Wind Power North Two Limited

Balblair Wind Farm

Environmental Impact Assessment Report (Volume 2)

Chapter 13 - Noise

663896

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CONTENTS

TABLES

13 NOISE

13.1 Introduction

13.1.1 This chapter reports the outcomes of the assessment of potential noise effects arising from the proposed Development (see **Chapter 2: The Proposed Development**) during construction, operation and decommissioning. The specific objectives of the chapter are to:

- Describe the assessment methodology and criteria used in completing the assessment; and
- Describe the potential effects and cumulative effects.

13.1.2 This chapter is supported by the following figures and technical appendices, which are referenced throughout the text:

- **Figure 13.1: Site Layout, Study Areas and Monitoring Locations**
- **Figure 13.2: Proposed Development Noise Contours**
- **Figure 13.3: Proposed Development and Operating and Consented Developments Noise Contours**
- **Figure 13.4: Operating and Consented Developments Noise Contours**
- **Figure 13.5: Proposed Development and Operating, Consented and In-Planning Developments Noise Contours**
- **Figure 13.6: Operating, Consented and In-Planning Developments Noise Contours**

13.1.3 The Technical Appendices referred to in the chapter are as follows:

- **Technical Appendix 13.1: Legislation, Policy and Guidance**
- **Technical Appendix 13.2: Noise Modelling and Calculations**
- **Technical Appendix 13.3: Baseline Noise Measurements**

13.2 Relevant legislation, planning policy and guidance

13.2.1 No relevant legislation has been directly referred to in undertaking this assessment.

Policy

13.2.2 The applicable policy informing the assessments is summarised as follows, with further details provided in **Technical Appendix 13.1**:

National

- National Planning Framework 4
- Onshore Wind Policy Statement 2022
- Planning Advice Note PAN1/2011: Planning and Noise
- Scottish Government 2014: Web Based Planning Advice, Onshore Wind Turbines
- Planning Advice Note PAN 50

Local

- Highland-wide Local Development Plan 2012
- The Highland Council Onshore Wind Energy Supplementary Guidance

Guidance

13.2.3 The applicable guidance informing the assessments is summarised as follows, with further details provided in **Technical Appendix 13.1**:

- British Standard 5228:2009+A1:2014, Code of practice for noise and vibration control on construction and open sites, BSI
- ETSU-R-97: The Assessment and Rating of Noise from Wind Farms, ETSU for the DTI
- A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise, Institute of Acoustics

13.3 Consultation undertaken

13.3.1 **Table 13.1** provides a summary of the consultation activities undertaken in support of the preparation of this assessment.

Table 13.1: Summary of consultation responses relevant to this chapter

Consultee	Issue Raised	Response/Action Taken
Statutory Consultee		
The Highland Council (THC) Environmental Health	It was noted that both Craigton and Coirshellach properties were considered suitable for use as receptor locations for noise assessment. It was requested that the report clarify whether measures have been taken to exclude noise from on-site agricultural activities at Craigton, as this could affect the accuracy of the results. It was suggested that a more conservative approach might be to use lower figures from all baseline surveys, including the Garvary survey, for the assessment.	Data exclusions have been undertaken where recorded noise levels appear to be influenced by extraneous noise sources. Noise levels from the quietest location (Coirshellach) have been assumed in the assessment for all locations except Craigton. See **Paragraph 13.4.36**.
	It was requested that the Garvary data be included in the report for comparison purposes. Including data from multiple surveys was seen as important to ensure the robustness and representativeness of the baseline noise data used in the assessment.	Garvary baseline data has been included in the assessment. See **Where there are** differences between noise levels in 2024 and 2019, these are considered likely to be due to statistical variability or variation in local conditions such as the amount of foliage on the nearby vegetation, rather than being an indication of a long-term change in background noise levels at Craigton. Table 13.14.
	The target noise levels are either a simplified standard of 35 dB L_{A90} at wind speeds up to 10 ms^{-1} or a composite standard of 35 dB L_{A90} (daytime) and 38 dB L_{A90} (night-time) or up to 5 dB above background noise levels at up to 12 ms^{-1}. The night-time lower limit of 43 dB L_{A90} as suggested in ETSU is not considered acceptable in many areas of the highlands due to very low background levels. These limits would apply to cumulative noise levels from more than one development.	The proposed target noise limits have been adopted for the operational and cumulative noise assessment See **Paragraph 13.4.35**.
	It was emphasised that any NSRs where predicted noise levels exceed 25 dB should be considered in the cumulative noise assessment.	Receptors with predicted noise levels from the Proposed Development of 25 dB or higher are included in the assessment. See **Paragraph 13.4.7**.

Consultee	Issue Raised	Response/Action Taken
	It was also agreed that receptors more than 10 dB below the noise levels from other developments could be excluded from further cumulative assessment.	
	It was asked whether a property located northwest of the site at Garvary is derelict, and it was requested that this be clarified in the report to ensure accurate identification of noise-sensitive receptors.	Garvary Wind Farm EIAR states that the Garvary property will be vacant for the life of the development. It is therefore excluded from the potential future scenario in which Garvary is consented..
	Noise from small single turbines can be scoped out. Operational vibration, infrasound, low frequency noise and amplitude modulation can be scoped out from further assessment. Construction vibration can be scoped out of further assessment.	These matters have been scoped out of the assessment. See **Table 13.2**.
	The assessment should include a table of figures which includes the following: - • The predicted levels from this development based at each noise sensitive location (NSL) at wind speeds up to 12 ms^{-1}. • The maximum levels based on consented limits from each existing or consented wind farm development at each NSL. If any reduction is made for controlling property or another reason, this should be made clear. • The predicted levels from each existing or consented wind farm development at each NSL. • The cumulative levels based on consented and predicted levels at each NSL.	This chapter is supported by tables of figures at **13.7 Predicted Effects**, **13.8 Cumulative Effects**, **13.9 Potential Future Scenario** and in **Technical Appendix 13.2**.
	The assessment should also include a mitigation scheme to be implemented should noise levels from the development be subsequently found to exceed consented levels.	No mitigation is required for the proposed Development to meet noise limits.
	When assessing the cumulative impact from more than one wind farm, consideration must be given to any increase in exposure time. Regardless of whether cumulative levels can meet relevant criteria, if a	Qualitative discussion of this issue is included. See **Paragraph 13.8.7**.

Consultee	Issue Raised	Response/Action Taken
	noise sensitive property subsequently becomes affected by wind turbine noise from more than one direction this could result in a significant loss of respite.	
	It is unlikely that construction noise at the turbine sites will have a significant impact on receptors due to separation distances however, there will be work carried out on new and upgrading of access roads which may be in closer proximity to receptors. The assessment should include: - 1) A description of construction activities with reference to noise generating plant and equipment. 2) A detailed plan showing the location of noise sources, noise sensitive premises and any survey measurement locations. 3) A description of any noise mitigation methods that will be employed and the predicted effect of said methods on noise levels. 4) A prediction of noise levels resultant at the curtilage of noise sensitive receptors. 5) An assessment of the predicted noise levels in comparison with relevant standards. Regardless of whether a construction noise assessment is required, it is expected that the developer/contractor will employ the best practicable means to reduce the impact of noise from construction activities. The applicant will be required to submit a scheme demonstrating how this will be implemented. Particular attention should be given to the use of tonal reversing alarms and ground compaction plant which are often the most intrusive noise generating elements of a large construction project.	Construction noise assessment includes construction and upgrades of access roads, including calculations of noise levels from associated plant. See **Paragraph** 13-12**13.4.13.** Details of construction noise sources and calculation assumptions are included in **Technical Appendix 13.2**. Outline Construction Environmental Management Plan is provided in **Technical Appendix 2.1: Outline Construction Environmental Management Plan.**
	If the application includes a proposal for a substation or battery storage site, depending on separation distances to receptors, a separate noise assessment may be required.	Operational noise from substation and battery energy storage system (BESS) is considered qualitatively. No detailed assessment is considered to be required due to large distances between substation/BESS and receptors. See **Paragraph 13.7.29**.

13.4 Approach to Assessment

Scope of Assessment

13.4.1 The scope of this assessment has been established through an ongoing scoping process. Further information can be found in **Chapter 4: EIA Approach and Methodology.**

13.4.2 This section provides an update to the scope of the assessment and re-iterates/updates the evidence base for scoping out matters following further iterative assessment.

Receptors/matters scoped out of further assessment

13.4.3 **Table 13.2** presents the receptors/matters that are scoped out of further assessment, together with appropriate justification. Where a change has occurred since EIA scoping, this is clearly stated and justified.

Table 13.2: Receptor/matters scoped out of further assessment

Receptor/matter	Phase	Justification	Change since EIA Scoping?
Vibration at sensitive receptors	Construction	The nature of wind farm construction works and the distances involved are such that the risk of significant effects relating to ground-borne vibration are very low. The closest receptor to turbine locations where main construction activities will occur is approximately 1 km, while the closest receptor to the access track centreline is approximately 150 m. Potentially significant construction vibration effects are not anticipated beyond 100 m from conventional construction activities, and potentially significant vibration effects from blasting are not anticipated beyond 500 m from borrow pits. Therefore, due to the distances between anticipated construction activities and receptors, construction vibration	No. The Scoping Opinion agreed that this receptor/matter should be scoped out of further assessment.

