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11 NOISE AND VIBRATION

11.1 Introduction

11.1.1 This chapter summarises the assessment of the potential noise and vibration effects of the Proposed Development on the residents of nearby dwellings. Full details of the noise assessment can be found in **Volume 4, Technical Appendix 11.1**. The assessment considers the Proposed Development's construction, its operation and decommissioning.

11.1.2 The operational noise assessment of the proposed turbines includes cumulative consideration of other proposed wind farms in proximity, wind farms further than 5 km have not been included because their potential noise contribution was considered negligible.

11.1.3 This chapter is supported by the following figure which is referenced throughout the text:

- **Volume 3a, Figure 11.1** – Noise Contours and Assessment Locations

11.1.4 The Technical Appendix referred to in the Chapter is as follows:

- **Volume 4, Technical Appendix 11.1**: Environmental Noise Assessment.

11.2 Statutory and Planning Context

11.2.1 Scottish National Planning Framework 4 (Scottish Government, 2023) provides advice on how the planning system should manage the process of encouraging, approving and implementing proposals including renewable energy schemes such as onshore wind farms. This is supplemented by the Onshore Wind Policy Statement (Scottish Government, 2022): in section 3.7, this advises the use of ETSU-R-97 framework to assess noise from wind energy developments and use of the Institute of Acoustics' (IOA) Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise (GPG) as a guide in conjunction with ETSU-R-97.

11.2.2 Planning Advice Note PAN1/2011 (Scottish Government, 2011) provides general advice on the role of the planning system in preventing and limiting the adverse effects of noise without prejudicing investment in enterprise, development and transport. PAN1/2011 provides general advice on a range of noise related planning matters, including references to noise associated with both construction activities and operational wind farms.

11.2.3 The Scottish Government's online guidance, 'Onshore wind turbines: planning advice' (Scottish Government, 2014), referenced in PAN1/2011, provides further advice on noise, and confirms that the recommendations of 'The Assessment and Rating of Noise from Wind Farms' (ETSU-R-97, The Working Group on Noise from Wind Turbines, 1997) *"should be followed by applicants and consultees, and used by planning authorities to assess and rate noise from wind energy developments"*.

11.2.4 Guidance on good practice on the application of ETSU-R-97 has been provided in the IOA GPG (Institute of Acoustics, 2013). This was subsequently endorsed by the Scottish Government which advised in the Online Renewables Planning Advice note that the IOA

GPG "*should be used by all IOA members and those undertaking assessments to ETSU-R-97"*.

11.2.5 For noise from non-wind turbines sources associated with the Proposed Development, such as fixed plant associated with the substation, PAN1/2011 references the BS 4142 standard. Although PAN1/2011 references the 1997 version of the standard, the more recent 2019 version (British Standards Institution, 2019) is now applicable and will be used.

11.2.6 PAN1/2011 and the Technical Advice Note accompanying PAN1/2011 note that construction noise control can be achieved through planning conditions that limit noise from temporary construction sites, or by means of the Control of Pollution Act (CoPA, UK Government, 1974). The CoPA provides two means of controlling construction noise and vibration. Section 60 provides the Local Authority with the power to impose at any time operating conditions on the development site. Section 61 allows the developer to negotiate a prior consent for a set of operating procedures with the Local Authority before commencement of site works.

11.2.7 For detailed guidance on construction noise and its control, the PAN1/2011 Technical Advice Note refers to British Standard BS 5228 'Noise control on construction and open sites' but confirms that the updated version of this standard (British Standards Institution, 2014) is relevant when used within the planning process.

11.2.8 The Argyll and Bute Council Adopted Local Development Plan 2 (A&BC LDP2, 2024) includes policy LDP 5 (Renewable Energy), which explains that A&BC will support proposals where it can be demonstrated acceptable impacts, either in isolation or cumulatively, with regards to a number of effects which include noise on communities and residential dwellings.

