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15. NOISE AND VIBRATION

15.1 Executive Summary

15.1.1 A noise assessment has been carried out for the Proposed Development, considering both construction and operational phases.

15.1.2 The construction noise assessment, based on BS5228, identified potential significant impacts at several nearby Noise Sensitive Receptors (NSRs), particularly during evening and weekend hours. Activities such as felling, tower erection, and civil works are predicted to exceed acceptable noise thresholds without mitigation.

15.1.3 To address this, a Construction Noise Management Plan (CNMP) will be implemented, including measures like scheduling noisy activities outside sensitive hours and reducing equipment idle time. With these in place, residual impacts are expected to be minor. If construction extends beyond the planned schedule, a Construction Traffic Management Plan (CTMP) may be required to manage traffic-related noise.

15.1.4 Operational noise, assessed using TGN(E)322 and BS4142, is predicted to have negligible impact at all NSRs, requiring no mitigation. Cumulative operational noise from nearby developments is also considered negligible. Any overlapping construction schedules will be managed through updates to the CNMP to avoid significant cumulative effects.

15.2 Introduction

15.2.1 This chapter considers the potential effects, including cumulative effects, of Noise and Vibration during the construction and operation of the Proposed Development at noise sensitive receptors (NSRs) within the Study Area. Where potential significant effects are predicted, appropriate mitigation measures are proposed, and the significance of predicted residual effects are assessed.

15.2.2 This chapter, and its associated Technical Appendices, are not intended to be read as a standalone assessment and reference should be made to the introductory chapters of this Environmental Impact Assessment (EIA) Report.

15.2.3 The objectives of this chapter are to:

- Describe the assessment methodology and significance criteria used in the assessment;
- Identify the NSRs in the vicinity of the proposed development;
- Describe and define the baseline noise environment;
- Identify the dominant sound sources associated with the operation and construction of the proposed development;
- Predict the potential direct and indirect impacts on noise sensitive receptors; and
- Indicate any requirements for mitigation measures, if applicable, to provide sufficient levels of protection for all noise sensitive receptors.

15.2.4 This chapter was prepared and overseen by experienced acoustic consultants at Wood PLC, with appropriate memberships of the Institute of Acoustics (IOA), and experience of EIA in the context of energy grid and mixed-use industrial developments.

15.2.5 This chapter is necessarily technical in nature, so, to assist the reader, a glossary of acoustic terminology is included in **Volume 5, Appendix 15.1: Acoustic Terminology.**

15.2.6 This chapter considers noise arising from construction operations and noise arising from the overhead line (OHL) infrastructure during its operation. In summary of the types of operational noise that can arise, an energised OHL can be the source of an audible phenomenon known as 'corona discharge'. This is a limited electrical breakdown of the air in the vicinity of the OHL conductors. While OHL conductors are designed and constructed to minimise corona discharge, surface irregularities such as damage, attached raindrops, insects and other types of contamination can increase local electric field strength beyond the inception level for local corona discharge at these locations. Such corona discharge can be the source of audible noise, a crackling sound accompanied sometimes by a low frequency hum. These noise levels are present in 275 kV OHLs and are more likely to be prominent in 400 kV OHLs, depending on the conductor type.

15.2.7 The highest noise levels generated by an OHL usually occur during light rain when water droplets, collecting on the surface of the conductor, can initiate corona discharge. The number of droplets that collect, and hence the amount of noise, depends on the rate of rainfall. Mist or fog can also cause corona discharge from droplets condensing on and attaching to the conductor surface. Sometimes, after a prolonged spell of dry weather, conductors can become contaminated with accumulated dust particles and other materials on which corona discharge can occur and audible noise can be generated. Later rain showers have the effect of washing the conductors clean of such debris.

15.2.8 An OHL may also produce 'aeolian noise'. Aeolian noise is caused by wind blowing over a structure resulting in vibration that matches the natural frequency of the structure, or vortex shedding on the surface of a structure. There is currently not a standardised method to predict this type of noise, therefore it is difficult to assess. This type of noise is usually infrequent and depends on wind velocity and direction.

15.2.9 Additional information which supports this chapter is presented in the following technical appendices:

- **Volume 5, Appendix 15.1: Acoustic Terminology**
- **Volume 5, Appendix 15.2: Construction Activity**
- **Volume 5, Appendix 15.3: Noise Sensitive Receptors**
- **Volume 5, Appendix 15.4: Construction Noise Impact Assessment**
- **Volume 5, Appendix 15.5: Operational Noise Impact Assessment**

15.3 Scope of Assessment

Effects Assessed in Full

15.3.1 The scope of this assessment is to quantify the noise and vibration impacts that are predicted from the construction and operational phases (including cumulative effects) of the Proposed Development and to evaluate the significance of the effects following mitigation.

15.3.2 The EIA Scoping process, baseline conditions and professional judgement has identified the following effects for detailed assessment:

- Effects during construction of Noise and Vibration;
- Effects during operation of Noise;
- Cumulative effects during construction of Noise and Vibration; and
- Cumulative effects during operation of Noise.

15.3.3 The assessment scenarios used for this topic will be during construction and for the fully operational development.

Effects Scoped Out

15.3.4 On the basis of the desk-based assessment undertaken, the professional judgement of the EIA team, experience from other relevant projects and policy guidance or standards, and feedback received from consultees, the following operational effects have been 'scoped out' of detailed assessment. These have been confirmed with The Highland Council (THC) through Scoping Report and Opinion.

- There are no known operational vibrational issues associated with the Proposed Development at nearby NSRs. Therefore, vibration due to operation is not expected to be perceptible or adversely impact receptors and has not been assessed further.
- Any operational maintenance works required will be short-term and intermittent and are not expected to give rise to significant effects relating to noise and vibration. Therefore, noise from operational maintenance is not expected to adversely impact receptors and has not been assessed further.

Study Area

15.3.5 The Study Area for the assessment of noise and vibration encompasses the area over which all desk-based and field data were gathered to inform the assessment presented in this chapter. The Study Area comprises 89 nearby NSRs in proximity to the Proposed Development. NSRs were compiled from AddressBase data[1], detailed maps, and aerial photographs of the area surrounding the Proposed Development. These NSRs are all within 500 m of the nearest point to the Proposed Development. The reason 500 m was chosen was as it would allow all NSRs that could be impacted by the Proposed Development to be considered by the assessment.

15.4 Methodology

Legislation

15.4.1 The assessment of construction noise will comply with the following legislation, standards, and guidance.

The Control of Pollution Act 1974 (COPA)

15.4.2 Section 60 of the Act enables Local Authority officers to serve a notice in respect of noise nuisance from construction works, instructing the Principal Contractors to minimise nuisance to neighbouring properties through specific conditions. Section 61 of the Act provides a method by which a contractor can apply to the Local Authority for prior consent to undertake construction works in advance of their commencement. If consent is given, the application is exempt from any enforcement action under Section 60 of the same act.

Policy

15.4.3 The following policies of relevance to the assessment have been considered:

Planning Advice Note (PAN) 1/2011: 'Planning and Noise[2]'

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

15.4.5 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 (including

1 Emapsite, n.d. UK Mapping and Data. [Online] Available at: https://www.emapsite.com/
2 Planning Advice Note: Planning and noise (PAN 1/2011), The Scottish Government , 2011

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: Methods for rating and assessing industrial and commercial sound.

Guidance

15.4.6 This assessment is carried out in accordance with the principles contained within the following documents:

British Standard 5228-1/2:2009 +A1:2014 (BS5228), Code of Practice for Noise and Vibration Control on Construction and Open Sites[3]

15.4.7 Guidance on the prediction and assessment of noise and vibration from construction sites is provided in British Standard (BS) 5228 2009 +A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise. BS5228-1 provides recommended limits for noise from construction sites.

15.4.8 The Construction Noise Impact Assessment (CNIA) has been carried out according to the ABC method specified in Table E.1 of BS5228-1, in which NSRs are classified in categories A, B or C according to their measured or background noise level (the threshold values and categories are shown in **Table 15.4**). If the site noise level exceeds the threshold value of the appropriate category, then a potential significant effect is indicated. For the purposes of this assessment NSRs will be classed as Category A, which is the most conservative, as background noise levels are estimated to be below 55 dB. If changes occur to the planned equipment an updated CNIA will be required.

15.4.9 A desk-based CNIA has been prepared for the purpose of assessing the effects of the works on NSRs within the Study Area. This assessment has been produced in line with British Standard 5228-1:2009 +A1:2014 (BS5228), Code of Practice for Noise and Vibration Control on Construction and Open Sites.

15.4.10 The proposed working hours of the construction activities are outlined in **Table 15.1**. Likely construction equipment has been identified with input from the OHL Contractors and associated noise levels have been taken from Annex C of BS5228-1. At the time of writing, the exact start and end date of each activity is not known. Therefore, the sequence of activities is shown. The activity is analysed to determine the percentage of the construction time each piece of equipment is being used and how many are in use. Using this information, a total equivalent noise level is calculated. The dispersion of this total noise level is then modelled, accounting for distance and ground absorption

Table 15.1: Construction Schedule

Contract Works	Proposed Working Hours
Felling (where required)	During British Summer Time (30 Mar to 26 Oct) Every day 07:00 – 19:00 During Greenwich Mean Time (26 Nov to 29 March) Every day 07:00 – 18:00
Tower Assembly and Erection	
Foundations	
Civil Works	
Stringing of Conductor	

15.4.11 From the outlined construction schedule above, it is expected that the majority of construction works will occur during weekday daytime hours, however it is possible that some work is required to extend into Saturday afternoons and Sundays, hours as categorised in BS5228 and seen in **Table 15.5**.

3 British Standard 5228: Code of practice for noise and vibration control on construction and open sites (BS5228), BSI, 2009, amended 2014

15.4.12 To calculate the potential construction noise levels from the Proposed Development, information regarding the proposed construction activities is required. The Principal Contractors will be responsible for developing the detailed construction methodology and associated plant requirements following contract award, however, **Volume 5, Appendix 15.2: Construction Activities** shows indicative plant activities, assumed plant items, their assumed quantities, their assumed utilisation, and associated noise levels at a distance of 10 m, taken from BS 5228 and based on estimated construction activities provided by OHL Contractors. By combining the items' noise levels (LA,eq at 10 m (dB)) with the amount of time each will be running (utilisation) and their quantity, the total equivalent noise can be calculated for each row. These are then logarithmically summed to give a total value for the construction noise at 10 m. To ensure a realistic worst-case assessment, it has been assumed that all works within the phases will take place simultaneously for the indicated percentage of the working hours, despite this being unlikely in practice. The total equivalent noise level at 10 m for each activity can be used in a propagation calculation to find the specific noise at each receptor.

15.4.13 For the construction assessment, the distance to NSRs is determined using the address location and the nearest tower location of the Proposed Alignment (for all phases except felling and access). Noise from felling is calculated using the distance from the NSR to the nearest felling buffer associated with the operational corridor. Felling for access tracks was considered, however there were no significant instances of this in proximity to NSRs. Access track noise is calculated using the distance from the NSR to the nearest access track. A worst case assessment is conducted to account for the potential change in Proposed Alignment within the Limit of Deviation (LoD). The standard LoD is 100 m either side of the centreline, however, the need for an operational corridor of 45 m within the LoD means that towers are limited to a permanent movement of 55 m from the current proposed position. Therefore, the assessment assumes the minimum distance to the tower location of the Proposed Alignment, with 55 m subtracted from this value (unless otherwise stated due to LoD restrictions). The full extent of the LoD could be used for construction works on a temporary basis, however, the average activity over the working period will be at the geometric centre of the construction area, which is the tower itself, and therefore noise is calculated for each phase assuming the works take place at the tower location.

15.4.14 Attenuation has been calculated over mixed hard and soft ground to the F.2.3.2 method in BS 5228. Given the dominance of soft ground in the area surrounding the Proposed Development, this is slightly conservative. The effects of barriers or topographical screening have not been considered as a conservative approach.

15.4.15 In line with best practice (BS5228-1), a Construction Noise Management Plan (CNMP) will be developed by the Principal Contractors prior to starting construction works. The detail of the CNMP will be agreed with the Local Authority and is expected to be secured by an appropriately worded condition attached to the s37 consent.

15.4.16 Part 2: Vibration. BS5228-2 provides recommended limits for vibration from construction sites. The construction vibration impact assessment (CVIA) has been carried out against the guidance on effects of vibration levels specified in Table B.1 of BS5228-2. The level of vibration ranging from 0.14 mm.s-1 to 10 mm.s-1 indicates where vibration may be perceptible however acceptable, or intolerable.

15.4.17 Construction activities that induce vibration are likely to be limited to potential piling activities where required at foundations. As a realistic worst-case assessment, all towers are assumed to require foundations works. The formulae for the prediction of groundborne vibration due to piling is taken from Table E.1 in BS5228-2.

15.4.18 Potential for heavy goods vehicle (HGV) vibration on receptors along haul roads will be predicted using the procedures in Transport and Road Research Laboratory (TRL) Research Report 246 – Traffic Induced Vibrations in Buildings. The predictive method in Section 3.4.4 of TRL 246 is used. The expected value of maximum vertical peak particle velocity (PPV) at a building foundation can be calculated as:

$$PPV = 0.028\, a \left(\frac{v}{48}\right) t\, p \left(\frac{r}{6}\right)^{x}$$

15.4.19 Where a = maximum height or depth of the surface defect in mm, v = expected speed of HGV in km/h and t = ground scaling factor (Table 7 of TRL 246). If the surface defect occurs in one wheel path only, then p = 0.75, otherwise, p = 1, r = distance of foundation from the defect in metres, and x = power factor obtained from Table 7 from TRL 246 for most appropriate soil type. Chalk rock has been selected for this assessment. The ground scaling factor is 0.1 and power factor is -1.08.

Design Manual for Roads and Bridges LA 111 Noise and Vibration[4]

15.4.20 The Design Manual for Roads and Bridges (DMRB) LA 111 Noise and Vibration document provides guidelines for the assessment and management of noise and vibration impacts associated with road projects. The guidance sets out the requirements for assessing noise and vibration impacts from road schemes, ensuring that these impacts are identified, quantified, and managed appropriately.

