Preliminary Environmental Information Report

Calderdale Energy Park

7 April 2026

Volume 2, Chapter 15 : Noise and Vibration
PINS Reference: EN0110023
Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 – Reg 5 (2) (a).

Calderdale energy park

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15 Noise and Vibration

15.1 Introduction

15.1.1 This Chapter of the PEIR has been prepared by TNEI on behalf of the Applicant and presents a preliminary assessment of the likely significant noise effects from the Proposed Development. It is based on the environmental information available to date (which is detailed in this Chapter), as well as the current description of the Proposed Development as set out in **Chapter 4: The Proposed Development**.

15.1.2 This Chapter concludes there are no likely significant noise effects during the construction, operation and maintenance and decommissioning phases of the Proposed Development.

15.1.3 The conclusions of the following topic assessments are relevant to the receptors of this assessment, and have been taken into account in the assessment for noise:

- **Chapter 14: Transport and Access.**

15.1.4 This Chapter is supported by:

- **Appendix 15-1: Construction Noise and Vibration Report**;
- **Appendix 15-2: Wind Turbine Operational Noise Report** ; and
- **Appendix 15-3: Substation Noise Impact Assessment.**

15.1.5 Supporting Figures can be found at:

- **Figure 15-1: Construction Noise Assessment Locations**;
- **Figure 15-2: Operational Noise Assessment Locations**;
- **Figure 15-3: Cumulative Turbine Locations**; and
- **Figure 15-4: Substation Noise Assessment Locations**.

15.2 Legislation Policy and Guidance

15.2.1 Key policy, legislation and guidance relating to Noise and Vibration and of relevance to this preliminary assessment comprises the following, as shown in **Table 15-1**.

Table 15-1: Legislation, Policy and Guidance

Type	Name	Relevance to Assessment
Legislation	The Control of Pollution Act (COPA) 1974[1]	Gives Local Authorities (LAs) powers for controlling noise and vibration from construction sites and other similar works.
	The Environment Protection Act 1990[2]	Provides a framework for environmental protection in the UK.
National planning policy	NPS EN-1[3]	Sets out overarching national policy for nationally significant energy infrastructure. Section 5.12 discusses potential impacts from noise and vibration, referencing the use of British Standard (BS) 5228 and BS 4142 for the assessment of construction and operational noise, respectively. EN-3 and EN-5 are referenced as providing specific guidance for noise related to renewables and electricity networks.
	NPS EN-3[4]	Sets out national policy for renewable energy infrastructure. Section 2.12 discusses noise impacts from wind turbines, and states that ETSU-R-97 is the methodology to be used for the assessment of operational wind turbine noise, adding that this

[1] Control of Pollution Act 1974, c. 40. Available at: https://www.legislation.gov.uk/ukpga/1974/40/contents (Accessed: 23 February 2026).
[2] *Environmental Protection Act 1990, c. 43. Available at: www.legislation.gov.uk (Accessed: 23 February 2026).*
[3] Department for Energy Security and Net Zero (2026) Overarching National Policy Statement for energy (EN-1). Available at: www.gov.uk (Accessed: 23 February 2026).
[4] Department for Energy Security and Net Zero (2026) National Policy Statement for renewable energy infrastructure (EN-3). Available at: https://www.gov.uk/government/publications/national-policy-statement-for-renewable-energy-infrastructure-en-3-2025 (Accessed: 23 February 2026).

Type	Name	Relevance to Assessment
		should include industry good practice (such as *"A good practice guide to the application of ETSU-R-97 for the assessment and rating of wind turbine noise"* by the Institute of Acoustics (2013)).
	NPS EN-5[5]	Sets out national policy for electricity networks infrastructure. Section 2.9.27-2.9.44 discusses noise impacts from electrical infrastructure, referencing the use of BS 4142 for the assessment of noise from substations.
	National Planning Policy Framework (NPPF)[6]	The policies in the NPPF are material considerations which should be taken into account in dealing with planning applications. Section 187 states Planning policies and decisions should contribute to and enhance the natural and local environment by: *"Preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by…noise pollution…"* Section 196 states that planning policies and decisions should:

[5] Department for Energy Security and Net Zero (2026) National Policy Statement for electricity networks infrastructure (EN-5). Available at: https://www.gov.uk/government/publications/national-policy-statement-for-electricity-networks-infrastructure-en-5-2025 (Accessed: 23 February 2026).
[6] Ministry of Housing, Communities and Local Government (2025) National Planning Policy Framework. Available at: https://www.gov.uk/government/publications/national-planning-policy-framework--2 (Accessed: 23 February 2026).

Type	Name	Relevance to Assessment
		"mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life" And in addition should: *"identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason"*
	Noise policy statement for England[7]	Noise Policy Statement for England sets out the long-term vision of Government noise policy and should apply to all forms of noise, including environmental noise, neighbour and neighbourhood noise.
Local planning policy	Calderdale Local Plan 2018/19 – 2032/33 Written Statement (March 2023)[8]	Provides a spatial framework for determining planning applications and for controlling and shaping land-use and development across the Borough. Policy EN1: Pollution Control states: *"The Council will seek to reduce the amount of new development that may reasonably be expected to cause pollution or be exposed to pollution. When determining planning applications, consideration will be given to the following issues:*

[7] Department for Environment, Food and Rural Affairs (2010) Noise policy statement for England (NPSE). Available at: https://www.gov.uk/government/publications/noise-policy-statement-for-england (Accessed: 23 February 2026).
[8] Calderdale Council (2023) Calderdale Local Plan 2018/19 – 2032/33: Written Statement. Available at: www.calderdale.gov.uk (Accessed: 23 February 2026).

Type	Name	Relevance to Assessment
		a. The likelihood of light, noise, smell, vibration or other emissions that pose an unacceptable risk to the amenity of the local area."
	Burnley's Local Plan 2012 – 2032, Adopted July 2018[9]	Outlines the overall strategy for development in the borough. Policy CC3: Wind Energy Development supports wind energy development so long as *"the development would not result in unacceptable noise or …impacts on local residents and sensitive users of the site or its surroundings'* and *'Measures are taken to avoid, and where appropriate mitigate, unacceptable adverse impacts on local amenity resulting from development, its construction and operation."*
	Local Plan for the Bradford District – Core Strategy Development Plan Document, Adopted July 2017[10]	Outlines the development strategy for the district. Policy EN8: Environmental Protection Policy EN8 states that: *"In order to protect public health and the environment the Council will require that: Proposals which are likely to cause pollution or are likely to result in exposure to sources of pollution (including noise, odour and light pollution) or risks to safety, will only be permitted if measures can be implemented to minimise pollution and risk to a level that provides a high standard of protection for health, environmental quality and*

[9] Burnley Borough Council (2018) Burnley's Local Plan: local plan 2012-2032. Available at: www.burnley.gov.uk (Accessed: 23 February 2026).
[10] City of Bradford Metropolitan District Council (2017) Local Plan for the Bradford District: Core Strategy Development Plan Document. Available at: www.bradford.gov.uk (Accessed: 23 February 2026).

Type	Name	Relevance to Assessment
		amenity". Policy EN6: Energy states: *"All proposals for renewable and low carbon generation must include full assessment of the environmental, economic and social impacts and, where assessment shows that potential adverse impacts can be managed, the integration of measures to minimise such impacts".*
	Pendle Local Plan (Part 1) Core Strategy 2021-2040 (Adopted December 2025)[11]	Outlines the strategy for the development and growth. Policy DM03: Renewable Heat and Energy states: *"Proposals for commercial wind turbine developments must:* *(a) Show evidence of consultation with local communities affected by the proposal.* *(b) Demonstrate that any planning impacts identified during the consultation process have been fully addressed.* *(c) Be in a location where the physical, environmental, technical and policy constraints do not make the site unsuitable."*
National guidance	ETSU-R-97 'The Assessment and Rating of Noise from Wind Farms' (Noise Working Group (NWG), 1996)[12] ('ETSU-R-97')	Current guidance on how to assess wind turbine noise, which includes an agreed methodology for defining acceptable noise limits for wind farm developments.
	Institute of Acoustics (IOA) 'A Good Practice Guide to the Application of ETSU-R-	Current Good Practice Guidance (GPG) in the application of ETSU-R-97. The document

[11] Pendle Borough Council (2025) Pendle Local Plan Fourth Edition (2021-2040). Available at: www.pendle.gov.uk (Accessed: 18 March 2026).
[12] ETSU for the DTI (Department of Trade and Industry). The Working Group on Noise from Wind Turbines ETSU-R-97 The Assessment and Rating of Noise from Wind Farms'. 1996.

Type	Name	Relevance to Assessment
	97 for the Assessment and Rating of Wind Turbine Noise'[13] (IOA GPG, 2013)	provides guidance on background data collection, data analysis and limit derivation, noise predictions, cumulative issues, reporting requirements and other matters such as noise related Development Consent Order (DCO) requirements.
	British Standard BS 4142:2014+A1:2019 'Methods for Rating and Assessing Industrial and Commercial Sound'[14] ('BS 4142')	Provides guidance on the assessment and rating of industrial and commercial noise.
	British Standard 5228-1: 2009+A1:2014[15] 'Code of practice for noise and vibration control on construction and open developments - Noise' ('BS 5228')	Provides guidance on controlling noise from construction and demolition sites and is a recognised Code of Practice to support COPA 1974.
	British Standard 5228-2: 2009+A1:2014[16] 'Code of practice for noise and vibration control on construction and open developments - Vibration'	Provides guidance on controlling vibration from construction and demolition sites and is a recognised Code of Practice to support COPA 1974.
	Calculation of Road Traffic Noise[17]	Provides a method for the prediction and measurement of noise levels from road traffic.

[13] Institute of Acoustics. Good Practice Guidance on the application of ETSU-R-97 for wind turbine noise assessment. 2013.
[14] British Standards Institute. Methods for Rating and Assessing Industrial and Commercial Sound. UK : BSI, 2014. BS4142:2014 + A1:2019.
[15] Code of Practice for Noise and Vibration Control on Construction and Open Sites. Noise. BSI, 2014. BS 5228:2009 +A1:2014.
[16] Code of Practice for Noise and Vibration Control on Construction and Open Sites. Vibration. BSI, 2014. BS 5228:2009 +A1:2014.
[17] Department of Transport and Welsh Office (1988) Calculation of Road Traffic Noise. London: Her Majesty's Stationery Office.

Type	Name	Relevance to Assessment
	Design Manual for Roads and Bridges[18]	Provides requirements and advice for the design, assessment and operation for UK roads.
	PPG for Noise[19]	Provides useful additional detail regarding the relationship between noise effect levels, their associated responses and the required action set out in the NPPF. Also, refers to noise from wind energy developments being considered in the PPG on Renewable and Low Carbon Energy and ETSU-R-97.
	PPG for Renewable and Low Carbon Energy[20]	Guidance that helps Local Planning Authorities in developing policies for renewable and low carbon energy and to help identify the planning considerations for such developments. Refers to ETSU-R-97.
Local Guidance	West Yorkshire Planning Consultation Guidance – Noise & Vibration (May 2016)[21]	Provides a framework for assessing and managing noise and vibration proposals within West Yorkshire. Note: It has not been possible to access this guidance document, and as such it has not been used to inform the PEIR. Where possible, the document will be used to inform the ES.

[18] Highways Agency, Transport Scotland, Welsh Government and Department for Regional Development Northern Ireland (2011) Design Manual for Roads and Bridges: Volume 11, Section 3, Part 7 – HD 213/11 Noise and Vibration.
[19] Ministry of Housing, Communities and Local Government (2019) Noise. Available at: www.gov.uk (Accessed: 23 February 2026).
[20] Ministry of Housing, Communities and Local Government (2023) Renewable and low carbon energy. Available at: www.gov.uk (Accessed: 23 February 2026).
[21] West Yorkshire Noise Officers Group (2016) West Yorkshire Planning Consultation Guidance: Noise & Vibration.

15.3 Scoping and Stakeholder Engagement

2025 Scoping Opinion

15.3.1 In September 2025, a request for a Scoping Opinion was submitted alongside a Scoping Report to the Planning Inspectorate (PINS) under the EIA Regulations. The Scoping Opinion forms the primary statutory basis for defining the scope of the EIA. **Table 15-2** presents the details of the PINS Scoping Opinion relevant to Noise and Vibration and confirms how these have been addressed within the proposed scope of assessment.

Table 15-2: Consideration of PINS Scoping Opinion

Consultee	PINS ID	Summary of Scoping Opinion	Consideration within Proposed Scope of Assessment
PINS	3.8.1	The Scoping Report sets out findings from a number of reports to demonstrate that significant effects from infrasound and low frequency noise is unlikely. The Scoping Report does not confirm whether other elements of the Proposed Development could generate low frequency noise and or infrasound, this should be confirmed in the ES and assessment provided, where significant effects are likely to occur. The ES should consider the potential of significant effects from components cumulatively.	With regards to low frequency noise from operational wind turbines, EN-3 states: "*There is currently no evidence that ground transmitted vibration, infrasound or low frequency noise from wind turbines occurs at a sufficient level to be harmful to human health. Therefore, the Secretary of State should give no weight to claims of harm to human health as a result of ground transmitted vibration, infrasound or low frequency noise".* As such, low frequency or infrasound from the wind turbines has been scoped out of assessment. Notwithstanding this, a detailed discussion of infrasound and low frequency noise from wind turbines is included within Section 3.2 of **Appendix 15-2: Wind Turbine Operational Noise Report**, which provides a summary

Consultee	PINS ID	Summary of Scoping Opinion	Consideration within Proposed Scope of Assessment
			of current research and findings on the topic detailing why the assessment is not necessary. The predictions and assessment of noise from construction activities and from the operation of the proposed substation consider frequencies from 63 Hz through to 10,000 Hz. No low frequency noise below this range is anticipated.
	3.8.2	The Scoping Report notes the lack of industry wide methodology for the assessment of amplitude modulation. This is not, in itself a reason to scope this matter out. A final layout is also not known at this stage. The Applicant is encouraged to discuss this matter with the relevant consultation bodies to seek further agreement to scope this matter out should it be agreed that significant effects are unlikely. The Inspectorate is unable to agree to scope this matter out at present.	Detailed discussion of Amplitude Modulation (AM) is included within Section 3.2 of **Appendix 15-2: Wind Turbine Operational Noise Report**. A summary of current research and findings on the topic is provided, which concludes that specific assessment of AM is not necessary, and it is therefore scoped out.
	3.8.3	The Scoping Report refers to a report undertaken in Scotland on vibration. The information provided however does not set out the distance at which	This comment relates to operational vibration, which is considered (though not assessed), along with infrasound and low frequency noise, within Section 3.2 of **Appendix 15-**

Consultee	PINS ID	Summary of Scoping Opinion	Consideration within Proposed Scope of Assessment
		vibration will be experienced. Based on the limited information provided, the Inspectorate is unable to agree to scope this matter out. The ES should clarify the distance at which vibration is experienced (for example at source) and provide evidence of no significant effects.	**2: Wind Turbine Operational Noise Report.** As stated above, EN-3 states: "*There is currently no evidence that ground transmitted vibration, infrasound or low frequency noise from wind turbines occurs at a sufficient level to be harmful to human health. Therefore, the Secretary of State should give no weight to claims of harm to human health as a result of ground transmitted vibration, infrasound or low frequency noise".* As such, vibration from the operational wind turbines has been scoped out of assessment.
	3.8.4	The Scoping Report states that no vibration inducing construction activities are to be taken place in proximity of sensitive receptors. At present there is little information pertaining to where activities would take place and where construction compounds for example would be required. Furthermore, no information on machinery to be used has been provided. The Scoping Report goes on to state that the Construction Environmental Management Plan (CEMP) would secure	Discussion of construction vibration is included within **Appendix 15-1: Construction Noise and Vibration Report**.

