8. NOISE ASSESSMENT

8.1 Introduction

Bureau Veritas has been appointed by Scottish and Southern Electricity Networks (SSEN) Transmission to undertake a noise impact assessment for the proposed substation development at An Suidhe.

The purpose of this Noise Impact Assessment (NIA) Report is to support the Town and Country Planning and Section 37 applications for the Project and identify any noise related impacts associated with the scheme, during construction and once operational.

8.2 Site Descriptions

The An Suidhe Project is located approximately 430 m to the northwest of the existing An Suidhe Substation site, and approximately 940 m northwest to A83 and approximately 2.5 km west of Argyll Caravan Park. The site is located in a rural area and currently comprises mainly open grassland.

The nearest residential premises have been identified as 'Old School House' approximately 900 m to the southeast of the site and 'Killean Farmhouse' approximately 960 m to the south of the site. Other properties are located at a further distance to the east (dwellings in Auchnangoul and Dalchenna Farm), southeast (dwelling and B&B in Claonairigh and dwellings in Kenmore), and northeast (dwellings in Auchnabreac).

A site location plan is provided in **Annex R**.

8.3 Development Proposals

Components of the Proposed Development that are subject to an application for planning consent under the Town and Country Planning (Scotland) Act 1997 (as amended) are as follows:

- A substation platform approximately 1.3 ha at a height of 176 AOD;
- Gas insulated Switchgear (GIS) building, maximum height 22 m and single storey control building annex;
- 275/132 kV super grid transformer (SGT), rated at 480 MVA located in a ventilated building of maximum height 16 m;
- Two gantries and electrical equipment/downleads to connect the OHL and the proposed substation;
- A Temporary Works Area (TWA) adjacent to the Proposed Development site, of approximately 0.69 ha.
- Diesel generator housed in a building;
- Borehole for water;
- Turning and parking areas;
- Use of existing forestry access track with upgrades, approximately 1.7 km in length;
- Construction of a new access track, approximately 174 m long;
- A 2.4 m high security fence of palisade construction around the substation platform perimeter;
- Deer fence around new areas of woodland planting;
- Landscape planting to screen the Proposed Development and provide biodiversity enhancement; and
- Foul and surface water drainage.

Components of the Associated Development subject to an application for consent under Section 37 of the Electricity Act 1989 are as follows:

- Construction of six new steel lattice towers to support the realigned overhead line which will connect into the new substation;
- Two downleads from the realigned overhead line into the substation;
- Tree and vegetation clearance where required;
- Construction of three new permanent access tracks leading to the three northern most towers:
- One of approximately 164 m;

- One of approximately 109 m;
- One of approximately 14 m;
- Temporary overhead line diversions during construction; and
- Dismantling of the existing overhead line section connecting the existing 132kV substation which comprises seven redundant towers and associated cabling.

In addition, distribution network assets, such as the proposed 33 kV interconnector cable, would be undergrounded to make way for the Associated Development and can be carried out under Permitted Development rights.

8.4 Legislation and Guidance

8.5 Scope of the Assessment

This assessment considers effects of noise on noise-sensitive receptors (NSRs) due to:

- potential construction noise effects (including construction traffic noise) on NSRs in the vicinity of the substation site and the new overhead line (OHL); and
- the potential effects of noise emissions from the operational substation.

Given the separation distances between the proposed sections of OHL, required to divert the Inveraray to Crossaig 275 kV OHL into and out of the proposed substation, and the nearest noise sensitive receptors, detailed assessment of the potential noise impacts of the new OHL route once operational has been scoped out. Calculations based on the proposed conductor and tower design, in accordance with TR(T)94 'A Method for Assessing the Community Response to Overhead Line Noise', indicate that during worst case (audible noise induced by rainfall) conditions noise impacts would be negligible beyond 40 m (based on a prevailing background sound level of 35 dB LA90). The nearest noise-sensitive receptor is situated more than 960 m from the Project.

Likewise, the potential impacts of vibration during construction and operation are not expected to be significant due to the separation distances. Although localised blasting of the bedrock may be required during the site preparation works, the vibration magnitudes would be well below the threshold criteria for the onset of cosmetic building damage. In the event that blasting vibration may be perceptible at the nearest residential properties, the actual impact would not be significant with the implementation of best practice which would include prior notification of blasting operations.