15.4.21 The DMRB LA 111 guidance provides a method of assessing the noise and vibration due to construction traffic on existing roads. The magnitude of impact caused by construction traffic is determined by the increase in noise level from the calculated existing baseline noise levels. Vibration levels are assessed to absolute limits.

15.4.22 During any time period, the significance of the effect is defined by the lowest observable adverse effect level (LOAEL) and significant observable adverse effect level (SOAEL).

TGN(E)322 – Operational Audible Noise Assessment Process for Overhead Lines

15.4.23 National Grid Electricity Transmission (NGET)[5] has derived a procedure which is followed by Transmission Network Operators, including SSEN Transmission, to assess the impact of OHL noise in both dry and rainy conditions – TGN(E)322 – Operational Audible Noise Assessment Process for Overhead Lines. The guidance of the British Standard BS 4142:2014 can also be used to assess the impact of the noise from a specific industrial source at NSRs.

15.4.24 The NSRs in this chapter are building premises classified as medium sensitivity according to TGN(E)322.

15.4.25 The procedure requires that a series of assessments are conducted in tiers. Tiers 1 and 2 determine the worst case wet noise and combined dry and wet noise levels, for the purposes of screening out NSRs from further assessment. For NSRs that proceed to Tier 3, the procedure requires that the background noise at NSRs be measured during quiet night times and in dry conditions with little wind. The nature of the ground surface around the sensitive receptors is noted so that the contribution to background noise (BGN) of the surface noise attributable to the rainfall can be derived from empirically derived curves (Miller curves). The logarithmic sum of the measured BGN and the empirically derived contribution for rainfall is adopted as the BGN level, in wet conditions, against which to compare the predicted received noise from the OHL. Using the parameters provided in TGN(E)322 the likelihood of an adverse impact can be assessed.

15.4.26 The assessment procedure follows the process set out in TGN(E)322, which recommends that:

- The outcome of the Tier 1 assessment has determined whether the ‘worst case’ wet noise impact is predicted to be acceptable, or whether further assessment is required. Only the wet noise is assessed to a certain limit (34 dB(A) for residential receptors);
- The outcome of the Tier 2 assessment has determined whether the combined wet and dry noise impact is acceptable, or whether further assessment is required. Historical rain data in the region is used to calculate the mean annual wet hours and new criteria for a ‘combined’ wet and dry noise level. Using the formula for

4 Transport Scotland, 2019. Design Manual for Roads and Bridges (DMRB), LA 111 Noise and Vibration
5 The Transmission Operator in England and Wales

combined wet and dry noise criteria in Appendix D of TGN(E)322, this results in a range for adverse impacts of **36.7 dB(A) to 46.7 dB(A).** Where the combined wet/dry noise falls below 36.7 dB(A), the NSR will be assessed to experience 'No Adverse Impacts' and OHL noise is deemed acceptable, and no further action is necessary. Where the combined wet/dry noise is within this range, the NSRs falls into the Adverse Impacts category. TGN(E)322 suggests that NSRs in this category should be considered to proceed to Tier 3 given the scale and cost of noise mitigation associated with minimising the noise. If the combined wet/dry noise is above 46.7 dB(A), then the NSR falls into the Significant Adverse Impact category and must proceed to Tier 3;

- The outcome of the Tier 3 assessment has determined whether the noise impact is acceptable, whether the noise needs to be mitigated and minimized or whether the noise is unacceptable;
- The Tier 3 assessment takes account of existing background sound levels in the area and noise levels due to rainfall;
- The attended collection of night-time background noise levels at NSRs, or groups of such NSRs, within approximately 500 m of the centreline of the OHL during suitable dry weather conditions, before construction;
- Allowance for the effects of rainfall on BGN (TGN(E)322 considers fog – an atypical condition – to produce lower noise levels than in rain but is still referred to as 'wet noise');
- Prediction of contribution from conductors; and
- Determination of total excess at the most likely rain rate.

15.4.27 If Tier 3 is required, the excess wet figure is derived by comparing the total noise to the background noise level for the appropriate Miller Curve rating at each receptor at a rain rate of 1 mm/hr. Miller curve descriptions are provided in **Table 15.2**.

Table 15.2: Miller Curve Description

Miller Curve	Description
R-1	Essentially bare, porous ground (that is ploughed field or snow-covered ground), no standing puddles or water. Relatively small-leafed ground cover vegetation, such as grass lawn, meadow, hayfield shortly after mowing, field of small-leaf plants.
R-2	Non-porous, hard, bare ground or pavement, falling raindrops splash on thin layers of puddles of collected water; or in or beside wooded area of deciduous trees without leaves or with only small leaves; or in or beside wooded area of coniferous trees or evergreens having needles rather than leaves; or thin-leafed ground cover of crop, such as hay, clover, or grain.
R-3	A few small, fully leafed deciduous trees 15 to 30 m or a few large, fully leafed trees 30 to 90 m distance.
R-4	Large area of fully leafed trees or large-leafed crops or vegetation, such as corn starting 15 to 30 m distance.
R-5	Large area of fully leafed trees or large-leafed crops or vegetation surrounding the area of interest.

British Standard 4142:2014+A1:2019: Methods for rating and assessing industrial and commercial sound (BS 4142)[6]

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

6 British Standard 4142: Methods for rating and assessing industrial and commercial sound (BS 4142), BSI, 2014, Amended 2019

- 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; and
- 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.

15.4.29 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.

15.4.30 In accordance with the assessment methodology, the specific sound level (LAeq,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" (LAr,Tr).The British Standard effectively compares and rates the difference between the rating level and the typical background sound level (LA90,T) in the absence of the noise source being assessed.

15.4.31 BS 4142 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.

15.4.32 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; and
- 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."

Consultation Undertaken to Date

15.4.33 To inform the scope of the assessment for the Proposed Development, consultation was undertaken with THC. **Table 15.3** summarises the responses relevant to this chapter and provides information on where and/or how points raised have been addressed in this assessment.

Table 15.3: Summary of Consultation Undertaken

Consultee	Type of Consultation	Response	How Issue has been Addressed
THC (18/12/2024)	Scoping Response (24/04588/SCOP)	Planning conditions are not used to control the impact of construction noise, as similar powers are available to the Local Authority under Section 60 of the Control of Pollution Act 1974. A construction noise and vibration assessment in accordance with BS 5228-1 is required. The noise assessment will also require including an assessment of	Construction noise and vibration is assessed to BS 5228-1 and BS 5228-2 respectively. The construction programme requires working from 0700 – 1900 every day, although the majority of works are expected in daytime hours. Therefore, construction activities will be fully assessed to BS5228 using the 55 dB limit (in accordance with the Evening

Consultee	Type of Consultation	Response	How Issue has been Addressed
		the impact of noise from construction traffic. If piling is required in locations close to residential properties, this can also result in significant disturbance. In addition to nuisance, one of the most common concerns about piling is the perceived risk of structural damage. An assessment must be completed for operational noise, including demonstrating noise arising from the Proposed Development and surveying background noise levels should an NSR be likely to be affected by the noise. This work should be undertaken in line with relevant standards and guidance.	and Weekends limit, as per BS 5228-1) due to working hours falling out of Monday to Friday: 07:00 to 19:00 and Saturday: 07:00 to 13:00. Special measures and arrangements would be made for works in proximity to sensitive receptors, and controlled with the CEMP. An operational noise impact assessment is included in **Volume 5, Appendix 15.5: Operational Noise Impact Assessment** in accordance with TGN(E)322. It was found that no baseline noise surveys were required due to the results of the impact assessment, and operational noise not proceeding to a Tier 3 as it is screened out at Tier 1 of TGN(E)322.

Determining Baseline

Existing Baseline

15.4.34 As part of the TGN(E)322 operational noise impact assessment, BGN levels are required for Tier 3. BGN levels are ascertained by conducting free-field attended spot measurements at each noise sensitive receptor (in the Tier 3 assessment) using a Class 1 sound level meter.

15.4.35 A field survey was not required due to the outcome of the Tier 1 TGN(E)322 operational noise assessment. No NSRs proceed to Tier 3 and therefore background noise is not required. Background noise is not required for the construction noise impact assessment, using the ABC method of BS5228, and assuming all NSRs fall into the most conservative 'A' category.

15.4.36 Some field surveys were conducted in early stages of the Proposed Development, when the Proposed Alignment was not finalised, however the results of the final calculation found that these were not required and therefore baseline surveys were subsequently not used or have not been included in this EIA Report.

Future Baseline

15.4.37 It is likely that a steady increase in background noise levels can be assumed due to potential future expansion of settlements, even if small in scale, and potential increases of traffic movement. However, these changes are unpredictable, or irrelevant in the context of this assessment.

Determining Sensitivity of Receptors

15.4.38 The sensitivity of the NSR is estimated in its current state prior to any change implied by the Proposed Development. The level of sensitivity is determined according to existing regulations and guidance, societal value, and vulnerability. The definition of receptor sensitivity is outlined in TGN(E)322. Prior to detailed assessment, all NSRs considered in this assessment are assumed to be residential in nature. Therefore, the sensitivity is assumed as medium unless otherwise specified.

Identification of Sensitive Receptors

15.4.39 Potential NSRs were processed from AddressBase data and cross-checked with the SSEN Land team and satellite imagery. All potential receptors from the AddressBase dataset that fall within 500 m of the centreline of the Proposed Alignment are considered in the construction noise and vibration assessment and operational noise assessment. This resulted in the identification of 89 NSRs.

15.4.40 For the operational noise assessment, according to the Electrical Power Research Institute (EPRI) method, recommended by the TGN(E)322, an OHL passes a Tier 1 assessment of TGN(E)322 if the wet noise falls below 34 dB(A) at that receptor, assuming a medium sensitivity for residential receptors. No vulnerable subgroups of High sensitivity have been identified. It was calculated that the wet noise from the proposed conductor Triple Araucaria, is predicted to produce 34 dB(A) of wet noise up to a distance of 26 m. Adding a buffer of 10 m, for variances in property size, meant that addresses up to 36 m from the Proposed Development would fail at Tier 1 and progress to Tier 2.

15.4.41 The 89 NSRs are detailed in **Volume 5, Appendix 15.1: Noise Sensitive Receptors (NSRs)** and shown in **Volume 3, Figure 15.1**.

Determining Magnitude of Impact

15.4.42 The impact magnitude has been assessed for both the construction noise and vibration in addition to the operational noise. These methods to determine impact magnitude of either high, medium, low, or negligible are described in the following sections.

Construction Noise

15.4.43 The noise criteria provided for the ABC method detailed in BS5228-1 are shown in **Table 15.4**. NSRs are classified in categories A, B or C according to their measured or estimated background noise level. If the site noise level exceeds the threshold value of the appropriate category, then a potential significant effect is indicated.

Table 15.4: Construction Noise Impact Assessment Criteria

Assessment Category and Threshold Value Period	Threshold value, LAeq (dB)		
	Category A	Category B	Category C
Night-time	45	50	55
Evenings and weekends	55	60	65
Daytime and Saturdays	65	70	75

15.4.44 The construction time periods according to BS5228-1 are show in **Table 15.5**.

Table 15.5: Construction Noise Time Periods

Assessment Category	Definition
Night-time	23:00 to 07:00 everyday
Evenings and weekends	19:00 to 23:00 on weekdays 13:00 to 23:00 on Saturdays 07:00 to 23:00 on Sundays
Daytime and Saturdays	07:00 to 19:00 on weekdays 07:00 to 13:00 on Saturdays

15.4.45 To determine the threshold value and noise limit to which the construction noise is assessed against, the periods must be defined and categories identified.

15.4.46 Night-time is defined as between 23:00 and 07:00. This is also in line with the BS 4142 definition for night-time. Evenings and weekends are defined as 19:00 – 23:00 on weekdays, 13:00 – 23:00 on Saturdays and 07:00 – 23:00 on Sundays. Daytime is defined to be 07:00 – 19:00 on weekdays and 07:00 – 13:00 on Saturdays.

15.4.47 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. This is true for the Study Area given the rural setting, and to ensure that the assessment is conservative, the Proposed Development will be assessed to Category A thresholds. Higher category thresholds are usually for more urbanised or industrial areas with high ambient noise levels.

15.4.48 From the outlined construction schedule, work is expected 7 days a week. It is likely that the majority of construction works will occur during daytime periods, however, may extend into evening and weekends. It is not known what activities within each phase will take place at what times. Therefore, the 55 dB(A) limit has been adopted in this case to ensure a conservative assessment takes place. While work is expected to take place between 7am and 7pm every day, construction activity will take place within the hours of Daytime and Saturdays, therefore the noise is also assessed to a 65 dB limit in the case that noisier work is prioritised then rather than Saturday afternoons or Sundays.

15.4.49 The following magnitude of impact at receptors can be determined from **Table 15.6**.

Table 15.6: Construction Noise - Magnitude of Impact at Receptors

Magnitude of Impact	Construction Noise Level (dB)	
	Evenings and Weekends (55 dB Limit)	Daytime and Saturdays (65 dB Limit)
High	> 60	> 70
Medium	56 to 60	66 to 70
Low	BGN to 55	BGN to 65
Negligible	< BGN	< BGN

15.4.50 Excess over the 55 dB criteria will result in medium impact magnitude. Excess of 5 dB or more over the noise limit will result in high impact magnitude. For the daytime assessment the 55 dB(A) limit is replaced with 65 dB(A).

15.4.51 The works are expected to be short term in nature (less than one month long).

15.4.52 Construction traffic movements for local haul roads and Site access are incorporated within the BS 5228-1 assessment, however additional criteria extend to construction traffic on highways. **Table 15.7** shows noise impact criteria for the assessment of changes to road traffic noise due to the addition of Proposed Development related construction traffic, with reference from Table 3.17 of DMRB, LA 111 Noise and Vibration.

Table 15.7: Construction Traffic Noise – Magnitude of Impact at Receptors

Magnitude of Change	Traffic Noise Level Change (dB(A))
Negligible	0.1 to 0.9
Low	1.0 to 2.9
Medium	3 to 4.9
High	> 5

15.4.53 A change in construction traffic noise levels above 3 dB are considered to be a High impact if occurring for a duration exceeding:

- 10 or more days or nights in any 15 consecutive days or nights; and/or
- A total number of days exceeding 40 in any six consecutive months.