Receptor/matter	Phase	Justification	Change since EIA Scoping?
		effects have been scoped out.	
Vibration at sensitive receptors	Decommissioning	The nature of wind farm decommissioning works and the distances involved are such that the risk of significant effects relating to ground-borne vibration are very low. The closest receptor to turbine locations where main decommissioning activities will occur is approximately 1 km. Therefore, due to the large distances between anticipated decommissioning activities and receptors, decommissioning vibration effects have been scoped out.	No. The Scoping Opinion agreed that this receptor/matter should be scoped out of further assessment.
Vibration at sensitive receptors	Operation	The levels of ground-borne vibration generated by operational wind turbines is very low. The closest receptor to the proposed turbine locations is approximately 1 km. Therefore, due to large distances between turbines and receptors, operational vibration effects have been scoped out.	No. The Scoping Opinion agreed that this receptor/matter should be scoped out of further assessment.
Other wind farm noise matters	Operation	Issues frequently raised by third parties in relation to wind farm development in general, such as infrasound, low frequency noise and amplitude modulation were proposed to be discussed in generalised terms within the noise chapter or technical appendix,	Yes. The Scoping Opinion confirmed that this receptor/matter can be scoped out from further assessment.

Receptor/matter	Phase	Justification	Change since EIA Scoping?
		but is no longer considered to be required following the scoping response from THC.	

Receptors/matters scoped into further assessment

13.4.4 **Table 13.3** presents the receptors/matters that are scoped into further assessment, together with appropriate justification. Where a change has occurred since EIA scoping, this is clearly stated and justified.

Table 13.3: Receptor/matters scoped into further assessment

Receptor/matter	Phase	Justification	Change since EIA Scoping?
Noise from the proposed Development at noise-sensitive receptors	Operation	Operational noise assessment is carried out for the receptors identified above, as required by ETSU-R-97 and the IOA GPG.	No. The Scoping Opinion agreed that this receptor/matter should be scoped in for further assessment.
Cumulative operational noise at noise-sensitive receptors	Operation	A cumulative operational noise assessment is carried out for noise sensitive properties where predicted operational noise levels from the proposed Development are 25 dB L_{A90} or greater. Below 25 dB L_{A90}, the contributions to cumulative noise levels by the proposed Development will be negligible where there is the potential for cumulative noise levels will to be above 35 dB L_{A90}. The cumulative assessment includes the operational Lairg wind farm and the approved Lairg II wind farm. Where other proposed Development applications for Garvary wind farm (in planning), Acheildh (formerly known as Lairg III) wind farm (in planning), or Braelangwell wind farm (scoping/screening) are consented prior to the submission of the application for the proposed Development, these wind farms will also be	Yes, details changed. The Scoping Opinion indicated that consented and operational cumulative wind farms should be considered, with ambiguity surrounding the inclusion of proposed wind farm developments. Proposed wind farm development noise levels are therefore included separately, for reference.

Receptor/matter	Phase	Justification	Change since EIA Scoping?
		included in the cumulative assessment. A further informative cumulative noise assessment is also undertaken for developments with active submitted applications, even if they are yet to be consented.	
Construction Noise	Construction	An overview of likely construction noise effects is presented with reference to the relevant criteria set out in BS 5228. Noise from construction vehicles travelling along access tracks is also included within the construction noise assessment.	No. The Scoping Opinion agreed that this receptor/matter should be scoped in for further assessment.
Construction Traffic Noise	Construction	Noise from construction vehicles travelling along public roads on the delivery/access route is considered based on the information in the Transport and Access assessment. The temporary traffic noise increase is calculated and evaluated against relevant noise change criteria.	No. The Scoping Opinion agreed that this receptor/matter should be scoped in for further assessment.
Construction noise	Decommissioning	The overall noise impacts during decommissioning are usually equal to or lower than during the construction phase and will be assessed and mitigated as required at the time of decommissioning.	No. The Scoping Opinion agreed that this receptor/matter should be scoped in for further assessment.

Construction Noise Study Area

13.4.5 The study area for the construction assessment comprises all noise-sensitive receptors within 500 m of main construction work areas, including the substation, turbine locations, borrow pits, and construction compounds, and within 300 m of access track construction areas. It is assumed that construction works in relation to construction or modification of access tracks could occur in areas within 50 m of the access track centreline. Therefore, in effect, receptors within 350 m of the access track centreline are included in the study area. The receptors located within this area are set out in **Table 13.4**, all of which are located close to the access track tie-in with the A836, as shown in **Figure 13.1**.

13.4.6 Some of the access track construction works may take place for the purposes of the Garvary wind farm development and the use of such tracks would be shared between developments. It is assumed, as a worst-case assumption, that all access track

construction works would be required to be completed as part of the proposed Development.

Table 13.4: Noise-Sensitive Receptors Included in the Construction Assessment

Receptor ID	Address	OS Coordinates (Easting, Northing)	Distance to Construction Areas (Approx.)
CR1	The Coach House, Aultnagar, Lairg, IV27 4EX	258390, 898986	180 m to access track centreline
CR2	The Gatehouse, Aultnagar, Lairg, IV27 4EX	258118, 899068	320 m to access track centreline
CR3	Aultnagar Lodge Hotel, Lairg, IV27 4EX	258380, 898924	220 m to access track centreline
CR4	Uphill, Achinduich, Lairg, IV27 4EX	258126, 899868	130 m to access track centreline
CR5	Shepherds Cottage, Achinduich, Lairg, IV27 4EX	258084, 899930	180 m to access track centreline
CR6	Achinduich Lodge, Lairg, IV27 4EX	258039, 899889	140 m to access track centreline

Operational Noise – Study Area

13.4.7 The operational noise study area comprises all noise-sensitive receptors where the predicted noise levels from the proposed Development alone are 25 dB or greater. Noise-sensitive receptors in this case comprise residential dwellings. The receptors located within this area are set out in **Table 13.5** and as shown in **Figure 13.1**.

Table 13.5: Noise-Sensitive Receptors Included in the Operational Assessment

Receptor ID	Address	OS Coordinates (Easting, Northing)	Distance to Closest Turbine (Approx.)
R1	Craigton, Bonar Bridge, IV24 3AS	262715, 896167	1.0 km
R2	Coirshellach, Bonar Bridge, IV24 3AS	261492, 895258	1.5 km
R3	Ausdale, Bonar Bridge, IV24 3AS	262635, 895687	1.3 km
R4	Reidbreac, Bonar Bridge, IV24 3AT	263569, 896428	1.4 km
R5	Clasbhan, Bonar Bridge, IV24 3AT	264003, 896396	1.8 km

Receptor ID	Address	OS Coordinates (Easting, Northing)	Distance to Closest Turbine (Approx.)
R6	Sleasdariadh, Bonar Bridge, IV24 3AT	264331, 896367	2.1 km
R7	1 Airdens, Bonar Bridge, IV24 3AS	261405, 894305	2.4 km
R8	Achue Cottage, Bonar Bridge, IV24 3AS	262977, 894325	2.7 km
R9	Loanboadich, Rhinamain Road, Bonar Bridge, IV24 3AS	261047, 893982	2.7 km
R10	13 Airdens, Bonar Bridge, IV24 3AS	262670, 893661	3.3 km
R11	Garvary, Bonar Bridge, IV24 3AT	263285, 899365	2.4 km

13.4.8 At noise-sensitive receptor locations outside of the study area, operational noise effects from the proposed Development will be negligible.

13.4.9 Two potential receptors were identified within the study area but subsequently identified as not noise-sensitive and were excluded from the assessment, as set out in **Table 13.6**.

Table 13.6: Non-Sensitive Properties Excluded from the Assessment

Address	Reason for Exclusion from Assessment	OS Coordinates (Easting, Northing)
Badbog, Bonar Bridge, IV24 3AT	Disrepair, significant works required to bring the property into habitable condition	263694, 896154
Achuan, Bonar Bridge, IV24 3AS	Disrepair, significant works required to bring the property into habitable condition	262362, 895089

Baseline Methodology

Desk Study

13.4.10 A desktop review was conducted to inform the assessment of the proposed Development. The review comprised the following components:

- Relevant legislation, policy and guidance documents were reviewed for updates.
- THC wind farm application web-portal was reviewed to identify existing, consented, and in-planning wind farm applications in the vicinity of the proposed Development, to inform the developments to be included in the cumulative operational noise assessment.
- Scoping responses from all relevant stakeholders were reviewed, and relevant comments considered, as described above.

- Available planning application documents (EIAR) for the Garvary wind farm development (most recent wind farm application in the vicinity) were reviewed to identify and consider relevant information, including baseline noise data captured.
- OpenStreetMap, OS, and AddressBase Plus data was reviewed to identify potential noise-sensitive receptors.
- Candidate wind turbine manufacturer sound power level specifications were used to calculate noise predictions.
- The proposed Development design, as detailed in **Chapter 2** was used to inform the locations of noise sources and to define the study areas.

Field Surveys

13.4.11 A background noise survey was conducted over the period 12th February to 4th March 2024, at two properties in the vicinity of the proposed Development, Craigton and Coirshellach, as shown in **Figure 13.1**. Further details of these measurements can be seen in **Technical Appendix 13.3**.

Other Field Surveys

13.4.12 A background noise survey was conducted for the purposes of the Garvary EIAR over the period July to September 2019, at a number of locations, one of which, Craigton, was representative of the receptors identified in relation to the proposed Development.

Assessment Methodology

Construction Noise Assessment Method

13.4.13 Annex E of BS 5228-1 details several methods for the assessment of significance of construction noise effects in relation to ambient noise levels, including the 'ABC method' set out in Table E.1, which sets a series of noise thresholds depending on the existing ambient sound levels and the applicable time period. The relevant details of table E.1 are reproduced below as **Table 13.7**.

Table 13.7: BS 5228-1 Threshold of Potential Significant Effect at Dwellings

Assessment category and threshold value period	Threshold value, in decibels (dB) ($L_{Aeq,T}$)		
	Category A [A)]	Category B [B)]	Category C [C)]
Night-time (23:00-07:00)	45	50	55
Evenings and weekends [D)]	55	60	65
Daytime (07:00-19:00) and Saturdays (07:00-13:00)	65	70	75
Night-time (23:00-07:00)	45	50	55

[A)] Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values.

[B)] Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values.