11.3 Consultation Undertaken

11.3.1 A summary of the consultation undertaken is set out in **Table 11.1**.

Table 11.1: Summary of consultation responses relevant to this chapter

Consultee	Summary of Key Issues	How this is addressed in this Chapter
ECU – on behalf of Scottish Ministers	Final list of noise receptors should be agreed following discussion with A&BC.	Specific engagement on the noise assessment methodology was undertaken with Argyll and Bute Council (see below).
Scoping Opinion date 07 October 2022	Noise assessment should be carried out in line with relevant legislation and standards (as detailed in chapter 4 of the scoping report). The assessment should be formatted as per Table 6.1 of the IOA "A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise".	All relevant detailed information in accordance with IOA GPG guidance to be included in noise technical appendix (**Volume 4, Technical Appendix 11.1**).

Consultee	Summary of Key Issues	How this is addressed in this Chapter
Argyll and Bute Council Environmental Health Department – December 2024	Email consultation sent by Hoare Lea setting out the proposed operational noise assessment approach for wind turbine noise – No response received from A&BC EH.	Proposed approach adopted in the assessment.

11.4 Approach to the Assessment

Scope of Assessment

11.4.1 Noise and vibration which arises from the construction of a wind farm is a factor which should be taken into account when considering the total effect of the Proposed Development. However, in assessing the effects of construction noise, it is accepted that the associated works are of a temporary nature. The main work locations for construction of the proposed turbines (and decommissioning of the existing turbines) are more than 1.5 km from the nearest noise sensitive residences and are unlikely to cause significant effects. The construction and use of access tracks and some of the required infrastructure would, however, occur at lesser separation distances and associated effects were considered further. Assessment of the temporary effects of construction noise is primarily aimed at understanding the need for dedicated management measures and, if so, the types of measures that are required. Further details of construction traffic routes and proposed working hours are described **in Volume 2, Chapter 2: Proposed Development and Design Evolution**.

11.4.2 Once constructed and operating, wind turbines may emit two types of noise: aerodynamic noise from the blades, and mechanical noise from other components (which is easier to minimise by good engineering design). Aerodynamic noise tends to be perceived when the wind speeds are low, although at very low wind speeds the blades do not rotate or rotate very slowly and so, at these wind speeds, negligible aerodynamic noise is generated. In higher winds, aerodynamic noise is generally masked by the normal sound of wind blowing through trees and around buildings.

11.4.3 The Proposed Development will include a substation facility which will emit some noise during operation, however given the large separation distance of more than 2.5 km to the nearest Noise-Sensitive Receptor (NSR), and based on professional judgement, the substation noise is considered negligible and not considered further in the assessment.

11.4.4 The following effects have been assessed in full:

- the potential effect of noise and vibration during construction of the Proposed Development (including construction traffic noise both for the Proposed Development in isolation and cumulatively); and
- the potential effect of noise during operation of the Proposed Development, in isolation and cumulatively.

11.4.5 On the basis of the desk-based work undertaken, the professional judgement of the EIA team, experience from other relevant projects and policy guidance or standards, the following effects have been 'scoped out':

- Construction activities (including decommissioning of the existing turbines) typically undertaken at a distance of more than 1 km from the nearest noise-

sensitive receptors, due to their temporary nature, are unlikely to represent significant effects and were scoped out.

- Decommissioning is likely to result in less noise than during construction of the Proposed Development and similar management measures can be employed and therefore this was scoped out.
- The results of previous research detailed in **Volume 4, Appendix 11.1** has demonstrated that vibration resulting from the operation of wind farms is imperceptible at typical separation distances. Therefore, vibration effects during operation do not warrant detailed assessment and were scoped out.
- Traffic during the operational phase of the Proposed Development is likely to be very low and is considered unlikely to have any noise effects and was therefore scoped out.
- As the substation is more than 2.5 km from the nearest NSR, the associated operational noise levels are likely to be negligible, and this assessment was therefore also scoped out.