Consultee	PINS ID	Summary of Scoping Opinion	Consideration within Proposed Scope of Assessment
		vibration levels at residential properties. At this time, this is not secured. The ES should set out this information and should this enable a conclusion of no significant effects, this matter can be scoped out.	
	3.8.5	The Scoping Report does not set out decommissioning requirements and limited information is provided for the construction phase. The Inspectorate therefore does not agree to scope this matter out at this time.	Decommissioning noise is scoped in and considered alongside construction noise in Section 3.7 of **Appendix 15-1: Construction Noise and Vibration Report**.
	3.8.6	The Scoping Report notes noise effects from cable corridor route construction to be negligible. The Scoping Report includes cable corridor search areas with little information on nearby sensitive receptors. The ES should assess impacts on any sensitive receptors and secure any required mitigation to enable this matter to be scoped out.	Construction noise from works along the Bradford West Cable Corridor is considered within the construction noise assessment, the full detail of which is provided in **Appendix 15-1: Construction Noise and Vibration Report**.
	3.8.7	The Inspectorate is content to scope out operation noise of the cable corridor noting that maintenance works to the cable during the	Noted that operational noise associated with the Bradford West Cable Corridor is agreed to be scoped out.

Consultee	PINS ID	Summary of Scoping Opinion	Consideration within Proposed Scope of Assessment
		operation period will be limited.	
	3.8.8	The Inspectorate is content that the level of operational traffic, whilst not specifically set out in the scoping report is likely to be infrequent maintenance activities and therefore unlikely to result in significant effects.	Noted that noise from operational traffic movements is agreed to be scoped out.
	3.8.9	The Scoping Report focusses on vibration from the windfarm however the EIA should consider vibration from all sources including traffic, the BESS and machinery unless it can be demonstrated that such effects would not be significant with agreement from the relevant consultation bodies.	The BESS has been removed from the Proposed Development. Vibration from traffic and machinery is considered in **Appendix 15-1: Construction Noise and Vibration Report**.
	3.8.10	This figure shows a previous iteration of the Proposed Development comprising a greater number of turbines, the ES should ensure that all figures and assessment relate to the latest layout for which development consent is being sought.	The wind farm layout for the purposes of the PEIR is shown on **Figure 4-1** and **Figure 4-2** and this has informed the preliminary assessment of effects presented in this Chapter.

15.3.2 A series of comments/responses were also received from other stakeholders as part of the 2025 Scoping Opinion. These are summarised, alongside responses to the points raised, in **Table 15-3** below.

Table 15-3: Consideration of Scoping Responses

Consultee	Summary of Scoping Opinion Response	Consideration within Scope of Assessment
Blackshaw Parish Council, on behalf of Stronger Together	Raised concerns with regard to the impact of BESS noise on the disturbance of ecological and ornithological habitats. Raised concerns regarding tonal noise and AM and that AM should be scoped in.	The BESS has been removed from the Proposed Development. Detailed discussion of AM is included within Section 3.2 of **Appendix 15-2: Wind Turbine Operational Noise Report**. A summary of current research and findings on the topic is provided, which concludes that specific assessment of AM is not necessary, and it is therefore scoped out.
Bradford Council	The Environmental Health Officer (EHO) officer agreed to the proposed Noise Monitoring Locations (NMLs) and attended the installation of NML6. A request was made that the noise assessments should reference the *'West Yorkshire Planning Consultation Guidance, Noise & Vibration'* (2016).	It has not been possible to access the *'West Yorkshire Planning Consultation Guidance, Noise & Vibration'* (2016), and as such it has not been used to inform the PEIR. Where possible, the document will be used to inform the ES.
Calderdale Council	A detailed consultation response was provided by the Council. The Council did not agree to the following topics being scoped out:	-
	Decommissioning noise	Decommissioning noise has been scoped in. Decommissioning noise levels are anticipated to be no greater than construction noise levels, as discussed in Sections 15.4.35-15.4.37. As such, the assessment of construction noise effects is

Consultee	Summary of Scoping Opinion Response	Consideration within Scope of Assessment
		considered to be representative of worst-case decommissioning noise effects. Further assessment of decommissioning will be provided in the ES.
	Vibration (Construction and Decommissioning Phases)	Discussion of construction and vibration is included within **Appendix 15-1: Construction Noise and Vibration Report**. Decommissioning vibration levels are anticipated to be no greater than construction vibration levels. As such, the assessment of construction vibration effects is considered to be representative of worst-case decommissioning noise effects. Further assessment of decommissioning will be provided in the ES.
	Infrasound and Low Frequency Noise	No assessment is provided of low frequency or infrasound from the wind turbines, as this is not required. As stated above, EN-3 states: "*There is currently no evidence that ground transmitted vibration, infrasound or low frequency noise from wind turbines occurs at a sufficient level to be harmful to human health. Therefore, the Secretary of State should give no weight to claims of harm to human health as a result of ground transmitted vibration, infrasound or low frequency noise".* Notwithstanding, a detailed discussion of infrasound and low frequency noise from wind turbines is included within Section 3.2 of **Appendix 15-2: Wind Turbine Operational Noise Report**, which provides a

Consultee	Summary of Scoping Opinion Response	Consideration within Scope of Assessment
		summary of current research and findings on the topic detailing why the assessment is not necessary.
	Amplitude Modulation	Detailed discussion of AM is included within Section 3.2 of **T Appendix 15-2: Wind Turbine Operational Noise Report**. A summary of current research and findings on the topic is provided, which concludes that specific assessment of AM is not necessary.
	Cable Corridor Route (Construction)	Construction noise from works along the Bradford West Cable Corridor is considered within **Appendix 15-1: Construction Noise and Vibration Report.**
	Assessment of users of bridleways/PRoW	A preliminary assessment is included within **Appendix 15-2: Wind Turbine Operational Noise Report**.
Colne Town Council	It is understood that the final turbine locations are not yet known, once these are, then any studies on noise and vibration will need to be restarted.	A preliminary assessment based on the layout for the purposes of the PEIR is provided in **Figure 4-1** and **Figure 4-2** and this has informed the preliminary assessment presented within this Chapter. The noise assessment for the final turbine locations (subject to micro-siting) will be included within the ES.
Environment Agency	The EIA should include impacts from noise and vibration associated with construction on fish and aquatic ecology.	**Chapter 8: Biodiversity** considers impacts on ecological species, and notes with regards to fish and aquatic wildlife that further survey work is required before detailed assessment can be undertaken. This topic will therefore be considered as part of the ES, once the required

Consultee	Summary of Scoping Opinion Response	Consideration within Scope of Assessment
		baseline surveys have been completed/updated.
National Grid	The response noted that the operation of National Grid infrastructure can produce noise and that this should be considered appropriately for new noise sensitive developments.	Operational noise from the proposed substation is considered in **Appendix 15-3: Operational Substation Noise Impact Assessment**. Operational noise from the Bradford West Cable Corridor has been agreed to be scoped out of the assessment by PINS (see above).
Natural England	The noise assessment should consider the noise impacts on the birds and set this in the context of the existing noise environment (level change and noise type).	Potential impacts on birds from noise (and other matters) has been qualitatively considered as part of **Chapter 9: Ornithology**.
	Impacts should be assessed on National Trail users including noise impacts.	A preliminary assessment is included within **Appendix 15-2: Wind Turbine Operational Noise Report**.
Wadsworth Parish Council	Raised concerns about overcrowding of turbines and potential noise and vibration implications.	Site design and turbine interspacing forms a key part of the design process and further details are provided in **Chapter 5: Alternatives and Design Evolution**. A preliminary assessment of noise and vibration impacts is presented in this Chapter and a final assessment will be reported as part of the ES.

Further Stakeholder Engagement

15.3.3 An overview of other engagement (beyond the PINS Scoping Opinion) undertaken to date for noise, and how this has informed the scope of the assessment, is provided in **Table 15-4** (as set out below).

Table 15-4: Other Engagement Undertaken

Consultee	Type and Date	Summary of Discussion	Discussion Response
Calderdale Council	Noise consultation letter to provide further information on the proposed methodologies and background noise monitoring locations (25 February 2025).	No response was received.	N/A
Burnley Borough Council	Noise consultation letter to provide further information on the proposed methodologies and background noise monitoring locations (25 February 2025).	No response was received.	N/A
Pendle Council	Noise consultation letter to provide further information on the proposed methodologies and background noise monitoring locations (24 February 2025).	The Environmental Health Officer (EHO) requested the address of the receptors identified within the Pendle Council area.	Addresses were provided by TNEI on 25 February 2025.
	Following this, a short telephone call was arranged to discuss the approach to the background noise survey.	A call took place on 26 February 2025 to discuss the survey approach.	The call detailed the proposed monitoring locations and survey methodology (ETSU-R-97), which were agreed as appropriate.
	TNEI contacted the EHO via email on 10 March 2025 to notify them that the background noise survey was due to commence and to invite the EHO to attend.	The EHO confirmed they were unable to attend the equipment installation.	N/A

Consultee	Type and Date	Summary of Discussion	Discussion Response
Bradford Council	Noise consultation letter to provide further information on the proposed methodologies and background noise monitoring locations (25 February 2025).	The EHO responded to the letter to confirm their stance on several questions asked as part of the consultation letter, relating to the proposed assessment methodology.	The EHO confirmed approval of the use of BS5228 for the assessment of construction noise, and that decommissioning noise can be scoped out. The EHO confirmed approval of the use of ETSU-R-97 and the IOA GPG for operational wind turbine noise, and the proposed approach to noise limits. The EHO confirmed approval of the general locations of proposed noise monitoring locations and expressed interest in attending the equipment installation. The EHO confirmed that they were not aware of any other cumulative wind developments in the area, other than those identified in the Scoping Report.

Consultee	Type and Date	Summary of Discussion	Discussion Response
			Correspondence between TNEland the EHO is included within **Appendix 15-2: Wind Turbine Operational Noise Report**.
Bradford Council	Email correspondence dated 10 – 12 March 2025	The EHO was invited to attend the installation of the noise monitoring equipment located within the Bradford Council area (NML6 and NML7).	The EHO accepted the invitation and attended the installation of the equipment at NML6. During the site visit, the EHO confirmed their approval of the choice of NML. Correspondence between TNEI and the EHO is included within **Appendix 15-2: Wind Turbine Operational Noise Report**.

15.4 Assessment Methodology

15.4.1 A summary is provided below with further details in the relevant Technical Appendices.

Study Area – Construction and Decommissioning Noise

15.4.2 The study area for the construction noise assessment is defined through the identification of the closest residential Noise Sensitive Receptors (NSRs) to the Proposed Development, on the assumption that if noise levels are acceptable at the closest receptors, then they should also be acceptable at more distant locations.

15.4.3 The study area for the construction and decommissioning noise assessment is shown in **Figure 15-1**.

Study Area – Construction Traffic Noise

15.4.4 The study area for the construction traffic noise assessment is based on those roads that are expected to experience increased traffic flows associated with the construction of the Proposed Development and aligns with the study area described in **Chapter 14: Transport and Access.**

15.4.5 The study area for the construction traffic noise assessment covers the roads detailed in Figure 6 of **Appendix 14-1: Transport Assessment**.

Study Area - Operational Wind Turbine Noise

15.4.6 Prior to the commencement of the baseline noise survey, initial desktop noise modelling was undertaken using EMD WindPRO software[22] to identify the nearest residential NSRs likely to be affected by the operation of the Proposed Development.

15.4.7 The indicative wind turbine layout presented at the non-statutory consultation stage was input into the modelling software and, using noise data for a candidate turbine representative of the type that could be installed on the site[23], a noise contour plot was produced. The noise contour plot indicated wind turbine noise levels surrounding the Turbine Area, and all properties or clusters of properties within the 35 dB(A) noise contour were identified.

15.4.8 This 35 dB(A) noise contour provides the basis for determining an appropriate study area, which considers all NSRs within the contour. The study area for the operational noise assessment of the wind turbines is shown in **Figure 15-2**.

Study Area – Operational Substation Noise

15.4.9 The study area for the operational noise assessment of the onsite substation is defined through the identification of the closest residential NSRs to the onsite substation, on the assumption that if noise levels are acceptable at the closest receptors, then they should also be acceptable at more distant locations.

15.4.10 The study area for the operational noise assessment of the onsite substation is shown in **Figure 15-4**.

Study Area – Use of NALs

15.4.11 Noise Assessment Locations (NALs) are the points at which noise levels are calculated and assessed. Typically, a representative sample of assessment locations is defined for each noise effect assessment outlined above, which are

[22] EMD International (2025) *WindPro 4.2*.
[23] Candidate turbine used for predictions is the Vestas V162 7.2MW with a 119 m hub and 200 m tip.

chosen to represent the noise immission levels at the closest individual or group of NSRs.

15.4.12 For the construction noise assessment, a total of 42 Construction Noise Assessment Locations (CNALs) have been considered. These are shown in **Figure 15-1**. CNAL coordinates are included in **Appendix 15-1: Construction Noise and Vibration Report**.

15.4.13 For the operational noise assessment of the wind turbines, a total of 49 NALs have been considered. These are shown in **Figure 15-2**. NAL coordinates are included in **Appendix 15-2: Wind Turbine Operational Noise Report**.

15.4.14 For the operational noise assessment of the onsite substation, a total of three Substation Noise Assessment Locations (SNALs) have been considered. These are shown in **Figure 15-4**. SNAL coordinates are included in **Appendix 15-3: Operational Substation Noise Impact Assessment**.

Sources

15.4.15 Data has been gathered from a number of sources to inform the baseline conditions within the study areas defined above. Sources comprise the following, and are referenced throughout the Chapter where required:

- Initial noise predictions undertaken using WindPro noise modelling software, to determine the likely extent of operational wind turbine noise impacts from the Proposed Development to define a study area;
- Baseline Survey undertaken by TNEI at nine NMLs from March 2025 to May 2025 to measure current baseline noise levels (and rainfall) to inform all of the noise effect assessments; and
- Wind speed and direction data measured by the Applicant using a Light Detection and Ranging (LiDAR) located within the Turbine Area (at 399645, 433691), used to inform the baseline noise survey.

Methodology

Assessment Methodology: Use of Observable Adverse Effects Levels

15.4.16 The Noise Policy Statement for England (NPSE) sets out the long-term vision of Government noise policy and should apply to all forms of noise, including environmental noise, neighbour and neighbourhood noise. The NPSE refers to "environmental noise" with the key aims being to:

- *"Avoid significant adverse impacts on health and quality of life while taking into account the guiding principles of sustainable development;*

- *Mitigate and minimise adverse impacts on health and quality of life; and*
- *Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development".*

15.4.17 The NPSE also introduces the use of concepts from toxicology, as used by the World Health Organisation for the quantification of noise impacts:

"*NOEL – No Observed Effect Level*

This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected.

An extension of these two concepts leads the Noise Policy Statement for England to the introduction of a third concept, a significant observed adverse effect level.

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur".

15.4.18 Expanding on the concept of SOAEL, the NPSE goes on to state:

"It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise. However, not having specific SOAEL values in the Noise Policy Statement for England provides the necessary policy flexibility until further evidence and suitable guidance is available."

15.4.19 Accordingly, it is necessary for the assessor to refer to additional guidance to help define a level(s) for SOAEL and the other effects levels. It is also necessary to consider the context of a development to define a level for SOAEL.