The scope of the assessment has been informed by the following guidelines/policies:

- Planning Advice Note (PAN) 1/2011 - Planning and Noise[1]
- BS 5228-1: 2009+A1: 2014 – Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise;[2]
- Design Manual for Roads and Bridges - LA 111 Noise and Vibration, Revision 2[3]; and
- BS 4142:2014+A1:2019 - Methods for rating and assessing industrial and commercial sound[4].

8.6 Consultation

Consultation was undertaken with the Environmental Health Officer at Argyll & Bute Council (ABC) to agree the survey and assessment methodology to be adopted for this NIA. This included agreement on the location and scope of baseline noise surveys, and assessment criteria.

[1] The Scottish Government, Planning Advice Note 1/2011: planning and noise, 3 Mar 2011. Reviewed from https://www.gov.scot/publications/planning-advice-note-1-2011-planning-noise/documents/

[2] BSI Standards Publication, BS 5228-1:2009+A1:2014: Code of practice for noise and vibration control on construction and open sites – Part 1: Noise, December 2008.

[3] The Highway Agency, Transport Scotland, Welsh Government and the Department for Infrastructure, Design Manual for Roads and Bridges - LA 111 Noise and Vibration, Revision 2, May 2020. Reviewed from https://www.standardsforhighways.co.uk/prod/attachments/cc8cfcf7-c235-4052-8d32-d5398796b364?inline=true

[4] BSI Standards Publication, BS 4142:2014+A1:2019 - Methods for rating and assessing industrial and commercial sound, October 2014.

The construction noise and vibration assessment, as described in more detail below, follows the guidance presented in BS5228:2009+A1:2014 Parts 1: Noise and 2: Vibration.

The assessment criteria are broadly in line with the following assessment methodology, with the sound rating level of the operational substation being required to not exceed the existing background sound level, in line with British Standard 4142:2014+A1:2019.

8.7 Policy

A summary of the relevant planning policy, guidance documents and British Standards is included in the following sections.

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

Published in March 2011, this document provides advice on the role of the planning system in helping to prevent and limit adverse effects of noise (Scottish Government, 2011). Information and advice on noise assessment methods are provided in the accompanying Technical Advice Note (TAN): *Assessment of Noise*. Included within the PAN document and the accompanying TAN are details of the legislation, technical standards and codes of practice for specific noise issues.

Of relevance to the assessment of development generated road traffic noise, it is stated that a change of 3 dB(A) is the minimum perceptible under normal conditions, and that a change of 10 dB(A) corresponds roughly to a halving or doubling of the perceived loudness of a sound.

Neither PAN 1/2011 nor the associated TAN provide specific guidance on the assessment of noise from fixed plant, but the TAN includes an example assessment scenario for 'New noisy development (incl. commercial and recreation) affecting a noise sensitive building', which is based on BS 4142:1997: *Method for rating industrial noise affecting mixed residential and industrial areas*. This British Standard has been replaced with BS 4142:2014+A1:2019: *Methods for rating and assessing industrial and commercial sound*.

British Standard 5228-1: 2009+A1:2014 – Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise.

BS5228 details the ABC method for construction noise assessment[5], which is shown in **Table 8.1**.

Table 8.1 Construction Noise Impact Assessment Criteria Assessment

Assessment **category and threshold value period**	Threshold value, $L_{A,eq}$ (dB)		
	Category A	**Category B**	**Category C**
Night-time	45	50	55
Evenings and weekends	55	60	65
Daytime and Saturdays	65	70	75

[5] BSI Standards Publication, BS 5228-1:2009+A1:2014: Code of practice for noise and vibration control on construction and open sites – Part 1: Noise, December 2008, pp119-120.

- Night-time is considered between 23:00 and 07:00. Evenings and weekends are considered to be 19:00 – 23:00 on weekdays, 13:00 – 23:00 on Saturdays and 07:00 – 23:00 on Sundays. Daytime is considered to be 07:00 – 19:00 on weekdays and Saturdays 07:00 – 13:00.
- The NSR is defined as Category A if the ambient noise levels (rounded to the nearest 5 dB) are less than those stated for category A.
- The NSR is defined as Category B if the ambient noise levels (rounded to the nearest 5 dB) are equal to those stated for category A.
- The NSR is defined as Category C if the ambient noise levels (rounded to the nearest 5 dB) are greater than those stated for category A.