Construction Vibration

15.4.54 Vibrations, even of very low magnitude, can be perceptible to people and can interfere with the satisfactory conduct of certain activities, e.g. delicate procedures in hospital operating theatres, use of very sensitive laboratory weighing equipment. Vibration nuisance is frequently associated with the assumption that, if vibrations can be felt, then damage is inevitable; however, considerably greater levels of vibration are required to cause damage to buildings and structures. Vibrations transmitted from site activities to the neighbourhood can, therefore, cause anxiety as well as annoyance, and can disturb sleep, work or leisure activities.

15.4.55 Criteria for construction vibration due to access tracks and foundation works are taken from Table B.1 in BS5228-2 and shown in **Table 15.8**. Vibration is measured as peak particle velocity (PPV).

Table 15.8: Construction Vibration Impact Assessment Criteria (Table B.1 in BS5228-2)

Impact Magnitude	Vibration Level, Peak Particle Velocity (PPV) $mm \cdot s^{-1}$	Impact
Negligible	<0.3	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
Low	0.3 to 1.0	Vibration might be just perceptible in residential environments.
Medium	1.0 to 10	It is likely that vibration of this level in residential environments will cause complaints but can be tolerated if prior warning and explanation have been given to residents.
High	>10	Vibration is likely to be intolerable for any more than a very brief exposure to this level in most building environments.

15.4.56 Excess over the 10 $mm \cdot s^{-1}$ criteria will result in high impact magnitude. Construction vibration between the 1 $mm \cdot s^{-1}$ and 10 $mm \cdot s^{-1}$ threshold will result in medium impact magnitude. Below 1 $mm \cdot s^{-1}$ will result in Low impact magnitude. Below 0.3 $mm \cdot s^{-1}$ is negligible.

Operational Noise

15.4.57 The impact of operational noise is approached as a tiered assessment in TGN(E)322.

15.4.58 The outcome of the Tier 1 assessment will determine whether the 'worst case' wet noise impact is predicted to be acceptable, or whether further assessment is required. Predicted free field wet noise levels at the external façade of the NSR are compared against the Tier 1 noise criteria outlined in **Table 15.9**.

Table 15.9: Operational Noise – Tier 1

Use	No Adverse Impact – Screened Out	Tier 2 Assessment Required
Vulnerable subgroups	< 29 dB(A)	> 29 dB(A)
Residential	< 34 dB(A)	> 34 dB(A)
Schools and Hotels	< 39 dB(A)	> 39 dB(A)

15.4.59 Where the predicted wet noise levels fall into the 'No Adverse Impact' category in **Table 15.9**, the noise from the OHL is acceptable. Receptors falling into this category are screened out of further assessment and no further action or assessment is necessary, impact can be considered negligible.

15.4.60 A Tier 2 Assessment shall be carried out where predicted Wet Noise levels exceed the 'No Adverse Impact' Category. A tier 2 assessment considers the combined dry and wet noise contribution through logarithmic calculation to determine new noise criteria. The combined noise criteria are presented in **Table 15.10**.

Table 15.10: Operation Noise – Tier 2

Use	No Adverse Impact	Adverse Impact	Significant Adverse Impact
Vulnerable Subgroups	< 31.7 dB(A)	31.7 – 41.7 dB(A)	> 41.7 dB(A)
Residential	< 36.7 dB(A)	36.7 – 46.7 dB(A)	> 46.7 dB(A)
Schools and Hotels	< 41.7 dB(A)	41.7 – 51.7 dB(A)	> 51.7 dB(A)

15.4.61 Where the predicted combined wet/dry noise level falls into the 'no adverse impact' category in a Tier 2 assessment, impacts can be considered negligible.

15.4.62 Where the predicted combined wet/dry noise level falls into the 'significant adverse impact' category in a Tier 2 assessment, TGN(E)322 states a Tier 3 assessment will be necessary. Where the predicted noise levels fall into the 'adverse impact' category, mitigation should be considered or also considered to proceed to Tier 3.

15.4.63 The outcome of the Tier 3 assessment will determine whether the noise impact is acceptable, whether the noise needs to be mitigated and minimised or whether the noise is unacceptable. The Tier 3 assessment takes account of existing background sound levels in the area and noise levels due to rainfall. The Tier 3 Assessment requires the impact of Dry Noise and Wet Noise to be assessed separately using two different methods which are based on the principles of BS41425. The two methods differ in that the Dry Noise assessment requires the determination of the existing baseline sound level, whilst for the Wet Noise assessment, it is necessary to predict the increase in background sound levels due to rainfall.

15.4.64 The magnitude of a predicted noise impact at a given receptor can be interpreted as the degree of alteration that is undergone by the receptor as a consequence of the impact. Magnitude criteria can be quantitative using standards such as BS 4142. As reported in the table below, the impact magnitude is worked out on a case-by-case basis for each NSR and classified as negligible, low, medium, or high. Information from the rating level, the background sound level, and the stated impacts from a BS4142 assessment have been converted into representative impact magnitudes, detailed in **Table 15.11**.

Table 15.11: BS4142 Impact Magnitude

Impact Magnitude	Definition	Tier 1 Criteria for Magnitude of Impact	Tier 2 Criteria for Magnitude of Impact	TGN(E)322 Tier 3 Criteria for Magnitude of Impact (Difference between OHL Rating Noise Level and Background Sound Level)
Negligible	Impact to the receptor is immeasurable, undetectable or within the range of normal natural background variation.	<34 dBA wet noise	<36.7 dBA combined wet and dry noise	≤ 0 dB
Low	The lower the rating level is relative to the measured background sound level, the less likely it is that the	>34 dBA, further assessment	>36.7 dBA, further assessment	0 to 4 dB

Impact Magnitude	Definition	Tier 1 Criteria for Magnitude of Impact	Tier 2 Criteria for Magnitude of Impact	TGN(E)322 Tier 3 Criteria for Magnitude of Impact (Difference between OHL Rating Noise Level and Background Sound Level)
	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	required at Tier 2	required at Tier 3	
Medium	A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.			5 to 9 dB
High	A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.			≥ 10 dB

15.4.65 A difference in the rating level at the NSR compared to background sound levels of +10dB or more is likely to be an indication of a high impact.

15.4.66 A difference of +5dB to +9dB is likely to be an indication of a medium impact.

15.4.67 A difference of 0 to +4dB is an indication of a low impact.

15.4.68 If the level of noise from the OHL does not exceed the background sound level, this is an indication of noise from the OHL having a negligible impact.

Determining Significance of Effect

15.4.69 After assessing the sensitivity of the NSR in its baseline state, and then the impact magnitude of the noise likely to affect the NSR, an estimate of the effect significance can be derived by applying a calculation matrix (**Table 15.12**).

15.4.70 The measure of significance is the key output of the impact assessment process and drives the requirement for mitigation measures to be applied during operation to offset or reduce potential project generated effects.

15.4.71 The evaluation of effect significance shall be performed based on the significance matrix presented in TGN(E)322 and based on professional judgement, considering both sensitivity and magnitude of change. Resulting moderate and major effects are considered significant in the context of the EIA Regulations and require mitigation.

Table 15.12: Evaluation of the Effect Significance

Magnitude of Change	Sensitivity of NSR				
		High	**Medium**	**Low**	**Negligible**
	High	Major	Major	Moderate	Negligible
	Medium	Major	Moderate	Minor	Negligible
	Low	Moderate	Minor	Minor	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

Limitations and Assumptions

15.4.72 The following assumptions have been made when undertaking the assessment of effects:

- Two scenarios are assessed in this chapter. In the first noise levels are evaluated assuming the Proposed Development is constructed according to the specified design. The second scenario assesses noise levels based on the assumption that the proposed towers could be relocated up to a maximum of 55 meters within the LoD to accommodate potential future adjustments in tower positioning during micro-siting.
- Estimated noise emissions from the Proposed Development's construction noise activities and plant items have been extracted from Annex C in BS 5228-1. Where equipment has been proposed that cannot be extracted from BS 5228-1, information of source noise levels is taken from projects of a similar nature. This assessment considers conservative assumptions with the aim to produce a realistic worst-case assessment. The assumptions include a direct path from source to receiver with no screening or change in terrain level. The ground factor is assumed as a mix of both hard and soft terrain. The assessment assumes equipment is producing the maximum sound power level for the entire time it is assumed as operational according to the construction schedule in **Volume 5, Appendix 15.2: Construction Activities**. In practice, noise levels during construction would be expected to be lower than the assessment details.
- There will be periods just after rainfall or during foggy conditions where there is some noise emission from the OHL, although these levels are less than those during rain according to TGN(E)322. Noise generated under these circumstances is referred to as 'wet noise'. These periods where background noise is less than those during periods of rainfall are not accounted for in the assessment as there is no standardised methodology or procedure. The number of droplets, and hence the noise level, will depend primarily on the rate of rainfall. Historical studies determined that hum inception typically occurs at a rainfall rate of approximately 1 mm/hr. Hum inception is the point at which during rainfall the low-frequency humming component of corona discharge noise becomes noticeable. This hum induces a tonal component of the noise, which is represented by a 6 dB tonal penalty at Tier 3 of a TGN(E)322 assessment.
- There is a degree of uncertainty when conducting assessments on developments in the planning stage, given that the design may change due to other logistical considerations. Further assessments may be required should there be substantial modifications to the site design that could influence the results of this assessment. Assumptions include a flat terrain between OHL centreline and NSR, an uncertainty distance of 10 m has been included when determining distance from source to receiver. In Tier 1 and 2 of the TGN(E)322 assessment, no acoustic absorption due to the ground is included to ensure a realistic worst-case assessment. The calculation for OHL conductor noise uses the Electric Power Research Institute (EPRI)[7] method of calculation which assumes a moderately aged conductor, which is appropriate for the assessment of the Proposed Development for the lifetime of its operation.

7 EPRI AC Transmission Line Reference Book – 200 kV and Above, Third Edition, Final Report, 2005, Electrical Power Research Institute

- The assessments are based on information available at the time of publication, any changes to design or specification of the Proposed Development that may lead to increased adverse effects would require re-assessment.
- The perception and impact of noise is subjective. However, the standard methodologies aim to assess noise objectively. Whilst some information is subject to change such as the construction activities and, it is considered that there is sufficient information to enable an informed decision to be taken in relation to the identification and assessment of potential significant environmental effects on noise and vibration.

Limits of Deviation

15.4.73 The standard LoD around towers is 100 m either side of the centreline. The full extent of the LoD could be used for construction works on a temporary basis, however the need for an Operational Corridor (OC) of 45 m within the LoD means that towers are limited to a permanent movement of 55 m from the current proposed position. Towers are also restricted to being no closer than 100 m from any NSR in the vast majority of cases.

15.4.74 For the construction assessment, the distance from NSRs (the AddressBase point) to towers (centre of the tower base) has been measured using QGIS, with 55 m subtracted for a realistic worst-case assumption for towers or restricted by the LoD. The closest the construction of the Proposed Development can be to any NSR is at the outer edge of the LoD, so the distance between the NSR and construction area will never be less than this. However, the average activity over the working period will be at the geometric centre of the construction area which is the tower itself, so noise is calculated for each phase as if it takes place at the tower.

15.4.75 For the purposes of the operational assessment, the distance will by default be the distance from the NSR (the AddressBase point) to the Proposed Alignment (centreline). A second scenario has been assessed where 55 m is subtracted from the distance from the NSR to the Proposed Alignment for a realistic worst-case movement of the towers.

15.5 Assessment of Effects – Construction

Construction Noise

15.5.1 A desk-based construction noise appraisal has been prepared for the purpose of assessing the effects of the works on any nearby NSRs. This appraisal has been produced in line with BS 5228-1:2009 +A1:2014 (BS5228), Code of Practice for Noise and Vibration Control on Construction and Open Sites.

15.5.2 Construction noise is assessed to a 55 dB limit in the case that work takes place during the Saturday afternoons or Sundays (defined as Evening and Weekends in paragraph 15.4.44). Work will also take place in the during weekdays and Saturday mornings and therefore would be assessed to a 65 dB limit. Results have been included for both noise limits. The magnitude of change from each phase has been compared to the sensitivity of the NSRs and the resultant significance of effect has been evaluated. Where effects have been predicted to be significant, these are shown as detailed results in **Volume 5, Appendix 15.4: Construction Noise Impact Assessment**, a summary of results are presented in **Table 15.13** and **Table 15.14**.

15.5.3 The proposed construction routes reported in the first draft of **Chapter 14: Traffic and Transport** have been used as the basis for the assessment of haul routes using information obtained in May 2025. The traffic data is described as ‘peak’ traffic and therefore is conservative. Construction traffic noise calculations have followed guidance from BS 5228-1 Annex F.2.5 ‘Method for mobile plant using a regular well-defined route (e.g. haul roads) and noise levels incorporated into overall construction noise assessment.

Table 15.13: Summary of Construction Noise Results – Number of Predicted Receptors – Using Proposed Alignment for Distance to NSR

Phase	Daytime and Saturday mornings (65 dB limit)		Evenings and Weekends (55 dB limit)	
	Medium Impacts (65 dB to 70 dB)	High Impacts (Above 70 dB)	Medium Impacts (55 dB to 60 dB)	High Impacts (Above 60 dB)
Foundation	0	0	29	18
Tower Assembly and Erection	0	0	41	1
Civil/Access	8	18	25	33
Stringing	0	0	23	0
Felling	1	0	32	15

15.5.4 **Table 15.13** provides the number of NSRs that are predicted during each phase of construction to exceed either the 55 dB Evenings and Weekends category limit or the 65 dB Daytime and Saturday mornings category limit. Each count is split into medium and high impact exceedances. The NSRs with High impact exceedances require the most attention when the CNMP is created. These results are based on distances to the Proposed Development without any future deviations.

15.5.5 During felling, noise at 47 out of 89 NSRs are above the 55 dB noise limit, 15 NSRs result in **High** impact. If completed within the hours specified as the Daytime and Saturdays category, then there is only one exceedance, resulting in a **medium** impact. The distance is taken from the NSR to the edge of the nearest felling area. Areas of management felling are not included in this assessment.