Assessment category and threshold value period	Threshold value, in decibels (dB) ($L_{Aeq,T}$)		
	Category A [A)]	Category B [B)]	Category C [C)]
[C)] Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values. [D)] 19:00-23:00 weekdays, 13:00-23:00 Saturdays, and 07:00-23:00 Sundays			

13.4.14 It is assumed, as a worst-case assumption, that all receptors experience the lowest ambient sound levels, and therefore the Category A thresholds set out in **Table 13.7** are set as the threshold above which potential significant effects could occur.

13.4.15 Where relevant, noise levels are predicted based on indicative plant items, with sound power levels taken from BS 5228 Annex C. Details of the access track construction noise prediction methods and assumptions are set out in **Technical Appendix 13.2**.

13.4.16 Where the predicted construction noise levels do not exceed the Category A values, noise effects will be considered to be **'Not Significant'**.

13.4.17 Where the predicted construction noise levels exceed the Category A values, this is an indication of the potential for a significant effect to occur. Other contextual factors should then be considered, to determine whether the effect is **'Significant'**. Relevant factors include the number of receptors affected, the margin of exceedance, and the duration and character of the noise impact.

Blasting Noise

13.4.18 Blasting activities may be required in the process of creating borrow pits for the construction activities. Blasting for borrow pits is subject to the PAN 50 guidance which require an environmental assessment where the surface of mineral extraction proposals exceed 25 hectares.

13.4.19 The total surface area of all borrow pits for the proposed Development is well below this value. Blasting is therefore included as part of the overall construction noise assessment for the main turbine construction works.

Construction Traffic Noise – Vehicles on Access Tracks

13.4.20 Where construction traffic movements will occur along access tracks away from the public road network, a buffer of 300 m will be applied and indicative calculations will be conducted for receptors within this distance from access tracks using the method set out in BS 5228 Annex F *Estimating noise from sites, sub-clause F.2.5 Method for mobile plant using regular well-defined route (e.g. haul roads)* using the formula:

$$L_{Aeq,T} = L_{wA} - 33 + 10\log_{10}Q - 10\log_{10}V - 10\log_{10}d$$

where:

L_{wA} is the sound power level of the plant, in decibels (dB);

Q is the number of vehicles per hour;

V is the average vehicle speed, in kilometres per hour (km/h);

d is the distance of receiving position from the centre of haul road, in metres (m).

13.4.21 Such noise can be assessed against the criteria in **Table 13.7.**

Construction Traffic Noise – Vehicles on Public Roads

13.4.22 Construction traffic movements along local roads during the construction of the development will cause a short-term increase in road traffic noise levels, particularly for dwellings located adjacent to the proposed routes to and from the proposed Development.

13.4.23 The potential increase in traffic noise at roadside locations is calculated using the prediction methods in Calculation of Road Traffic Noise (CRTN, 1988), based on construction traffic and future baseline traffic data. The predicted change in road traffic noise levels along the access route relative to the future baseline levels are assessed against the criteria set out in **Table 13.8**.

Table 13.8: Significance Criteria for a Change in Road Traffic Noise

Noise Change, dB	Magnitude of Impact
0	No change
0.1 – 0.9	Negligible
1.0 – 2.9	Minor
3.0 – 4.9	Moderate
5.0+	Major

13.4.24 Where the increase in noise due to construction vehicles on the public road network is less than 3 dB, the impact is considered to be **'Not-Significant'**. Where a noise change is 3 dB or more, the impact is considered to be **'Significant'** at receptors within 50 m of the affected road links.

Operational Noise – Wind Turbine Noise Predictions

13.4.25 Noise predictions are carried out using ISO 9613 (ISO, 1993) (ISO, 2024) as referred to within the IOA GPG. The details of the prediction methodology are set out in **Technical Appendix 13.2**. The turbine locations used for the proposed Development noise predictions are shown in **Table 13.9**.

Table 13.9: Proposed Development Turbine Coordinates

Turbine ID	Easting	Northing	Hub Height
T01	261444	897263	112
T02	262051	897323	132
T03	262356	897142	132
T04	261155	897038	112
T05	261455	896833	112

Turbine ID	Easting	Northing	Hub Height
T06	262067	896903	112
T07	261084	896668	112
T08	261752	897080	112

13.4.26 For the purposes of the assessment, a candidate turbine model is assumed, namely a Vestas V136 STE 4.5 Megawatt (MW) turbine. Two hub heights of 112 m and 132 m are assumed respectively, as described in **Table 13.9**, based on a 136 m rotor diameter for this candidate turbine model in order to reach the proposed maximum tip heights of 180 m or 200 m for the relevant turbines.

13.4.27 For each of the two hub heights assumed, the octave band sound power levels used in the predictions are shown in **Table 13.10** and **Table 13.11** respectively, with reference to standardised 10 m height integer wind speeds from 3 to 12 ms^{-1}. Sound power levels are based on manufacturer supplied data for the turbine operating in power-optimised mode PO4, adjusted to 10 m from hub height-specified sound power levels using a reference ground roughness length of 0.05 m, plus an uncertainty factor of +2 dB.

Table 13.10: Vestas V136 STE 4.5 MW Sound Power Levels (dB L_{WA}) at 112 m Hub Height

Standardised 10 m height wind speed, ms^{-1}	Octave band centre frequency (Hz)								Total
	63	125	250	500	1000	2000	4000	8000	
3	72.7	80.8	86.1	88.6	88.3	85.1	79.1	70.3	93.7
4	76.9	85.2	90.4	92.6	91.8	87.9	81.1	71.2	97.5
5	81.9	90.1	95.4	97.6	96.9	93.1	86.4	76.7	102.5
6	85.0	93.3	98.5	100.8	100.0	96.1	89.3	79.4	105.6
7	85.2	93.4	98.7	101.0	100.3	96.6	90.0	80.4	105.9
8	84.8	92.9	98.2	100.8	100.5	97.3	91.3	82.4	105.9
9	84.6	92.8	98.1	100.7	100.5	97.5	91.7	83.1	105.9
10	84.6	92.8	98.1	100.7	100.5	97.5	91.7	83.1	105.9
11	84.6	92.8	98.1	100.7	100.5	97.5	91.7	83.1	105.9
12	84.6	92.8	98.1	100.7	100.5	97.5	91.7	83.1	105.9

Table 13.11: Vestas V136 STE 4.5 MW Sound Power Levels (dB L_{WA}) at 132 m Hub Height

Standardised 10 m height wind speed, ms^{-1}	Octave band centre frequency (Hz)								Total
	63	125	250	500	1000	2000	4000	8000	
3	72.9	81.1	86.4	88.8	88.4	85.1	79.0	70.0	93.9
4	77.3	85.5	90.8	93.0	92.2	88.3	81.5	71.6	97.9
5	82.4	90.6	95.9	98.1	97.4	93.7	87.0	77.2	103.0
6	85.2	93.5	98.7	101.0	100.2	96.3	89.4	79.4	105.8
7	85.1	93.4	98.6	101.0	100.3	96.7	90.2	80.6	105.9
8	84.7	92.8	98.2	100.7	100.5	97.4	91.6	82.9	105.9
9	84.6	92.8	98.1	100.7	100.5	97.5	91.7	83.1	105.9
10	84.6	92.8	98.1	100.7	100.5	97.5	91.7	83.1	105.9
11	84.6	92.8	98.1	100.7	100.5	97.5	91.7	83.1	105.9
12	84.6	92.8	98.1	100.7	100.5	97.5	91.7	83.1	105.9

13.4.28 The ETSU-R-97 noise limits assume that the wind turbine noise contains no audible tones. Where tones are present, a correction should be added to the measured or predicted noise level before comparison with the recommended limits. In general, modern turbines are designed to minimise tonality, such that their noise immissions would not normally warrant a penalty under ETSU-R-97. A penalty has therefore not been added to the predicted noise levels as it is assumed that there will not be tonal noise at receptor locations that requires a penalty.

13.4.29 Where topographical features are present between source and receiver, there is the potential for barrier effects, whereby the line-of-sight between source and receiver is obscured resulting in reduced sound propagation, and for 'concave ground profile' effects (for example across a valley) resulting in higher levels of sound propagation. An analysis of the ground profiles between the proposed turbines and the neighbouring dwellings has been carried out. The resulting corrections incorporated into the prediction calculations are set out in **Technical Appendix 13.2**, alongside further explanation of these effects.

Operational Noise – Derivation of Noise Limits

13.4.30 Background noise measurements are used to inform the ETSU-R-97 noise limits. It is often possible to re-use previous baseline noise monitoring, providing the noise data is suitably robust and the acoustic environment is unlikely to have changed since the noise monitoring campaign. In this instance, there exists some suitable historic data obtained for the Garvary wind farm noise assessment in 2019 representative of some relevant noise-sensitive receptors. This data is supplemented by noise measurements undertaken for this EIAR in 2024. Both sets of data are used to derive applicable noise limits for the assessment.

13.4.31 The assessment has been conducted on the basis that where noise levels meet or are below the noise limits, the noise impacts are considered to be **'Not Significant'**.

13.4.32 With regard to the daytime noise limits, the IOA GPG states:

"The day amenity noise limits have been set in ETSU-R-97 on the basis of protecting the amenity of residents whilst outside their dwellings in garden areas. The daytime amenity noise limits are formed in two parts: Part 1 is a simple relationship between the prevailing background noise level (with wind speed) with an allowance of +5 dB; Part 2 is a fixed limit during periods of quiet. ETSU-R-97 describes three criteria to consider when determining the fixed part of the limit in the range of 35 dB to 40 dB L_{A90}, all of which should be considered. They are:

1) *The number of noise-affected properties;*
2) *The potential impact on the power output of the wind farm; and*
3) *The likely duration and level of exposure"*

13.4.33 In this instance there are relatively few properties affected. The scoping response from THC indicated that due to the remoteness and low background noise levels in this area, a lower limiting value of 35 dB would be appropriate during the daytime.