For the purpose of this assessment, noise levels are assessed with reference to the 5 dB(A) Change method presented in Annex E of BS 5228-1. Subject to lower cut-off values of 65 dB, 55 dB and 45 dB L_{Aeq}, T from site noise alone, for the daytime, evening and night-time periods, respectively, any increase over 5 dB is deemed as medium or high magnitude of change (depending on the excess), while under 5 dB change is deemed to be a low or negligible magnitude of change (depending on the margin).

Design Manual for Roads and Bridges - LA 111 Noise and Vibration, Revision 2

The Design Manual for Road and Bridges (DMRB) LA 111 'Noise and Vibration' 2020 provides a method of evaluating both the immediate and long-term impact of abrupt changes in the 18-hour traffic flow (06.00-24.00) in terms of the effects on people and, principally, occupiers of residential property.

Individuals vary widely in their response to traffic noise, although the average or community response from a large number of people to the same level of traffic noise is fairly stable.

Consequently, a community average degree of annoyance can be related to the $L_{10,18h}$ traffic noise level. The annoyance caused by the existing traffic noise and the predicted future traffic noise is calculated, enabling the increase, or decrease in the percentage of people likely to be annoyed to be determined.

DMRB requires that an assessment is undertaken where an increase in a road traffic flow of 25% or greater is predicted (equivalent to an increase or decrease in road traffic noise of approximately 1 dB(A)). This implies that road traffic flow increases of up to 25% offer no significant impact in environmental noise terms.

British Standard 4142: 2014+A1:2019: Methods for rating and assessing industrial and commercial sound (BS 4142)

British Standard 4142 describes methods for rating and assessing the following:

- Sound from industrial and manufacturing processes
- Sound from fixed installations which comprise mechanical and electrical plant and equipment
- Sound from the loading and unloading of goods and materials at industrial and/or commercial premises
- Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train movements on or around an industrial and/or commercial site

The methods use 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.

In accordance with the assessment methodology, the specific sound level ($L_{Aeq,T}$) of the noise source being assessed is corrected, by the application corrections for acoustic features, such as tonal qualities and/or distinct impulses, to give a "rating level" ($L_{Ar,Tr}$).The British Standard effectively compares and rates the difference between the rating level and the typical background sound level ($L_{A90,T}$) in the absence of the noise source being assessed.

The British Standard advises that the time interval ('T') of the background sound measurement should be sufficient to obtain a representative or typical value of the background sound level at the time(s) when the noise source in question is likely to operate or is proposed to operate in the future.

Comparing the rating level with the background sound level, BS 4142 states:

> "*Typically, the greater this difference, the greater the magnitude of impact.*
>
> *A difference 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.*"

In this assessment consideration has been given to both BS 4142 and BS 8233, in order to ensure that the development proposals are considered in context of the prevailing noise environment.

8.8 Criteria for Assessing Sensitivity of Receptors

The guidance contained within Technical Advice Note to PAN 1/2011 has been drawn upon in the generation of an appropriate set of receptor sensitivity criteria. These criteria are presented in **Table 8.2** and have been applied for the construction and operational phases of the proposed development.

Table 8.2 Construction Noise Impact Assessment Criteria Assessment

Sensitivity	Description	Examples
High	Receptors where people or operations are particularly susceptible to noise and/or vibration.	Residential, quiet outdoor recreational areas, schools and hospitals.
Medium	Receptors moderately sensitive to noise and/or vibration, where it may cause some distraction or disturbance.	Residential, quiet outdoor recreational areas, schools and hospitals
Low	Receptors where distraction or disturbance from noise and/or vibration is minimal.	Unoccupied buildings or factories and working environments with existing levels of noise.
Negligible	Receptors where noise would have a negligible impact.	Areas which are not considered to be noise sensitive e.g., vacant land.

8.9 Criteria for Assessing Magnitude of Change

In accordance with relevant technical guidance above, the potential impact during the proposed construction and operation phases have been assessed using the following criteria:

Construction Phase - Site Works

High: Predicted short-term (<8 weeks) construction noise level more than 75 dB $L_{Aeq,1hour}$ at a residential property.