15.5.6 Noise at 42 of 89 NSRs are above the 55 dB limit during tower assembly and erection, with one NSR rated as High impact. No NSRs would exceed the 65 dB limit if this phase were to take place during day time hours. The distance is taken from the NSR to the nearest proposed tower location.

15.5.7 Noise at 47 of 89 NSRs are above the 55 dB limit during construction of the foundations, with 18 NSRs rated as **High** impact. No NSRs would exceed the 65 dB limit if this phase were to take place during day time hours. The distance is taken from the NSR to the nearest proposed tower location.

15.5.8 Noise at 58 of 89 NSRs are above the 55 dB limit during Civil/Access works, with 33 NSRs rated as high impact. 26 NSRs would exceed the 65 dB limit if this phase were to take place during day time hours, with 18 of these exceedances being high impact. The distance is taken from the NSR to the nearest access track.

15.5.9 Noise at 23 of 89 NSRs are above the 55 dB limit during the stringing of conductor, with all exceedances rated as medium impact. No NSRs would exceed the 65 dB limit if this phase were to take place during day time hours. The distance is taken from the NSR to the nearest proposed tower location .

15.5.10 Therefore, prior to the mitigation measures, construction noise is assessed in the worst case as resulting in medium and high impacts, on medium sensitivity receptors, causing **moderate** and **major** effects which are **significant** in the context of the EIA Regulations. This is due to the 55 dB limit exceedances during felling, tower assembly and erection, foundations, civil works and stringing of conductors.

15.5.11 Certain activities such as foundations, tower assembly and erection, and stringing could be subject to movement within the LoD of the Proposed Development. **Table 15.14** provides a summary of construction

exceedances for the case where activities move to the realistic worst-case position within the LoD for each NSR.

Table 15.14: Summary of Construction Noise Results – Number of Predicted Receptors – If Towers Move 55 m

Phase	Daytime and Saturdays (65 dB limit)		Evenings and Weekends (55 dB limit)	
	Medium Impacts (65 dB to 70 dB)	High Impacts (Above 70 dB)	Medium Impacts (55 dB to 60 dB)	High Impacts (Above 60 dB)
Foundation	2	0	29	28
Tower Assembly and Erection	0	0	36	13
Civil/Access	8	18	25	33
Stringing	0	0	33	3
Felling	1	0	32	15

15.5.12 The number of NSRs which are predicted to be in excess of the construction noise limit is slightly increased compared to the results using distances to the Proposed Alignment/tower positions, as seen in **Table 15.13**. No increase in number of exceedances is seen if works are conducted during the Daytime and Saturdays category, except for the Foundation works. Prior to the mitigation measures, construction noise is assessed as resulting in medium and high impacts, on medium sensitivity receptors, causing **moderate** and **major** effects which are **significant** in the context of the EIA Regulations.

15.5.13 Construction related traffic and transport impacts for main access routes have been assessed by calculating the relative increase in road traffic noise level adjacent to public roads used by construction traffic. The standard UK calculation method Calculation of Road Traffic Noise (CRTN) was used to calculate the noise level, at a nominal distance of 10 m from each road, using baseline traffic flows and also accounting for the addition of construction traffic as reported in **Chapter 14: Traffic and Transport**.

15.5.14 The average 18-hour traffic flows, HGV movements, and average vehicle speed reported in **Chapter 14: Traffic and Transport** have been used for the purposes of the noise calculation as is required by CRTN. Noise levels for the baseline and baseline + construction traffic scenarios are presented in for both cars and HGVs. Location numbers in

15.5.15 **Table 15.15** are defined traffic monitoring locations from **Chapter 14: Traffic and Transport**.

Table 15.15: Summary of Calculation of Road Traffic Noise Results

Location	Speed	2026 Baseline Vehicles per Hour	Baseline + Development Vehicles per Hour	Increase (%)	% HGV Baseline	% HGV Future	Noise Level Baseline (dB)	Noise Level Future (dB)	Increase (dB)	Impact
1	60	89	150	69%	7.1%	32.1%	66.2	71.4	5.2	High
2	60	12	19	58%	45.8%	55.6%	N/A	N/A	N/A	Negligible
3	40	80	141	76%	20.1%	41.1%	64	68.6	4.6	Medium
4	60	151	212	40%	11.7%	28.0%	69.2	72.5	3.3	Medium
5	30	174	259	49%	8.7%	28.1%	64.3	69.1	4.8	Medium
6	60	17	29	71%	10.5%	34.9%	N/A	N/A	N/A	Negligible

Location	Speed	2026 Baseline Vehicles per Hour	Baseline + Development Vehicles per Hour	Increase (%)	% HGV Baseline	% HGV Future	Noise Level Baseline (dB)	Noise Level Future (dB)	Increase (dB)	Impact
7	30	265	350	32%	8.2%	22.7%	66	69.7	3.7	Medium
8	30	320	405	27%	6.6%	19.4%	66.4	70	3.6	Medium
9	60	50	65	30%	3.4%	16.2%	63	66.1	3.1	Medium
10	40	40	64	60%	20.7%	35.2%	N/A	64.7	N/A	N/A
11	30	102	118	16%	6.4%	13.3%	61.4	63.5	2.1	Low
12	30	106	131	24%	7.6%	17.0%	61.9	64.7	2.8	Low
13	30	31	40	29%	29.9%	36.0%	N/A	N/A	N/A	N/A
14	60	109	130	19%	8.1%	15.5%	67.3	69	1.7	Low
15	60	483	621	29%	7.1%	19.5%	73.5	76.3	2.8	Low
16	60	912	1050	15%	7.2%	14.5%	76.3	78	1.7	Low
17	30	88	104	18%	22.4%	27.4%	63.7	65.1	1.4	Low
18	30	83	90	8%	21.4%	23.9%	63.4	64	0.6	Negligible
19	50	1887	2025	7%	4.2%	8.2%	77.5	78.6	1.1	Low
20	40	313	321	3%	5.3%	7.0%	67.4	67.9	0.5	Negligible
21	40	168	173	3%	1.5%	3.2%	63.7	64.3	0.6	Negligible
22	30	81	85	5%	2.9%	6.1%	59.3	60.5	1.2	Low
23	20	378	381	1%	5.0%	5.6%	64.3	65.9	1.6	Low
24	30	390	401	3%	5.4%	6.3%	66.9	67.3	0.4	Negligible
25	40	313	321	3%	2.8%	3.3%	66.8	67	0.2	Negligible
26	60	13	20	54%	30.8%	30.0%	N/A	N/A	N/A	Negligible

15.5.16 The works are short term in nature (less than a month long) and are therefore likely to be **not significant**. The following considers the situation should the work extend beyond their planned schedule and the durations discussed in 15.4.53.

15.5.17 Impacts on the majority of sections (~77%) are predicted as either **low** or **negligible** and therefore **not significant**. Change in road traffic noise was unable to be accurately calculated for locations 2, 6, 10, 13, this is because the traffic volume is below 50 vehicles per hour. Traffic volume this low over the short durations in question (less than a month) are not likely to produce significant effects, so these are assumed to be **negligible** (see **Chapter 14: Traffic and Transport** for description of site references).

15.5.18 Medium impacts are predicted at locations 3,4,5,7,8,9, which results in **moderate** effects on medium sensitivity receptors. A single high impact (5.2 dB) is predicted at Section 1: A9 Banniskirk, DfT ID: 40960, resulting in a m**ajor** effect on medium sensitivity receptors. However, the data suggests peak traffic levels, which are a conservative assumption, it is more likely in practice that flows will result in a **moderate** effect.

15.5.19 The impacts predicted if the works extend beyond their schedule can be mitigated through a CTMP for the seven sections highlighted (1,3,4,5,7,8,9).

Construction Vibration

15.5.20 A desk-based construction vibration appraisal has been prepared for the purpose of assessing the effects of the works on any nearby residents. This appraisal has been produced in line with BS 5228-2:2009 +A1:2014 (BS5228), Code of Practice for Noise and Vibration Control on Construction and Open Sites.

15.5.21 BS5228-2 provides recommended limits for vibration from construction sites. The CVIA has been carried out against the guidance on effects of vibration levels specified in Table B.1 of BS5228-2. The level of vibration ranging from 0.14 mm.s-1 to 10 mm.s-1 indicates where vibration may be perceptible however acceptable, or intolerable.

15.5.22 Construction activities that induce vibration are likely to be limited to potential piling activities where required at foundations. The formulae for the prediction of groundborne vibration due to piling is taken from Table E.1 in BS5228-2.

15.5.23 Potential of HGV vibration on receptors along haul roads has been predicted using the procedures in Transport and Road Research Laboratory (TRL) Research Report 246 – Traffic Induced Vibrations in Buildings.

15.5.24 Construction activities associated with vibration are largely unknown at time of writing, therefore, the realistic worst-case parameters will be assumed for vibration due to foundation excavation and piling taking place at Tower N220 and impacting the closest receptor to the tower (NSR 36 at 159 m from the nearest tower). If the assessment passes at the closest receptor, it will pass at all others. The parameters that affect resultant vibration from piling, v_{res}, have been extracted from Table E.1 of BS5228-2 are shown in **Table 15.16**.

Table 15.16: Groundborne Vibration Parameters from Mechanised Construction Works (Table E.1 of BS5228-2)

Vibration Parameter	Range
Maximum amplitude of drum vibration, in millimetres (mm)	Between 0.4 and 1.72 mm
Pile toe depth, in metres (m)	Between 1 and 27 m
Vibrating roller drum width, in metres (m)	Between 0.75 and 2.2 m
Number of vibrating drums	1 or 2
Slope distance from the pile toe or tunnel crown, in metres (m)	Depends on distance between source and receiver and pile toe depth
Nominal hammer energy, in joules (J)	Between 1.5 and 85 kJ
Potential energy of a raised tamper, in joules (J)	Between 1 and 12 MJ
Distance measured along the ground surface, in m	159 metres for closest NSR 36 (100 meters used in calculations)

15.5.25 **Table 15.17** shows the realistic worst-case results of the ground-borne vibration due to piling. Vibratory compaction, percussive piling, and vibratory piling have been calculated in the case these activities will take place. The vibration calculation methods presented in Table E.1 of BS5228-2 are recommended for distances of approximately 5 to 100 meters from source to receiver, given the closest NSR is 159 m away (104 m when considering maximum tower movement) a conservative 100 m distance was used in these calculations to ensure accuracy with the standard.

Table 15.17: Ground-borne Vibration Results from Foundation Works at Tower N220 on NSR 36

Vibration Operation	Resultant PPV (mms^{-1})	Magnitude of Impact
Vibratory Compaction (Steady State)	0.24	Negligible

Vibration Operation	Resultant PPV (mms^{-1})	Magnitude of Impact
Vibratory Compaction (Start Up and Run Down)	0.52	Low
Percussive Piling	0.12	Negligible
Vibratory Piling	0.24	Negligible
Dynamic Compaction	15.33	High

15.5.26 Impacts for potential vibration works have been assessed as up to high. In this worst case, the vibration would be very perceptible in residential environments, therefore, the significance of effect for construction vibration is **major** and **significant**.

15.5.27 Construction vibration due to traffic is assessed based on absolute levels. As similar vibration levels on the existing roads will be generated by heavy vehicle traffic already, no change to absolute levels is predicted on these roads and impacts are predicted to be **negligible**.

15.5.28 Vibration due to traffic on new access tracks has been assessed using the same assessment method as construction noise due to HGVs on access tracks It is estimated that there are 10 heavy goods vehicles passing by the NSRs per hour. Ground-borne vibration arises primarily from the interaction of vehicle tyres with irregularities in the road surface, such as potholes, cracks, or bumps. In this case, the road defect is a 25 mm depression, which could amplify groundborne vibrations. However, it is important to consider the condition of the road surface, ground conditions, and vehicle characteristics when evaluating the magnitude of impact. Road defects that are within 15 m of NSRs should be repaired and/or reduce vehicle speeds to reduce the impact of the defects.

15.5.29 There are several NSRs along access tracks. In this case, with a vehicle traveling at an assumed maximum 60 km/h over a 25 mm road defect, at a distance of 15 m from any NSR, over chalk rock, it is expected that the resultant PPV at the NSR is 0.07 $mm._{s-1}$, indicating low impact. Therefore, the significance of effect for construction traffic vibration is **minor** and **not significant.**

15.5.30 Construction-related traffic vibrations are typically temporary and transient, depending on the frequency and volume of construction vehicle movements. LA 111 provides criteria for determining significance based on the duration of the vibration impacts, which shall constitute a potential significant effect:

- 10 or more days or nights within any 15 consecutive days, or 40 or more days within any six consecutive months.

15.6 Assessment of Effects – Operation

15.6.1 There are differences in assessment methods for dry and wet conditions. Dry noise is assessed by indicating the excess of rating level over background. During wet conditions, the noise output from OHLs varies according to the number and size of rain droplets accumulated on the surface of the conductors. Therefore, there is a strong relationship between the rainfall rate and the noise output from an OHL. Background noise levels also increase with rainfall rate, such that during very heavy rain, OHL noise is generally inaudible. For these reasons, an alternative noise assessment method to deal with rain-induced noise is required. The external rain-induced noise levels are assessed using the methodology developed by National Grid and detailed in their Technical Guidance Note TGN(E)322.

15.6.2 The excess wet figure is derived by comparing the total noise to the background noise level for the appropriate Miller Curve rating at each receptor at a rain rate of 1 mm/hr.

15.6.3 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.

15.6.4 Due to the lack of a standardised quantitative prediction method for the assessment of potential aeolian noise impacts, a summary is as follows. While aeolian noise is possible under specific wind conditions, its occurrence is typically infrequent. Wind must be incident on the insulators or dampers of the OHL at certain direction and speed for the aeolian noise to be induced. If the wind is too low there will be no noise induced. If the wind is too high, then background noise is raised and aeolian noise impacts are less likely to be significant. While aeolian noise may be audible several hundred metres from a tower, these specific conditions of wind conditions are not likely to be frequent enough to cause noise impacts. Therefore, the focus is on anticipating and mitigating potential aeolian noise through appropriate design measures for the Proposed Development.