Baseline Methodology

Field Surveys

11.4.6 As explained in paragraph **11.4.18**, it was not necessary to undertake a baseline noise survey to support the assessment of operational noise from the wind turbines under the ETSU-R-97 methodology, as a simplified approach was used with a fixed threshold of 35 decibels (dB)(A) being applied. In this case, ETSU-R-97 does not require detailed background noise surveys to be undertaken.

Assessment Methodology

Guidance

11.4.7 Detailed guidance on construction noise and its control is provided by British Standard BS 5228-1 (British Standards Institution, 2014). Analysis of construction noise impacts has been undertaken in accordance with the methodologies outlined in this standard, which provides methods for predicting construction noise levels on the basis of reference data for the emissions of typical construction plant and activities. These methods include the calculation of construction traffic along access tracks and haul routes to the Proposed Development, and construction activities at fixed locations including the bases of turbines, temporary construction compounds, and the substation. The construction noise assessment has been based on indicative data for the types of plant likely to be used during the construction works, as presented in BS 5228-1.

11.4.8 When considering the potential for blasting to be employed to assist with rock extraction, reference can be made to the guidance of Planning Advice Note PAN50 (Scottish Government, 1996), which considers the environmental effects of mineral working. The main document summarises the key issues with regard to various environmental impacts relating to surface mineral extraction and processing such as road traffic, blasting, noise, dust, visual intrusion etc. In addition, several annexes to the main document have been published which consider specific aspects in more detail: Annex A, 'The Control of Noise at Surface Mineral Workings' and Annex D 'The Control of Blasting at Surface Mineral Workings'. BS 5228-1 and BS 5228-2 also provide guidance relating to surface mineral extraction including the assessment of noise and vibration effects associated with

blasting. Because of the difficulties in predicting noise and air overpressure resulting from blasting operations, these activities are best controlled following the use of good practice during the setting and detonation of charges (see **Volume 4, Appendix 11.1**).

11.4.9 Operational wind turbine noise has been assessed using the methodology contained in ETSU-R-97, which requires consideration of total cumulative noise from all wind turbines at each noise sensitive receptor location, when compared with noise limits determined in line with this guidance. Best practice guidance in the IOA GPG on the application of ETSU-R-97 will also be referenced, in particular when predicting noise levels from operating wind turbines.

Study Area

11.4.10 The study area for the assessment of operational noise comprises noise-sensitive residential properties nearest to the proposed turbines, located at approximate distances of up to 3 km from the turbines of the Proposed Development. The assessment properties considered are shown in **Volume 3a**, **Figure 11.1**.

11.4.11 The assessment of construction noise has considered the same residential properties as the operational assessment, as well as dwellings located alongside the construction traffic route.

Sensitivity of Receptors

11.4.12 Sensitivity has been determined on the basis that all noise sensitive receptors considered in this chapter are residential and therefore of high sensitivity.

Magnitude of Impact

Construction noise

11.4.13 Assessment of construction noise has been completed in accordance with BS 5228-1; predicting construction noise levels using reference emissions data for typical construction plant and activities, at fixed locations (e.g. the wind turbines, Site compounds or substations etc.) as well as haul routes within the Site. The BS 5228 calculated levels are then compared with the construction noise criteria. Assessment of construction related traffic on public roads has been completed using the methodology provided by Calculation of Road Traffic Noise (CRTN) and the guidance of the Design Manual for Roads and Bridges (DMRB). The relevant magnitude criteria are set out in **Section 3.4 of Volume 4, Appendix 11.1**, with an impact scale from negligible through minor to moderate and major. The duration and nature of the construction activities should also be taken into account.

11.4.14 Based on the range of guidance values set out in BS 5228-1 Annex E, and other relevant guidance, the significance criteria presented in **Table 11.2** have been derived. The values have been chosen in recognition of the relatively low ambient noise typically observed in rural environments. The presented criteria have been normalised to free-field day-time noise levels occurring over a time period, T, equal to the duration of a working day on site. Specifically, the criteria relate to day-time hours from 07:00 to 19:00 on weekdays, and 07:00 to 13:00 on Saturdays.. For construction outside these hours at weekends (13:00 to 19:00 on Saturdays and 07:00 to 19:00 on Sundays) the thresholds of **Table 11.2** of would reduce by 10 dB(A) in each category.