13.4.34 With regard to the night-time noise limits, the THC scoping response indicated that a night-time lower limiting value of 38 dB is suitable for assessment of noise effects in this area, rather than the 43 dB lower limiting value specified in ETSU-R-97.

13.4.35 On a precautionary basis, a daytime noise limit of 5 dB above background noise levels or 35 dB L_{A90} (whichever is higher) is adopted, while a night-time noise limit of 5 dB above background noise levels or 38 dB (whichever is higher) is adopted. It is noted that the daytime noise limits are therefore the minimum recommended by ETSU-R-97 and that higher noise limits could be adopted if justified by contextual considerations. The night-time noise limits are 5 dB below the limits recommended by ETSU-R-97, and therefore constitute a substantially worst-case approach.

13.4.36 Background noise data are available for Craigton (2019 and 2024) and Coirshellach (2024). Noise levels at Coirshellach are generally the lowest of these measurements and are also the most strongly correlated with wind speeds. At Craigton, there is a notably larger variation in noise levels for a given set of wind conditions, compared to at Coirshellach. This is likely due in part to the fact that there are several trees in the vicinity of the Craigton measurement location which may not be representative of all other receptor locations and is likely to result in higher noise levels than could otherwise occur. While several other receptors have trees nearby, the background sound levels from Coirshellach are assumed to be representative of all locations except Craigton, as a worst-case assumption. At Craigton, the data from the 2019 and 2024 surveys are compared and the lowest applicable noise levels are adopted for the assessment resulting in a conservative assessment.

13.4.37 Receptors R1 and R2 are financially involved with the proposed Development. As such, the lower-limiting value of 45 dB is adopted for the purpose of setting noise limits at those properties for both daytime and night-time.

Operational Noise – Cumulative Noise

13.4.38 There are two wind farms (one operational and one consented but not yet built) within 10 km of the proposed Development which have been considered in the cumulative operational noise assessment. Details of the cumulative developments are provided in **Table 13.12**.

Table 13.12: Cumulative Wind Farm Developments

Wind Farm Name	Status	Number of Turbines	Distance to Closest Relevant Receptor
Lairg	Existing	3	7.8 km
Lairg II	Approved	10	6.2 km

13.4.39 Further details of the assumed turbine models for each wind farm alongside sound power levels, turbine locations and dimensions, and other relevant noise calculation assumptions, are provided in **Technical Appendix 13.2**.

13.4.40 Where cumulative noise levels are predicted, the standard uncertainty uplift of +2 dB is adopted where the development is installed and the turbine type is known, or an increased +4 dB uncertainty uplift where the development is not yet installed and the turbine type may differ from the model(s) assumed for these calculations.

Operational Noise – Potential Future Scenario

13.4.41 In addition to the two identified cumulative wind farms, two potential future wind farm developments currently in planning are also identified. Details of these potential future developments are provided in **Table 13.13**.

13.4.42 These wind farms are considered for contextual reference purposes, with regards to future sustainable development and the setting of appropriate cumulative noise limits.

Table 13.13: Potential Future Wind Farm Developments

Wind Farm Name	Status	Number of Turbines	Distance to Closest Relevant Receptor
Acheilidh (formerly Lairg III)	In Planning	12	3.2 km
Garvary	In Planning	25	3.3 km

13.4.43 Further details of the assumed turbine models for each potential future wind farm alongside sound power levels, turbine locations and dimensions, and other relevant noise calculation assumptions, are provided in **Technical Appendix 13.2**.

13.4.44 An increased +4 dB uncertainty uplift is applied, due to these development not being installed so the turbine type therefore may differ from the model(s) assumed for these calculations.

13.4.45 It is noted that if the Garvary wind farm development were consented, the R11 Garvary receptor would remain vacant throughout the life of the development. This receptor is therefore excluded for the future scenario where Garvary is assumed to be consented.

Determination of Significance

13.4.46 Significance is determined in accordance with ETSU-R-97. Noise levels are considered to be acceptable where they do not exceed the specified noise limits. Such noise levels are therefore considered to be **'Not Significant'**, whilst noise levels exceeding the noise limit are considered to be **'Significant'**.

Cumulative Effects

13.4.47 Cumulative noise is assessed against cumulative noise limits in accordance with ETSU-R-97. Noise levels exceeding the specified noise limit are considered to be potentially **'Significant'** whilst noise levels below the noise limit are considered to be **'Not Significant'**.

Difficulties and Uncertainties

Representativeness of Baseline Noise Data

13.4.48 The baseline noise data used to assess the potential impacts of the proposed Development was gathered from a limited number of measurement locations, which cannot fully represent the diversity of noise environments across all receptor locations. Variations in local conditions, such as topography, weather, vegetation, and proximity to noise sources, can influence the extent to which these measurements are representative. As a result, while efforts have been made to exclude periods of unrepresentative data and to apply reasonable worst-case assumptions, the baseline data cannot perfectly reflect all potential noise conditions at all locations, leading to a degree of uncertainty when setting noise limits. Nevertheless, the application of noise limits from the available data has been applied in a conservative manner to minimise the likelihood of overestimating existing background sound levels.

Uncertainties in Turbine Manufacturer Sound Power Level Specifications

13.4.49 The sound power level data provided by the turbine manufacturer, which serves as a critical input for noise calculations, contains some degree of uncertainty. Manufacturer specifications are typically based on idealised or controlled conditions, and actual operational noise levels could vary. This introduces uncertainty in the predicted noise levels, particularly in the case of operational turbines. While an uplift of +2 dB has been applied as a reasonable worst-case assumption, in part to account for sound power level uncertainties, there remains the potential for discrepancies between predicted and actual noise emissions. However, if the proposed Development is consented, noise limits will be applied at noise sensitive receptor locations which must be met for the duration of the operation of the wind farm.

Calculation Uncertainties

13.4.50 The noise calculations used in the assessment are based on standard modelling techniques and established methodologies, such as ISO 9613, which provides general guidance on noise propagation. However, these methods rely on a range of assumptions, including uniform ground conditions and standard atmospheric conditions. Furthermore, the calculation methods do not account for other real-world complexities, such as dynamic changes in wind direction or turbine performance over time, which could

introduce additional uncertainties into the noise predictions. Downwind propagation is assumed for all calculations, as a worst-case assumption. While an uplift of +2 dB has been applied as a reasonable worst-case assumption, in part to account for noise propagation uncertainties, there remains the potential for discrepancies between predicted and actual noise emissions. However, if the proposed Development is consented, noise limits will be applied at noise sensitive receptor locations which must be met for the duration of the operation of the wind farm.

Cumulative Uncertainties Related to Other Developments

13.4.51 The cumulative noise effects from nearby wind farm developments are another source of uncertainty. While the assessment considers operational, approved, and submitted developments, the specific noise levels resulting from these developments can be difficult to predict. The noise impacts from future developments are particularly difficult to predict accurately, as their precise development details are not yet fully determined. Predictions therefore rely on submitted application details as indicative estimates, including for the likely noise emissions of the developments.

Conclusions

13.4.52 Considering the difficulties and uncertainties described, and the assumptions adopted, the assessment is considered to represent a suitably robust evaluation of the likely noise effects due to the proposed Development.

13.5 Existing environment

Background Noise Levels

13.5.1 Three sets of background noise levels have been considered in the assessment, a 2019 Garvary survey at Craigton and a 2024 survey at both Coirshellach and Craigton. The resulting derived background sound levels for these surveys are shown in **Where there are** differences between noise levels in 2024 and 2019, these are considered likely to be due to statistical variability or variation in local conditions such as the amount of foliage on the nearby vegetation, rather than being an indication of a long-term change in background noise levels at Craigton.

13.5.2 Table 13.14 and **Table 13.15** for the daytime and night-time respectively. Details of the derivation of these background noise levels are provided in **Technical Appendix 13.3**.

13.5.3 Where there are differences between noise levels in 2024 and 2019, these are considered likely to be due to statistical variability or variation in local conditions such as the amount of foliage on the nearby vegetation, rather than being an indication of a long-term change in background noise levels at Craigton.

Table 13.14: Daytime Background Noise Levels

Location and Year	Standardised 10 m height wind speed (ms^{-1})									
	3	4	5	6	7	8	9	10	11	12
Craigton 2019	23.0	24.1	25.7	27.6	29.9	32.5	35.3	38.3	41.4	44.5

Location and Year	Standardised 10 m height wind speed (ms^{-1})									
	3	4	5	6	7	8	9	10	11	12
Craigton 2024	24.4	25.6	26.4	27.2	28.2	29.6	31.8	35.0	39.4	45.3
Coirshellach 2024	18.3	19.4	21.0	23.0	25.4	28.2	31.3	34.7	38.4	42.3

Table 13.15: Night-time Background Noise Levels

Location and Year	Standardised 10 m height wind speed (ms^{-1})									
	3	4	5	6	7	8	9	10	11	12
Craigton 2019	25.5	27.6	29.9	32.3	34.7	37.2	39.6	41.9	44.1	46.1
Craigton 2024	22.5	23.8	25.7	28.2	30.9	33.9	37.0	40.0	42.8	45.3
Coirshellach 2024	17.1	18.3	20.4	23.2	26.5	30.2	34.2	38.3	42.3	46.1

13.5.4 Noise levels at Coirshellach are more strongly correlated with wind speeds than at Craigton, with the least variability observed for given wind conditions. This location therefore best represents the wind noise experienced throughout the wider area, although the generally higher noise levels at Craigton are considered representative of the Craigton property and may be more representative of locations where there is a notable level of tree coverage in the vicinity.

Future baseline

13.5.5 No notable changes in baseline noise conditions are anticipated in relation to operational noise or the main construction activities.

13.5.6 Increases in road traffic flows are anticipated to occur in future, which is likely to result in greater levels of road traffic noise. This is taken into account in the construction traffic noise assessment through use of the future baseline traffic data, while road traffic noise was observed during baseline surveys not to be the dominant sound source at receptor locations, and therefore such changes are likely to be negligible at receptor locations.