15.6.5 The corona-induced audible noise of the OHL in rainfall has been calculated using the EPRI[8] method as recommended in TGN(E)322. Noise emissions at distances up to 500 m of the Triple Araucaria conductor have been calculated. The external rain-induced noise levels have been assessed using the TGN(E)322 methodology developed by National Grid.

15.6.6 In the TGN(E)322 method, previously mentioned in paragraph 15.3.23, the tiered system screens out receptors of low enough wet noise in Tier 1. If the wet noise is above 34 dB(A), Tier 2 assesses the combined wet and dry noise. This stage assesses the proportion of time the area is raining or is dry and calculates a ‘combined’ wet and dry noise. Dry noise is assumed to be 25 dB less than wet noise. Table 2 of TGN(E)322 provides criteria on various rainfall. Historical rain data in the region has been used to calculate the mean annual wet hours from the period of 01 June 2014 to 01 December 2024. If combined noise is above 36.8 dBA, NSRs proceed to a Tier 3 assessment. If Tier 3 is required, the total noise is assessed at a realistic worst-case rain rate of 1 mm/hr to provide the excess above the wet background noise.

15.6.7 All receptors are of medium sensitivity. As shown in **Volume 5, Appendix 15.4: Operational Noise Impact Assessment**, for the Tier 1 assessment, the wet noise at each location is predicted to be between 12.2 and 28.5 dB. Also detailed is the distance from the NSRs to the nearest point on the existing line, also shown **Volume 5, Appendix 15.3: Noise Sensitive Receptors**.

15.6.8 Audible noise from the wet Proposed Development falls below 34 dB(A) for all receptors and therefore no NSRs proceed to Tier 2 of the assessment. This results in **negligible** magnitude of impact at the NSRs and therefore **not significant**.

15.7 Cumulative Effects

15.7.1 A summary of intra-project cumulative effects are presented in Error! Reference source not found. and inter-p roject cumulative effects presented in Error! Reference source not found..

[8] Electrical Power Research Institute, 2005. *EPRI AC Transmission Line Reference Book – 200 kV and Above*, Third Edition, Final Report, 2005, Electrical Power Research Institute.

Table 15.18: Intra Developments

Development	Location	Description	Status	Distance from Proposed Development	Cumulative Assessment
Banniskirk 400kV Substation and HVDC Converter Station	Land 360m north east of Achalone Cottage, Achalone, Halkirk.	A new 400 kV Substation & HVDC Converter Station to connect to the proposed new 400 kV OHL between Spittal & Beauly, the new Spittal to Peterhead HVDC Link, and the existing Spittal 275/132 kV Substation.	Under Consideration	Adjacent	The construction of the cumulative development has the potential to have a cumulative noise impact due to the equipment and increased traffic. If the construction works are coincidental, a Principal Contractor must create a detailed CNMP that must be updated to include working times, activities and a schedule. There is the potential for activities that are associated with the construction of the site that take place concurrently to raise the noise above either the 65 dB daytime noise limit or the 55 dB evening and weekend limit at the Proposed Development NSRs. Therefore, it is possible for cumulative construction noise to result in major effect which is significant. Cumulative construction noise is required to be controlled through an updated assessment by the Principal Contractor, and a CNMP. Therefore, with the appropriate mitigation, in the form of reducing equivalent sound pressure level over the working day during civils and access works, residual effects are likely to be minor and not significant. During operation, the converter station will contain air conditioning units and cooling units, as well as AC equipment for operation of the facility, so will create noise. While recognising there are other noise generating uses in the vicinity of the site, there are a small number of properties which may be adversely affected by noise from the development. Realistic worst-case results from the proposed Banniskirk 400kV Substation and HVDC Converter Station site will occur in dry conditions, which is where the OHL noise is at a minimum. In wet conditions, the OHL noise is elevated. In these conditions, the background noise is increased due to the rainfall, which would make the effects of the other developments such as the HVDC converter station and substation development less likely to have an impact on the relevant receptors. There are no NSRs within the overlap of the Study Area between the Proposed Development and the Banniskirk Substation and HVDC Converter Station (i.e. no NSRs within 500m of both developments).

Development	Location	Description	Status	Distance from Proposed Development	Cumulative Assessment
					Therefore, cumulative impacts due to the Banniskirk development would be low and considered to have negligible impact.
Carnaig 400kV Substation	Land 1800m NE of Sleastray, Bonar Bridge.	Carnaig 400kV Substation	Under Consideration	Adjacent	There are no NSRs within the overlap of the Study Area between the Proposed Development and the Carnaig Substation (i.e. no NSRs within 500m of both developments). However, the construction of the development has the potential to have a cumulative noise impact due to the equipment and increased traffic. If the construction works are coincidental, a Principal Contractor must create a detailed CNMP that must be updated to include working times, activities and a schedule. There is the potential for activities that are associated with the construction of the site that take place concurrently to raise the noise above either the 65 dB daytime noise limit or the 55 dB evening and weekend limit at the Proposed Development NSRs. Therefore, it is possible for cumulative construction noise to result in major effect which is significant. Cumulative construction noise is required to be controlled through an updated assessment by the Principal Contractor, and a CNMP. Therefore, with the appropriate mitigation, as above, residual effects are likely to be minor and not significant. Carnaig Substation is expected to be a source of noise in the Study Area associated with the Proposed Development. The Proposed Development is assessed for realistic worst-case noise in wet conditions. In these conditions, the background noise is raised due to rainfall, therefore, operational noise from Carnaig Substation will be less prominent and likely to have a negligible impact on NSRs when considered cumulatively with the operational noise from the Proposed Development. These cumulative receptors are unlikely to exceed wet background noise with contributions from Carnaig Substation and the Proposed Development. The realistic worst-case noise effects of Carnaig Substation are assessed in dry conditions, where noise from the Proposed Development is negligible. Therefore, cumulative noise in dry and wet conditions is not significant.
Fanellan 400kV Substation and HVDC Converter Station	Land 300m NW Of Fanellan Farmhouse Kiltarlity.	Proposed new 400 kV substation and HVDC converter station comprising new buildings, platform, plant and machinery, access,	Under Consideration	Adjacent	Cumulative construction noise as above. Fanellan Substation and HVDC Converter Station is expected to be a source of noise in the Study Area associated with the Proposed Development. The Proposed Development is assessed for realistic worst-case noise in wet conditions. In these

Development	Location	Description	Status	Distance from Proposed Development	Cumulative Assessment
		laydown/work compound area(s), landscaping, site drainage, and other ancillary works (National Development).			conditions, the background noise is raised due to rainfall, therefore, operational noise from Fanellan Substation will be less prominent and likely to have a negligible impact on NSRs when considered cumulatively with the operational noise from the Proposed Development. There are no NSRs within the overlap of the study area between the Proposed Development and the Fanellan Substation and HVDC Converter Station (i.e. no NSRs within 500m of both developments). Therefore, no receptors are likely to exceed wet background noise with contributions from Fanellan Substation and HVDC Converter Station and the Proposed Development.

Table 15.19: Inter Developments

Development	Location	Description	Status	Distance from Proposed Development	Cumulative Assessment
Banniskirk – Sinclair's Bay HVDC UGC	New underground cable between Spittal and Sinclair's Bay	Circa 30 km of onshore underground HVDC cable from Spittal travelling between Loch Scarmclate and Loch Watten, and through to landfall connections at Sinclair's Bay.	Early Development	Adjacent	The construction of the development has the potential to have a cumulative noise impact due to the equipment and increased traffic. If the construction works are coincidental, a Principal Contractor must create a detailed CNMP that must be updated to include working times, activities and a schedule. There is the potential for activities that are associated with the construction of the site that take place concurrently to raise the noise above either the 65 dB daytime noise limit or the 55 dB evening and weekend limit at the Proposed Development NSRs. Therefore, it is possible for cumulative construction noise to result in major effect which is significant. Cumulative construction noise is required to be controlled through an updated assessment by the Principal Contractor, and a CNMP. Therefore, with the appropriate mitigation, residual effects are likely to be minor and not significant. No operational noise is expected from an underground cable, therefore no cumulative operational noise is negligible.
Banniskirk – Spittal 275kV UGC Connection	New underground cable adjacent to Spittal 275kV Substation.	Circa 1km of underground cable from the Banniskirk 400 kV substation and HVDC converter station to the existing 275kV substation at Spittal.	Early Development	Adjacent	Cumulative construction noise as above. No operational noise is expected from the underground cable, therefore no cumulative operational noise is negligible.

Development	Location	Description	Status	Distance from Proposed Development	Cumulative Assessment
Strathy Wood Wind Farm Grid Connection	Land Between Strathy North and South Wind Farms Strathy	Installation and operation of approximately 4.5 km of 132 kV OHL on double circuit steel structure towers and the installation and operation of 2 No. trident wood H poles each with downlead spans of up to 18 m from each pole for connection onto an existing trident H wood pole 132 kV OHL.	Under Consideration	~25 km west	Cumulative construction noise as above. Cumulative operational noise as above, at this distance any effects would be negligible.
Strathy South Wind Farm Grid Connection	Land Between Strathy North and South Wind Farms Strathy	Overhead electricity transmission line (rated up to 275 kV) to serve Strathy South, Armadale, Melvich and Kirkton wind farm proposals. Comprising approximately 11km of steel lattice tower double circuit line from the end of the Strathy Wood to Strathy North steel lattice circuit near to Strathy North to Connagill substation, including removal of existing wood pole infrastructure near Strathy North to near Melvich.	Scoping Application Decision Issued	~25 km west	Cumulative construction noise as above. Cumulative operational noise as above, at this distance any effects would be negligible.
Kirkton Energy Park	Land 1800 m SW of Kirkton Cemetery Melvich	Erection and operation of a wind farm comprising of 11 wind turbines of up to 149.9 m blade tip height, Battery Energy Storage System (BESS), access tracks, substation, control building, 2 borrow pits, temporary construction compound and associated development for a period of 30 years.	Awaiting Decision	~25 km west	Cumulative construction noise as above. Cumulative operational noise as above, at this distance any effects would be negligible.

Development	Location	Description	Status	Distance from Proposed Development	Cumulative Assessment
West of Orkney Wind Farm Grid Connection	AC Substation at Spittal Site, Halkirk, KW12 6XA	Construction of onshore transmission infrastructure comprising up to two cable landfalls, an onshore substation and up to five associated export circuits.	Application Permitted	Adjacent	Cumulative construction noise as above. Operational noise of the West of Orkney Windfarm Grid Connection has been assessed as low noise subject to the implementation of a noise control strategy. No significant residual noise and vibration impacts were predicted in the EIA. There are no NSRs within the overlap of the Study Area between the Proposed Development and the West of Orkney Wind Farm Grid Connection (i.e. no NSRs within 500 m of both developments). Therefore, no significant cumulative effects are predicted from the Watten Windfarm Grid Connection.
Ayre Offshore Wind Farm	Land 1500 m East of Old Free Church Manse Bower	Onshore infrastructure including substation, inter-array cables, export cables and associated infrastructure.	Scoping Application Decision Issued	Adjacent	Cumulative construction noise as above. The operational noise impacts of windfarms are assessed in different conditions to substation noise. Windfarm noise is increased in high winds, where the background noise also increases. This reduces the impact of the operational noise of the Proposed Development to a negligible level, due to the increase in background noise when windfarm noise may be significant. There is no overlap of the Study Area between the Proposed Development and Ayre Offshore Wind Farm (i.e. no NSRs within 500 m of both developments). Therefore, no significant cumulative effects are predicted from the Ayre Offshore Windfarm.
Ouglassy Wind Farm	Ouglassy Wind Farm.	Development comprised of up to eight wind turbines, with a blade tip height of up to 180 m, BESS technology, associated infrastructure and ancillary development.	Scoping Application Decision Issued	Adjacent	Cumulative construction noise as above. The operational noise impacts of windfarms are assessed in different conditions to substation noise. Windfarm noise is increased in high winds, where the background noise also increases. This reduces the impact of the operational noise of the Proposed Development to a negligible level, due to the increase in background noise when windfarm noise may be significant. There is no overlap of the Study Area between the Proposed Development and Ouglassy Wind Farm (i.e. no NSRs within 500 m of both developments). Therefore, no significant cumulative effects are predicted from the Ouglassy Windfarm.
Watten Wind Farm	Land 3670 m south west of Watten Village Hall Watten	Erection and operation of a wind farm for a period of 35 years, comprising of 7 wind turbines with a maximum blade tip height of 220m,	Under Consideration	Adjacent	Cumulative construction noise as above. The battery storage and substation will contain air conditioning units and cooling units, as well as AC equipment for operation of the facility, so will create noise. While recognising there are other noise generating uses in the vicinity of the site, there are a

Development	Location	Description	Status	Distance from Proposed Development	Cumulative Assessment
		access tracks, borrow pits, substation, control building, battery storage and ancillary infrastructure.			small number of properties which may be adversely affected by noise from the development. Realistic worst-case results from the development site will occur in dry conditions, which is where the OHL noise is at a minimum. In wet conditions, the OHL noise is elevated. In these conditions, the background noise is increased due to the rainfall, which would make the effects of the other developments less likely to have an impact on the relevant receptors. The operational noise impacts of windfarms, battery storage, and substations are assessed in different conditions to OHL noise. Windfarm noise is increased in high winds, where the background noise also increases. This reduces the impact of the operational noise of the Proposed Development to a negligible level, due to the increase in background noise when windfarm noise may be significant. There are no NSRs within the overlap of the study area between the Proposed Development and Watten Wind Farm (i.e. no NSRs within 500m of both developments). Therefore, no significant cumulative effects are predicted from the Watten Windfarm.
Carnaig – Loch Buidhe 275kV UGC Connection	New underground cable adjacent to Loch Buidhe 275 kV Substation.	Circa 1km of underground cable (UGC) from the proposed Carnaig 400 kV substation to the existing 275 kV substation at Loch Buidhe.	Early Development	Adjacent	Cumulative construction noise as above. No operational noise is expected from the underground cable, therefore no cumulative operational noise is negligible.
Garvary Wind Farm	Land 4600 m north east of Invershin Community Hall Invershin.	Erection and operation of wind farm for a period of 30 years, comprising of 25 (as amended) wind turbines with maximum blade tip height of up to 180m, access tracks, up to 6 borrow pits, substation, battery storage compound, control building, 4 meteorological masts, and ancillary infrastructure.	Under Consideration	Adjacent	Cumulative construction noise as above. The operational noise impacts of windfarms are assessed in different conditions to substation noise. Windfarm noise is increased in high winds, where the background noise also increases. This reduces the impact of the operational noise of the Proposed Development to a negligible level, due to the increase in background noise when windfarm noise may be significant. There is no overlap of the Study Area between the Proposed Development and Garvary Wind Farm (i.e. no NSRs within 500 m of both developments). Therefore, no significant cumulative effects are predicted from the Garvary Windfarm.
Inveroykel Wind Farm	Land 1.5km South Of 2 Easter	Scoping request for the erection and operation of a wind farm comprising	Scoping Application	Adjacent	Cumulative construction noise as above.