Table 11.2: Impact Magnitude Criteria for Construction Noise

Impact Magnitude	Definition
Major	Construction noise is generally greater than 75 dB L_{Aeq} during the construction period, or with periods of more than 85 dB L_{Aeq} lasting 1 to 4 weeks.
Moderate	Construction noise is generally less than or equal to 75 dB L_{Aeq} during the construction period, with periods of up to 85 dB L_{Aeq} lasting 1 to 4 weeks.
Minor	Construction noise is generally less than or equal to 65 dB L_{Aeq} during the construction period, with periods of up to 75 dB L_{Aeq} lasting 1 to 4 weeks.
Negligible	Construction noise is generally less than or equal to 55dB L_{Aeq}, with periods of up to 65 dB L_{Aeq} lasting 1 to 4 weeks.

11.4.15 When considering the impact of short-term changes in traffic, associated with the construction activities, on existing roads in the vicinity of the Proposed Development, reference can be made to the criteria set out in the DMRB, 2020. A classification of magnitudes of changes in the predicted traffic noise level for short-term changes, such as those associated with construction activities, is set out in **Table 11.3.** This classification can be considered in addition to the criteria of **Table 11.2**.

Table 11.3: Significance Criteria for Changes in Traffic Noise Associated with Construction Traffic

Impact Magnitude	Definition
Major	More than 5 dB
Moderate	3 to 5 dB
Minor	1 to 3 dB
Negligible	Less than 1 dB

Operational noise

11.4.16 Operational wind turbine noise has been assessed using the methodology contained in ETSU-R-97, which considers total noise from all wind turbines at each noise sensitive receptor location and compares these to the relevant noise limits. Predicted noise levels are provided following best practice guidance in the IOA GPG. For operational wind turbine noise, the assessment in **Appendix 11.1** determines whether noise levels (including cumulative contributions from other wind farms) are below or above the ETSU-R-97 criteria.

11.4.17 In summary, ETSU-R-97 noise limits can be defined in relation to measured background noise levels during quiet periods and their variation with wind speeds:

- For day-time periods, the limit is either a fixed level between 35 and 40 dB(A), or 5 dB above the derived background noise level, whichever is the higher; and
- For night-time periods, the limit is either a fixed level of 43 dB(A), or 5 dB above the derived background noise level, whichever is the higher.

11.4.18 ETSU-R-97 also offers an alternative simplified assessment methodology: if predicted noise levels do not exceed 35 dB(A) up to a wind speed of 10 metres per second (m/s), then they are considered acceptable and background noise surveys are not considered necessary. This approach is precautionary and has been adopted for assessment of the

Proposed Development in isolation based on predicted noise contours from the Proposed Development (see **Volume 3a, Figure 11.1**) and given the separation distance of more than 1.9 km from the proposed turbines to the nearest noise-sensitive receptors.

11.4.19 Full details of the operational noise assessment, including details of the noise output of the candidate turbine for this scheme and the calculation parameters on which predictions have been based, can be found in **Volume 4, Technical Appendix 11.1**. The noise model used is based on the ISO 9613-2 standard (International Standards Organisation, 2024), in addition to applying the additional guidance set out in the IOA GPG.

Determination of Significance

11.4.20 For construction noise, the magnitude of impact translates directly to effect significance, given all receptors are of high sensitivity, with a scale of significance from negligible, through minor to moderate and major. Major or moderate construction impacts are considered 'significant' in the context of the EIA Regulations.

11.4.21 For operational noise, if predicted (cumulative) noise levels from wind turbines are within the ETSU-R-97 derived noise limits, operational noise is considered acceptable, and therefore not significant in EIA terms. If the predicted wind turbine noise levels are above the ETSU-R-97 noise limits, operational noise is considered unacceptable and significant in EIA terms.