15.4.20 PPG: Noise has been issued by the Government specifically for noise, and *PPG: Noise* largely reaffirms the messages set out in both the NPPF and the NPSE with regard to quantifying the impact of noise, stating:

"Plan-making and decision making need to take account of the acoustic environment and in doing so consider:

- whether or not a significant adverse effect is occurring or likely to occur;
- whether or not an adverse effect is occurring or likely to occur; and
- whether or not a good standard of amenity can be achieved."

15.4.21 PPG: Noise provides useful additional detail regarding the relationship between the noise effect levels, their associated responses and the required action set out in the NPPF. **Table 15-5** summarises the noise exposure hierarchy, based on the likely average response of those affected.

Table 15-5: Noise Exposure Hierarchy Table

Response	Examples of Outcomes	Increasing Effect Level	Action
No Observed Effect Level (NOEL)			
Not present	No Effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level (NOAEL)			
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level (LOAEL)			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response (e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise). Potential for	Observed Adverse Impact	Mitigate and reduce to a minimum

Response	Examples of Outcomes	Increasing Effect Level	Action
	some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.		
Significant Observed Adverse Effect Level (SOAEL)			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response (e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise). Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid

15.4.22 Assigning a value to SOAEL (and other effects levels) that can then be used to determine the significance of effects, is usually possible with reference to British Standards and other similar guidance documents;

- BS 5228 can be used for construction noise;
- BS 4142 can be used for operational substation noise; and
- LA111 (rev2) Design Manual for Roads and Bridges (DMRB) can be used for road traffic noise.

15.4.23 This approach, however, cannot be applied to the assessment of operational wind turbine noise, which compares noise levels to the ETSU-R-97 noise limits; an exceedance of the limit is classed as a significant effect, whilst noise levels that are below the limits are classed as not significant.

Assessment Methodology: Construction and Decommissioning Noise

15.4.24 The assessment of construction and decommissioning noise was undertaken using guidance contained in BS 5228.

15.4.25 The prediction of construction (and decommissioning) noise levels was undertaken using the calculation methodology presented in ISO 9613-2:2024[24], using the source noise level data for assumed plant and activities from BS 5228. Although BS 5228 contains its own calculation methodology, the standard states that caution is required when predicting noise using the BS 5228 model at distances greater than 300 m from the source, whereas the ISO 9613 prediction model is verified for much greater distances, such as those that occur between the construction and deconstruction working areas/locations and the nearest NSRs.

15.4.26 The assessment process can be summarised as follows:

- Identify the nearest NSRs to potential construction activities and select representative CNALs[25] (also applicable to decommissioning);
- Quantify the Ambient Noise Level (dB $L_{Aeq(t)}$) in the vicinity of the NSRs;
- Based on the Ambient Noise Level, determine appropriate threshold values, as detailed in BS 5228, for each NAL;
- Predict the noise immission levels at each NAL for various construction activities or periods (as applicable to decommissioning);
- Compare the predicted noise levels against the threshold values to determine the likelihood for significant effects;
- Where necessary, develop suitable additional mitigation measures to reduce any significant effects during the construction and decommissioning phases; and
- Assess any residual effects taking into account any identified mitigation.

15.4.27 Throughout the construction period, activities and plant, as well as any associated construction traffic, would influence the noise generated. However, the final selection of plant and equipment to be used, and the timetable that would be employed, would be determined by the appointed contractor(s) and detailed

[24] International Standards Organisation, ISO9613-2: 2024 'Acoustics - Attenuation of sound during propagation outdoors Part 2: Engineering method for the prediction of sound pressure level outdoors'.
[25] Note that the term CNAL has been used for NALs during decommissioning as well as construction

arrangements for onsite management would be decided at that time. This preliminary assessment has, therefore, been based upon an assumed typical selection of plant for a wind farm development of this size and considers a number of construction/decommissioning scenarios that have been modelled to represent the likely noisiest activities that would occur across each quarter of the construction/decommissioning phase.

15.4.28 For each scenario, plant and/or construction activities have been modelled located in the closest activity areas to each NAL, whereas in reality, plant will move around the Proposed Development and for much of the time would be operating at more distant locations.

15.4.29 The core hours for construction/decommissioning activity are anticipated to be 07:00 – 18:00 Monday to Friday and 08:00 – 14:00 on Saturdays, with no working on Sundays or Bank Holidays.

15.4.30 Notwithstanding the above, a requirement for out-of-hours work could arise, for example, from delivery and unloading of abnormal invisible loads (AILs), concrete pouring and finishing works, Horizontal Directional Drilling (HDD) works, or to ensure optimal use is made of fair weather windows for the erection of turbine blades. These activities will typically be short term in nature, occurring for less than one continuous month. Where a need for out-of-hours work is required, this would be approved in the final CEMP prior to construction commencing.

15.4.31 However, there may also be a requirement for some plant to be operational during night-time for longer periods, for example, use of a portable generator to provide lighting for site compounds. Accordingly, a night-time scenario has also been considered within the preliminary assessment to consider noise from the Proposed Development when no specific works are taking place.

15.4.32 **Chapter 4: The Proposed Development** outlines the tasks that will be undertaken during the construction period, which is estimated to last 30 months. For the purposes of the preliminary assessment, noise modelling has been undertaken for 11 construction phases, each representing the activities undertaken during one quarter during the course of 2029 to 2032. Each modelled quarter simulates the likely overlap of several tasks that will occur throughout the construction stage, and the bullets below provide an overview of the activities modelled, based on an anticipated worst-case:

- Quarter 4 2029: Initial construction activity is underway, with enabling works beginning for the Western Access Route at the A6088 and Eastern Access Route at Cold Edge Road;

- Quarter 1 2030: The Access Routes upgrades continue along Lancashire Moor Road and Hill House Edge Lane respectively towards the Turbine Area with progression from initial main road junctions, access tracks continue being laid and upgrades to existing roads continue heading closer to the Turbine Area;
- Quarter 2 2030: Final construction activity for both Access Routes are completed and reach the respective entrances into the Turbine Area;
- Quarter 3 2030: Construction compound 1 and its associated internal site access track is completed and construction of other internal site access tracks, including access track to substation compound and main site compound. Construction of onsite substation and turbine bases begin;
- Quarter 4 2030: Construction of internal site access tracks is complete, and concrete batching plant is constructed and becomes operational. Onsite substation construction continues;
- Quarter 1 2031: Construction of turbine bases continue. Substation construction continues and onsite cabling installation begins. Works at the Point of Connection with Bradford West Substation begin;
- Quarter 2 2031: Construction of turbine bases continues. Substation construction continues and onsite cabling installation completed. Initial deliveries of wind turbines begins. Works at the Point of Connection at Bradford West Substation continue and export cabling installation begins. Trenchless (e.g. Horizontal Directional Drilling) works begin along the Bradford West Cable Corridor.
- Quarter 3 2031: Construction of the onsite substation is nearing completion, with the export cabling installation continuing. Works at the Point of Connection at Bradford West Substation continue alongside the wind turbine deliveries. Trenchless (e.g. Horizontal Directional Drilling) works continue to be used along the Bradford West Cable Corridor.
- Quarter 4 2031: Construction of the onsite substation buildings are completed and electrical equipment deliveries begin. Work on export cabling route continues and works at the Point of Connection at Bradford West Substation continue. Wind turbine deliveries continue and the installation of wind turbines begins. Trenchless (e.g. Horizontal Directional Drilling) works continue along the Bradford West Cable Corridor.
- Quarter 1 2032: Electrical equipment is fully brought onto site for the substation and works at the Point of Connection with Bradford West Substation near completion. Wind turbine installation continues.

- Quarter 2 2032: Works at Bradford West Substation are completed and the onsite substation undergoes commissioning. Wind turbine installation is completed and commissioning begins.

15.4.33 In addition to the above, a 'Night-time' scenario has also been included to model noise from generators located within the construction compounds, to provide power to lighting and buildings. This scenario does not model any specific night-time works.

15.4.34 More detailed descriptions of the construction activities are provided in **Appendix 15-1: Construction Noise and Vibration Report**. It is noted that the anticipated activities and their duration will be refined further and where required, an updated assessment will be presented in the ES. The CEMP will be approved prior to construction commencing.

15.4.35 **Chapter 4: The Proposed Development** sets out that decommissioning would primarily consist of dismantling and removal of infrastructure. Such activities would use far less plant than construction, for example, cranes and excavators would still be required for moving turbine and substation parts, but the earth-moving equipment required to reinstate the land to its baseline condition would be much reduced. Although the modelled scenarios relate to the construction phase of the Proposed Development only, it is reasonable to assume that noise levels from decommissioning works would be similar or less than those generated during the construction phase, as similar, or less plant would be required.

15.4.36 It is noted that in the Scoping Response from Calderdale Council, the EHO states: "Decommissioning should be considered as there will removal of concrete and possibly using a pecking method which will amplify around the valley". Concrete breaking is not anticipated and **Chapter 4: The Proposed Development** states "The turbine foundations and cabling are likely to remain in-situ".

15.4.37 As such, it is considered that the modelling of construction noise can also be used for the assessment of decommissioning noise, and that the conclusions of the construction noise assessment also apply to the decommissioning phase.

15.4.38 Table E.1 of BS 5228-1 (represented here as **Table 15-6**) contains an example of the significance criteria that can be used to assess construction noise for residential receptors.

15.4.39 Three categories of thresholds are provided for varying assessment periods (night-time, evenings, weekends). The appropriate category for any given receptor can be chosen after quantifying the existing ambient noise levels (rounded to the nearest 5 dB) at that location for the given assessment period. BS 5228 provides the following advice regarding the thresholds:

"Note 1: A potential significant effect is indicated if the LAeq,T noise level arising from the site exceeds the threshold level for the category appropriate to the ambient noise level.

Note 2: If the ambient noise level exceeds the Category C threshold values given in the Table (i.e. the ambient noise level is higher than the above values), then a potential significant effect is indicated if the total LAeq,T noise level for the period increases by more than 3 dB due to site noise.

Note 3: Applied to residential receptors only."

15.4.40 Therefore, the assessment of construction noise reflects a specific noise threshold for the locality for a particular period of the day, rather than an absolute noise level limit.

Table 15-6: Construction Noise Threshold Values

Assessment Category and Threshold Value Period	Threshold Value $L_{Aeq,T}$ dB		
	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

(A) Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values;
(B) Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values;
(C) Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than category A values; and
(D) Evenings and Weekends - 19:00-23:00 weekdays, 13:00-23:00 Saturdays and 07:00 – 23:00 Sundays.

15.4.41 The assessment of construction noise is made against the threshold levels set in BS 5228, which cannot be used to determine a magnitude of impact. Rather, the assessment indicates the potential for a significant effect to occur and then additional factors, such as duration of exposure, need to be considered. Although not explicit, BS 5228 suggests that a duration of exposure to noise levels above the thresholds for more than one month is likely to be significant.

Construction and Decommissioning Traffic Noise

15.4.42 Although BS 5228 provides a method for calculating noise from a moving noise source (i.e. mobile plant), there is no specific guidance available for the assessment of noise from construction traffic travelling outwith a designated construction area, for example, on public roads. A bespoke assessment methodology has therefore been derived, drawing on guidance presented in Calculation of Road Traffic Noise (CRTN) and DMRB.

15.4.43 CRTN provides a methodology for the prediction of road traffic noise, which can be undertaken with due consideration of traffic flows, vehicle speed, percentage of Heavy Goods Vehicles (HGVs), road surface and gradient.

15.4.44 DMRB provides a methodology for the assessment of road traffic noise on new or upgraded trunk roads. It provides guideline noise levels for road traffic for the short-term (i.e., when a new road is first opened) and for the long-term, situation[26]. For the preliminary assessment, the short-term recommendations/criteria have been used, as all traffic noise associated with the construction of the Proposed Development will be temporary in nature.

15.4.45 Traffic count data and predicted traffic flow numbers are as detailed in **Chapter 14: Transport and Access** and **Appendix 14-1,** including traffic count data scaled up to provide estimated traffic flows for the construction period (assumed to be commencing in 2029, with peak levels in 2031). The traffic count locations are included in Figure 8 of **Appendix 14-1**.

15.4.46 The assessment methodology follows a three-step process, as follows:

- Scoping – to differentiate between road sections that need further assessment and road sections where negligible/not significant noise impacts will occur;
- Stage 1 Simple Assessment – to determine whether road traffic noise is above or below a threshold where adverse effects may occur (the Lowest Observable Adverse Effects Level (LOAEL)); and
- Stage 2 Detailed Assessment – To determine the magnitude of change for road sections where the LOAEL is exceeded.

15.4.47 For each road section to be assessed, the baseline traffic flow is compared to the predicted traffic flow. In this case the data has been provided as 24 hour, Average Annual Daily Traffic data.

15.4.48 It is generally recognised that an increase in traffic flow of 25% or a decrease in traffic flow of 20% results in a noise level change of 1 dB, and in respect of the

[26] DMRB considers the long-term situation to be 15 years.

Scoping stage, DMRB states: *"is the project likely to cause a change in the BNL[27] of 1dB $L_{A10,18hr}$ in the do-minimum opening year (DMOY) compared to the do-something opening year (DSOY)?"*.

15.4.49 In this case the DMOY is taken as the baseline traffic flow in 2031 without the Proposed Development and the DSOY is the 2031 baseline traffic flow plus Proposed Development construction traffic. 2031 has been chosen as this represents the construction year with the highest anticipated traffic movements.

15.4.50 Where road sections are determined to have an increase in traffic flow of less than 25%, no further assessment is required, as any increase in traffic flow will be negligible/not significant in terms of noise (i.e. less than a 1 dB change). In this instance, construction traffic effects would be considered Not Significant.

15.4.51 Where road sections are determined to have an increase in traffic flow of 25% or more, the assessment moves on to the Stage 1 Simple Assessment, which requires road traffic noise levels to be calculated and compared to the LOAEL, which is specified in DMRB.

15.4.52 If the Stage 1 simple assessment indicates noise levels above the LOAEL then the assessment moves on to Stage 2 Detailed Assessment, which considers the 'Magnitude of Change' by comparing baseline noise levels with the predicted noise levels. The preliminary assessment reported in this Chapter is based on the traffic data derived from the current design for the Proposed Development. As this will be further refined following the design fix, an updated assessment will be presented in the ES.

15.4.53 Traffic count data for the decommissioning of the Proposed Development is not available, therefore a detailed assessment of decommissioning noise cannot be undertaken at this stage. However, the number of vehicle movements is anticipated to be the same or lower than those required for construction, therefore where the construction traffic noise assessment concludes the effects are Not Significant, this will apply to decommissioning traffic noise also.

Operational Wind Farm Noise

15.4.54 The NPS EN-3 states in section 2.12.104 that the assessment of noise from operational wind turbines should use ETSU-R-97, taking account of industry good practice and referencing the IOA GPG specifically. EN-3 also notes that references to these documents are inclusive of any updated, successor or supplementary guidance endorsed or published by the Government.

[27] Baseline noise level

15.4.55 In England, the PPG 'Planning for renewable and low carbon energy'[28] states:

"The report, ETSU-R-97: The assessment and rating of noise from wind farms should be used by local planning authorities when assessing and rating noise from wind energy developments. Good practice guidance on noise assessments of wind farms has been prepared by the Institute of Acoustics. The Department for Energy Security and Net Zero accept that it represents current industry good practice and endorses it as a supplement to ETSU-R-97. It is available on the Department for Energy Security and Net Zero's website."