Medium: Predicted short-term (<8 weeks) construction noise level more than or equal to 65 dB $L_{Aeq,1hour}$ and less than 75 dB $L_{Aeq,1hour}$ at a residential property.

Low: Predicted short-term (<8 weeks) construction noise level more than or equal to 60 dB $L_{Aeq,1hour}$ and less than 65 dB $L_{Aeq,1hour}$ at a residential property.

Negligible: Predicted short-term (<8 weeks) construction noise level less than 60 dB $L_{Aeq,1hour}$ at a residential property.

Construction Phase - Offsite Road Traffic

High: Increase in local road traffic noise of more than 5 dB(A)

Medium: Increase in local road traffic noise of 3 - 4.9 dB(A)

Low: Increase in local road traffic noise of 1 - 2.9 dB(A)

Negligible: Increase in local road traffic noise of less than 1 dB(A)

Operation Phase

High: Predicted operational rating noise level +10 dB or greater above the existing background L_{A90} level.

Medium: Predicted operational rating noise level +5 to +9 dB above the existing background L_{A90} level.

Low: Predicted operational rating noise level +2 to +4 dB above the existing background L_{A90} level.

Negligible: Predicted operational rating noise level less than 2 dB above the existing background L_{A90} level.

The assessment has been undertaken using 'worst-case' noise levels to predict the potential 'worst-case' noise impact on the principal receptors in the area.

8.10 Significance Criteria

The significance of effect has been determined with consideration to both the receptor sensitivity and the magnitude of change according to the matrix detailed in Table 8.3 **drawing on the guidance within TAN 1/2011.**

Table 8.3 Significance of Effect Matrix

Magnitude of Change	Receptor Sensitivity			
	High	Medium	Low	Negligible
High	Major	Moderate	Minor	Negligible
Medium	Moderate	Moderate	Minor	Negligible
Low	Minor	Negligible	Negligible	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

Effects have been categorised as either ‘adverse’ (e.g., noise level increases) or ‘beneficial’ (e.g., noise level decreases).

- The residual effects are assessed for individual NSRs as follows:
- negligible and minor effects are considered to be ‘not significant’; and
- moderate and major effects are considered to be ‘significant’.

8.11 Baseline Noise Survey

To inform the assessment, a baseline noise survey was undertaken at the nearest NSR to the Project. Full data and analysis of the baseline noise surveys are included in **Annex R** of this report. A summary of the baseline noise survey work is included below.

The survey was undertaken over a period of 10 days to determine the current prevailing noise environment at the nearest NSRs in the vicinity of the site. Measurements were conducted over this duration in order to capture sufficient data under representative meteorological conditions, with all data obtained under unsuitable conditions excluded from the final dataset.

The noise survey commenced in the afternoon of Wednesday 6 October 2021 and concluded on the afternoon of Friday 15 October 2021.

8.12 Measurement Locations

The measurements were made within free-field conditions, i.e., at least 3.5 m from any acoustically reflective surfaces other than the ground. The measurement location adopted during the baseline noise survey is labelled in **Annex R.** The measurement location is described below:

An Suidhe Substation - Measurement Location 1 (ML1) – In the garden to the southwest of Killean Farmhouse, 1.5 m above ground level.

Old School House and Killean Farmhouse are the nearest noise sensitive receptors. Given that the dominant sound source at Old School House and Killean Farmhouse is traffic on the A83; and as Killean Farmhouse is further from the A83, the baseline data at MP1 has been used to inform the background sound levels for both locations to provide a robust assessment.

8.13 Meteorological Conditions

Meteorological conditions were monitored at the monitoring location ML1.

The wind speed at ML1 was mostly lower than 5 ms^{-1} and the dominant wind direction is north west. The meteorological data at ML1 was used to expurgate the noise data measured at the site when the wind speed was higher than 5 ms^{-1} and when rain occurred.