13.6 Embedded mitigation

Design Considerations

13.6.1 Predicted operational noise levels were reviewed as the project layout evolved such that operational noise was considered as one of several design constraints taken into account during the design phase of the proposed Development.

13.6.2 Furthermore, the candidate turbine model selected for the proposed Development (Vestas V136 STE 4.5 MW) has a serrated trailing edge (STE) design which has an inherent reduction effect on noise emissions compared to equivalent non-STE turbines. This is incorporated into the sound power specification provided by the manufacturer.

Best Practice Measures

13.6.3 Noise during the construction (and decommissioning) phase, including noise from construction traffic, will be minimised through the adoption of Best Practicable Means (BPM). Methods for mitigating and minimising noise will be set out in the detailed Construction Environmental Management Plan (CEMP) that will be prepared before construction commences. An outline CEMP has been produced as part of this EIA Report and presented i**n Technical Appendix 2.1.**

13.7 Predicted Effects

Construction Noise Effects

Construction of Turbines and Substation

13.7.1 The construction of the proposed Development will occur at distances that are unlikely to breach typical construction noise limits prescribed within BS 5228 at the nearest noise sensitive receptors. This, combined with the short-term nature of the works, means that a detailed assessment of the construction noise impacts is not considered necessary.

13.7.2 All residential locations are at least around 1 km from the nearest turbine hardstanding area, construction compound, substation and the nearest borrow pit.

13.7.3 Nonetheless, construction noise has the potential to be audible, and is subject to BPM, which will be detailed and secured within the CEMP. Some examples of BPM include switching off vehicles when not in use, placing materials on the ground instead of dropping them, and maximising separation distances between noise sources and noise-sensitive receptors.

13.7.4 Construction noise levels will meet relevant construction noise criteria and construction noise effects will be **'Not Significant'**, subject to the appropriate adoption of BPM mitigation measures.

Construction and Upgrades of Access Tracks

13.7.5 The average position of construction plant during the upgrade of the access tracks is assumed to be close to the centreline of the access track. This results in predictions at a closest distance of 130 m from the closest receptor, CR4 Uphill. The works are likely to move along the access track relatively quickly, resulting in only short periods of time where the maximum noise levels may be observed. Noise levels are calculated for the closest approach to the receptor, but will be lower for much of the construction works.

13.7.6 Alongside provisions for the main construction works, access track upgrade works are also subject to BPM, which will be detailed and secured within the CEMP.

13.7.7 Indicative calculations have been undertaken using the methods described in BS 5228. Details of these predictions are included in **Technical Appendix 13.2**. The resulting predicted noise levels are given in **Table 13.16** for the identified receptors.

Table 13.16: Construction Noise Calculations

Receptor	Distance from Access Track Centreline	Predicted Construction Noise Levels, dB(A)
CR1 The Coach House	180 m	67
CR2 The Gatehouse	320 m	61
CR3 Aultnagar Lodge Hotel	220 m	65
CR4 Uphill	130 m	70
CR5 Shepherds Cottage	180 m	67
CR6 Achinduich Lodge	140 m	70

13.7.8 It is also noted that the calculated noise levels are at the worst-affected building façade facing construction areas, with a +3 dB increase adopted in each case to account for the façade reflection. Other parts of the property not facing the construction areas, or garden areas away from the building façade, will experience lower sound levels.

13.7.9 The predicted maximum noise levels at CR1, CR4, CR5 and CR6 are greater than the daytime noise criteria in **Table 13.7**, by up to 5 dB, indicating the potential for a significant effect. However, consideration must be given to the number of receptors affected, the extent of the exceedance, and the duration and character of works, in order to determine if there is a significant effect.

13.7.10 A maximum of four receptors are potentially affected by noise levels up to 5 dB in excess of the construction noise criteria.

13.7.11 In addition, noise levels are calculated to be at or below the daytime noise threshold at a distance of approximately 210 m or greater, which results in a length of access track of up to 180 m where the maximum noise levels might exceed 65 dB at one or more receptors. Works in relation to a 180 m length of access track works would be anticipated to be completed in a short timeframe, such that there would not be a significant effect.

13.7.12 Construction noise effects are therefore predicted to be **'Not Significant'**, subject to the appropriate adoption of BPM mitigation measures.

Blasting

13.7.13 There may be a need for blasting in the process of expanding borrow pits for the construction activities. Regarding blasting and its potential effect on neighbours to site, BS 5228 states that:

"Vibration and air overpressure from blasting operations is a special case and can under some circumstances give rise to concern or even alarm to persons unaccustomed to it. The adoption of good blasting practices will reduce the inherent and associated impulsive noise: prior warning to members of the public, individually, if necessary, is important".

13.7.14 Noise from blasting will not exceed the construction noise thresholds in **Table 13.7** for a substantial period of time. As such blasting noise is considered to be **'Not Significant'**, subject to the adoption of appropriate BPM mitigation measures.

Construction Traffic Noise – Construction Vehicles on Access Tracks

13.7.15 The predicted changes in road traffic on public roads during the construction phase are assessed in **Chapter 12: Traffic and Transport**.

13.7.16 Construction vehicles will use the access tracks away from the public road network. Calculations are conducted for the nearest receptor (CR4 Uphill) 130 m from the track centreline, based on the BS 5228 haul road calculations. The highest sound power levels for a road lorry (115 dB L_{WA} – BS 5228 Annex C Ref C.11-18) is assumed to apply for all construction vehicles using the access track, as a worst-case assumption. An average of 25.5 vehicles per hour are assumed, based on a maximum anticipated construction vehicles of 102 vehicles per day, spread over an 8-hour day. An average speed of 20 km/h is assumed.

13.7.17 Predicted noise levels from construction vehicles using the access track away from the public road network are up to 65 dB at the closest approach, which meets the daytime threshold in **Table 13.7** and are therefore **'Not Significant'**.

13.7.18 Any deliveries which are necessary to undertake during night-time and/or other sensitive hours, and therefore have a greater potential to disturb the residents of neighbouring dwellings, will be agreed with THC and residents will be kept informed of these activities prior to any night-time deliveries taking place. These arrangements will be secured within the Construction Environmental Management Plan (CEMP). See outline CEMP in **Technical Appendix 2.1.**

13.7.19 Some night-time transportation of abnormal loads may be required in order to minimise the impact of slow-moving vehicles on road traffic flows. Such activities will be infrequent, with noise effects anticipated to be **'Not Significant'**.

Construction Traffic Noise – Construction Vehicles on Public Roads

13.7.20 Indicative calculations have been undertaken in relation to construction traffic changes, on the basis of the 24-hour Annual Average Daily Traffic (AADT), which are assumed to be sufficiently similar to the Annual Average Weekday Traffic (AAWT) for use in the assessment.

13.7.21 Two-way traffic data are provided for 11 road links. The traffic data and predicted changes in road traffic noise levels are set out in **Table 13.17**, based on daily construction vehicles of up to 40 light vehicles and up to 144 Heavy Goods Vehicles (HGV). The data for the peak construction month has been used as a worst-case assumption.

Table 13.17: Construction Traffic Noise Calculations

Road Link	Existing Baseline Traffic Flow		Baseline + Construction Traffic Flow		Predicted Relative Change in Traffic Noise Level	Impact Significance
	Total Traffic Flow	Total HGV	Total Traffic Flow	Total HGV		
A836 between A839 and A839	1898	156 (8%)	1908	156 (8%)	0.0 dB(A)	Negligible

Road Link	Existing Baseline Traffic Flow		Baseline + Construction Traffic Flow		Predicted Relative Change in Traffic Noise Level	Impact Significance
	Total Traffic Flow	Total HGV	Total Traffic Flow	Total HGV		
A836 between A949 and A837	1745	113 (6%)	1929	257 (13%)	2.1 dB(A)	Minor
A836 between B9176 and A949	1820	140 (8%)	1912	212 (11%)	1.1 dB(A)	Minor
A836 between A9 and B9176	671	156 (23%)	763	228 (30%)	1.8 dB(A)	Minor
A839 between A9 and A836	850	37 (4%)	860	37 (4%)	0.1 dB(A)	Negligible
A9 between A949 and A839	4300	343 (8%)	4300	343 (8%)	0.0 dB(A)	Negligible
A9 between A836 and A949	7056	367 (5%)	7148	439 (6%)	0.3 dB(A)	Negligible
A9 between B9174 and A836	8250	660 (8%)	8434	804 (10%)	0.5 dB(A)	Negligible
A949 between A836 and A9	992	54 (5%)	1084	126 (12%)	2.1 dB(A)	Minor
A9 between A949 and A949	7029	389 (6%)	7029	389 (6%)	0.0 dB(A)	Negligible
A836 between A837 and A839	1046	85 (8%)	1056	85 (8%)	0.1 dB(A)	Negligible

13.7.22 The highest predicted temporary increase in traffic noise is 2.1 dB, which is considered to be a minor increase (see **Table 13.8**) and is therefore **'Not Significant'**.

Operational Noise Effects – Turbine Noise

Noise Limits

13.7.23 Operational noise is assessed against derived daytime and night-time noise limits, which vary with wind speed between 3 and 12 ms^{-1}. The noise limits for the daytime are derived on the basis of, daytime noise limits of 5 dB above background noise levels or 35 dB L_{A90} (whichever is higher) and night-time noise limits of 5 dB above background noise levels or 38 dB (whichever is higher).

13.7.24 An exception is made for receptors R1 and R2 which are financially involved in the proposed Development and therefore have noise limits derived on the basis of 5 dB above background noise levels or 45 dB L_{A90} (whichever is higher) for both daytime and night-time. Noise limits at Craigton are based on background noise levels at Craigton.

Noise limits at all other locations are based on background noise levels at Coirshellach, which are generally lower than those at Craigton, as a worst-case assumption. Adopted noise limits are shown in **Table 13.18**.