Nature of Effect

11.4.22 Construction effects are considered to be adverse short-term, whilst operational noise effects are considered to be adverse long-term in nature.

Cumulative Effects

11.4.23 The ETSU-R-97 noise limits apply to the cumulative levels from all wind turbines. In this instance, the Cruach Clenmacrie and Corr Chnoc Wind Farms are currently in planning with the Scottish Energy Consent Unit and have been included in the cumulative assessment. Full details of the cumulative operational noise assessment, including details of the assumed noise output assumed for these wind farms and the calculation parameters on which predictions have been based, can be found in **Volume 4, Technical Appendix 11.1**.

11.4.24 Other existing or proposed wind turbines more than 5 km will have no acoustically important cumulative effects and are not considered in the assessment. The Barachander Wind Farm is only at the scoping stage to the southeast of the Proposed Development and therefore not included in this assessment in the absence of sufficient detailed information to enable a full assessment.

11.4.25 The potential for cumulative construction traffic effects has been assessed on the basis of the assessment set out in **Volume 2, Chapter 10: Traffic & Transport** using the CRTN methodology. The criteria of **Table 11.3** can also be referenced.

Difficulties and Uncertainties

11.4.26 For construction noise and vibration, predicted noise levels are based on assuming standard machinery and equipment are used and that these are operated in the way intended by their manufacturers. It is also assumed that these items of equipment are all

used, within the work area for each of the construction activity, at the closest point to the nearest receptor location(s), which is considered to be a precautionary assumption, with noise/vibration levels lower than predicted for much of the construction period.

11.4.27 For operational wind turbine noise, the assessment is based upon a candidate wind turbine (the Vestas V136 4.5 MW model). This candidate was selected as representative (on a robust basis) of the type and size of turbine that would be used for the Proposed Development, therefore likely to result in practice in noise immission levels similar or lower to those presented.

11.4.28 Whilst some assumptions have been identified, it is considered that there is sufficient information to enable an informed decision to be taken in relation to the identification and assessment of likely significant noise and vibration effects.

11.5 Existing Environment

11.5.1 The Proposed Development is located in an area of relatively low population density. The noise environment in the surrounding area is generally expected to be characterised by 'natural' sources, such as wind disturbed vegetation, birds and farm animals. Other sources of noise include intermittent local road and agricultural vehicle movements in the area. Given the large separation distance of the nearest residences from the existing wind farm, noise from the existing wind turbines is unlikely to be a notable characteristic of the sound environment at these receptors.

11.5.2 In absence of the Proposed Development, environmental noise levels in the area are likely to remain largely similar to those currently experienced in the short term with the existing wind farm in operation, provided that no other major developments are constructed in the area which would affect these levels. When the existing wind farm reaches the end of its operational life, operational noise from these turbines would cease to represent a contribution to the baseline noise environment.

11.6 Embedded Mitigation

Design Considerations

11.6.1 The design of the turbine layout of the Proposed Development has considered the potential for significant operational noise effects, based on a representative candidate turbine model, comparing predictions against the simplified criterion of ETSU-R-97 throughout the design process.

Best Practice Measures

11.6.2 To reduce the potential effects of construction noise, the following good practice measures are proposed:

11.6.3 Noise-generating construction activities and heavy goods vehicle (HGV) deliveries to the Site (except for abnormal loads) would be limited to the hours 07:00 to 19:00 Monday to Sundays. Those activities that are unlikely to give rise to noise audible at noise-sensitive receptors (such as training, staff mobilisation or limited equipment maintenance) may continue outside of the stated hours. Some activities such as concrete pours for foundation or turbine component lifting may also be required outside the above working

hours, but this would not include the associated preparation and mobilisation work which would be restricted to the above working hours.

11.6.4 All construction activities shall adhere to good practice as set out in BS 5228.

- All equipment will be maintained in good working order and any associated noise attenuation such as engine casing and exhaust silencers shall remain fitted at all times.
- Where flexibility exists, construction activities will be separated from residential neighbours by the maximum possible distances.
- Construction plant capable of generating significant noise and vibration levels will be operated in a manner to restrict the duration of the higher magnitude levels.