15.4.56 In June 2024, DESNZ awarded a contract to Noise Consultants Limited to update ETSU-R-97. A draft update of new guidance 'Assessment and Rating of Wind Turbine Noise'[29] (2025) was published for consultation on 4 July 2025. Given the draft status of the guidance and the recommendations included on the front page of the draft document itself (reproduced below), the consultation draft has not been considered further in this assessment. The Consultation document states:

"This draft guidance update does not represent a final position from government. It should not be used by local planning authorities during or after the consultation period in relation to ongoing planning applications. Following this consultation, we will analyse responses and issue a formal government response. Until this time, the current guidance remains suitable for assessing wind turbine noise. Planning authorities should continue to use existing guidance and are advised not to delay planning decisions on the basis of this consultation."

15.4.57 There is no confirmed date for the publication of final guidance.

15.4.58 Accordingly, the wind farm operational noise preliminary assessment has been undertaken in accordance with ETSU-R-97. ETSU-R-97 provides a robust basis for determining acceptable noise limits for wind farm developments.

15.4.59 Section 2.12.163 of EN-3 states:

"Where the correct methodology has been followed and a wind farm is shown to comply with ETSU-R-97 recommended noise limits, the Secretary of State should give no weight to adverse noise impacts from the operation of the wind turbines."

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[28] Government (2023). Guidance 'Renewable and low carbon energy'. Available at: https://www.gov.uk/guidance/renewable-and-low-carbon-energy#wind-turbines. Date Accessed: 30/11/2025.

[29] Department for Energy Security and Net Zero (2025). Assessment and rating of wind turbine noise guidance: proposed updates. Available from: https://www.gov.uk/government/consultations/assessment-and-rating-of-wind-turbine-noise-guidance-proposed-updates (last accessed 04/12/2025).

15.4.60 Consequently, the test applied to operational noise is whether or not the calculated wind farm noise levels at nearby noise sensitive properties would be below the noise limits derived in accordance with ETSU-R-97 and this is used to inform the assessment of likely significant effects.

15.4.61 Limits differ between daytime and night-time periods. The daytime criteria are based upon background noise levels measured during the 'quiet periods of the day' comprising:

- All evenings from 18:00 – 23:00;
- Saturday afternoons from 13:00 – 18:00; and
- All day Sunday 07:00 – 23:00.

15.4.62 For the avoidance of doubt, the limits that are set based upon the background data collected during the quiet daytime period apply to the entire daytime period (07:00 – 23:00). Night-time periods are defined as 23:00 – 07:00, with no differentiation made between weekdays and weekends.

15.4.63 The wind speed range that should be considered ranges between the cut-in wind speed for the turbines (usually about 2 to 3 ms^{-1}) up to 12 ms^{-1}, where all wind speeds are referenced to a 10m measurement height.

15.4.64 ETSU-R-97 recommends that wind farm noise for the daytime periods should be limited to 5 dB(A) above the prevailing background or a fixed minimum level (FML) within the range 35 – 40 dB $L_{A90,10min}$, whichever is the higher. The precise choice of the criterion level within the range 35 – 40 dB(A) depends on a number of factors, including:

- The number of dwellings in the neighbourhood of the wind farm (relatively few dwellings suggest a figure towards the upper end);
- The effect of noise limits on the number of kWh generated (larger sites tend to suggest a higher figure); and
- The duration and level of exposure to any noise.

15.4.65 Following a review of the guidance in ETSU-R-97, the three factors listed above[30], and after a review of the noise limits for other wind farm / turbine developments in the surrounding area (see **Table 15-11**), noise limits for the Proposed Development operating in conjunction with other wind turbines/wind farms have been set at 40 dB(A) or background plus 5 dB whichever is the greater during the daytime period

[30] A detailed discussion of the three factors is provided in Section 6.7.4 of **Technical Appendix 15-2**.

and at 43 dB(A) or background plus 5 dB whichever is the greater during the night-time period.

15.4.66 Two sets of noise limits have been derived; The 'Total ETSU-R-97 Noise Limit' relates to noise from all wind farm / turbine developments in the area (see **Table Table** 15-11), and the 'Site Specific Noise Limits' relate to limits to the Proposed Development only.

15.4.67 Where wind turbine immissions from the other wind turbines at a given receptor are found to be at least 10 dB below the Total ETSU-R-97 Noise Limit, it is considered that they will be using a negligible proportion of the limit[31], as such it is considered appropriate to allocate the entire noise limit to the Proposed Development. For the receptors where turbine predictions are found to be within 10 dB of the Total ETSU-R-97 Noise Limit, apportionment of the Total ETSU-R-97 Noise Limits is undertaken in accordance with current good practice (the IOA GPG).

15.4.68 For night-time periods, the recommended limits are 5 dB(A) above prevailing background or a fixed minimum level of 43 dB $L_{A90,10min}$, whichever is higher, whilst taking account of the proportion of the noise limit that has already been allocated to, or could theoretically be used by, other any wind turbine/wind farms in the area.

15.4.69 The exception to the setting of both the daytime and night-time FML occurs where a property occupier has a financial involvement in a wind farm development. In this case, the FML can be increased to 45 dB(A), or a higher permissible limit above background during the daytime and night-time periods.

15.4.70 Noise predictions have been undertaken using ISO9613-2. The model calculates, on an octave band basis, attenuation due to geometric spreading, atmospheric absorption and ground effects. The noise model was set up to provide realistic noise predictions, including mixed ground attenuation (G=0.5), atmospheric attenuation relating to 70 % Relative Humidity and 10 °C, and a receiver height of 4m.

15.4.71 Typically wind farm noise assessments assume all properties are downwind of all wind turbines at all times, as this results in the highest wind turbine noise levels. However, where properties are located in between groups of turbines they cannot be downwind of all wind turbines simultaneously and therefore it is appropriate to consider the effect of wind direction on predicted noise levels and the influence of wind directivity has been considered in this assessment. Further information is provided in **Section 6.4** of **Appendix 15-2: Wind Turbine Operational Noise Report.**

[31] For example - 40 dB + 30 dB = 40.4 dB and this is considered to be a negligible change.

15.4.72 The wind turbine noise immission levels are based on the $L_{A90,10min}$ noise indicator in accordance with the recommendations in ETSU-R-97, which were obtained by subtracting 2 dB(A) from the turbine sound power level data (L_{Aeq} indicator).

15.4.73 In line with the IOA GPG, an assessment has been undertaken to determine whether a concave ground profile correction (+3 dB) or barrier correction (-2 dB), is required due to the topography between the wind turbines and the NSRs. Propagation across a valley (concave ground) increases the number of reflection paths, and in turn, has the potential to increase sound levels at a given receptor. Terrain screening effects (barrier corrections) act as blocking points, subsequently reductions in sound levels at a given receptor can potentially be observed. A concave ground and barrier correction was found to be required for a number of turbines at a number of receptors as detailed in Annex 6, **Appendix 15-2: Wind Turbine Operational Noise Report.**

15.4.74 More information relating to all the parameters for operational noise discussed above has been provided in **Appendix 15-2: Wind Turbine Operational Noise Report**. The preliminary assessment is based on the current wind turbine layout, which will be further refined for the ES and therefore, where required, an updated assessment will be provided in the ES.

15.4.75 The need for a cumulative operational wind farm noise assessment was considered in accordance with the guidance contained within the IOA GPG.

15.4.76 There are a number of operational wind farm/wind turbines within the vicinity of the Proposed Development (see **Table 15-11**). As such, and where required, a cumulative noise assessment was undertaken.

15.4.77 All the wind turbines modelled in the cumulative noise assessment (Stage 2), are summarised in Annex 6 of **Appendix 15-2: Wind Turbine Operational Noise Report**. The location of the wind turbines for the Proposed Development and the other wind turbines/wind farms in the area are shown in **Figure 15-3**. This list will continue to be reviewed until the commencement of the modelling for the ES. This will be the 'cut-off' date for the identification of additional wind turbines/wind farms to be included (in summer 2026). Further details will be provided in the ES.

15.4.78 The noise assessment was undertaken in three separate stages:

- Stage 1 – establish the Total ETSU-R-97 Noise Limits for each NAL using the measured background noise levels to derive appropriate limits for the operation of all turbines in the area;
- Stage 2 – undertake noise modelling to determine whether noise predictions from the Proposed Development on its own are within 10 dB of the noise

predictions from other wind turbines within the area. Where turbine predictions are within 10 dB then a cumulative noise assessment was undertaken; and

- Stage 3 – establish the Site Specific Noise Limits for the Proposed Development (through apportioning the Total ETSU-R-97 Noise Limits) and compare the noise predictions from the Proposed Development against the Site Specific Noise Limits.

15.4.79 The aim of the cumulative operational noise assessment therefore is to establish the Total ETSU-R-97 Noise Limits, determine the likely impacts of the Proposed Development operating alongside other wind turbine/wind farms at the nearest NSRs, derive Site Specific Noise Limits for the Proposed Development, and to demonstrate that the Proposed Development could meet the Site Specific Noise Limits.

15.4.80 Uncertainty in sound power data for the Proposed Development has been accounted for using the guidance contained within Section 4.2 of the IOA GPG.

Operational Substation Noise

15.4.81 The operational noise assessment for the onsite substation has been undertaken in accordance with BS 4142.

15.4.82 To complete the BS 4142 assessment, the predicted noise immission levels (referred to in the standard as the 'Specific Sound Level') are converted into a Rating Level. The Rating Level accounts for characteristics that might be present in the sound at the receptor location, which may increase annoyance or make the Specific Sound Level more noticeable than a more uniform sound. Where a particular character is expected to be present in the sound at the receptor, a character correction(s) is added to the Specific Sound Level. The resultant Rating Level is then compared to the Background Sound Level to provide an initial indication as to the likelihood of adverse impacts. Stage 2 of the assessment, which is a qualitative, context-based assessment, then determines the actual magnitude of impact.

15.4.83 The process of undertaking a BS 4142 assessment can be summarised as follows:

- Measure existing background sound levels at or close to the nearest noise sensitive receptors for daytime and night-time periods[32];

[32] Background noise survey data captured for the ETSU-R-97 assessment has been re-analysed in line with BS 4142 for the purposes of the Operational Substation Noise assessment. Additional information regarding the assessment methodology can be found in Section 3.2 of **Technical Appendix 15-3: Operational Substation Noise Impact Assessment**.

- Predict the noise levels likely to be received at the NSRs from the Proposed Development;
- Add character corrections, as required, to account for the characteristics of the sound source to determine the Rating Level;
- Compare the Rating Level with the measured background sound levels to determine the initial estimate of impact (stage 1 assessment); then
- Consider the context (stage 2 assessment) to refine the initial estimate of impact through a qualitative assessment.

15.4.84 In respect of the Stage 1 assessment, the BS 4142 states:

'Obtain an initial estimate of the impact of the specific sound by subtracting the measured background sound level from the rating level, and consider the following…

a) Typically, the greater this difference, the greater the magnitude of the impact.

b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.

c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.

d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.'

15.4.85 For the Stage 2 assessment, BS 4142 requires that the assessment considers the context in which the sound occurs and as such there is no definitive pass/fail element defined. Contextual factors can include (but are not limited to) considerations of the absolute level of sound, the character and level of the residual sound[33] compared to the character and level of the specific sound[34], and the sensitivity of the receptor. In areas where background noise levels are particularly low, or already high, the absolute level of sound can be of particular importance.

[33] The sound level of all noise sources in an area, except the sound source to be assessed, over a given time interval, t. Described using the metric $L_{Aeq(t)}$.
[34] The equivalent continuous A-weighted sound pressure level (SPL) produced by the specific sound source at the assessment location over a given reference time interval, i.e. the sound level of just the sound source to be assessed. Described using the metric $L_{Aeq(t)}$.

Detailed discussion of contextual factors relevant to the Proposed Development is included within **Appendix 15-3: Operational Substation Noise Impact Assessment**.

15.4.86 Noise level predictions for the substation have been calculated in accordance with ISO 9613-2:2024.

15.4.87 The preliminary assessment is based on the current infrastructure layout, which will be further refined for the ES and therefore, where required, an updated assessment of operational substation noise will be provided in the ES.

Significance Criteria – Construction and Decommissioning Noise

Receptors and Receptor Sensitivity

15.4.88 All CNALs represent residential dwellings, which are considered to be of high sensitivity. No other receptor types or levels of sensitivity have been considered.

Magnitude of Impact (Construction Noise)

15.4.89 **Table 15-7** sets out how the BS 5228 threshold levels can be related to the NPSE noise exposure effects levels and the subsequent magnitude of impact. Note that the thresholds must be exceeded for more than 1 month for moderate and major magnitude of impact.

Table 15-7: Magnitude of Impact (Construction Noise)

BS 5228 assessment outcome	Equivalent noise exposure hierarchy rating	Equivalent magnitude of impact
Predicted noise levels exceed the BS 5228 threshold levels for a period of more than one month during evening and or night-time periods	Significant Observed Adverse Effects Level Noise levels would be "Present and Very Disruptive", which is an "unacceptable adverse effect" level. The respective action is to "Prevent" this level of effect.	Major
Predicted noise levels exceed the BS 5228 threshold levels for a period of more than one month during daytime periods	Significant Observed Adverse Effects Level Noise levels would be "Present and Disruptive", which is a "Significant Observed Adverse Effect" level. The	Moderate

BS 5228 assessment outcome	Equivalent noise exposure hierarchy rating	Equivalent magnitude of impact
	respective action is to "Avoid" this level of effect.	
Predicted noise levels exceed the BS 5228 threshold levels for a period of less than one month	Lowest Observed Adverse Effects Level Noise Levels would be "Present and Intrusive", which is the "Lowest Observed Adverse Effect" level. The respective action is to "Mitigate and reduce to a minimum" this level of effect.	Minor
Predicted noise levels are below BS 5228 threshold levels but greater than the BS5228 ambient noise level.	No Observed Adverse Effects Level Noise Levels would be "Present and Not Intrusive", which is a "No Observed Adverse Effect" level. There are "No specific measures required" as a result of this level of effect.	Negligible
Predicted noise levels are below the BS5228 ambient noise level.	No Observed Effects Level Noise Levels would be "Not Present" and there is "No Observed Effect". There are "No specific measures required" as a result of this level of effect.	No impact

Significance of effect

15.4.90 With due regard to the above, the assessment criteria to determine the level of significance of effects for construction noise levels are as detailed in **Table 15-8**. Significant effects are defined as Major or Moderate.

15.4.91 Note: Level of significance is derived for high sensitivity residential receptors only. No other receptor types or lower sensitivities are considered, on the assumption that if noise levels are acceptable for the most sensitive receptors, they will also be acceptable for receptors with lower levels of sensitivity.

Table 15-8: Level of Significance of Effects

		Sensitivity
Magnitude of impact		High
	Major - SOAEL	Major
	Moderate – SOAEL	Moderate
	Minor – LOAEL	Minor
	Negligible - NOAEL	Negligible
	Not noticeable - NOEL	No impact

Significance Criteria – Construction Traffic Noise

15.4.92 Where the change in traffic flows is less than an increase of 25% or a decrease of 20%, this is considered not significant. Where the change in traffic flows exceeds an increase of 25% or a decrease of 20%, this is considered a significant effect.

Significance Criteria – Operational Wind Turbine Noise

15.4.93 ETSU-R-97 does not define significance criteria in line with the EIA Regulations, rather it sets out criteria for acceptable noise levels that provide a reasonable degree of protection to wind farm neighbours, without placing unreasonable restrictions on wind farm development. Achievement of ETSU-R-97 derived noise limits ensures that wind turbine noise will comply with current Government guidance. As noted in Section 15.4.59, NPS EN-3 notes in Section 2.12.163:

"Where the correct methodology has been followed and a wind farm is shown to comply with ETSU-R-97 recommended noise limits, the Secretary of State should give no weight to adverse noise impacts from the operation of the wind turbines."