Table 13.18: Derived Noise Limits, dB L_{A90}

Location and Time Period	Standardised 10 m height wind speed (ms^{-1})									
	3	4	5	6	7	8	9	10	11	12
Craigton (R1) Daytime	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	50.3
Craigton (R1) Night-time	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	46.4	49.5
Coirshellach (R2) Daytime	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	47.3
Coirshellach (R2) Night-time	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	47.3	51.1
All Other Locations (R3-11) Daytime	35.0	35.0	35.0	35.0	35.0	35.0	36.3	39.7	43.4	47.3
All Other Locations (R3-11) Night-time	38.0	38.0	38.0	38.0	38.0	38.0	39.2	43.3	47.3	51.1

Turbine Noise Predictions

13.7.25 Operational noise predictions have been carried out for the candidate wind turbine under consideration for the proposed Development (Vestas V136), in line with the methodology set out in the IOA GPG. Full details of the prediction methodology are set out in **Technical Appendix 13.2**, but the main assumptions are described below:

- Receiver height of 4 m;
- Ground effect ground coefficient G = 0.5;
- Atmospheric attenuation corresponding to a temperature of 10 ºC and a relative humidity of 70 %;
- Topographical barriers and concave ground profile corrections have been applied according to the IOA GPG;
- Downwind propagation is assumed for all receptors; and
- The manufacturer's sound power level data is uplifted by +2 dB to account for sound power and propagation uncertainties.

13.7.26 The results of the operational noise predictions at identified receptors are shown in **Table 13.19**. The results are also presented as a noise contour plot valid for standardised 10 m height wind speeds of 7 ms^{-1} in **Figure 13.2**, representing the wind speed with the highest predicted operational noise levels.

Table 13.19: Predicted Downwind Operational Noise Levels, dB L_{A90}

Receptor	Standardised 10 m height wind speed (ms^{-1})									
	3	4	5	6	7	8	9	10	11	12
R1 Craigton	25.3	29.2	34.2	37.2	37.4	37.2	36.8	36.4	36.0	35.6
R2 Coirshellach	21.7	25.5	30.6	33.7	33.8	33.6	33.2	32.7	32.2	31.8
R3 Ausdale	22.6	26.4	31.4	34.5	34.6	34.4	34.0	33.5	33.1	32.6
R4 Reidbreac	21.9	25.8	30.8	33.9	34.0	33.8	33.3	32.8	32.4	31.9
R5 Clasbhan	18.6	22.4	27.5	30.5	30.6	30.4	29.9	29.4	28.8	28.3
R6 Sleasdariadh	16.9	20.7	25.8	28.8	28.9	28.6	28.1	27.6	27.0	26.5
R7 1 Airdens	15.9	19.7	24.7	27.8	28.0	27.7	27.2	26.6	26.1	25.6
R8 Achue Cottage	15.1	19.0	24.0	27.1	27.2	26.9	26.3	25.8	25.2	24.6
R9 Loanboadich	13.2	17.0	22.0	25.1	25.3	25.0	24.4	23.9	23.3	22.7
R10 13 Airdens	13.0	16.9	21.9	25.0	25.1	24.8	24.2	23.6	23.0	22.4
R11 Garvary	14.5	18.3	23.4	26.4	26.5	26.2	25.7	25.1	24.6	24.1

Turbine Noise Assessment

13.7.27 Predicted noise levels are the same for both daytime and night-time. In **Table 13.20** and **Table 13.21** the predicted noise levels for each receptor are compared against the respective daytime and night-time noise limits, as set out in **Table 13.18**. Note that a negative value indicates that the predicted noise levels are below the noise limits and a positive value would represent the margin of exceedance of the noise limits.

Table 13.20: Operational Noise Levels Minus Daytime Noise Limits, dB L_{A90}

Receptor	Standardised 10 m height wind speed (ms^{-1})									
	3	4	5	6	7	8	9	10	11	12
R1 Craigton	-19.7	-15.8	-10.8	-7.8	-7.6	-7.8	-8.2	-8.6	-9.0	-14.7
R2 Coirshellach	-23.3	-19.5	-14.4	-11.3	-11.2	-11.4	-11.8	-12.3	-12.8	-15.5
R3 Ausdale	-12.4	-8.6	-3.6	-0.5	-0.4	-0.6	-2.3	-6.2	-10.3	-14.7
R4 Reidbreac	-13.1	-9.2	-4.2	-1.1	-1.0	-1.2	-3.0	-6.9	-11.0	-15.4
R5 Clasbhan	-16.4	-12.6	-7.5	-4.5	-4.4	-4.6	-6.4	-10.3	-14.6	-19.0
R6 Sleasdariadh	-18.1	-14.3	-9.2	-6.2	-6.1	-6.4	-8.2	-12.1	-16.4	-20.8
R7 1 Airdens	-19.1	-15.3	-10.3	-7.2	-7.0	-7.3	-9.1	-13.1	-17.3	-21.7

Receptor	Standardised 10 m height wind speed (ms^{-1})									
	3	4	5	6	7	8	9	10	11	12
R8 Achue Cottage	-19.9	-16.0	-11.0	-7.9	-7.8	-8.1	-10.0	-13.9	-18.2	-22.7
R9 Loanboadich	-21.8	-18.0	-13.0	-9.9	-9.7	-10.0	-11.9	-15.8	-20.1	-24.6
R10 13 Airdens	-22.0	-18.1	-13.1	-10.0	-9.9	-10.2	-12.1	-16.1	-20.4	-24.9
R11 Garvary	-20.5	-16.7	-11.6	-8.6	-8.5	-8.8	-10.6	-14.6	-18.8	-23.2

Table 13.21: Operational Noise Levels Minus Night-time Noise Limits, dB L_{A90}

Receptor	Standardised 10 m height wind speed (ms^{-1})									
	3	4	5	6	7	8	9	10	11	12
R1 Craigton	-19.7	-15.8	-10.8	-7.8	-7.6	-7.8	-8.2	-8.6	-10.4	-13.9
R2 Coirshellach	-23.3	-19.5	-14.4	-11.3	-11.2	-11.4	-11.8	-12.3	-15.1	-19.3
R3 Ausdale	-15.4	-11.6	-6.6	-3.5	-3.4	-3.6	-5.2	-9.8	-14.2	-18.5
R4 Reidbreac	-16.1	-12.2	-7.2	-4.1	-4.0	-4.2	-5.9	-10.5	-14.9	-19.2
R5 Clasbhan	-19.4	-15.6	-10.5	-7.5	-7.4	-7.6	-9.3	-13.9	-18.5	-22.8
R6 Sleasdariadh	-21.1	-17.3	-12.2	-9.2	-9.1	-9.4	-11.1	-15.7	-20.3	-24.6
R7 1 Airdens	-22.1	-18.3	-13.3	-10.2	-10.0	-10.3	-12.0	-16.7	-21.2	-25.5
R8 Achue Cottage	-22.9	-19.0	-14.0	-10.9	-10.8	-11.1	-12.9	-17.5	-22.1	-26.5
R9 Loanboadich	-24.8	-21.0	-16.0	-12.9	-12.7	-13.0	-14.8	-19.4	-24.0	-28.4
R10 13 Airdens	-25.0	-21.1	-16.1	-13.0	-12.9	-13.2	-15.0	-19.7	-24.3	-28.7
R11 Garvary	-23.5	-19.7	-14.6	-11.6	-11.5	-11.8	-13.5	-18.2	-22.7	-27.0

13.7.28 At all identified receptors, the direct operational noise impact from the proposed Development meets the applicable noise limits and is therefore **'Not Significant'**.

Operational Noise Effects – Substation and BESS Noise

13.7.29 A substation and BESS are proposed to be co-located in a remote area to the north of the proposed turbines. There is no line of sight between the substation and any identified noise-sensitive receptor due to the intervening topography, while the closest receptor, R1 Craigton, is over 1700 m away from the proposed location of the substation and BESS.

13.7.30 Due to the large separation distances and where there is no line of sight, it is considered to be highly unlikely that noise from the substation and BESS would be audible at any noise-sensitive receptor locations.

13.7.31 Operational noise effects from the substation and BESS are therefore considered to be **'Not Significant'**.

13.8 Cumulative Effects

Cumulative Construction Noise Effects

13.8.1 There is the potential for the Lairg II, Garvary or Acheilidh developments to be constructed at a similar or overlapping time period to the proposed Development. However, due to the remote nature of the area and the large separation distances involved, the combined effect of noise from simultaneous construction activities is considered likely to be negligible and thus **'Not Significant'**.

13.8.2 Even during the most intensive periods of deliveries to multiple development construction sites, and at receptors relatively close to the access tracks, it is unlikely that noise thresholds in **Table 13.7** would be exceeded for a significant period, due to the sporadic and intermittent nature of the noise from vehicles passing the neighbouring dwellings and the slow speeds at which construction vehicles will pass. Cumulative traffic noise effects on access tracks are therefore considered to be **'Not Significant'**.

13.8.3 Noise associated with construction traffic movements along local public roads during the construction of multiple wind farm developments will cause short-term increases in noise levels, particularly for dwellings located along the proposed routes to multiple developments and given the rural nature of the area.

13.8.4 However, the noise increase is likely to remain less than 3 dB as an average over a given assessment period. For this reason, as well as due to the limited duration of these potential noise increases, the cumulative increase in noise from road traffic during the construction phase is considered to be **'Not Significant'**.

Cumulative Operational Noise Effects

Predicted Cumulative Noise Levels

13.8.5 There are two windfarms in the vicinity of the Site which have been considered in the cumulative operational noise impact assessment (see **Table 13.12**). Details of the assumptions and input data adopted for the cumulative windfarms are set out in **Technical Appendix 13.2**. A cumulative assessment has been carried out for each of the receptors identified for the operational noise assessment (see **Table 13.5).**

13.8.6 The prediction method for the cumulative noise assessment, as described in **Technical Appendix 13.2**, is the same as that for the operational noise assessment.