11.6.5 If blasting is required as part of construction activities:

- blasting should take place under controlled conditions with the agreement of A&BC
- good practices during the setting and detonation of charge should be followed, in order to control air overpressure, in line with guidance set out in PAN50 (Scottish Government, 1996) and British Standard BS 5228-2.
- vibration levels at the nearest sensitive properties are best controlled through onsite testing processes, with progressively increased charges, carried out in consultation with A&BC.
- blasting within 1 km of the noise-sensitive receptors should also be avoided during Saturday afternoons and Sundays.

11.6.6 The above measures will be implemented as part of the overarching Construction Environmental Management Plan (CEMP) which will be secured through a planning condition and include measures to control construction noise as set out above

11.6.7 Traffic movements will be managed by a Construction Traffic Management Plan (CTMP) as part of the CEMP. Turbine deliveries would only take place outside these times with the prior consent of A&BC and Police Scotland, and this will be controlled by an Abnormal Load Transport Management Plan as part of the CTMP.

11.7 Predicted Effects

Construction Impacts

11.7.1 The proposed construction activities within the Proposed Development site and around the turbines, including decommissioning of the existing turbines, erection of the new ones and most of the other infrastructure (such as the substation) or temporary construction compound (TCC2) would occur at more than 1.9 km from nearby residential properties and were scoped out.

11.7.2 Activities in the open storage compound (TCC1), located approximately 200 m north of Barguillean Farm, have been considered. However, no activities likely to generate substantial noise are expected at the compound, which is planned to be used for storage until the temporary construction compound (TCC2) is constructed, and as such, represents a **negligible** magnitude of impact on highly sensitive receptors.

11.7.3 Predicted noise levels for other construction activities occurring in potential proximity to the closest noise sensitive receptor for each of the key activities during construction of the Proposed Development are set out in **Table 3, Section 5.1** of **Volume 4, Technical Appendix 11.1.**

11.7.4 For track upgrade and construction, as well as activities associated with rock breaking along the access road south of Glen Lonan Road, predicted noise levels of up to 67 dB are generally predicted for a short-term period, which would correspond to a **minor** impact magnitude.

11.7.5 For the track upgrade activity which will come close to properties such as Am Barr (easting/northing 197857 / 728789), predicted worst-case noise levels may be higher than 75 dB and could be considered to have a moderate impact magnitude. However, these predicted noise levels are likely to represent those during a very short-term period when activity is closest to the receptor (less than 1 week). Noise levels will quickly diminish as the track upgrade progresses, moving the activity further from the property. The short-term nature of this activity consequently categorises the impact to be of **minor** magnitude based on professional judgement.

11.7.6 However, some of the construction activities considered above could occur during Saturday afternoons and Sundays, which would increase the impact magnitude determining using the criteria of **Table 11.2** (see 11.4.14). This would represent an increase in the impact magnitude to **moderate** at worst, even taking into account the duration of the works.

11.7.7 The effect of traffic on existing roads was assessed for the Proposed Development in isolation. Change in traffic noise levels for respective roads is presented in **Table 5** of **Volume 4, Technical Appendix 11**, which shows a change of 0.3 dB or less for the Proposed Development. Based on the criteria outlined in **Table 11.3**, the results present negligible adverse impact on high-sensitive receptors for the Proposed Development in isolation.

11.7.8 In conclusion, noise from construction traffic and activities has been assessed and is predicted to result in a **minor to moderate** impact on **high-sensitive** receptors as a worst-case, which represents a local short-term adverse **moderate** effect, which is **significant** in EIA terms.

Operational Noise

Wind turbines

11.7.9 The predictions of operational noise for the Proposed Development in isolation are detailed in **Table 6** of **Volume 4, Technical Appendix 11.1** and are also illustrated on **Figure 11.1**. These varied between 14 dB(A) at low wind speeds to 32 dB(A) at high wind speeds, over the range of 3 m/s to 12 m/s over which predictions were made (in line with ETSU-R-97 guidance).