Development	Location	Description	Status	Distance from Proposed Development	Cumulative Assessment
	Kilmachalmack Strathkyle Ardgay.	29 turbines with a maximum blade tip height of 230 m, BESS facility and associated infrastructure.	Decision Issued		The operational noise impacts of windfarms are assessed in different conditions to substation noise. Windfarm noise is increased in high winds, where the background noise also increases. This reduces the impact of the operational noise of the Proposed Development to a negligible level, due to the increase in background noise when windfarm noise may be significant. There is no overlap of the Study Area between the Proposed Development and Inveroykel Wind Farm (i.e. no NSRs within 500 m of both developments). Therefore, no significant cumulative effects are predicted from the Inveroykel Windfarm.
Braelangwell Wind Farm	Land 1400 m North of Ar Dachaigh Ardgay.	Erection and operation of a wind farm comprising of up to 17 wind turbines with a maximum blade tip height of 220 m and associated infrastructure.	Scoping Application Decision Issued	Adjacent	Cumulative construction noise as above. The operational noise impacts of windfarms are assessed in different conditions to substation noise. Windfarm noise is increased in high winds, where the background noise also increases. This reduces the impact of the operational noise of the Proposed Development to a negligible level, due to the increase in background noise when windfarm noise may be significant. There is no overlap of the Study Area between the Proposed Development and Braelangwell Wind Farm (i.e. no NSRs within 500 m of both developments). Therefore, no significant cumulative effects are predicted from the Braelangwell Windfarm.
Balblair Wind Farm	Land 695m NW of Coirshellach Airdens Bonar Bridge.	Erection and operation of a wind farm, comprising 9 wind turbines with a maximum blade tip height of 180m, energy storage facility, access tracks, borrow pits, substation, control building, anemometer mast, LiDAR compound, and ancillary infrastructure.	Scoping Application Decision Issued	Adjacent	Cumulative construction noise as above. The operational noise impacts of windfarms are assessed in different conditions to substation noise. Windfarm noise is increased in high winds, where the background noise also increases. This reduces the impact of the operational noise of the Proposed Development to a negligible level, due to the increase in background noise when windfarm noise may be significant. There is no overlap of the Study Area between the Proposed Development and Balblair Wind Farm (i.e. no NSRs within 500 m of both developments). Therefore, no significant cumulative effects are predicted from the Balblair Windfarm.
Abhainn Dubh Wind Farm	Land 3450m North of Kaytoo Heights of Dochcarty Dingwall.	Erection and operation of a wind farm for a period of 30 years, comprising of 13 wind turbines with a maximum blade tip height of 149.9 m, energy storage facility, access	Under Consideration	Adjacent	Cumulative construction noise as above. The operational noise impacts of windfarms, battery storage, and substations are assessed in different conditions to substation noise. Windfarm noise is increased in high winds, where the background noise also increases. This reduces the impact of the

Development	Location	Description	Status	Distance from Proposed Development	Cumulative Assessment
		tracks, borrow pits, substation, anemometer mast, control building, and ancillary infrastructure.			operational noise of the Proposed Development to a negligible level, due to the increase in background noise when windfarm noise may be significant. The receptor that is most likely to experience cumulative effects is approximately 250 m away from the land due to be used for the Abhainn Dubh windfarm, and is at least 150 m from Proposed Development. At a distance of 150 m the operational assessment predicts no impact. Therefore, no significant operational cumulative effects are predicted from the Abhainn Dubh Windfarm. The construction of the Abhainn Dubh Wind Farm has the potential to have a cumulative noise impact due to the equipment and increased traffic. If the construction works are coincidental, once a contractor has been appointed, a detailed CNMP must be updated to include working times, activities and a schedule. There is the potential for activities that are associated with the construction of the Abhainn Dubh Wind Farm that take place concurrently to raise the noise above either the 65 dB daytime noise limit or the 55 dB evening and weekend limit at the Proposed Development receptors. Therefore, it is possible for cumulative construction noise to result in major effect which is significant. Cumulative construction noise is required to be controlled through an updated assessment by the Principal Contractor, and a CNMP.
Ceislein Wind Farm	Land 3km SW Of Wester Lealty At Cnoc Ceislain Novar Evanton.	Erection and operation of a wind farm comprising up to 20 turbines with a maximum blade tip height of 250m, potential BESS and associated infrastructure, with a combined generating capacity exceeding 50 MW.	Scoping Application Decision Issued	Adjacent	Cumulative construction noise as above. The operational noise impacts of windfarms are assessed in different conditions to substation noise. Windfarm noise is increased in high winds, where the background noise also increases. This reduces the impact of the operational noise of the Proposed Development to a negligible level, due to the increase in background noise when windfarm noise may be significant. There is no overlap of the Study Area between the Proposed Development and Ceislein Wind Farm (i.e. no NSRs within 500 m of both developments). Therefore, no significant cumulative effects are predicted from the Ceislein Windfarm.
Creachan Wind Farm	Land 5.8 km north east of The Bothy Kildermorie Strathrusdale Alness.	Erection and Operation of a Wind Farm, comprising up to 21 Turbines with a maximum blade tip height 220 m, BESS facility, access tracks,	Scoping Application Decision Issued	Adjacent	Cumulative construction noise as above. The operational noise impacts of windfarms are assessed in different conditions to substation noise. Windfarm noise is increased in high winds, where the background noise also increases. This reduces the impact of the operational noise of the Proposed Development to a negligible level, due to the increase in background noise when

Development	Location	Description	Status	Distance from Proposed Development	Cumulative Assessment
		borrow pits, substation, control building, and ancillary infrastructure.			windfarm noise may be significant. There is no overlap of the Study Area between the Proposed Development and Creachan Wind Farm (i.e. no NSRs within 500m of both developments). Therefore, no significant cumulative effects are predicted from the Creachan Windfarm.
Abhainn Dubh 132 kV OHL Wind Farm Connection	Land 140m NW Of 2 Clashnabuiac Alness.	EIA Screening Opinion for construction and operation of a 132 kV single circuit OHL of approximately 8.4 km and approximately 1 km of UGC to connect the proposed Abhainn Dubh Wind Farm to the existing Fyrish Substation.	Screening Application EIA Required	Adjacent	Cumulative construction noise as above. Operational noise from a 132kV OHL and an underground cable is negligible, therefore there are no cumulative operational impacts.
Western Isles HVDC UGC	New underground cable between Dundonnell and Beauly.	Circa 80 km of onshore underground HVDC cable from Dundonnell to a mainland HVDC Converter Station near Beauly.	Early Development	Adjacent	Cumulative construction noise as above. No operational noise is expected from a underground cable, therefore no cumulative operational noise is negligible.
Beauly to Blackhillock to New Deer to Peterhead 400kV OHL	Land 1525m south east of Finglack Culloden Moor Inverness.	Section 37 application for the construction of a new double circuit steel structure 400kV OHL between Beauly, Blackhillock, New Deer and Peterhead, approximately 194km in length, including the diversion of an existing 400kV OHL into a proposed new Coachford 400kV substation near Blackhillock, removal of the existing 132 kV OHL from Beauly to Knocknagael substations, and rationalisation and crossings of the existing transmission network.	Scoping Application Decision Issued	Adjacent	Cumulative construction noise as above. The BBNP 400 kV OHL is a potential source of cumulative noise. The conductor type for the BBNP OHL is Triple Araucaria. There are no NSRs within the overlap of the study area between the Proposed Development and the BBNP OHL (i.e. no NSRs within 500m of both developments). At 1km away a 400 kV Triple Araucaria OHL would produce negligible effects and thus the cumulative effects will be negligible.

Development	Location	Description	Status	Distance from Proposed Development	Cumulative Assessment
Loch Toftingall BESS	Land 725 m east of Mybster Sub Station Spittal	Erection and operation of a BESS with a maximum output of 49.9 MW including switchgear and control buildings, landscaping, fencing and ancillary infrastructure.	Under Consideration	~1 km west	Cumulative construction noise as above. The operational noise generated by battery storage systems and overhead lines are different and are assessed in different ways. The nature of noise from a BESS site will be made up of fan noise from the battery storage units, and 100Hz tones from any transformers associated with the site. The transformers on this site are enclosed in buildings reducing any likely cumulative impact. As fan noise is broadband in nature, the transformers are enclosed and the site is ~1km from the proposed development, there are likely to be negligible cumulative effects.
Ballach Wind Farm	Land 6260 m north east of Erchless Forest Cottage Struy Beauly	Scoping request for Ballach Wind Farm - Erection and Operation of a Wind Farm for a period of 35 years, comprising 36 turbines with a maximum blade tip height of 200 m and 230 m, along with a BESS and ancillary infrastructure.	Scoping Application Decision Issued	~1 km west	Cumulative construction noise as above. The operational noise impacts of windfarms are assessed in different conditions to substation noise. Windfarm noise is increased in high winds, where the background noise also increases. This reduces the impact of the operational noise of the Proposed Development to a negligible level, due to the increase in background noise when windfarm noise may be significant. There is no overlap of the Study Area between the Proposed Development and Ballach Wind Farm (i.e. no NSRs within 500 m of both developments). Therefore, no significant cumulative effects are predicted from the Ballach Windfarm.
Golticlay Wind Farm Redesign	Land 2040 m north east of Bulreanrob Lybster	Erection and operation of a wind farm for a period of 35 years, comprising up to 13 wind turbines, 11 with a maximum blade tip height of 200 m, two with a maximum blade tip height of 180 m, access tracks, borrow pits, substation, control building, metrological mast, and ancillary infrastructure.	Approved by Scottish Ministers	~2km east	Cumulative construction noise as above. The operational noise impacts of windfarms are assessed in different conditions to substation noise. Windfarm noise is increased in high winds, where the background noise also increases. This reduces the impact of the operational noise of the Proposed Development to a negligible level, due to the increase in background noise when windfarm noise may be significant. There is no overlap of the Study Area between the Proposed Development and Golticlay Wind Farm (i.e. no NSRs within 500 m of both developments). Therefore, no significant cumulative effects are predicted from the Golticlay Windfarm.

Development	Location	Description	Status	Distance from Proposed Development	Cumulative Assessment
Hill of Lynchrobbie Wind Farm	Land At Hill of Lynchrobbie Dunbeath	Erection of two wind turbines with a tip height of up to 149.9 m, capacity of circa 4.5 MW each, and ancillary infrastructure; including battery storage facility of up to 5 MW.	Scoping Application Decision Issued	~2 km east	Cumulative construction noise as above. The operational noise impacts of windfarms are assessed in different conditions to substation noise. Windfarm noise is increased in high winds, where the background noise also increases. This reduces the impact of the operational noise of the Proposed Development to a negligible level, due to the increase in background noise when windfarm noise may be significant. There is no overlap of the Study Area between the Proposed Development and Lynchrobbie Wind Farm (i.e. no NSRs within 500 m of both developments). Therefore, no significant cumulative effects are predicted from the Lynchrobbie Windfarm.
Tormsdale Wind Farm	Land At Tormsdale 1500 m South of Bridge of Westerdale, Halkirk	Erection and operation of wind farm for period of 30 years, comprising of 10 wind turbines with maximum blade tip height of 149.9 m, access tracks, substation, control building, BESS, and ancillary infrastructure.	S36 Raise Objection	~2km west	Cumulative construction noise as above. The operational noise impacts of windfarms, battery storage, and substations are assessed in different conditions to substation noise. Windfarm noise is increased in high winds, where the background noise also increases. This reduces the impact of the operational noise of the Proposed Development to a negligible level, due to the increase in background noise when windfarm noise may be significant. There is no overlap of the Study Area between the Proposed Development and Tormsdale Wind Farm (i.e. no NSRs within 500 m of both developments). Therefore, no significant cumulative effects are predicted from the Tormsdale Windfarm.
Acheilidh Wind Farm (fka Lairg III)	Land 1150 m south west of Tigh An Alt Acheilidh Rogart	Erection and operation of a wind farm for a period of 35 years, comprising of 12 wind turbines with a maximum blade tip height of between 200 m and 230 m, BESS, access tracks, borrow pits, substation, control building, and ancillary infrastructure.	S36 Raise Objection	~2km north	Cumulative construction noise as above. The operational noise impacts of windfarms, battery storage, and substations are assessed in different conditions to substation noise. Windfarm noise is increased in high winds, where the background noise also increases. This reduces the impact of the operational noise of the Proposed Development to a negligible level, due to the increase in background noise when windfarm noise may be significant. There is no overlap of the Study Area between the Proposed Development and Acheilidh Wind Farm (i.e. no NSRs within 500 m of both developments). Therefore, no significant cumulative effects are predicted from the Acheilidh Windfarm.
Lairg II Wind Farm Redesign	Land 2400 m south east of	Erection and Operation of a Wind Farm for a period of 35 years, comprising of 5 No. Wind Turbines	Application Permitted	~3km north	Cumulative construction noise as above. The operational noise impacts of windfarms are assessed in different conditions to substation noise. Windfarm noise is increased in high winds, where the background

Development	Location	Description	Status	Distance from Proposed Development	Cumulative Assessment
	Cracrail Toroboll Lairg	with a maximum blade tip height of 200 m, 2 No. Wind Turbines with a maximum blade tip height of 190 m, 3 No. Wind Turbines with a maximum blade tip height of 150 m, access tracks, borrow pits, 132 kV substation, control building, energy storage compound and ancillary infrastructure.			noise also increases. This reduces the impact of the operational noise of the Proposed Development to a negligible level, due to the increase in background noise when windfarm noise may be significant. There is no overlap of the Study Area between the Proposed Development and Lairg II Wind Farm Redesign (i.e. no NSRs within 500 m of both developments). Therefore, no significant cumulative effects are predicted from the Lairg II Windfarm.
Carn Fearna Wind Farm	Land 4 km North East Of Garve	EIA Scoping request for the erection and operation of a wind farm, comprising up to 9 wind turbines with a tip height of approximately 200m, BESS, and ancillary infrastructure.	Scoping Application Decision Issued	~5 km north west	Cumulative construction noise as above. Cumulative operational noise as above, at this distance any effects would be negligible.
Tarvie Wind Farm	Land 1750 m south west of Tarvie Services Tarvie Strathpeffer	EIA Scoping request for the erection and operation of a wind farm, comprising up to five wind turbines with a tip height of approximately 200 m and ancillary infrastructure.	Scoping Application Decision Issued	~5 km west	Cumulative construction noise as above. Cumulative operational noise as above, at this distance any effects would be negligible.
Carn Fearna 132kV OHL Wind Farm Connection	Land 4km North East Of Garve	EIA Screening Opinion for construction and operation of a 132 kV single circuit OHL of approximately 7 km to connect the proposed Carn Fearna Wind Farm to the existing Corriemoillie Substation.	Awaiting decision	~5 km west	Cumulative construction noise as above. Cumulative operational noise as above, at this distance any effects would be negligible.
Strathrory Wind Farm Redesign	Land At Torr Leathann, Strathrory,	Erection and operation of a Wind Farm for a period of 35 years, comprising a total of seven wind turbines with turbines 1,2,3 and 5 having a maximum blade tip height	Appeal Allowed	~6km east	Cumulative construction noise as above. Cumulative operational noise as above, at this distance any effects would be negligible.

