of Physics<br>PhD, The Potential of Combined Heat & Power, Wind Power & Load Management for Cost Reduction in Small Electricity Supply Systems, Department of Applied Physics, University of Strathclyde<br>BSc Physics, University of Durham |

## Appendix B – Suggested Planning Condition Wording

The energy storage project shall be designed and operated to ensure that the rating sound level, determined using the BS 4142:2014 methodology external to any neighbouring property, shall not exceed 35 dB $L_{Ar}$ or the background sound level plus 5 dB for both daytime and night-time periods, whichever is the greater.