8.14 Measurement Equipment

The baseline noise survey measurements were undertaken using the following Class 1 specification noise measuring equipment:

Table 8.4 Noise measurement equipment

Equipment Type	Manufacturer	Model	Serial Number
Sound Level Meter	Rion	NL-52	00231668
Microphone	Rion	UC-59	04713
Calibrator	Rion	NC-74	34536109
Met-Station	Davis	Pro-D	N/A

The sound level meter and associated measurement chain was calibrated to traceable standards within the preceding two years and the portable calibrator within the preceding 12 months. The sound level meter was calibrated both prior to and upon completion of the survey. No significant drift was noted to have occurred.

8.15 Measurement Results

A summary of the noise levels measured during the noise survey are presented in **Table 8.5**

Table 8.5 Measurement results filtered by meteorological data, free-field dB

Location	Time Period	Sound Pressure Level, dB			
		$L_{Aeq,15min}$	$L_{Amax,15min}$	$L_{A10,15min}$	$L_{A90,15min}$
ML1	Day	33 – 69 Average 44 Mode 44	27- 82 Average 56 Mode 55	34 – 68 Average 47 Mode 46	32 – 52 Average 39 Mode 38
	Night	32 – 48 Average 39 Mode 39	34 – 66 Average 50 Mode 52	32 – 51 Average 40 Mode 38	32 – 47 Average 37 Mode 35

Based on the calculated average and mode sound levels in **Table 8.5** and the sound level distributions shown in **Annex R**, the representative L_{Aeq} and typical L_{A90} at ML1 are 44 dB and 38 dB during daytime, and 39 dB and 35 dB during night-time.

8.16 Noise emission data

8.17 Construction Noise

The sources presented in **Table 8.6** have been used to determine static construction noise levels. To ensure a worst-case assessment, it has been assumed that all phases of works will take place simultaneously.

Table 8.6 Static Construction Activities and Associated Noise Levels

Activity	Plant Item	No.	BS 5228 reference	Utilisation %	$L_{A,eq}$ at 10 m (dB)
Forestry	Harvester	1	Manufacturer supplied	5%	86
	Forwarder	1	Manufacturer supplied	50%	87
	Petrol Driven Chainsaw	1	Table D2 No. 14	80%	83
	Wheeled loader	1	Table C2 No. 27	20%	80
	Lorry	1	Table C2 No. 34	100%	80
Site Preparation	Tracked Excavator	2	Table C2 No. 3	50%	78
	Dozer	3	Table C2 No. 1	50%	75
Topsoil Strip	Tracked Excavator	2	Table C2 No. 3	50%	78
	Dozer	3	Table C2 No. 1	50%	75

Access Road	Wheeled Backhoe	1	Table C2 No. 8	50%	68
	Dumper	2	Table C4 No. 7	50%	78
	Vibratory Roller	1	Table C2 No. 40	50%	73
Tower Construction	Excavator	1	Table C2 No. 14	50%	79
	Steel Tube Piling Rig	1	Table C3 No. 8	50%	88
	Concrete Pump	1	Table C3 No. 25	50%	78
	Crane	1	Table C3 No. 29	40%	70
	Rock breaker	1	Table C9 No. 12	50%	85
Tensioning	Winder	1	Manufacturer supplied	60%	77
	Rear Winder	1	Manufacturer supplied	60%	77

8.18 Construction Traffic Noise

Estimated traffic data for substation construction has been provided by the Transport team of Arcus Consulting, as shown in **Table 8.7** below. The Proposed Development will be constructed over a 30-month period. Forestry felling works are likely to commence several months in advance of substation earthworks / construction and have therefore been included within this assessment.

Table 8.7 Estimate of Construction Vehicle Numbers for the Proposed Development

Construction Task	Vehicle Type	Approximate No. of Loads
HGV		
Forestry Machine Delivery	Low loader lorry	4
Forestry Operations	Fuel lorry	4
Earthworks Substation Platform	20T Tipper lorry	840
Earthworks Site Compound	20T Tipper lorry	250
Concrete for all work	Concrete wagon (6m^3 carry capacity)	228
Building & External civils deliveries (steelwork, cladding, drainage, fencing etc)	HGV Trailer	90
Electrical equipment deliveries	HGV Trailer	198
Transformer delivery	Abnormal indivisible load	1
Transformer removal	Abnormal indivisible load	1
Car/ Light Goods Vehicle (LGV)		
Personnel to and from site	Car/ Light Goods Vehicle	26,400
Total No. of HGVs and LGVs (Two-way trips)		**28,016**

Table B.1 (see **Annex R)** presents the one-way movements of the baseline traffic data of A83 in 2019. For the purpose of the assessment, impacts are presented for HGVs and light good vehicles (LGVs). The following number of two-way baseline traffic movements are assumed i.e., half the number of one-way movements:

- HGVs: 141 two-way movements, comprising of HGV movements only; and
- LGVs: 1,435 two-way movements, comprising of two wheeled motor vehicles, cars and taxis, buses and coaches and light goods vehicles.