13.8.7 The identified cumulative developments are located to the north of the proposed Development and the receptors within the operational noise study area. Given this positioning, it is generally expected that, for most receptors and over most of the time, receptors will likely be either downwind, crosswind or upwind of all cumulative developments simultaneously. Therefore, there is a limited extent to which the levels of respite experienced at receptors would be reduced as a result of the introduction of the proposed Development.

13.8.8 As a worst-case assumption, predictions are undertaken for the combined downwind noise levels for all identified cumulative wind farm developments.

13.8.9 The cumulative predicted noise levels from all built and consented windfarms, plus the proposed Development, are set out in **Table 13.22**. The predicted noise levels include

the standard uncertainty of +2 dB for the proposed Development and for developments where they are built. A +4 dB uncertainty factor is applied where developments are consented but not built, due to the additional uncertainty surrounding the turbines to be installed. The results are also presented as a noise contour plot valid for standardised 10 m height wind speeds of 7 ms^{-1} at **Figure 13.3**, representing the wind speed with the highest cumulative noise levels.

Table 13.22: Cumulative Operational Noise Levels, dB L_{A90}

Receptor	Standardised 10 m height wind speed (ms^{-1})									
	3	4	5	6	7	8	9	10	11	12
R1 Craigton	25.4	29.2	34.3	37.3	37.4	37.3	36.9	36.5	36.1	35.7
R2 Coirshellach	21.8	25.6	30.6	33.7	33.9	33.7	33.3	32.8	32.4	31.9
R3 Ausdale	22.7	26.5	31.5	34.6	34.7	34.5	34.1	33.6	33.2	32.8
R4 Reidbreac	22.1	25.9	30.9	34.0	34.1	33.9	33.5	33.0	32.6	32.1
R5 Clasbhan	18.9	22.6	27.6	30.7	30.8	30.6	30.1	29.7	29.2	28.7
R6 Sleasdariadh	17.3	21.0	26.0	29.0	29.2	29.0	28.5	28.0	27.5	27.1
R7 1 Airdens	16.2	19.9	24.9	28.0	28.2	28.0	27.5	27.0	26.5	26.0
R8 Achue Cottage	15.5	19.2	24.2	27.3	27.4	27.2	26.7	26.2	25.7	25.1
R9 Loanboadich	13.7	17.4	22.3	25.4	25.7	25.4	24.9	24.4	24.0	23.5
R10 13 Airdens	13.5	17.2	22.1	25.2	25.4	25.2	24.7	24.1	23.6	23.1
R11 Garvary	17.0	20.1	24.9	28.1	28.7	28.5	28.3	28.0	27.7	27.5

13.8.10 Operational noise levels from all identified cumulative wind farm developments in the absence of the proposed Development (operating and consented developments only) are set out in **Table 13.23**. The results are also presented as a noise contour plot valid for standardised 10 m height wind speeds of 7 ms^{-1} at **Figure 13.4**, representing the critical wind speed for the noise assessment but may not be the highest noise levels for a given development.

13.8.11 The predicted noise levels for Lairg Wind Farm are at the consented noise limit of 35 dB at the closest identified receptor, 85 Tomich (co-ordinates 260958, 904949, not within the study area for the proposed Development). Predicted noise levels for Lairg 2 Wind Farm are above the consented noise limit of 35 dB, at the closest identified receptor, 104 Toroboll (co-ordinates 259589, 904137, not within the study area for the proposed Development). These predictions are therefore considered to represent the worst-case contributions of these developments to the cumulative noise levels.

Table 13.23: Operational Noise Levels – Lairg and Lairg II Only, dB L_{A90}

Receptor	Standardised 10 m height wind speed (ms^{-1})									
	3	4	5	6	7	8	9	10	11	12
R1 Craigton	7.8	9.7	13.4	17.1	18.5	18.6	18.7	18.8	18.8	18.8
R2 Coirshellach	6.4	8.3	12.0	15.7	17.1	17.3	17.4	17.4	17.4	17.4
R3 Ausdale	6.8	8.7	12.5	16.1	17.5	17.7	17.8	17.8	17.8	17.8
R4 Reidbreac	8.1	10.0	13.8	17.4	18.9	19.0	19.1	19.1	19.2	19.2
R5 Clasbhan	7.2	9.1	12.8	16.4	17.9	18.0	18.1	18.2	18.2	18.2
R6 Sleasdariadh	6.9	8.8	12.5	16.1	17.6	17.7	17.8	17.9	17.9	17.9
R7 1 Airdens	5.0	6.9	10.5	14.1	15.6	15.8	15.9	15.9	16.0	16.0
R8 Achue Cottage	4.6	6.6	10.2	13.8	15.3	15.4	15.5	15.6	15.6	15.6
R9 Loanboadich	4.5	6.5	10.1	13.7	15.1	15.3	15.4	15.5	15.5	15.5
R10 13 Airdens	3.8	5.8	9.4	13.0	14.4	14.6	14.7	14.8	14.8	14.8
R11 Garvary	13.6	15.4	19.5	23.2	24.7	24.7	24.8	24.8	24.8	24.8

Cumulative Operational Noise Assessment

13.8.12 In **Table 13.24** and **Table 13.25** the predicted cumulative noise levels for each receptor are compared against the respective daytime and night-time noise limits, as set out in **Table 13.18**. Note that a negative value indicates that the predicted noise levels are below the noise limits and a positive value would represent the margin of exceedance of the noise limits.

Table 13.24: Cumulative Noise Levels Minus Daytime Noise Limits, dB L_{A90}

Receptor	Standardised 10 m height wind speed (ms^{-1})									
	3	4	5	6	7	8	9	10	11	12
R1 Craigton	-19.6	-15.8	-10.7	-7.7	-7.6	-7.7	-8.1	-8.5	-8.9	-14.6
R2 Coirshellach	-23.2	-19.4	-14.4	-11.3	-11.1	-11.3	-11.7	-12.2	-12.6	-15.4
R3 Ausdale	-12.3	-8.5	-3.5	-0.4	-0.3	-0.5	-2.2	-6.1	-10.2	-14.5
R4 Reidbreac	-12.9	-9.1	-4.1	-1.0	-0.9	-1.1	-2.8	-6.7	-10.8	-15.2
R5 Clasbhan	-16.1	-12.4	-7.4	-4.3	-4.2	-4.4	-6.2	-10.0	-14.2	-18.6
R6 Sleasdariadh	-17.7	-14.0	-9.0	-6.0	-5.8	-6.0	-7.8	-11.7	-15.9	-20.2
R7 1 Airdens	-18.8	-15.1	-10.1	-7.0	-6.8	-7.0	-8.8	-12.7	-16.9	-21.3

Receptor	Standardised 10 m height wind speed (ms^{-1})									
	3	4	5	6	7	8	9	10	11	12
R8 Achue Cottage	-19.5	-15.8	-10.8	-7.7	-7.6	-7.8	-9.6	-13.5	-17.7	-22.2
R9 Loanboadich	-21.3	-17.6	-12.7	-9.6	-9.3	-9.6	-11.4	-15.3	-19.4	-23.8
R10 13 Airdens	-21.5	-17.8	-12.9	-9.8	-9.6	-9.8	-11.6	-15.6	-19.8	-24.2
R11 Garvary	-18.0	-14.9	-10.1	-6.9	-6.3	-6.5	-8.0	-11.7	-15.7	-19.8

Table 13.25: Cumulative Noise Levels Minus Night-time Noise Limits, dB L_{A90}

Receptor	Standardised 10 m height wind speed (ms^{-1})									
	3	4	5	6	7	8	9	10	11	12
R1 Craigton	-19.6	-15.8	-10.7	-7.7	-7.6	-7.7	-8.1	-8.5	-10.3	-13.8
R2 Coirshellach	-23.2	-19.4	-14.4	-11.3	-11.1	-11.3	-11.7	-12.2	-14.9	-19.2
R3 Ausdale	-15.3	-11.5	-6.5	-3.4	-3.3	-3.5	-5.1	-9.7	-14.1	-18.3
R4 Reidbreac	-15.9	-12.1	-7.1	-4.0	-3.9	-4.1	-5.7	-10.3	-14.7	-19.0
R5 Clasbhan	-19.1	-15.4	-10.4	-7.3	-7.2	-7.4	-9.1	-13.6	-18.1	-22.4
R6 Sleasdariadh	-20.7	-17.0	-12.0	-9.0	-8.8	-9.0	-10.7	-15.3	-19.8	-24.0
R7 1 Airdens	-21.8	-18.1	-13.1	-10.0	-9.8	-10.0	-11.7	-16.3	-20.8	-25.1
R8 Achue Cottage	-22.5	-18.8	-13.8	-10.7	-10.6	-10.8	-12.5	-17.1	-21.6	-26.0
R9 Loanboadich	-24.3	-20.6	-15.7	-12.6	-12.3	-12.6	-14.3	-18.9	-23.3	-27.6
R10 13 Airdens	-24.5	-20.8	-15.9	-12.8	-12.6	-12.8	-14.5	-19.2	-23.7	-28.0
R11 Garvary	-21.0	-17.9	-13.1	-9.9	-9.3	-9.5	-10.9	-15.3	-19.6	-23.6

13.8.13 The highest noise levels are predicted at Craigton, which is financially involved in the proposed Development and is predicted to experience cumulative noise levels of up to 37.4 dB (with an applicable noise limit lower limiting value of 45 dB). Cumulative noise levels at all other locations are below the noise limits in **Table 13.18** for all locations at all wind speeds. Cumulative noise effects are therefore predicted to be **'Not Significant'**.

13.9 Potential Future Scenario

13.9.1 While only Lairg (built) and Lairg 2 (consented) wind farms are required to be considered within the cumulative assessment, there is the potential for other developments currently in planning to be consented and subsequently built in the future, which would contribute to cumulative noise levels in the area.