15.4.94 Compliance with the ETSU-R-97 noise limits indicates 'acceptable' levels of noise.

15.4.95 The use of the term 'significance' in this Chapter in relation to operational wind turbine noise effects refers to compliance or non-compliance with the ETSU-R-97 derived noise limits. For situations where predicted wind turbine noise meets or is less than the noise limits defined in ETSU-R-97, then the noise effects are deemed to be not significant. Any breach of the ETSU-R-97 derived noise limits due to the Proposed Development is deemed to result in a significant effect.

Significance Criteria – Operational Substation Noise

Receptors and Receptor Sensitivity

15.4.96 All SNALs, detailed in **Table 5-2** of **Appendix 15-3: Operational Substation Noise Impact Assessment**, represent residential dwellings, which are considered to be of high sensitivity. No other receptor types or levels of sensitivity have been considered.

Magnitude of Impact

15.4.97 BS 4142 does not define magnitude of impact criteria; rather it describes a framework for the measurement of noise and provides a method to determine the likelihood of adverse impact through a qualitative assessment.

15.4.98 **Table 15-9** sets out how the BS 4142 assessment outcome can be related to the NPSE noise exposure effects levels and the subsequent magnitude of impact.

Table 15-9: Magnitude of Impact (Substation Noise)

BS 4142 assessment outcome	Equivalent noise exposure hierarchy rating	Equivalent magnitude of impact
BS 4142 indication of significant adverse impact.	Significant Observed Adverse Effects Level Noise levels would be *"Present and Very Disruptive"*, which is an *"unacceptable adverse effect"* level. The respective action is to ***"Prevent"*** this level of effect.	Major
BS 4142 indication of adverse impact.	Significant Observed Adverse Effects Level Noise levels would be *"Present and Disruptive"*, which is a *"Significant Observed Adverse Effect"* level. The respective action is to "***Avoid***" this level of effect.	Moderate
No BS 4142 indication of an adverse impact.	Lowest Observed Adverse Effects Level Noise Levels would be *"Present and Intrusive"*, which is the *"Lowest Observed Adverse Effect"*	Minor

BS 4142 assessment outcome	Equivalent noise exposure hierarchy rating	Equivalent magnitude of impact
	level. The respective action is to "***Mitigate and reduce to a minimum***" this level of effect.	
BS 4142 Rating Level less than measured background sound levels.	No Observed Adverse Effects Level Noise Levels would be *"Present and Not Intrusive"*, which is a *"No Observed Adverse Effect"* level. There are "***No specific measures required***" as a result of this level of effect.	Negligible
BS 4142 Rating Level more than 10dB below the measured background sound levels.	No Observed Effects Level Noise Levels would be "*Not Present*" and there is "*No Observed Effect*". There are "***No specific measures required***" as a result of this level of effect.	No impact

Significance of Effect

15.4.99 With due regard to the above, the assessment criteria to determine the level of significance of effects for operational substation noise levels are as detailed in **Table 15-10.** Significant effects are defined as Major or Moderate.

Table 15-10: Level of Significance of Effects

		Sensitivity
		High
Magnitude of impact	Major - SOAEL	Major
	Moderate – SOAEL	Moderate
	Minor – LOAEL	Minor
	Negligible - NOAEL	Negligible
	Not noticeable - NOEL	No impact

Limitations and Assumptions

15.4.100 Noise immission levels will vary throughout the construction period as construction activities, plant and locations vary. For much of the working day the noise associated with construction activities will be less than predicted, as the assessment assumes all equipment is continually operating at full power and (for static plant and activities) in locations closest to the NSRs, whereas in practice, operating times, equipment load and precise location will vary throughout the day. This approach has been adopted to represent a worst-case assessment.

15.4.101 The exact model of wind turbine to be installed will be the result of a future procurement/tendering process should Development Consent be granted. Achievement of the Site Specific Noise Limits determined by this assessment will be a key determining factor in the final choice of wind turbine for the Proposed Development. Predictions of wind turbine noise for the Proposed Development have been made using the sound power level data for two candidate wind turbines, the Vestas V172 7.2 MW with serrated blades and a hub height of 114m and the Vestas V136 4.5 MW with serrated blades and a hub height of 82 m, which are considered representative of the type of wind turbine that could be installed.

15.4.102 Similarly, candidate plant has been assumed for the modelling of operational substation noise and an updated noise model will be required once final plant specifications are determined. This will be secured by a DCO requirement.

15.5 Baseline Conditions

15.5.1 The Proposed Development is located within a rural location where the predominant sound sources in the area include wind induced noise (wind passing through vegetation and around buildings), local watercourses, agricultural noise and birdsong. At some receptors within / closer to nearby settlements, the soundscape may be influenced to a greater extent by road traffic noise and industrial noise sources.

15.5.2 There may also be noise from existing operational wind turbines located in the vicinity. **Table 15-11** summarises the cumulative wind farm developments in the area surrounding the Proposed Development.

Table 15-11: Cumulative Wind Turbine Developments

Wind Farm / Wind Turbine	Status	Number of Turbines	Make and Model of Turbine Considered in Modelling
Ovenden Moor Wind Farm	Operational	9	Nordex N80

Wind Farm / Wind Turbine	Status	Number of Turbines	Make and Model of Turbine Considered in Modelling
Coal Clough Wind Farm	Operational	8	Gamesa G80
Todmorden Moor Wind Farm	Operational	5	Nordex N90
Small Turbine 11/03544/FUL	Operational	1	Endurance E-3120 50 kW
Small Turbine 14/03122/FUL	Operational	2	Gaia 11kW
Small Turbine 92/02632/FUL	Operational	1	Vestas V27 225kW
Small Turbine 13/04394/FUL	Operational	1	Endurance E-3120 50 kW
Small Turbine 13/12/0368P	Operational	1	Endurance E-3120 50 kW
Small Turbine 13/14/0229P	Operational	1	Endurance E-3120 50 kW
Small Turbine APP/2014/0054	Operational	1	C&F CF20 20 kW
Small Turbine 13/13/0170P	Operational	2	Endurance E-3120 50 kW
Small Turbine APP/2006/1044	Operational	2	Proven WT6000
Small Turbine APP/2008/0416	Operational	1	Proven WT6000
Small Turbine APP/2008/0415	Operational	1	Proven WT6000
Small Turbine 05/01306/FUL	Operational	1	Proven WT6000
Small Turbine 08/01695/FUL	Operational	1	Proven WT6000
Small Turbine at Harbour Lodge	Operational	1	Windsave WS1200

Existing Baseline

15.5.3 The NSRs located within the 35 dB(A) noise contour that was calculated to define the study area were reviewed to determine which properties would make suitable monitoring locations to provide baseline noise data representative of all of the NSRs considered in the assessment.

15.5.4 The NMLs were selected following a detailed review of the area using aerial photography. Where practicable, locations were selected that were subject to minimal influence from other noise sources, such as local watercourses, operational wind turbines and vegetation (which can increase noise levels during higher wind speeds).

15.5.5 The proposed NMLs were included in consultation letters issued to Bradford Council, Burnley Council, Calderdale Council and Pendle Council, for their comment/approval. Bradford Council approved the monitoring locations within their local authority area and Pendle Council responded with some questions regarding the survey methodology but did not object to the proposals. No response was received from Calderdale or Burnley Councils.

15.5.6 Baseline noise monitoring was undertaken for the purposes of setting the ETSU-R-97 Noise Limits, as well as to inform the construction noise and substation noise assessments.

15.5.7 Data was recorded during the period 12 March 2025 – 7 May 2025 at nine NMLs, which are detailed in **Figure 15-2** and **Table 15-12**. The Sound Level Meters (SLMs) at NMLs 4-7 were installed on 12 March 2025 until 7 May 2025, whilst the SLMs at NMLs 1-3, 8 and 9 were installed on 13 March 2025 until 7 May 2025.

Table 15-12: Noise Monitoring Locations

NML Name	Easting	Northing
NML1 - Adjacent to Widdop Reservoir Lodge	393595	433000
NML2 - New Laithe Farm	396619	431719
NML3 - Reservoir Lodge	396525	433634
NML4 - Chapel	399361	431520
NML5 - Bedlam Farm	400042	431932
NML6 - Harbour Lodge	399637	435263
NML7 - Upper Ponden House	398390	436880
NML8 - Boulsworth Dyke Farm	392616	436865

NML Name	Easting	Northing
NML9 - New Bridge End	390821	434722

15.5.8 The SLM installed at NML1 stopped recording on 28 April due to a power failure, determined to be due to poor battery performance during cold temperatures. However, subsequent analysis indicated that this did not negatively impact the dataset collected at this location and sufficient datapoints were recorded to undertake the assessments in accordance with the relevant standards.

15.5.9 Details of the rationale behind the exact kit location and the noise sources observed at each NML are detailed in the Noise Monitoring Records and Installation Report, which are included in **Appendix 15-2: Wind Turbine Operational Noise Report.** The noise monitoring equipment used for the baseline noise survey meets with the requirements of the IOA GPG and BS 4142.

15.5.10 Throughout the baseline noise survey, meteorological data was obtained using a LiDAR unit located within the Turbine Area (Grid Reference 399645, 433691). In addition, tipping-bucket rain gauges were installed at NMLs 2, 4 and 7 for the duration of the noise survey to record periods of rainfall. This data was then correlated with the noise measurements for every 10-minute period to determine typical background noise levels for various wind speeds and directions. Further detail on the survey process can be found in Section 5.4 of **Appendix 15-2: Wind Turbine Operational Noise Report**.

15.5.11 The operational Ovenden Moor Wind Farm is located to 4km east of the Proposed Development, the operational Coal Clough Wind Farm is 6km southwest and the operational Todmorden Moor Wind Farm is 9km southwest. In addition, a number of small-scale (< 50 kW) turbines have been identified in the area surrounding the Proposed Development (as outlined in **Table 15-11**). NMLs were carefully selected such that they were located away from the operational turbines wherever possible as ETSU-R-97 states that background noise levels should be determined such that they are not influenced by existing turbine noise. The process undertaken to remove the influence of operational wind turbine noise is detailed in Section 5.6 of **Appendix 15-2: Wind Turbine Operational Noise Report**.

15.5.12 The prevailing ETSU-R-97 background noise levels are presented in Figures A1.2a-i of **Appendix 15-2: Wind Turbine Operational Noise Report** and detailed in **Table 15-13** and **Table 15-14**. Time series charts are included within **Appendix 15-2: Wind Turbine Operational Noise Report.**

Table 15-13: Summary of Prevailing Background Noise Levels during Quiet Daytime Periods (dB(A))

NML	Wind Speed (ms-1) as standardised to 10m height											
	1	2	3	4	5	6	7	8	9	10	11	12
NML1 – Adjacent to Widdop Reservoir Lodge	24.5	25.5	27.0	29.0	31.3	33.7	36.2	38.5	40.6	42.2	43.3	43.8
NML2 – New Laithe Farm	24.4	24.9	25.4	26.1	26.9	28.0	29.3	31.0	33.0	35.5	38.4	41.9
NML3 – Reservoir Lodge	18.7	19.2	20.2	21.7	23.4	25.5	27.7	29.9	32.1	34.2	36.1	37.8
NML4 – Chapel	24.2	25.0	25.6	26.1	26.6	27.1	27.9	29.0	30.5	32.6	35.4	39.0
NML5 – Bedlam Farm	23.1	24.6	25.8	26.8	27.7	28.8	30.1	31.8	34.0	37.0	40.8	45.5
NML6 - Harbour Lodge	23.6	24.1	24.9	26.0	27.3	28.9	30.7	32.8	35.0	37.4	39.9	42.6
NML7 - Upper Ponden House	24.6	25.5	26.4	27.2	28.1	29.2	30.5	32.1	34.1	36.5	39.5	43.1
NML8 - Boulsworth Dyke Farm	20.6	21.8	23.2	24.9	26.9	28.9	31.1	33.4	35.7	38.0	40.2	42.3
NML9 - New Bridge End	24.7*	24.7	24.7	25.2	26.2	27.4	28.8	30.2	31.6	32.8	33.7	34.2

**flatlined below 2 ms-1 as derived minimum occurs at this wind speed.*

Table 15-14: Summary of Prevailing Background Noise Levels during Night-time Periods (dB(A))

NML	Wind Speed (ms-1) as standardised to 10m height											
	1	2	3	4	5	6	7	8	9	10	11	12
NML1 - Adjacent to Widdop Reservoir Lodge	25.2*	25.2	25.4	26.2	27.5	29.3	31.5	34.0	36.8	39.8	42.9	46.1
NML2 - New Laithe Farm	24.6	24.8	24.9	25.0	25.2	25.7	26.7	28.3	30.7	34.0	38.4	44.0
NML3 - Reservoir Lodge	18.9	19.0	19.3	19.9	20.7	22.0	23.6	25.8	28.5	31.9	35.9	40.7
NML4 - Chapel	24.0	24.1	24.1	24.1	24.2	24.5	25.3	26.5	28.4	31.1	34.6	39.2
NML5 - Bedlam Farm	21.7	21.9	22.1	22.4	22.9	23.9	25.6	28.0	31.5	36.1	42.1	49.6
NML6 - Harbour Lodge	21.1	22.0	22.6	22.9	23.2	23.8	24.9	26.6	29.1	32.8	37.9	44.4
NML7 - Upper Ponden House	21.7	22.7	23.2	23.5	23.8	24.2	24.9	26.1	28.1	30.9	34.8	40.0
NML8 - Boulsworth Dyke Farm	20.4	22.2	23.6	24.8	26.0	27.2	28.7	30.6	33.1	36.3	40.4	45.5
NML9 - New Bridge End	25.9	25.9	26.0	26.0	26.2	26.5	27.0	27.8	28.8	30.2	31.9	34.1

**flatlined below 2 ms-1 as derived minimum occurs at this wind speed*

Further Data Collection

15.5.13 No further baseline noise surveys are anticipated to be required.

Future Conditions

Collection of Predicted Data

15.5.14 No specific baseline data collection activities have been undertaken to identify the likely future conditions as professional judgement has been used.

Future Baseline

15.5.15 In general, the dominant sources contributing to the baseline sound climate were wind induced noise, local watercourses, agricultural and birdsong with road traffic noise contributing to the noise environment at some receptors closer to settlements. Such sources are unlikely to substantively change over time, except for traffic flows which are generally expected to increase in line with expectations for macro-economic expansion though vehicle noise levels are expected to reduce over time. Therefore, contributing noise sources are unlikely to fundamentally change over time in the absence of the Proposed Development.

15.5.16 It is possible that noise propagation and resulting noise immission levels could change over the life of the Proposed Development due to climate change (as noise attenuation is influenced by air temperature, relative humidity and ground conditions).

15.5.17 In addition, the existing nearby cumulative operational wind turbines may be decommissioned. However, noise limits are set based on current background noise levels in the absence of wind turbine noise and would be set for the operational lifetime of the Proposed Development. The operator would be required to meet them for this duration.

15.6 Environmental Measures

15.6.1 This Section describes details of the environmental noise measures which have been included within the design of the Proposed Development (as presented in **Chapter 4: The Proposed Development**). These measures are an inherent part of the design of the Proposed Development and have been included to benefit noise and achieve positive effects where possible, as well as avoid, reduce or compensate for the adverse environmental effects of the Proposed Development.

Construction

15.6.2 To protect the amenity of local residents, construction noise activities would be controlled under the COPA which includes provisions on the control of noise pollution. In particular, Part III Section 60 of the COPA refers to the control of noise on construction sites. It provides that a Local Authority can serve a notice imposing requirements regarding the way in which works are to be carried out, including controlling noise from construction sites to prevent disturbance occurring. The

COPA also includes provision that the SoS may prepare codes of practice to give guidance on methods of minimising noise and requires the SoS to approve a code of practice for carrying out works to which Section 60 applies. British Standard 5228 is approved as a code of practice by the SoS.