As show in **Table B.2** (see **Annex R**), the monthly maximum two-way HGV movements during construction is 280 per month for a period of three months during earthworks. This equates to approximately 13 HGV movements per day (based on 22 working days per month).

This represents a 9% increase in the average number of HGVs on the A83 per day for the three months, which have the monthly highest traffic volume increase.

In terms of car and LGV movements construction will result in approximately 880 movements each month, assuming an even distribution across the construction period. This would result in approximately 34 two-way movements per day (assuming 26 working days per month), resulting in a <3% increase in the number of cars/LGVs on the A83.

Considering HGV and cars/LGVs combined the maximum number of monthly two-way movements is approximately 1,160 during months 7, 8 and 9 which equates to 53 two-way movements per day (assumes 22 working days per month). This represents a 3.4% daily increase in total vehicle movements on the A83 during months 7, 8 and 9 of construction.

The Associated Development will be constructed in a single-phase delivery, lasting 3 months in duration between months 13 and 14 of the Project's overall construction programme. The estimated number of vehicle movements during construction, including both light and heavy vehicles is summarised in **Table B.3 Annex R.** Additional car/LGV two-way movements are 12.7 per day and represent an additional 0.9% increase, 2.8% increase in total (assumes 26 working days per month).

As stated above, DMRB requires that an assessment is undertaken where an increase in a road traffic flow of 25% or greater is predicted (equivalent to an increase or decrease in road traffic noise of approximately 1 dB(A)). This implies that road traffic flow increases of up to 25% offer no significant impact in environmental noise terms.

Construction traffic noise is therefore assessed as no significant and scoped out of further assessment.

8.19 Construction Vibration

Ground borne and airborne vibration should be considered in relation to site preparation, piling and construction activities (e.g. rock breaking). Due to the complex relationship between the source of vibration, forcing frequency, the distance and geological characteristics between source and receiver and the construction of the receiving structure, it is very difficult to predict the degree of vibration which may occur.

However, the level of vibration required to cause structural damage is very high and unlikely to be reached in the construction of the Project. Most construction activities are not significant sources of ground borne vibration. Activities, such as earth-working and vibratory compaction produce relatively low levels of ground borne vibration. Piling activities can produce perceptible levels of vibration, and adverse effects of vibration would be expected only within approximately 10 m of such works.

The nearest residential receptor lies approximately 90 m from the Project. Therefore, construction vibration activities at the nearest receptor will not be perceptible (negligible adverse impact).

8.20 Operational Substation Noise

Detail of the fixed plant items associated with the proposed substation development has been provided by SSEN Transmission. Table 8.8 below details the specific plant items and their noise emission levels based on the measured data in Bureau Veritas library. Details of assumed sound spectrum of the plant items are provided in **Annex R**.

Table 8.8 Noise emission data for proposed plant items, L_W (dB)

Plant Item	Source	Assumed Sound Power Level, dBA L_w
1no. 480 MVA 275/132 kV Supergrid transformer	SSE Specification SP-NET-SST504	69

The above noise emission data was used in a detailed noise model of the site to predict the noise levels from the proposed substation at the nearest noise sensitive receptors. The following section details the modelling methodology and the assessment work undertaken.

8.21 Noise modelling

Noise emissions from the substation were based on specification and library sound power levels as detailed in **Table 8.3** above. The sound emission of the transformers was modelled as area sources. The height of the transformers was assumed to be 3.9 m.

A computational noise model of the site and surrounding area has been created using the CadnaA noise prediction software (Version 2021), which considered geometric spreading, topography, screening, ideal meteorological conditions and detailed information regarding the sources of noise. Noise propagation is calculated in accordance with ISO 9613-2: 1996[6].