13.9.2 The noise levels from these potential future developments provide important context for the proposed Development. Predictions have therefore been undertaken for reference,

to include all built, consented, and in-planning developments, plus the proposed Development, to evaluate this potential future scenario. Other potential future developments, such as those at a scoping stage, have not been included as the certainty of them coming forward is low and there is a lack of detail from which to draw any conclusions on a noise assessment.

13.9.3 It is assumed that in-planning developments, if consented, are likely to be consented with noise limits specified at their predicted levels plus 2 dB. A +4 dB uncertainty uplift has therefore been applied to the sound power levels for these developments, rather than the standard +2 dB uncertainty factor.

13.9.4 The potential future scenario noise levels are presented in **Table 13.26**. The results are also presented as a noise contour plot valid for standardised 10 m height wind speeds of 10 ms^{-1} at **Figure 13.5**.

13.9.5 As specified in the Garvary wind farm EIAR, the R11 Garvary receptor would remain vacant throughout the life of the Garvary wind farm development in the event of the Garvary development receiving consent. This receptor is therefore excluded from this scenario.

Table 13.26: Potential Future Scenario Noise Levels– Worst-Case, dB L_{A90}

Receptor	Standardised 10 m height wind speed (ms^{-1})									
	3	4	5	6	7	8	9	10	11	12
R1 Craigton	27.1	30.3	35.1	38.0	38.2	38.2	37.9	37.6	37.2	36.9
R2 Coirshellach	23.9	27.0	31.6	34.6	34.8	34.8	34.5	34.2	33.8	33.4
R3 Ausdale	25.0	28.0	32.6	35.5	35.7	35.7	35.5	35.1	34.8	34.4
R4 Reidbreac	25.0	27.9	32.4	35.3	35.6	35.6	35.4	35.1	34.7	34.4
R5 Clasbhan	23.1	25.5	29.7	32.6	32.8	32.9	32.7	32.4	32.1	31.8
R6 Sleasdariadh	22.4	24.6	28.6	31.4	31.7	31.8	31.6	31.4	31.1	30.8
R7 1 Airdens	19.1	21.9	26.4	29.4	29.7	29.7	29.5	29.1	28.7	28.4
R8 Achue Cottage	19.0	21.7	26.0	28.9	29.2	29.3	29.1	28.7	28.4	28.0
R9 Loanboadich	17.5	20.2	24.4	27.4	27.7	27.8	27.7	27.3	27.0	26.7
R10 13 Airdens	18.2	20.6	24.6	27.5	27.8	27.9	27.8	27.5	27.1	26.8

13.9.6 A comparison of predicted potential future scenario noise levels and the adopted daytime and night-time noise limits (see **Table 13.18**) are given in **Table 13.27** and **Table 13.28**, respectively. A positive value (in red text) indicates that the noise limit would be anticipated to be exceeded in the event that all developments under consideration in this scenario were consented.

13.9.7 Noise levels in the potential future scenario in the absence of the proposed Development (i.e. operating, consented, and in-planning developments) are presented as a noise contour plot valid for standardised 10 m height wind speeds of 10 ms^{-1} at **Figure 13.6**.

Table 13.27: Potential Future Scenario Noise Levels Minus Daytime Noise Limits, dB L_{A90}

Receptor	Standardised 10 m height wind speed (ms^{-1})									
	3	4	5	6	7	8	9	10	11	12
R1 Craigton	-17.9	-14.7	-9.9	-7.0	-6.8	-6.8	-7.1	-7.4	-7.8	-13.4
R2 Coirshellach	-21.1	-18.0	-13.4	-10.4	-10.2	-10.2	-10.5	-10.8	-11.2	-13.9
R3 Ausdale	-10.0	-7.0	-2.4	**0.5**	**0.7**	**0.7**	-0.8	-4.6	-8.6	-12.9
R4 Reidbreac	-10.0	-7.1	-2.6	**0.3**	**0.6**	**0.6**	-0.9	-4.6	-8.7	-12.9
R5 Clasbhan	-11.9	-9.5	-5.3	-2.4	-2.2	-2.1	-3.6	-7.3	-11.3	-15.5
R6 Sleasdariadh	-12.6	-10.4	-6.4	-3.6	-3.3	-3.2	-4.7	-8.3	-12.3	-16.5
R7 1 Airdens	-15.9	-13.1	-8.6	-5.6	-5.3	-5.3	-6.8	-10.6	-14.7	-18.9
R8 Achue	-16.0	-13.3	-9.0	-6.1	-5.8	-5.7	-7.2	-11.0	-15.0	-19.3
R9 Loanboadich	-17.5	-14.8	-10.6	-7.6	-7.3	-7.2	-8.6	-12.4	-16.4	-20.6
R10 13 Airdens	-16.8	-14.4	-10.4	-7.5	-7.2	-7.1	-8.5	-12.2	-16.3	-20.5

Table 13.28: Potential Future Scenario Noise Levels Minus Night-time Noise Limits, dB L_{A90}

Receptor	Standardised 10 m height wind speed (ms^{-1})									
	3	4	5	6	7	8	9	10	11	12
R1 Craigton	-17.9	-14.7	-9.9	-7.0	-6.8	-6.8	-7.1	-7.4	-9.2	-12.6
R2 Coirshellach	-21.1	-18.0	-13.4	-10.4	-10.2	-10.2	-10.5	-10.8	-13.5	-17.7
R3 Ausdale	-13.0	-10.0	-5.4	-2.5	-2.3	-2.3	-3.7	-8.2	-12.5	-16.7
R4 Reidbreac	-13.0	-10.1	-5.6	-2.7	-2.4	-2.4	-3.8	-8.2	-12.6	-16.7
R5 Clasbhan	-14.9	-12.5	-8.3	-5.4	-5.2	-5.1	-6.5	-10.9	-15.2	-19.3
R6 Sleasdariadh	-15.6	-13.4	-9.4	-6.6	-6.3	-6.2	-7.6	-11.9	-16.2	-20.3
R7 1 Airdens	-18.9	-16.1	-11.6	-8.6	-8.3	-8.3	-9.7	-14.2	-18.6	-22.7
R8 Achue Cottage	-19.0	-16.3	-12.0	-9.1	-8.8	-8.7	-10.1	-14.6	-18.9	-23.1
R9 Loanboadich	-20.5	-17.8	-13.6	-10.6	-10.3	-10.2	-11.5	-16.0	-20.3	-24.4
R10 13 Airdens	-19.8	-17.4	-13.4	-10.5	-10.2	-10.1	-11.4	-15.8	-20.2	-24.3

13.9.8 The potential future scenario noise levels are predicted to exceed the daytime noise limits at R3 Ausdale for standardised wind speeds of 6 to 8 ms^{-1} by a margin of up to 0.7 dB, and at R4 Reidbreac by a margin of up to 0.6 dB in the scenario where all existing,

consented and in planning developments are operating in addition to the proposed Development. A potential **'Significant'** effect is therefore indicated for this scenario.

13.9.9 All night-time noise limits are predicted to be met in the potential future scenario.

13.9.10 The margin by which the noise limit may be exceeded at R3 and R4 is small. Where there is the potential for this to occur, it would be infrequent, occurring only under downwind conditions, i.e. wind blowing from the north, which is uncommon in the UK (Met Office, 2023). In practice, the small margin of exceedance is likely to result in effects which are **'Not Significant'**. Mitigation to avoid this effect is therefore likely to be disproportionate, considering the number of properties affected, the extent of exposure, and the potential power-generation implications.

13.9.11 ETSU-R-97 provides for a range of lower limiting values when setting noise limits, between 35 and 40 dB depending on the context, including the number of receptors affected, the potential implications on power generation, and the duration and extent of exposure.

13.9.12 On the basis of infrequently elevated noise conditions at two receptor properties, with potentially disproportionate mitigation requirements, there is considered to be a strong justification for the adoption of higher noise limits in terms of cumulative noise. Noise limits of 5 dB above background noise levels or 37 dB, whichever is greater, are therefore proposed as suitable cumulative noise limits. This would be in line with ETSU-R-97 recommendations and would allow for future sustainable wind farm development in this area while maintaining reasonable levels of protection for residents with regards to noise.

13.9.13 In the event that Garvary and Acheilidh are consented, a higher cumulative noise limit should therefore be considered appropriate, based on the recommendations of ETSU-R-97.

13.10 Residual effects

13.10.1 Mitigation beyond the embedded mitigation is not required due there being no likely **'Significant'** effects arising.

13.11 Summary of effects

13.11.1 **Table 13.29** provides a summary of the conclusions of the impact assessment with respect to each taking into consideration embedded and any additional mitigation measures.

Table 13.29: Summary of effects

Potential impact	Pre-mitigation		Mitigation	Residual	
	Effect	Significance		Effect	Significance
Construction Phase					
Noise	Temporary Adverse	Not-Significant	None Required	Adverse	Not-Significant

Potential impact	Pre-mitigation		Mitigation	Residual	
	Effect	Significance		Effect	Significance
Traffic Noise	Temporary Adverse	Not-Significant	None Required	Adverse	Not-Significant
Cumulative Noise	Temporary Adverse	Not-Significant	None Required	Adverse	Not-Significant
Operational Phase					
Wind Turbine Noise	Adverse	Not-Significant	None Required	Adverse	Not-Significant
Substation Noise	Adverse	Not-Significant	None Required	Adverse	Not-Significant
Decommissioning Phase					
Noise	Temporary Adverse	Not-Significant	None Required	Adverse	Not-Significant
Traffic Noise	Temporary Adverse	Not-Significant	None Required	Adverse	Not-Significant
Cumulative Noise	Temporary Adverse	Not-Significant	None Required	Adverse	Not-Significant
Cumulative					
Cumulative Wind Turbine Noise	Adverse	Not-Significant	None Required	Adverse	Not-Significant

13.12 References

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