Development	Location	Description	Status	Distance from Proposed Development	Cumulative Assessment
	Ardross, Alness, IV17	of 180 m, turbine 4 having a maximum blade tip height of 160m, and turbines six and seven having a maximum blade tip height of 149.9 m, BESS, access tracks, borrow pit, substation, control building, and ancillary infrastructure.			
Swarclett Wind Farm	Land 975 m south east of Mains of Durran Castletown	Swarclett Wind Farm - Erection and operation of a wind farm for a period of 30 years, comprising two turbines with a maximum blade tip height of 149.9 m, battery storage and ancillary infrastructure.	Under Consideration	~7 km north east	Cumulative construction noise as above. Cumulative operational noise as above, at this distance any effects would be negligible.
Cogle Moss	Land 477 m north east of Blackpark Watten	Application for non-compliance with Condition 1 (Commencement of Development) and Condition 13 (Archaeology) of Planning Permission 15/02769/FUL.	Application Permitted	~8 km east	Cumulative construction noise as above. Cumulative operational noise as above, at this distance any effects would be negligible.
Thurso BESS	Land 610 m south west of Upper Geiselittle Thurso	Operation of an energy generating system, comprising a BESS up to 100 MW of energy, associated infrastructure, substation, security fencing, CCTV, security lighting and landscaping.	Under Consideration	~9 km north	Cumulative construction noise as above. Cumulative operational noise as above, at this distance any effects would be negligible.
Camster II Wind Farm	Land 2000 m north west of Tannach Hill Tannach Wick.	Erection of up to 11 wind turbines maximum tip height of 126.5 m with associated infrastructure.	Appeal Allowed	~10km east	Cumulative construction noise as above. Cumulative operational noise as above, at this distance any effects would be negligible.

Development	Location	Description	Status	Distance from Proposed Development	Cumulative Assessment
Achany Extension Wind Farm	Land 2 km north east of Glencassley Castle Rosehall	Erection and Operation of a Wind Farm for a period of 50 years, comprising of 20 Wind Turbines with a maximum blade tip height 149.9 m, access tracks, borrow pits, substation, control building, and ancillary infrastructure.	Approved by Scottish Ministers	~10km north	Cumulative construction noise as above. Cumulative operational noise as above, at this distance any effects would be negligible.
Cnoc Farasd Wind Farm	Land 2km north east of The Lodge Buntait Glenurquhart Drumnadrochit	Cnoc Farasd Wind Farm - Erection and operation of a wind farm comprising of up to nine wind turbines with a maximum blade tip height of 220 m, BESS and associated infrastructure.	Scoping Application Decision Issued	~10 km south west	Cumulative construction noise as above. Cumulative operational noise as above, at this distance any effects would be negligible.
Allt An Tuir Renewable Energy Park	Land 2335m South of March Cottage Rosehall	Erection and operation of a wind farm, comprising approximately nine wind turbines with a maximum blade tip height of 200 m, BESS, photovoltaic array and ancillary infrastructure	Scoping Application Decision Issued	~12 km north west	Cumulative construction noise as above. Cumulative operational noise as above, at this distance any effects would be negligible.
Creag Riabhach Wind Farm Connection	Land 1250 m north of Crask Inn Lairg	Installation and operation of 132 kV overhead electric line to connect Creag Riabhach Wind Farm to the grid.	Under Construction	~13 km north	Cumulative construction noise as above. Cumulative operational noise as above, at this distance any effects would be negligible.
Creag Riabhach Extension Wind Farm	Creag Riabhach Wind Farm Lairg, IV27 4AD	Erection and operation of three turbines with a maximum blade tip height of 149.9 m, installation of BESS, access tracks, and associated infrastructure.	Approved by Scottish Ministers	~28 km north	Cumulative construction noise as above. Cumulative operational noise as above, at this distance any effects would be negligible.

Development	Location	Description	Status	Distance from Proposed Development	Cumulative Assessment
Cairnmore Hill Wind Farm (Re-design)	Land 1580 m south east of Schoolhouse Forss Thurso	Erection and Operation of a Wind Farm for a period of 35 years, comprising of five wind turbines with a maximum blade tip height 138.5 m, access tracks, substation, control building, BESS, and ancillary infrastructure.	Under Consideration	~14km north west	Cumulative construction noise as above. Cumulative operational noise as above, at this distance any effects would be negligible.
Chrathaich Wind Farm	Land 3615m NW of Burnside Bhlaraidh Glenmoriston	Erection and operation of a wind farm for a period of 30 years, comprising of 14 wind turbines with a maximum blade tip height of 149.9 m, access tracks, borrow pits, substation, control building, and ancillary infrastructure.	S36 Raise No Objection	~14 km south west	Cumulative construction noise as above. Cumulative operational noise as above, at this distance any effects would be negligible.
Hollandmey Energy Development	Land at Hollandmey Farm And Philips Mains Phillips Mains Mey.	Erection and Operation of Renewable Energy Development in perpetuity comprising 10 wind turbines with a ground to blade tip height of 149.9 m, ground mounted solar arrays, BESS, access tracks, permanent met mast and LiDAR, two temporary met masts, up borrow pits and associated infrastructure.	Approved by Scottish Ministers	~15 km north east	Cumulative construction noise as above. Cumulative operational noise as above, at this distance any effects would be negligible.
Lochend Wind Farm Extension	Land 600 m north east of 10 Lochend Holding Barrock.	Erection and operation of a Wind Farm for a period of 40 years, comprising of five wind turbines with a maximum blade tip height 149.9m, BESS, access tracks and ancillary infrastructure.	Under Consideration	~15 km north east	Cumulative construction noise as above. Cumulative operational noise as above, at this distance any effects would be negligible.

Development	Location	Description	Status	Distance from Proposed Development	Cumulative Assessment
Chleansaid Wind Farm	Land 2375 m north west of Keepers Cottage Dalnessie Lairg	Erection and operation of a Wind Farm comprising 16 turbines 12 turbines at 200 m and four turbines at 180 m, generating around 96 MW and associated infrastructure (access tracks, borrow pits, substation, control building) and includes BESS facility 20 MW.	Approved by Scottish Ministers	~15km north	Cumulative construction noise as above. Cumulative operational noise as above, at this distance any effects would be negligible.
Slickly Wind Farm	Land 1650 m east of Slickly Croft Lyth Wick	11 wind turbines up to 149.9m blade tip height and associated infrastructure.	Appeal Allowed	~16km north west	Cumulative construction noise as above. Cumulative operational noise as above, at this distance any effects would be negligible.
Limekiln Extension Wind Farm	Land 3080 m west of Shepherds Cottage Shebster Thurso	Erection and Operation of a Wind Farm for a period of 30 years, comprising of five Wind Turbines with a maximum blade tip height 149.9m, with access tracks, hardstanding areas, substation, battery storage facility, control building compound, borrow pits and cabling.	Approved by Scottish Ministers	~16 km north west	Cumulative construction noise as above. Cumulative operational noise as above, at this distance any effects would be negligible.
Meall Buidhe Wind Farm	Land 4420 m north west of Croick Estate Ardgay	Erection of and operation of a Wind Farm for a period of 25 years comprising of eight Wind Turbines access tracks, substation, control building, and ancillary infrastructure with a maximum output of 40 Megawatts.	Appeal Allowed	~16km west	Cumulative construction noise as above. Cumulative operational noise as above, at this distance any effects would be negligible.
Limekiln Wind Farm	Land 2870 m south east of	Application under Section 36 of the Electricity Act 1989 to vary the consented Limekiln Wind Farm to	Approved by Scottish Ministers	~17 km north west	Cumulative construction noise as above.

Development	Location	Description	Status	Distance from Proposed Development	Cumulative Assessment
	Borlum House Reay	increase the blade tip height from 15 turbines at a maximum blade tip of 130 m and six turbines with a maximum blade tip height of 126 m to 21 turbines with a maximum blade tip height of 149.9 m.			Cumulative operational noise as above, at this distance any effects would be negligible.
Strath Tirry Wind Farm	Land 1450 m north east of Dalmichie Lairg	Erection and operation of a Wind Farm for a period of 30 years, comprising of 4 Wind Turbines with a maximum blade tip height of 135m, access tracks, borrow pits, substation, control building, meteorological mast and ancillary infrastructure.	Application Permitted	~17km north west	Cumulative construction noise as above. Cumulative operational noise as above, at this distance any effects would be negligible.
Forss III Wind Farm	Wind Farm Borrowstone Mains Forss Thurso	Erection and operation of one turbine with a max tip height of 100m, access tracks, sub-station, transformer unit and ancillary infrastructure.	Application Permitted	~19 km north west	Cumulative construction noise as above. Cumulative operational noise as above, at this distance any effects would be negligible.
Limekiln Wind Farm Connection	Between the existing Dounreay Substation and the new proposed Limekiln 132/33kV Substation	To construct and operate approximately 5 km of 132 kV trident H wood pole overhead line between Limekiln wind farm substation (OS Grid Ref: NC 977 627) and a new sealing end structure (OS Grid Ref: NC 985 658) approximately 900 m south of Dounreay substation including ancillary works.	Under Construction	~19 km north west	Cumulative construction noise as above. Cumulative operational noise as above, at this distance any effects would be negligible.
Shinness Wind Farm	Land 2290 m south east of	Erection and operation of a wind farm for a period of 40 years, comprising of 16 wind turbines with	Under Consideration	~20 km north west	Cumulative construction noise as above.

Development	Location	Description	Status	Distance from Proposed Development	Cumulative Assessment
	Aultnacoarach Shinness Lairg	a maximum blade tip height of 200 m, BESS, access tracks, borrow pits, substation, control building, and ancillary infrastructure.			Cumulative operational noise as above, at this distance any effects would be negligible.
Strath Oykel Wind Farm	Land 1700 m south west of Oape Ardgay	Strath Oykel Wind Farm and battery storage, 11 wind turbines of up to 200 metres and associated infrastructure.	Approved by Scottish Ministers	~20 km west	Cumulative construction noise as above. Cumulative operational noise as above, at this distance any effects would be negligible.
Loch Liath Wind Farm	Land 9000 m south west of Glenurquhart High School Balmacaan Road Drumnadrochit	Erection and operation of a wind farm for a period of 35 years, comprising a total of 13 wind turbines with Turbines 2, 3, 4, 5, 8, 9, 10, 11, 12, and 13 having a maximum blade tip height of 200 m, and Turbines 1, 6 and 7 having a maximum blade tip height of 180 m, access tracks, borrow pit, substation, control building, anemometer mast, and ancillary infrastructure.	Under Consideration	~20km south	Cumulative construction noise as above. Cumulative operational noise as above, at this distance any effects would be negligible.
Coillie Beith Wind Farm	Land 2335 m south of Langwell Lodge Langwell Lairg.	Erection and operation of a wind farm for a period of 50 years, comprising of up to 19 wind turbines with a maximum blade tip height of 200 m, BESS, access tracks, borrow pits, substation, control building, and ancillary infrastructure.	Scoping Application Decision Issued	~21 km west	Cumulative construction noise as above. Cumulative operational noise as above, at this distance any effects would be negligible.
Carn Na Saobhaidh Wind Farm	Carn Na Saobhaidh Wind Farm Monadhliath	The proposed development would consist of up to 29 wind turbines with	Scoping Application	~21 km south east	Cumulative construction noise as above. Cumulative operational noise as above, at this distance any effects would be negligible.