15.6.3 The environmental measures included within the design of the Proposed Development, during the construction phase, include:

- Locating noise producing activities/design elements (e.g. borrow pits) away from noise sensitive receptors, wherever practicable.

15.6.4 The environmental measures include the objectives of management plans to be adhered to during the construction of the Proposed Development to achieve positive effects and/or avoid or reduce adverse effects, such as the use of the following plans:

- An Outline Construction Environmental Management Plan (oCEMP) (**Appendix 4-2**), setting out how the Proposed Development will avoid, minimise and mitigate the environmental impact and ensure compliance with legislation during the construction phase.

15.6.5 A range of good practice measures will be detailed in the oCEMP (**Appendix 4-2**) and employed to minimise noise emissions during the construction phase. Good site practices would be implemented to reduce effects. Section 8 of British Standard 5228 recommends a number of simple control measures as summarised below that would be employed onsite during construction:

- Keep local residents informed of the proposed working schedule, where appropriate, including the times and duration of any abnormally noisy activity that may cause concern;
- Ensure that any extraordinary site work continuing throughout 24 hours of a day (for example, crane operations lifting components onto the tower) would be programmed, when appropriate, so that haulage vehicles would not arrive at or leave between 19:00 and 07:00, with the exception of AILs that would be scheduled to avoid peak traffic times;
- Ensure all vehicles and mechanical plant would be fitted with effective exhaust silencers and be subject to programmed maintenance;
- Select inherently quiet plant where appropriate – all major compressors would be ‘sound reduced’ models fitted with properly lined and sealed acoustic covers, which would be kept closed whenever the machines are in use;

- Ensure all ancillary pneumatic percussive tools would be fitted with mufflers or silencers of the type recommended by the manufacturers;
- Instruct that machines would be shut down between work periods or throttled down to a minimum;
- Regularly maintain all equipment used onsite, including maintenance related to noise emissions;
- Vehicles would be loaded carefully to ensure minimal drop heights so as to minimise noise during this operation; and
- Ensure all ancillary plant such as generators and pumps would be positioned so as to cause minimum noise disturbance and if necessary, temporary acoustic screens or enclosures should be provided.

Operation (and Maintenance)

15.6.6 Operational noise has been a key consideration throughout the design process for the Proposed Development. The design presented in this assessment is the result of an iterative process, to ensure that the final wind turbine layout and their locations strike a balance between maximising the potential for renewable energy generation while providing appropriate protection of residential amenity, as discussed in ETSU-R-97.

Decommissioning

15.6.7 The environmental measures include the objectives of management plans to be adhered to during the decommissioning phase of the Proposed Development to achieve positive effects and/or avoid or reduce adverse effects, such as the use of the following plans:

- An Outline Decommissioning Environmental Management Plan (oDEMP), setting out how the Proposed Development will avoid, minimise and mitigate the environmental impact and ensure compliance with legislation during the decommissioning phase. The detailed DEMP will include a range of good practice measures, anticipated to be in line with those included within the oCEMP (**Appendix 4-2**) (such as those detailed in **Section 15.6.5**) and reflective of good practice measures at the time.

15.7 Potential Effects Scoped Out

15.7.1 This section lists the effects which are scoped out of the noise assessment as they are not considered likely to be significant. This includes the evidence that justifies this approach, as shown in **Table 15-15** below.

Table 15-15: Potential Effects Scoped Out

Effects Scoped Out	Justification	Phase
Operational noise and vibration from the cable corridor	Negligible levels of noise will be produced from the operation of the grid connection, and noise relating to maintenance works will be limited, and therefore is unlikely to result in significant effects. As agreed by the Planning Inspectorate in the Scoping Opinion.	Operational and maintenance
Operational traffic noise and vibration	Traffic during the operational period will be limited to infrequent maintenance activities and therefore is unlikely to result in significant effects.	Operational and maintenance
Amplitude Modulation	Detailed discussion of AM is included within Section 3.2 of **Appendix 15-2: Wind Turbine Operational Noise Report**. A summary of current research and findings on the topic is provided, which concludes that specific assessment of AM is not necessary.	Operational and maintenance
Low Frequency Noise and Infrasound	No assessment is provided of low frequency or infrasound from the wind turbines, as this is not required. As stated above, EN-3 states; "*There is currently no evidence that ground transmitted vibration, infrasound or low frequency noise from wind turbines occurs at a sufficient level to be harmful to human health. Therefore, the Secretary of State should give no weight to claims of harm to human health as a result of ground transmitted vibration, infrasound or low frequency noise.*" Notwithstanding, a detailed discussion of infrasound and low frequency noise from wind turbines is included within Section 3.2 of **Appendix 15-2: Wind Turbine Operational Noise Report**, which provides a summary of current research and findings on the topic detailing why the assessment is not necessary.	Operational and maintenance

Effects Scoped Out	Justification	Phase
Construction Vibration	BS 5228 provides empirical formulae to estimate the levels of vibration that may be received from particular construction activities. However, the types of activity that are generally recognised as having the potential to generate vibration are restricted to piling, ground compaction and tunnelling. Piling and tunnelling are not relevant to the Proposed Development and the only relevant ground compaction that may occur is in relation to the use of vibratory rollers for the construction of tracks, which would be located at a minimum distance of 160m from the closest property for the Western Access Route and 50m from the closest property for the Eastern Access Route. In summary, no vibration inducing activities will be undertaken in the near vicinity of any sensitive receptors. Accordingly, no vibration effects are anticipated and no further assessment of vibration is required.	Construction

15.7.2 Where effects have likely significant effects and are therefore scoped in, please refer to the scoped in effects section in the Preliminary Environmental Assessment below.

15.8 Preliminary Environmental Assessment

Construction and Decommissioning Phases

Construction Noise

15.8.1 Construction stage works will include earthworks, turbine installation, erection of other above-ground infrastructure (e.g. the substation) and cable installation. During decommissioning, the works will include dismantling the turbines and other above-ground infrastructure onsite. These types of work can lead to noise generation.

15.8.2 The construction noise impact results summarised in **Table 15-16** show that the predicted construction noise levels are below the BS 5228 Daytime Category A threshold value of 65 dBA at all CNALs, with the exception of CNAL26. The threshold value at CNAL26 is exceeded by 3 dB in Q2 2030 (as indicated in **bold**). This coincides with the construction and upgrading of the A6033 Access Junction

at Cock Hill. Whilst the modelling has been undertaken in quarters, it is anticipated that this activity would take approximately one month to complete.

15.8.3 Predicted noise levels during core construction hours are equal to or below the BS 5228 evening and weekend Category A threshold value of 55 dBA at all CNALs except CNALs 1, 7, 26, 31, 33, 35, 38, 39 and 42 (as indicated in **bold**). Predicted levels at CNALs 1, 33, and 38 are equal to the threshold level, and at CNALs 7, 26, 31, 35, 39 and 42 exceed the evening and weekend threshold by between 1 – 8 dB.

15.8.4 These exceedances coincide with the proposed construction hours on Saturday, from 13:00-14:00. Activities during this time would be subject to evening/weekend thresholds for the hour of exceedance. The model has been produced as a worst-case scenario and therefore it is unlikely that the noise levels will be exceeded for this full period of time.

15.8.5 Activities that may need to take place outside of core construction hours, during BS 5228 evening and weekend periods, include: turbine erection, concrete pours, HDD works and AIL deliveries. The predicted noise levels are below the Category A threshold value of 55 dBA during the quarters where these activities are scheduled to occur, with the exception of CNAL 31 and CNAL 35, where this threshold is be exceeded due to nearby HDD works. The HDD works would be located in close proximity to these CNALs for a short period, less than one month.

15.8.6 Where there is an occasional requirement for the activities noted in **Section 15.8.5** to occur during night-time periods, this would be short-term in nature, and result in exceedances of the Category A night-time threshold for less than one month at any CNAL.

15.8.7 Outside of specific short-term works, some generation plant or similar may operate during night-time hours within the construction compounds. The predicted noise levels for the modelled night-time scenario are below the night-time Category A threshold value of 45 dBA.

Table 15-16: Construction Noise Predicted Immission Levels

CNAL	Noise Immission Levels (dB $L_{Aeq,t}$)											
	Q4 2029	Q1 2030	Q2 2030	Q3 2030	Q4 2030	Q1 2031	Q2 2031	Q3 2031	Q4 2031	Q1 2032	Q2 2032	Night
CNAL 1	18	16	26	51	**55**	**55**	**55**	**55**	47	40	41	18
CNAL 2	18	16	25	46	48	48	48	46	41	37	38	15
CNAL 3	18	16	26	54	54	54	54	51	48	39	38	17
CNAL 4	18	17	26	51	52	51	51	49	45	41	39	18

CNAL	Noise Immission Levels (dB $L_{Aeq,t}$)											
	Q4 2029	Q1 2030	Q2 2030	Q3 2030	Q4 2030	Q1 2031	Q2 2031	Q3 2031	Q4 2031	Q1 2032	Q2 2032	Night
CNAL 5	18	17	25	42	42	41	42	41	39	38	36	16
CNAL 6	18	17	25	40	41	41	40	40	37	35	35	14
CNAL 7	34	46	**56**	54	54	53	51	51	51	35	34	26
CNAL 8	24	26	43	43	43	43	36	35	35	33	35	17
CNAL 9	23	23	37	40	39	39	37	35	34	32	36	14
CNAL 10	26	22	33	39	36	37	38	34	35	31	34	15
CNAL 11	37	30	36	37	32	39	33	32	32	27	30	18
CNAL 12	44	36	36	36	31	42	33	32	31	26	28	18
CNAL 13	53	46	38	36	31	45	33	32	31	26	28	19
CNAL 14	53	47	38	36	31	46	33	33	31	26	28	19
CNAL 15	41	34	47	42	33	48	37	34	34	30	31	27
CNAL 16	28	22	38	41	36	41	39	34	38	30	36	19
CNAL 17	28	23	40	40	35	39	38	33	36	29	34	21
CNAL 18	24	20	35	38	35	38	40	33	34	30	36	16
CNAL 19	27	21	37	37	34	39	37	32	35	28	33	18
CNAL 20	24	19	33	36	34	38	39	32	34	29	36	15
CNAL 21	22	17	29	34	34	36	36	32	32	29	33	12
CNAL 22	20	16	27	39	40	44	44	37	39	34	40	13
CNAL 23	20	16	28	38	39	44	44	36	38	33	40	13
CNAL 24	19	16	26	43	43	45	45	40	40	35	40	14
CNAL 25	25	20	34	40	37	42	39	34	38	32	38	16
CNAL 26	35	31	**68**	52	34	38	48	34	34	31	33	29
CNAL 27	41	35	46	42	33	47	37	34	33	29	31	27
CNAL 28	53	47	38	36	31	46	33	32	31	26	28	19
CNAL 29	43	20	30	30	28	30	29	31	27	22	24	11
CNAL 30	29	20	25	28	26	28	27	40	27	21	22	8
CNAL 31	26	18	24	27	25	27	26	**59**	27	20	21	7
CNAL 32	23	16	22	26	24	26	25	45	29	19	20	6
CNAL 33	22	16	22	26	24	25	25	**55**	31	19	20	5
CNAL 34	21	15	21	25	23	25	25	50	35	18	19	4
CNAL 35	19	13	19	24	22	23	23	38	**62**	17	18	3
CNAL 36	25	17	23	26	25	26	26	44	28	19	20	6
CNAL 37	20	14	20	24	23	24	24	49	30	18	19	4
CNAL 38	42	**55**	44	44	43	43	53	53	52	33	31	17

CNAL	Noise Immission Levels (dB $L_{Aeq,t}$)											
	Q4 2029	Q1 2030	Q2 2030	Q3 2030	Q4 2030	Q1 2031	Q2 2031	Q3 2031	Q4 2031	Q1 2032	Q2 2032	Night
CNAL 39	**59**	48	38	38	38	38	48	48	48	28	29	13
CNAL 40	45	42	34	36	34	34	40	40	40	29	26	10
CNAL 41	48	29	21	38	23	22	41	41	41	19	20	1
CNAL 42	**58**	33	31	44	32	31	40	39	39	26	24	9

15.8.8 Whilst the BS 5228 Category A threshold values are exceeded at CNAL 26 during daytime hours, and CNALs 7, 31, 35, 39 and 42 during weekend/evening time hours (noting also that levels at CNAL 1 and CNAL 36 equal to, but not exceeding, the weekend/evening threshold level), the effect is not expected to be significant due to the duration of the works and magnitude of the exceedances (discussed in detail in **Appendix 15-1: Construction Noise and Vibration Report**). However, mitigation in the form of good practice during construction will be implemented to keep noise to a minimum and recommendations in accordance with BS 5228 are discussed below.

15.8.9 Where there is a requirement for short term night time works, such as the activities discussed in Section.

15.8.10 With due regard to **Table 15-7**, the magnitude of impact from construction noise at all CNALs and for all periods is minor, and combined with high sensitivity (as stated in **Section 15.4.90**) construction noise effects would therefore be **Not Significant**.

Additional Mitigation

15.8.11 Where construction activities may occur which could result in the 55 dBA threshold being exceeded, namely junction upgrades at site entrances and HDD activities, it is recommended that as part of the oCEMP (**Appendix 4-2**), construction should be restricted to BS 5228 Daytime periods where possible.

Residual Effects

15.8.12 The residual effects from construction and decommissioning noise are predicted to be **Not Significant**.

Construction Traffic Noise

15.8.13 During construction, there will be an increase in traffic travelling to / from the Proposed Development on the road network.

15.8.14 **Table 15-17** details the predicted percentage increase in traffic flows resulting from construction traffic generated by the Proposed Development. The values in this Table are taken from Table 12 of **Appendix 14-1**.

Table 15-17: 2031 Predicted Traffic Flow Increases

Location	Total % Traffic Flow Increase
A6068 Keighley Road, Cowling	0.1%
A6068 Access Junction	2.9%
A6068 Laneshawbridge	2.1%
A6068 Colne	1.7%
C682 Lancashire Moor Rd / Two Laws Rd	9.9%
A6033 Hebden Road Bridge	3.3%
A6033 Hebden Bridge	0.5%
A6033 Howarth	1.0%
A646 Burnley Road, Hebden Bridge	0.1%
A646 Bankfoot, Burnley	0.0%
A629 at Rawlings Street, Keighley	0.2%
M65 at Burnley	0.1%
A56 at Kelbrook	0.8%
A56 northeast of Thornton in Craven	1.4%
A59 West of Skipton	0.9%
Moor End Road, Halifax	0.4%
Mount Tabor Road	1.0%
Cold Edge Road	6.9%

15.8.15 The greatest increase is predicted to occur on C682 Lancashire Moor Rd / Two Laws Rd, where flows are predicted to increase by 9.9%, substantially below the 25% increase threshold. The increase in noise levels due to construction traffic are considered to be negligible, and no further assessment is required. Therefore, effects related to construction traffic noise will be **Not Significant**.

Additional Mitigation

15.8.16 No additional mitigation has been identified to be required.

Residual Effects

15.8.17 Residual effects remain unchanged (i.e. **Not Significant**).

Operational Wind Turbine Noise

15.8.18 Once completed, the wind turbines within the Proposed Development will generate noise. The assessment of such effects is set out using a staged-approach below.