The following assumptions were used in the model:

- All sound propagation assumes 10°C and 70% relative humidity.
- A ground absorption value of 0.7 was used for areas outside of the substation, with the exception of roads which were set to 0.0 (hard). Areas within the substation were assumed to be hard ground.

The sound sources are modelled as per the data shown in **Table 8.8.** Since the sources will be located internally, a 10 dB insertion loss is assumed, associated with the steel-frame structure. This value is an estimate based on experience of similar structures.

The results of the modelling are shown graphically in **Annex R**

8.22 Assessment

8.23 Construction Noise

The static noise level at the nearest receptor has been calculated based on the distance between that receptor and the Substation site or the closest tower. Propagation has been modelled over soft ground, given the dominance of soft ground in the area surrounding the Project. The effects of barriers or topographical screening has not been considered. **Table 8.9** below shows the results of construction noise calculation results at the nearest receptor.

Table 8.9 Construction Noise Levels of activities at the nearest receptor

Activity	Noise Level L_{Aeq} (dB)
Forestry	48
Site Preparation	38
Topsoil Strip	38
Access Road	38
Tower Construction	49
Tensioning	32
Total construction noise level	**52**

As mentioned above, noise levels are assessed with reference to the 5 dB(A) Change method, and subject to lower cut-off levels, as presented in Annex E of BS 5228-1. As the worst-case construction noise level is below

[6] ISO 9613-2: 1996, Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation, International Organization for Standardization, 1996

the lower threshold of 65 dB day and 55 dB evening, the potential impact to the nearest NSR is negligible during these periods.

As such, no noise mitigation is required for the construction activities. However, in any case, any mitigation required for noise generated by rock breaking will be agreed with Argyll and Bute Council, for inclusion in the Construction Noise Management Plan.

No construction works are proposed to take place during the night-time period without prior written agreement from ABC in exceptional circumstances.

8.24 Operational Substation Noise

Based on the noise emission data provided for each of the noise sources, as detailed in **Table 8.8**, and the noise modelling methodology detailed in **Section 5** of this report, noise level predictions have been undertaken to establish the likely specific sound levels at the NSR to the proposed substation.

The specific sound level then has an acoustic character penalty applied as a worst-case assumption in order to determine the sound rating level. The sound rating level is then compared with the typical background sound level during the night-time (worst case) period at the receptor in order to determent the likely impact, depending on context.

The results of the modelling indicate that the specific sound level from the substation would be 14 dB $L_{Aeq,T}$ at Old School House and 8 dB $L_{Aeq,T}$ at Killean Farmhouse at night.

The sound rating is the sum of the specific sound level, as detailed above, and any required acoustic character corrections. In practice, the penalty applied would range from 0 dB to 6 dB depending on the level of tonality at the receptor. A penalty of 2 dB would apply where a tone is just perceptible at the receptor, 4 dB where the tone is clearly perceptible, and 6 dB where it is highly perceptible. As such a low plant sound level is predicted, it is unlikely to be audible at the NSR, and therefore no penalty has been applied.

Therefore, the sound rating level from the substation would be 14 dB $L_{Ar,T}$ at the nearest NSR, which is the worst case receptor. The sound level from the substation would be expected to be similar during both daytime and night-time periods.

The assessment is conducted by subtracting the background sound level (modal values shown in **Table 8.5** from the sound rating level. As such, the assessment takes account of night-time periods when the typical background sound level is lower and hence the impact is at its highest. The impact during daytimes (due to the higher background sound level) would therefore be expected to be lower.

The sound rating level is therefore predicted to be 14 dB $L_{Ar,T}$. The typical background sound level during night-time periods was determined as being 35 dB $L_{A90,15min}$. As such, the assessment level is -21 dB which indicates a negligible impact.

8.25 Cumulative impacts

It is not anticipated that there will be any cumulative impacts, in terms of noise and vibration associated with the construction phase and the completion of the Development.

As discussed in Section 4.2, the maximum number of total vehicle movements per day is less than an increase of 25% of baseline traffic data on A83 and predicted as no significant traffic noise impacts. Given vehicle movements regarding the Associated Development will occur during months 13 and 14, there is no change to the worst-case scenario assessed. For cars/LGVs there will be a cumulative increase of 2.8% during peak construction and an increase in total vehicle movements of 4.1% (assumes 26 day working days per month), which is still much lower than an increase of 25% of baseline traffic data on A83.