11.7.10 ETSU-R-97 also requires consideration of cumulative operational noise levels. Cumulative predictions for operational noise were also made, as detailed in **Table 7** of **Volume 4, Technical Appendix 11.1**, which show predictions based on worst-case downwind conditions from all wind turbines of up to 36 dB(A) at one receptor (Clachadubh) and below the 35 dB(A) criteria for all other receptors at all wind speeds. However, as Clachadubh is located between the other wind farms and the Proposed Development, it cannot experience downwind condition from all turbines in practice, as such, a detailed directional prediction was undertaken at this receptor and presented in **Annex C** of **Technical Appendix 11.1.** This assessment shows that the total cumulative

level is compliant with the 35 dB(A) simplified ETSU-R-97 criterion (with negligible exceptions).

11.7.11 This means that the predicted operational noise levels from the Proposed Development (in isolation and cumulatively) comply with the simplified assessment criterion of 35 dB(A) set out in ETSU-R-97 and are therefore considered acceptable and **not significant** in EIA terms.

11.8 Mitigation

Construction

11.8.1 Construction working hours for any upgrade/construction works for the access track within 500 m of residential properties will be prohibited in the CEMP on Saturday afternoons (13:00 to 19:00) and Sundays.

Operation

11.8.2 The selection of the final turbine to be installed for the Proposed Development would be made on the basis of enabling the relevant noise limit of 35 dB L_{A90} to be achieved at all neighbouring residential properties, including any relevant tonality corrections. This could be secured through conditions attached to the planning consent, including the requirement that, in the event of a noise complaint, noise levels resulting from the operation of the wind farm are measured in order to demonstrate compliance with the conditioned noise limits. Such monitoring should be done in full accordance with ETSU-R-97 and relevant good practice.

11.9 Residual Effects

Construction

11.9.1 The proposed restriction on weekend works for activities within 500 m of residential properties would reduce the associated worst-case effects to be **minor** adverse short-term at most which is **not significant**.

Operation

11.9.2 At some locations under some wind conditions and for a certain proportion of the time, the wind farm noise may be audible; however, operational noise immission levels comply with the criteria of the ETSU-R-97 guidance commended by planning policy for the assessment of wind farm noise. The effect (long-term adverse) is therefore considered to be **not significant** in EIA terms.

11.10 Cumulative Effects

11.10.1 In accordance with ETSU-R-97, cumulative operational noise effects require consideration as part of the assessment of operational noise effects presented for the Proposed Development: see 11.7.10. This shows that compliance with the simplified assessment criterion of ETSU-R-97 is also demonstrated in the cumulative case (or with negligible exceedances). Therefore, cumulative operational noise levels are acceptable and **not significant** in EIA terms.

11.10.2 No Cumulative traffic effects are anticipated in the future year of 2032 and therefore, a cumulative construction traffic noise assessment was not required.

11.11 Summary of Effects

11.11.1 **Table 11.4** provides a summary of the conclusions of the impact assessment with respect to each potential effect taking into consideration embedded and any additional mitigation measures.

Table 11.4: Summary of effects

Potential impact	Pre-mitigation		Mitigation	Residual	
	Effect	Significance		Effect	Significance
Construction Phase					
Construction activities	Minor to moderate	Significant	Restrictions on some weekend works	Minor	Not significant
Construction traffic	Negligible	Not significant	None	Negligible	Not significant
Operational Phase					
Wind turbines	Acceptable	Not significant	Selection of final turbine model to meet noise limits.	Acceptable	Not significant
Energy Storage	Moderate	Significant	Equipment selection and/or solid screening.	Minor	Not significant
Cumulative effects					
Wind Turbines	Acceptable	Not significant	Selection of final turbine model to meet noise limits.	Acceptable	Not significant

11.12 References

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