Setting the Total ETSU-R-97 Noise Limits (Stage 1)

15.8.19 Based on the prevailing background noise levels, the Total ETSU-R-97 Noise Limits have been established for each of the NALs. The Total ETSU-R-97 Noise Limits are as detailed in **Table 15-18** and **Table 15-19** and have been based on an upper fixed minimum of 40 dB (Daytime) or background plus 5 dB and 43 dB (Night-time) or background plus 5 dB. Note no properties have been treated as financially involved in the Proposed Development.

Table 15-18: Total ETSU-R-97 Noise Limits Daytime (dB(A))

Location	Wind Speed (ms^{-1}) as standardised to 10m height											
	1	2	3	4	5	6	7	8	9	10	11	12
NAL 1	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.5	43.4	46.9
NAL 2	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.5	43.4	46.9
NAL 3	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.5	43.4	46.9
NAL 4	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.5	43.4	46.9
NAL 5	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.5	43.4	46.9
NAL 6	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.5	43.4	46.9
NAL 7	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.5	43.4	46.9
NAL 8	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.5	43.4	46.9
NAL 9	40.0	40.0	40.0	40.0	40.0	40.0	41.2	43.5	45.6	47.2	48.3	48.8
NAL 10	40.0	40.0	40.0	40.0	40.0	40.0	41.2	43.5	45.6	47.2	48.3	48.8
NAL 11	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
NAL 12	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.7	43.0	45.2	47.3
NAL 13	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.7	43.0	45.2	47.3

Location	Wind Speed (ms^{-1}) as standardised to 10m height											
	1	2	3	4	5	6	7	8	9	10	11	12
NAL 14	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.7	43.0	45.2	47.3
NAL 15	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	41.5	44.5	48.1
NAL 16	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	41.5	44.5	48.1
NAL 17	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	41.5	44.5	48.1
NAL 18	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	41.5	44.5	48.1
NAL 19	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	41.5	44.5	48.1
NAL 20	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	41.5	44.5	48.1
NAL 21	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	41.5	44.5	48.1
NAL 22	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	41.5	44.5	48.1
NAL 23	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	41.5	44.5	48.1
NAL 24	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	41.5	44.5	48.1
NAL 25	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	41.5	44.5	48.1
NAL 26	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	41.5	44.5	48.1
NAL 27	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	41.5	44.5	48.1
NAL 28	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	41.5	44.5	48.1
NAL 29	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	41.5	44.5	48.1
NAL 30	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	42.0	45.8	50.5
NAL 31	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	42.0	45.8	50.5
NAL 32	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	42.0	45.8	50.5
NAL 33	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.4	44.0
NAL 34	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.4	44.0
NAL 35	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.4	44.0
NAL 36	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	42.0	45.8	50.5
NAL 37	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.4	44.0
NAL 38	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.4	44.0

Location	Wind Speed (ms^{-1}) as standardised to 10m height											
	1	2	3	4	5	6	7	8	9	10	11	12
NAL 39	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.4	44.0
NAL 40	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.4	44.0
NAL 41	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.4	44.0
NAL 42	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.5	43.4	46.9
NAL 43	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.5	43.4	46.9
NAL 44	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.5	43.4	46.9
NAL 45	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.5	43.4	46.9
NAL 46	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.5	43.4	46.9
NAL 47	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.5	43.4	46.9
NAL 48	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.5	43.4	46.9
NAL 49	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.4	44.0

Table 15-19: Total ETSU-R-97 Noise Limits Night-time (dB(A))

Location	Wind Speed (ms^{-1}) as standardised to 10m height											
	1	2	3	4	5	6	7	8	9	10	11	12
NAL 1	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.4	49.0
NAL 2	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.4	49.0
NAL 3	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.4	49.0
NAL 4	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.4	49.0
NAL 5	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.4	49.0
NAL 6	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.4	49.0
NAL 7	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.4	49.0
NAL 8	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.4	49.0
NAL 9	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.8	47.9	51.1
NAL 10	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.8	47.9	51.1
NAL 11	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0

Location	Wind Speed (ms^{-1}) as standardised to 10m height											
	1	2	3	4	5	6	7	8	9	10	11	12
NAL 12	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.4	50.5
NAL 13	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.4	50.5
NAL 14	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.4	50.5
NAL 15	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.0
NAL 16	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.0
NAL 17	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.0
NAL 18	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.0
NAL 19	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.0
NAL 20	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.0
NAL 21	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.0
NAL 22	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.0
NAL 23	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.0
NAL 24	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.0
NAL 25	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.0
NAL 26	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.0
NAL 27	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.0
NAL 28	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.0
NAL 29	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.0
NAL 30	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	47.1	54.6
NAL 31	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	47.1	54.6
NAL 32	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	47.1	54.6
NAL 33	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.2
NAL 34	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.2
NAL 35	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.2
NAL 36	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	47.1	54.6
NAL 37	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.2
NAL 38	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.2

Location	Wind Speed (ms^{-1}) as standardised to 10m height											
	1	2	3	4	5	6	7	8	9	10	11	12
NAL 39	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.2
NAL 40	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.2
NAL 41	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.2
NAL 42	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.4	49.0
NAL 43	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.4	49.0
NAL 44	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.4	49.0
NAL 45	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.4	49.0
NAL 46	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.4	49.0
NAL 47	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.4	49.0
NAL 48	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.4	49.0
NAL 49	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.2

Predicting the likely effects and the requirement for a cumulative noise assessment (Stage 2)

15.8.20 A comparison has been undertaken of the predicted wind turbine noise immission levels from the Proposed Development alongside other wind turbine / wind farm schemes (see **Table 15-11**) at each of the identified noise sensitive receptors in order to demonstrate whether predictions are within 10 dB of each other. All cumulative turbines have been assumed to be operating in unconstrained mode.

15.8.21 **Table 15-20** summarises the results and confirms whether a cumulative noise assessment is required. As detailed above, if the predictions are greater than 10 dB apart then a cumulative noise assessment is not required. Where predictions are found to be within 10 dB of each other then a cumulative assessment is required.

Table 15-20: Cumulative Assessment Requirement

NAL	Are predicted wind turbine noise levels within 10 dB?	Is a cumulative assessment required?
NALs 11, 15 and 24-32	Yes	Yes
NALs 1-10, 12-14, 16-23 and 33-49	No	No

15.8.22 As summarised in **Table 15-20** above, a cumulative noise assessment is required at eleven receptors. The results of the cumulative noise assessment at NALs 11, 15 and 24-32 are summarised in tabular form in **Table 15-21** and **Table 15-22**. While only those NALs which require a cumulative assessment are considered in Stage 2, Stage 3 considers potential effects from the Proposed Development on all NALs (see **Section 15.8.24**).

15.8.23 The results show that the predicted cumulative wind turbine noise immission levels meet the Total ETSU-R-97 Noise limits under all conditions at all NALs during both daytime and night-time periods.

Table 15-21: ETSU-R-97 Compliance Table – Likely Cumulative Noise - Daytime

Location		Wind Speed (ms^{-1}) as standardised to 10m height											
		1	2	3	4	5	6	7	8	9	10	11	12
NAL11	Total Noise Limit: ETSU-R-97 dB LA90	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
	Predicted Cumulative Wind Turbine Noise dB LA90	-	-	-	21.4	25.0	28.5	29.7	29.7	29.8	29.9	30.0	30.0
	Exceedance Level dB LA90	-	-	-	-18.6	-15.0	-11.5	-10.3	-10.3	-10.2	-10.1	-10.0	-10.0
NAL15	Total Noise Limit: ETSU-R-97 dB LA90	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	41.5	44.5	48.1
	Predicted Cumulative Wind Turbine Noise dB LA90	-	-	-	23.7	27.4	30.8	32.0	32.0	32.0	32.0	32.1	32.1
	Exceedance Level dB LA90	-	-	-	-16.3	-12.6	-9.2	-8.0	-8.0	-8.0	-9.5	-12.4	-16.0
NAL24	Total Noise Limit: ETSU-R-97 dB LA90	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	41.5	44.5	48.1
	Predicted Cumulative Wind Turbine Noise dB LA90	-	-	-	27.3	31.0	34.4	35.6	35.6	35.6	35.7	35.7	35.7
	Exceedance Level dB LA90	-	-	-	-12.7	-9.0	-5.6	-4.4	-4.4	-4.4	-5.8	-8.8	-12.4
NAL25	Total Noise Limit: ETSU-R-97 dB LA90	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	41.5	44.5	48.1
	Predicted Cumulative Wind Turbine Noise dB LA90	-	-	-	31.8	34.2	37.0	38.1	38.2	38.4	38.5	38.7	38.9

Location		Wind Speed (ms^{-1}) as standardised to 10m height											
		1	2	3	4	5	6	7	8	9	10	11	12
NAL26	Exceedance Level dB LA90	-	-	-	-8.2	-5.8	-3.0	-1.9	-1.8	-1.6	-3.0	-5.8	-9.2
	Total Noise Limit: ETSU-R-97 dB LA90	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	41.5	44.5	48.1
	Predicted Cumulative Wind Turbine Noise dB LA90	-	-	-	26.4	30.1	33.5	34.7	34.7	34.8	34.8	34.8	34.8
NAL27	Exceedance Level dB LA90	-	-	-	-13.6	-9.9	-6.5	-5.3	-5.3	-5.2	-6.7	-9.7	-13.3
	Total Noise Limit: ETSU-R-97 dB LA90	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	41.5	44.5	48.1
	Predicted Cumulative Wind Turbine Noise dB LA90	-	-	-	26.0	29.6	33.0	34.2	34.2	34.3	34.3	34.3	34.3
NAL28	Exceedance Level dB LA90	-	-	-	-14.0	-10.4	-7.0	-5.8	-5.8	-5.7	-7.2	-10.2	-13.8
	Total Noise Limit: ETSU-R-97 dB LA90	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	41.5	44.5	48.1
	Predicted Cumulative Wind Turbine Noise dB LA90	-	-	-	25.7	29.4	32.7	33.9	33.9	34.0	34.0	34.0	34.0
NAL29	Exceedance Level dB LA90	-	-	-	-14.3	-10.6	-7.3	-6.1	-6.1	-6.0	-7.5	-10.5	-14.1
	Total Noise Limit: ETSU-R-97 dB LA90	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	41.5	44.5	48.1
	Predicted Cumulative Wind Turbine Noise dB LA90	-	-	-	24.3	27.8	31.0	32.1	32.2	32.3	32.4	32.4	32.4
	Exceedance Level dB LA90	-	-	-	-15.7	-12.2	-9.0	-7.9	-7.8	-7.7	-9.1	-12.1	-15.7

Location		Wind Speed (ms^{-1}) as standardised to 10m height											
		1	2	3	4	5	6	7	8	9	10	11	12
NAL30	Total Noise Limit: ETSU-R-97 dB LA90	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	42.0	45.8	50.5
	Predicted Cumulative Wind Turbine Noise dB LA90	-	-	-	24.6	28.0	31.2	32.2	32.4	32.5	32.5	32.5	32.5
	Exceedance Level dB LA90	-	-	-	-15.4	-12.0	-8.8	-7.8	-7.6	-7.5	-9.5	-13.3	-18.0
NAL31	Total Noise Limit: ETSU-R-97 dB LA90	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	42.0	45.8	50.5
	Predicted Cumulative Wind Turbine Noise dB LA90	-	-	-	24.6	28.0	31.2	32.3	32.4	32.5	32.5	32.6	32.6
	Exceedance Level dB LA90	-	-	-	-15.4	-12.0	-8.8	-7.7	-7.6	-7.5	-9.5	-13.2	-17.9
NAL32	Total Noise Limit: ETSU-R-97 dB LA90	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	42.0	45.8	50.5
	Predicted Cumulative Wind Turbine Noise dB LA90	-	-	-	25.6	29.3	32.8	34.0	34.0	34.0	34.0	34.0	34.0
	Exceedance Level dB LA90	-	-	-	-14.4	-10.7	-7.2	-6.0	-6.0	-6.0	-8.0	-11.8	-16.5

Note: For the cumulative noise predictions the noise model considers the range of noise data available for each turbine type modelled. For some turbines noise data was not available for wind speeds less than 4 ms^{-1} therefore no cumulative predictions are included for wind speeds less than 4 ms^{-1}. Acoustic emission data for two of the small turbines is not available at 4 ms^{-1} and data for one of the small turbines is not available at 5 ms^{-1}. The predicted noise levels from these turbines at these wind speeds are assumed to be equal to the predicted noise level at the nearest wind speed where data is available as a conservative measure.

Table 15-22: ETSU-R-97 Compliance Table – Likely Cumulative Noise – Night-time

Location		Wind Speed (ms^{-1}) as standardised to 10m height											
		1	2	3	4	5	6	7	8	9	10	11	12
NAL11	Total Noise Limit: ETSU-R-97 dB LA90	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0
	Predicted Cumulative Wind Turbine Noise dB LA90	-	-	-	21.4	25.0	28.5	29.7	29.7	29.8	29.9	30.0	30.0
	Exceedance Level dB LA90	-	-	-	-21.6	-18.0	-14.5	-13.3	-13.3	-13.2	-13.1	-13.0	-13.0
NAL15	Total Noise Limit: ETSU-R-97 dB LA90	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.0
	Predicted Cumulative Wind Turbine Noise dB LA90	-	-	-	23.7	27.4	30.8	32.0	32.0	32.0	32.0	32.1	32.1
	Exceedance Level dB LA90	-	-	-	-19.3	-15.6	-12.2	-11.0	-11.0	-11.0	-11.0	-10.9	-12.9
NAL24	Total Noise Limit: ETSU-R-97 dB LA90	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.0
	Predicted Cumulative Wind Turbine Noise dB LA90	-	-	-	27.3	31.0	34.4	35.6	35.6	35.6	35.7	35.7	35.7
	Exceedance Level dB LA90	-	-	-	-15.7	-12.0	-8.6	-7.4	-7.4	-7.4	-7.3	-7.3	-9.3
NAL25	Total Noise Limit: ETSU-R-97 dB LA90	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.0
	Predicted Cumulative Wind Turbine Noise dB LA90	-	-	-	31.8	34.2	37.0	38.1	38.2	38.4	38.5	38.7	38.9

Location		Wind Speed (ms^{-1}) as standardised to 10m height											
		1	2	3	4	5	6	7	8	9	10	11	12
NAL26	Exceedance Level dB LA90	-	-	-	-11.2	-8.8	-6.0	-4.9	-4.8	-4.6	-4.5	-4.3	-6.1
	Total Noise Limit: ETSU-R-97 dB LA90	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.0
	Predicted Cumulative Wind Turbine Noise dB LA90	-	-	-	26.4	30.1	33.5	34.7	34.7	34.8	34.8	34.8	34.8
NAL27	Exceedance Level dB LA90	-	-	-	-16.6	-12.9	-9.5	-8.3	-8.3	-8.2	-8.2	-8.2	-10.2
	Total Noise Limit: ETSU-R-97 dB LA90	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.0
	Predicted Cumulative Wind Turbine Noise dB LA90	-	-	-	26.0	29.6	33.0	34.2	34.2	34.3	34.3	34.3	34.3
NAL28	Exceedance Level dB LA90	-	-	-	-17.0	-13.4	-10.0	-8.8	-8.8	-8.7	-8.7	-8.7	-10.7
	Total Noise Limit: ETSU-R-97 dB LA90	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.0
	Predicted Cumulative Wind Turbine Noise dB LA90	-	-	-	25.7	29.4	32.7	33.9	33.9	34.0	34.0	34.0	34.0
NAL29	Exceedance Level dB LA90	-	-	-	-17.3	-13.6	-10.3	-9.1	-9.1	-9.0	-9.0	-9.0	-11.0
	Total Noise Limit: ETSU-R-97 dB LA90	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.0
	Predicted Cumulative Wind Turbine Noise dB LA90	-	-	-	24.3	27.8	31.0	32.1	32.2	32.3	32.4	32.4	32.4

Location		Wind Speed (ms^{-1}) as standardised to 10m height											
		1	2	3	4	5	6	7	8	9	10	11	12
NAL30	Exceedance Level dB LA90	-	-	-	-18.7	-15.2	-12.0	-10.9	-10.8	-10.7	-10.6	-10.6	-12.6
	Total Noise Limit: ETSU-R-97 dB LA90	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	47.1	54.6
	Predicted Cumulative Wind Turbine Noise dB LA90	-	-	-	24.6	28.0	31.2	32.2	32.4	32.5	32.5	32.5	32.5
NAL31	Exceedance Level dB LA90	-	-	-	-18.4	-15.0	-11.8	-10.8	-10.6	-10.5	-10.5	-14.6	-22.1
	Total Noise Limit: ETSU-R-97 dB LA90	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	47.1	54.6
	Predicted Cumulative Wind Turbine Noise dB LA90	-	-	-	24.6	28.0	31.2	32.3	32.4	32.5	32.5	32.6	32.6
NAL32	Exceedance Level dB LA90	-	-	-	-18.4	-15.0	-11.8	-10.7	-10.6	-10.5	-10.5	-14.5	-22.0
	Total Noise Limit: ETSU-R-97 dB LA90	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	47.1	54.6
	Predicted Cumulative Wind Turbine Noise dB LA90	-	-	-	25.6	29.3	32.8	34.0	34.0	34.0	34.0	34.0	34.0
	Exceedance Level dB LA90	-	-	-	-17.4	-13.7	-10.2	-9.0	-9.0	-9.0	-9.0	-13.1	-20.6

Note: For the cumulative noise predictions the noise model considers the range of noise data available for each turbine type modelled. For some turbines noise data was not available for wind speeds less than 4 ms^{-1} therefore no cumulative predictions are included for wind speeds less than 4 ms^{-1}. Acoustic emission data for two of the small turbines is not available at 4 ms^{-1} and data for one of the small turbines is not available at 5 ms^{-1}. The predicted noise levels from these turbines at these wind speeds

are assumed to be equal to the predicted noise level at the nearest wind speed where data is available as a conservative measure.