Development	Location	Description	Status	Distance from Proposed Development	Cumulative Assessment
	Mountains Near Farr Inverness	a maximum blade tip height of up to 200m & an associated BESS.	Decision Issued		
Baledigle Wind Farm	Land 1800 m north east of Radio Transmitter Station Forsinard	EIA Scoping request for the erection and operation of a wind farm comprising up to 13 wind turbines with a capacity of up to 91MW and a tip height of up to 250 m, BESS of up to 45 MW and ancillary infrastructure.	Scoping Application Decision Issued	~22km north west	Cumulative construction noise as above. Cumulative operational noise as above, at this distance any effects would be negligible.
Ackron Wind Farm	Land 1575 m north east of Ackron Farm Golval Forsinard	Erection and operation of a wind farm, comprising approximately 11 wind turbines with a maximum blade tip height of 200 m, possible battery storage system, and ancillary infrastructure.	Scoping Application Decision Issued	~25 km west	Cumulative construction noise as above. Cumulative operational noise as above, at this distance any effects would be negligible.
Forsinain Forest Wind Farm	Land 2400 m south east of Forsinain Forsinard	Erection and operation of a wind farm for a period of 40 years, comprising of 17 wind turbines with a maximum blade tip height of 250 m, energy storage facility, access tracks, borrow pits, substation, control building, and ancillary infrastructure.	Scoping Application Decision Issued	~25 km north west	Cumulative construction noise as above. Cumulative operational noise as above, at this distance any effects would be negligible.
Sallachy Wind Farm	Land At Sallachy Estate Lairg	Erection and Operation of a Wind Farm for a period of 30 years, comprising of nine Wind Turbines with a maximum blade tip height of 149.9 m, access tracks, temporary borrow pits and construction	Application Permitted	~25km north west	Cumulative construction noise as above. Cumulative operational noise as above, at this distance any effects would be negligible.

Development	Location	Description	Status	Distance from Proposed Development	Cumulative Assessment
		compound, substation compound, and ancillary infrastructure.			
Bhlaraidh Wind Farm extension	Glenmoriston Estate North of Levishie Invermoriston	Erection and Operation of Wind Farm for period of 50 years, comprising of 15 Wind Turbines with maximum blade tip height 180 m, access tracks, borrow pits, substation, control building, and ancillary infrastructure.	Approved by Scottish Ministers	~25km south	Cumulative construction noise as above. Cumulative operational noise as above, at this distance any effects would be negligible.
Lynemore Wind Farm	Land 2000 m south west of Lynemore Moy Tomatin	Erection and operation of a wind farm comprising up to 10 wind turbines with a maximum blade tip height of 200 m, battery energy storage facility and ancillary infrastructure.	Scoping Application Decision Issued	~25km south east	Cumulative construction noise as above. Cumulative operational noise as above, at this distance any effects would be negligible.
Loch Kemp Storage	Land 1300 m south west Of Dell Lodge Whitebridge	Construction of pumped hydro storage (Loch Kemp); dam, raise, and utilise Loch Kemp, as its upper reservoir, and connect by underground waterway systems and tunnels to a powerhouse & tailrace structure on the shores of Loch Ness.	Under Consideration	~25 km south	Cumulative construction noise as above. Cumulative operational noise as above, at this distance any effects would be negligible.
Corriegarth 2 Wind Farm	Land At Carn Na Saobhaidhe Gorthleck Inverness	Corriegarth 2 Wind Farm - Erection and Operation of a Wind Farm for a period of 30 years, comprising of 16 Wind Turbines with a maximum blade tip height of 149.9 m, access tracks, borrow pits, substation,	Approved by Scottish Ministers	~25 km south	Cumulative construction noise as above. Cumulative operational noise as above, at this distance any effects would be negligible.

Development	Location	Description	Status	Distance from Proposed Development	Cumulative Assessment
		control building, and ancillary infrastructure.			
Melvich Wind Energy Hub	Land 1500 m south west of Melvich.	Erection and operation of a wind farm for a period of 40 years, comprising 12 wind turbines with a maximum blade tip height of 149.9 m, energy storage facility, access tracks, borrow pits, substation, and ancillary infrastructure.	Awaiting decision	~27 km north west	Cumulative construction noise as above. Cumulative operational noise as above, at this distance any effects would be negligible.
Coille Line (formerly known as Fiag) Wind Farm	Land 3.4 km north east of Taigh Na Dreoilín Lairg.	Erection and operation of a wind farm for a period of 35 years, comprising of up to 22 wind turbines with a maximum blade tip height of 230 m, BESS access tracks, borrow pits, substation, control building, and ancillary infrastructure.	Scoping Application Decision Issued	~28 km north west	Cumulative construction noise as above. Cumulative operational noise as above, at this distance any effects would be negligible.

15.8 Mitigation

Embedded Mitigation

15.8.1 Topic specific embedded mitigation (mitigation achieved through design) is outlined below.

Operational Noise

15.8.2 The proposed conductor type, Triple Araucaria, has been selected for use on the Proposed Development, which is a low noise conductor.

15.8.3 Permanent towers and conductors are not proposed to be located within 100 m of NSRs, beyond this distance, the conductor produces relatively low noise. The purpose and key driver of the routing is to avoid proximity to NSRs such as residential properties.

15.8.4 Aeolian noise is caused by wind blowing through the conductors and/or structures. This type of noise is usually infrequent and depends on wind velocity and direction. Wind must blow steadily and perpendicular to the lines to set up an aeolian vibration, which can produce resonance if the frequency of the vibration matches the natural frequency of the line. Design of the conductors should implement best practice - it is recommended that dampers be attached to the lines to minimise aeolian vibration/noise and that the components used have no known history of producing aeolian noise.

Additional Mitigation

Construction Noise

15.8.5 Due to the assessment being performed on assumed information at this stage, a detailed construction noise assessment with a CNMP, in accordance with the guidance and procedures outlined in BS 5228-1, will need to be conducted by the Principal Contractors. The CNMP will be embedded within the Construction Environmental Management Plan (CEMP). Procedures could include where necessary and practicable:

- minimising the noise as much as is reasonably practicable at source;
- attenuation of noise propagation by the addition of acoustic absorptive screens or barriers within the Site;
- carrying out identified high noise level activities at a time when they are least likely to cause a nuisance to residents; and
- providing advance notice of unavoidable periods of high noise levels to residents.

15.8.6 In order to maintain low impact on the noise environment, consideration will be given to attenuation of construction noise at source by means of the following:

- giving due consideration to the effect of noise, in selection of construction methods;
- avoidance of vehicles waiting or queuing, particularly on public highways or in residential areas with their engines running;
- scheduling of deliveries to arrive during daytime hours only. Care should be taken to minimise noise while unloading delivery vehicles. Delivery vehicles should follow routes that minimise use of residential roads;
- ensure plant and equipment are regularly and properly maintained. All plant should be situated to sufficiently minimise noise impact at nearby properties;
- fit and maintain silencers to plant, machinery, and vehicles where appropriate and necessary;
- operate plant and equipment in modes of operation that minimise noise, and power down plant when not in use;
- use electrically powered plant rather than diesel or petrol driven, where this is practicable; and
- works typically not to take place outside of hours defined in the construction schedule.

15.8.7 Consideration will be given to the attenuation of construction noise in the transmission path by means of the following:

- locate plant and equipment liable to create noise as far from NSRs as is reasonably practicable or use natural land topography to reduce line of sight noise transmission;
- noise screens, hoardings and barriers should be erected where appropriate and necessary to shield high-noise level activities; and
- provide lined acoustic enclosures for equipment such as portable generators.

15.8.8 It is expected that the updated, detailed CNIA, CTMP and CNMP will address any remaining predicted noise excess, and should be conducted prior to the commencement of any construction works.

15.8.9 Potential significant effects that may result from the construction phases (including cumulative) of the Proposed Development include:

- Effects of construction noise on the surrounding area and on NSRs including effects of static and quasi-static construction noise from construction plant, such as excavators, dump trucks and cranes.
- Operational effects of noise from the Proposed Development on NSRs, mainly noise from corona discharge in wet conditions and the potential for aeolian noise in windy conditions.

Table 15.20: Recommended Mitigation – Construction

Mitigation Measure	Rationale	Proposed Development Stage/Timing	Responsibility
CNMP – to set out proactive strategies to manage and minimise the noise and vibration impacts generated by construction. In this plan, mitigation measures are recommended such as the control of the noise source levels, controlling the noise transmission path via noise barriers, time management and managing operational times of equipment when not in use. It should recommended that the noisiest activities are conducted during the "Daytime and Saturdays" time periods defined in **Table 15.5**. The CNMP will also include community engagement and stakeholder management plans to ensure legal compliance with Control of Pollution Act 1974.	Potential significant noise effects	Prior to and during construction	Principal Contractors
LoD Restriction - Construction noise is predicted to exceed 65 dB where towers may move the maximum distance from the Proposed Alignment within the LoD during piling and foundations. Prior to any change being made to the Proposed Development within the LoD however, a change control process would be undertaken to ensure that there is no unacceptable increase in adverse impacts as a result of the change.	Potential significant noise effects	Prior to construction	Applicant
Equipment Curtailment - Where possible, there should be a reduction of active time of the noisiest equipment during civils/access works (excavators and dumpers). If the equivalent sound pressure level can be reduced to an average of 62 dB(A) at 10 m over an entire working day, this reduces the overall impact of noise over the entire day to **minor** and therefore **not significant**. The noise should be calculated using a BS 5228-1 assessment.	Potential significant noise effects	During construction	Principal Contractors

Mitigation Measure	Rationale	Proposed Development Stage/Timing	Responsibility
Community Engagement - Communities should also be informed of noisy activities for the expected short term access works, residual construction effects will be reduced to **not significant.**	Potential significant noise effects	Before and during construction	Applicant
Duration of Works - The construction noise in general will be very short-term, maintaining this duration will ensure construction noise impacts are minimised.	Potential significant noise effects	During construction	Principal Contractors
CTMP - If the construction phases become longer term than their proposed schedule, it may be necessary to mitigate noise impacts for several sections (1,3,4,5,7,8,9) by using a CTMP. Traffic routes can be diverted or times of travel restricted in order to reduce noise impacts.	Potential significant noise effects	During construction	Principal Contractors

Operational Noise

15.8.10 No additional mitigation is proposed for operational noise, as the potential impacts are assessed as **not significant**

Summary of Mitigation

15.8.11 **Table 15.21** summarises the Noise and Vibration mitigation measures required for the Proposed Development.

Table 15.21: Summary of Noise and Vibration Mitigation Measures

Mitigation Item	Timing of Measure	Description	Mitigation Purpose / Objective	Specific Consultation or Approval Required	Potential Monitoring Requirements
NV-1	During construction	CNMP	To reduce noise impact of construction from the access roads and working areas	Principal Contractors will update CNMP when schedule and equipment is finalised, including being informed by a new CNIA if needed, to ensure construction noise is below noise limits. Consideration must be had to limit noisy activities to daytime hours rather than evenings to reduce potential impact. Temporary mitigation measures will be applied where necessary to reduce noise as stated in BS5228. Active operational time of equipment can be limited for works near identified NSRs, especially high impact equipment such as excavators and dumpers during civil/access works.	N/A

15.9 Residual Effects

Construction Noise and Vibration

15.9.1 There is the potential for significant impact during construction due to noise. The information used in this assessment may not precisely reflect the actual equipment used on site, therefore, the assessment may be required to be

reviewed and the CNMP updated as necessary by the Principal Contractors once site specifics are known. There must be focus on the civils and access works and how equipment is utilised during the working day. As a realistic worst-case assumption, access track noise has been calculated using the distance from the NSR to the nearest point on an access track. It is not likely that all the equipment proposed by the OHL Contractors will be used for the entire day at the respective nearest point to the NSR. In reality, the equivalent average sound pressure level over the working day will be much lower, while activities are also expected to be short term. It is expected that with the implementation of a CNMP any remaining impacts can be eliminated. Therefore, it is predicted that with the implementation of a CNMP using methods described in BS5228 to limit the potential impact of noise, on medium sensitivity receptors construction noise would result in **minor** effect at worst and therefore is **not significant**.

15.9.2 As mitigation to the high impact from dynamic compaction the potential energy of the raised tamper can be limited to 483 kJ. These measures would reduce the predicted impact from construction ground-borne vibrations to low impact, therefore making the significance **minor** and **not significant**.

Operational Noise

15.9.3 The assessment predicts all 89 NSRs with negligible effect from the operation of the Proposed Development. If the Proposed Alignment is moved to the worst case within the limit of deviation, this also results in negligible effect at all 89 NSRs. The outcome of the assessment predicts that residual noise would be **negligible** and **not significant**.

15.10 Summary

15.10.1 This chapter has considered the potential noise effects that could arise due to the Proposed Development during the construction and operational phases at the closest NSRs. The assessment has taken account of applicable planning policy and current guidance.

15.10.2 A desk-based construction noise assessment, in line with BS5228, has been prepared for the purpose of assessing the effects of the works on any nearby residents. For the purposes of this assessment NSRs are classed as Category A, which is the most conservative, and assessed as medium sensitivity. If construction takes place in the Evenings and Weekends working hours, noise is predicted to be above the 55 dB limit during felling at 47 NSRs, tower assembly and erection at 42 NSRs, foundation works at 47 NSRs, civil/access works at 58 NSRs and stringing at 23 NSRs and is therefore predicted to result in **major** (**significant)** impacts on medium sensitivity receptors without mitigation at those receptor locations.

15.10.3 The construction noise assessment is based on assumed information and should be updated with information from the Principal Contractor. Mitigation methods as provided in **Table 15.20** and **Table 15.21**, such as avoiding the most noisy activities during Weekend and Evening category hours if necessary and reducing on-time of equipment when not in use should be implemented through a robust CNMP. The CNMP will also detail the duration of felling, tower assembly, foundations, civil/access works, and stringing. The mitigation will help ensure residual construction noise of the Proposed Development will achieve a conclusion of **minor (not significant)** effect on nearby NSRs.

15.10.4 If the construction phases become longer term than their proposed schedule, it may be necessary to mitigate noise impacts for several sections by using a CTMP to outline travel time restriction or route diversions.

15.10.5 Operational noise has been assessed to TGN(E)322 and BS4142 standards. All NSRs are screened out at Tier 1 of the TGN(E)322 assessment, resulting in Negligible impacts which is Not Significant. Mitigation is not required as all NSRs pass the Tier 1 assessment.

Cumulative noise has been considered for operational noise from nearby proposed developments such as Banniskirk, Carnaig and Fanellan Substations, BBNP OHL, and nearby windfarms. Due to the low predicted operational noise of the Proposed Development and the distance to receptors, cumulative operational noise has been assessed as **negligible**. The cumulative effects of construction noise should be considered if construction

schedules of nearby developments overlap with the construction of the Proposed Development, and would be managed by the Principal Contractors through an updated CNMP to ensure no significant construction effects.