SSEN Transmission are proposing similar substation and OHL developments across Argyll that will likely run in parallel with the Project's construction period. SSEN Transmission's other substation project at Crarae (to the

north west of Minard) will use the same transportation route along the A83 during construction and will pass the An Suidhe substation access point. As such, it is scoped into the cumulative assessment.

Maximum vehicle movements will occur during months 7 to 9 of the construction schedule. During these months, An Suidhe and the Project will require a total of 560 HGVs and 1,760 cars/LGVs per month to service construction. This accumulates to 26 HGVs per day (assuming a 22 day month) and 68 LGVs per day (assuming a 26-day month). During months 7 to 9 of the construction schedule, cumulative worst case traffic movements therefore represent a 19% increase in HGVs, 5.3% increase in cars/LGVs and a 6.6% increase in total vehicles, which is still much lower than an increase of 25% of baseline traffic data on A83. All other months of the construction programme will experience an increased but significantly reduced level of additional traffic compared with months 7 - 9.

Other Projects that may be constructed in parallel with the substation include Earraghail and Tangy IV wind farms. The Environmental Statement for Tangy IV indicates that most construction traffic will be experienced in the south of the Mull of Kintyre[7]. Cumulative effects are unlikely. For Earraghail a maximum of 93 HGVs per day is predicted on the A83 south of Inveraray[8]. In the unlikely scenario that this maximum was to coincide with peak HGV movements for the An Suidhe and Crarae substations there would be an additional 119 HGVs on the A83 representing a worst case increase of 13% in total vehicles, which is still much lower than an increase of 25% of baseline traffic data on A83. This would not result in significant magnitude cumulative impact in environmental noise terms.

During the operational phase, the operation of the substation is very unlikely to result in significant increase in traffic volume, which will be cumulative with the impacts from other developments. Existing An Suidhe will remain, but all SSENT primary plant will be removed, as such it will be not included in the cumulative assessment. The noise impact, based on the potential traffic noise change, is therefore assessed as negligible.

8.26 Mitigation Measures

The assessment indicates that an adverse impact would not be expected. As such, no specific mitigation measures, above those which are embedded as part of the Project are required. It should also be noted that the assessment is based on specification data which is expected to be worst case and the actual plant used would be expected to be quieter

8.27 Summary

This report has considered the potential noise effects that could arise due to the Project at the closest NSR to the Project. The assessment has taken account of applicable planning policy and current guidance.

An assessment of construction noise and vibration from the Project has been undertaken. The results show that as the worst-case construction noise level is below the lower threshold of 65 dB day and 55 dB evening, the potential impact to the nearest NSR is negligible during these periods. Given the long distance from the Project to the nearest NSR, construction vibration activities will not be perceptible (negligible adverse impact).

An assessment of noise emissions from the proposed substation has been undertaken based on specification and assumed library noise emission data and a computer-based noise model. The results of this modelling exercise were compared against the existing noise environment on the site in accordance with BS 4142 and against the requirements of ABC. The assessment indicates that the proposed substation would not cause an adverse impact at nearby receptors.

It is not anticipated that there will be any cumulative impacts, in terms of noise and vibration associated with the construction phase and the completion of the Development. During construction, the cumulative worst case traffic

[7] https://www.energyconsents.scot/ApplicationDetails.aspx?cr=ECU00000673&T=5 Accessed July 2022

[8] EARRAGHAIL Renewable Energy Development, Environmental Statement, https://www.scottishpowerrenewables.com/pages/earraghail_renewable_energy_development.aspx Accessed July 2022

movements for a period of three months is lower than an increase of 25% of baseline traffic data on A83. During the operational phase, the operation of the substation is very unlikely to result in significant increase in traffic volume, which will be cumulative with the impacts from other developments. The noise impact, based on the potential traffic noise change, is therefore assessed as negligible.

In light of the findings of the assessment, it is considered that no specific mitigation measures are required above those which are embedded within the proposed development. However, it is recommended the impact is reassessed by acoustic consultants as manufacturers' data become available.