Derivation of Site Specific Noise Limits for the Proposed Development (Stage 3)

15.8.24 In order to protect residential amenity, the IOA GPG recommends that cumulatively, all wind farms (including the Proposed Development) should operate within the Total ETSU-R-97 Noise Limits, as demonstrated in Stage 2 above.

15.8.25 To allow this to occur, a set of Site Specific Noise Limits for the Proposed Development are required and these have been derived for each NAL. The apportionment options provided in the IOA GPG were considered to determine the most appropriate option for each NAL, as summarised in **Table 6.8** in **Appendix 15-2: Wind Turbine Operational Noise Report**.

15.8.26 The Site Specific Noise Limits and noise predictions for the Proposed Development on its own are summarised in **Table 15-23** and **Table 15-24** below. Only the NALs with predicted noise levels of greater than 35 dB(A)[35] are shown in these tables to provide a more focused assessment. The predicted noise levels at all remaining NALs are provided in Annex 6 of **Appendix 15-2: Wind Turbine Operational Noise Report**. The tables show that the predicted wind turbine noise immission levels meet the Site Specific Noise Limits under all conditions and at all locations for both daytime and night-time periods, except for certain wind speeds and directions during daytime periods at NALs 1, 2, 4-6, 42-45 and 49. The Applicant's preliminary assessment is therefore that for NALs 1, 2, 4-6, 42-45 and 49, prior to the implementation of additional mitigation, the effects would be adverse and Significant. For all other NALs, the effects prior to the implementation of additional mitigation, are **Not Significant**.

[35] The lowest limit level applicable to wind turbine noise, in line with within ETSU-R-97 and the IOA GPG. Where the highest level of predicted wind turbine noise at a NAL is below 35 dB, noise limits will be met regardless of wind speed.

Table 15-23: Site Specific Noise Limits Compliance Table – Daytime

Location		Wind Speed (ms^{-1}) as standardised to 10m height											
		1	2	3	4	5	6	7	8	9	10	11	12
NAL1	Site Specific Noise Limit dB LA90	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.5	43.4	46.9
	Predicted Wind Turbine Noise dB LA90	-	-	32.6	34.2	38.0	41.6	42.8	42.8	42.8	42.8	42.8	42.8
	Exceedance Level dB LA90	-	-	-7.4	-5.8	-2.0	**1.6**	**2.8**	**2.8**	**2.8**	**2.3**	-0.6	-4.1
NAL2	Site Specific Noise Limit dB LA90	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.5	43.4	46.9
	Predicted Wind Turbine Noise dB LA90	-	-	30.1	31.7	35.5	39.1	40.3	40.3	40.3	40.3	40.3	40.3
	Exceedance Level dB LA90	-	-	-9.9	-8.3	-4.5	-0.9	**0.3**	**0.3**	**0.3**	-0.2	-3.1	-6.6
NAL3	Site Specific Noise Limit dB LA90	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.5	43.4	46.9
	Predicted Wind Turbine Noise dB LA90	-	-	28.1	29.7	33.5	37.1	38.3	38.3	38.3	38.3	38.3	38.3
	Exceedance Level dB LA90	-	-	-11.9	-10.3	-6.5	-2.9	-1.7	-1.7	-1.7	-2.2	-5.1	-8.6
NAL4	Site Specific Noise Limit dB LA90	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.5	43.4	46.9
	Predicted Wind Turbine Noise dB LA90	-	-	30.2	31.8	35.6	39.2	40.4	40.4	40.4	40.4	40.4	40.4
	Exceedance Level dB LA90	-	-	-9.8	-8.2	-4.4	-0.8	**0.4**	**0.4**	**0.4**	-0.1	-3.0	-6.5
NA L5	Site Specific Noise Limit dB LA90	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.5	43.4	46.9

Location		Wind Speed (ms^{-1}) as standardised to 10m height											
		1	2	3	4	5	6	7	8	9	10	11	12
NAL6	Predicted Wind Turbine Noise dB LA90	-	-	30.4	32.0	35.8	39.4	40.6	40.6	40.6	40.6	40.6	40.6
	Exceedance Level dB LA90	-	-	-9.6	-8.0	-4.2	-0.6	**0.6**	**0.6**	**0.6**	**0.1**	-2.8	-6.3
	Site Specific Noise Limit dB LA90	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.5	43.4	46.9
NAL7	Predicted Wind Turbine Noise dB LA90	-	-	31.7	33.3	37.1	40.7	41.9	41.9	41.9	41.9	41.9	41.9
	Exceedance Level dB LA90	-	-	-8.3	-6.7	-2.9	**0.7**	**1.9**	**1.9**	**1.9**	**1.4**	-1.5	-5.0
	Site Specific Noise Limit dB LA90	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.5	43.4	46.9
NAL8	Predicted Wind Turbine Noise dB LA90	-	-	28.5	30.1	33.9	37.5	38.7	38.7	38.7	38.7	38.7	38.7
	Exceedance Level dB LA90	-	-	-11.5	-9.9	-6.1	-2.5	-1.3	-1.3	-1.3	-1.8	-4.7	-8.2
	Site Specific Noise Limit dB LA90	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.5	43.4	46.9
NAL9	Predicted Wind Turbine Noise dB LA90	-	-	28.2	29.8	33.6	37.2	38.4	38.4	38.4	38.4	38.4	38.4
	Exceedance Level dB LA90	-	-	-11.8	-10.2	-6.4	-2.8	-1.6	-1.6	-1.6	-2.1	-5.0	-8.5
	Site Specific Noise Limit dB LA90	40.0	40.0	40.0	40.0	40.0	40.0	41.2	43.5	45.6	47.2	48.3	48.8
	Predicted Wind Turbine Noise dB LA90	-	-	30.9	32.5	36.3	39.9	41.1	41.1	41.1	41.1	41.1	41.1
	Exceedance Level dB LA90	-	-	-9.1	-7.5	-3.7	-0.1	-0.1	-2.4	-4.5	-6.1	-7.2	-7.7

Location		Wind Speed (ms^{-1}) as standardised to 10m height											
		1	2	3	4	5	6	7	8	9	10	11	12
NAL10	Site Specific Noise Limit dB LA90	40.0	40.0	40.0	40.0	40.0	40.0	41.2	43.5	45.6	47.2	48.3	48.8
	Predicted Wind Turbine Noise dB LA90	-	-	29.9	31.5	35.3	38.9	40.1	40.1	40.1	40.1	40.1	40.1
	Exceedance Level dB LA90	-	-	-10.1	-8.5	-4.7	-1.1	-1.1	-3.4	-5.5	-7.1	-8.2	-8.7
NAL24	Site Specific Noise Limit dB LA90	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	41.5	44.5	48.1
	Predicted Wind Turbine Noise dB LA90	-	-	25.1	26.7	30.6	34.2	35.4	35.4	35.4	35.4	35.4	35.4
	Exceedance Level dB LA90	-	-	-14.9	-13.3	-9.4	-5.8	-4.6	-4.6	-4.6	-6.1	-9.1	-12.7
NAL25	Site Specific Noise Limit dB LA90	40.0	40.0	40.0	40.0	40.0	39.1	39.0	38.8	38.6	40.4	44.5	48.1
	Predicted Wind Turbine Noise dB LA90	-	-	28.1	29.7	33.6	37.1	38.3	38.3	38.3	38.3	38.3	38.3
	Exceedance Level dB LA90	-	-	-11.9	-10.3	-6.4	-2.0	-0.7	-0.5	-0.3	-2.1	-6.2	-9.8
NAL33	Site Specific Noise Limit dB LA90	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.4	44.0
	Predicted Wind Turbine Noise dB LA90	-	-	29.0	30.6	34.5	38.0	39.2	39.2	39.2	39.2	39.2	39.2
	Exceedance Level dB LA90	-	-	-11.0	-9.4	-5.5	-2.0	-0.8	-0.8	-0.8	-0.8	-1.2	-4.8
NA L34	Site Specific Noise Limit dB LA90	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.4	44.0

Location		Wind Speed (ms^{-1}) as standardised to 10m height											
		1	2	3	4	5	6	7	8	9	10	11	12
NAL35	Predicted Wind Turbine Noise dB LA90	-	-	27.4	29.0	32.8	36.4	37.6	37.6	37.6	37.6	37.6	37.6
	Exceedance Level dB LA90	-	-	-12.6	-11.0	-7.2	-3.6	-2.4	-2.4	-2.4	-2.4	-2.8	-6.4
	Site Specific Noise Limit dB LA90	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.4	44.0
NAL36	Predicted Wind Turbine Noise dB LA90	-	-	28.3	29.9	33.7	37.3	38.5	38.5	38.5	38.5	38.5	38.5
	Exceedance Level dB LA90	-	-	-11.7	-10.1	-6.3	-2.7	-1.5	-1.5	-1.5	-1.5	-1.9	-5.5
	Site Specific Noise Limit dB LA90	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	42.0	45.8	50.5
NAL37	Predicted Wind Turbine Noise dB LA90	-	-	27.4	29.0	32.9	36.4	37.6	37.6	37.6	37.6	37.6	37.6
	Exceedance Level dB LA90	-	-	-12.6	-11.0	-7.1	-3.6	-2.4	-2.4	-2.4	-4.4	-8.2	-12.9
	Site Specific Noise Limit dB LA90	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.4	44.0
NAL38	Predicted Wind Turbine Noise dB LA90	-	-	27.9	29.5	33.3	36.9	38.1	38.1	38.1	38.1	38.1	38.1
	Exceedance Level dB LA90	-	-	-12.1	-10.5	-6.7	-3.1	-1.9	-1.9	-1.9	-1.9	-2.3	-5.9
	Site Specific Noise Limit dB LA90	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.4	44.0
	Predicted Wind Turbine Noise dB LA90	-	-	27.4	29.0	32.8	36.4	37.6	37.6	37.6	37.6	37.6	37.6

Location		Wind Speed (ms^{-1}) as standardised to 10m height											
		1	2	3	4	5	6	7	8	9	10	11	12
NAL39	Exceedance Level dB LA90	-	-	-12.6	-11.0	-7.2	-3.6	-2.4	-2.4	-2.4	-2.4	-2.8	-6.4
	Site Specific Noise Limit dB LA90	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.4	44.0
	Predicted Wind Turbine Noise dB LA90	-	-	27.1	28.6	32.5	36.0	37.2	37.2	37.2	37.2	37.2	37.2
NAL40	Exceedance Level dB LA90	-	-	-12.9	-11.4	-7.5	-4.0	-2.8	-2.8	-2.8	-2.8	-3.2	-6.8
	Site Specific Noise Limit dB LA90	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.4	44.0
	Predicted Wind Turbine Noise dB LA90	-	-	26.5	28.1	31.9	35.5	36.7	36.7	36.7	36.7	36.7	36.7
NAL41	Exceedance Level dB LA90	-	-	-13.5	-11.9	-8.1	-4.5	-3.3	-3.3	-3.3	-3.3	-3.7	-7.3
	Site Specific Noise Limit dB LA90	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.4	44.0
	Predicted Wind Turbine Noise dB LA90	-	-	26.1	27.7	31.5	35.1	36.3	36.3	36.3	36.3	36.3	36.3
NAL42	Exceedance Level dB LA90	-	-	-13.9	-12.3	-8.5	-4.9	-3.7	-3.7	-3.7	-3.7	-4.1	-7.7
	Site Specific Noise Limit dB LA90	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.5	43.4	46.9
	Predicted Wind Turbine Noise dB LA90	-	-	31.8	33.4	37.2	40.7	42.0	42.0	42.0	42.0	42.0	42.0
NA L43	Exceedance Level dB LA90	-	-	-8.2	-6.6	-2.8	**0.7**	**2.0**	**2.0**	**2.0**	**1.5**	-1.4	-4.9
	Site Specific Noise Limit dB LA90	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.5	43.4	46.9

Location		Wind Speed (ms^{-1}) as standardised to 10m height											
		1	2	3	4	5	6	7	8	9	10	11	12
NAL44	Predicted Wind Turbine Noise dB LA90	-	-	31.6	33.1	37.0	40.5	41.7	41.7	41.7	41.7	41.7	41.7
	Exceedance Level dB LA90	-	-	-8.4	-6.9	-3.0	**0.5**	**1.7**	**1.7**	**1.7**	**1.2**	-1.7	-5.2
	Site Specific Noise Limit dB LA90	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.5	43.4	46.9
NAL45	Predicted Wind Turbine Noise dB LA90	-	-	30.1	31.7	35.5	39.1	40.3	40.3	40.3	40.3	40.3	40.3
	Exceedance Level dB LA90	-	-	-9.9	-8.3	-4.5	-0.9	**0.3**	**0.3**	**0.3**	-0.2	-3.1	-6.6
	Site Specific Noise Limit dB LA90	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.5	43.4	46.9
NAL46	Predicted Wind Turbine Noise dB LA90	-	-	31.6	33.2	37.0	40.6	41.8	41.8	41.8	41.8	41.8	41.8
	Exceedance Level dB LA90	-	-	-8.4	-6.8	-3.0	**0.6**	**1.8**	**1.8**	**1.8**	**1.3**	-1.6	-5.1
	Site Specific Noise Limit dB LA90	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.5	43.4	46.9
NAL47	Predicted Wind Turbine Noise dB LA90	-	-	28.4	30.0	33.8	37.4	38.6	38.6	38.6	38.6	38.6	38.6
	Exceedance Level dB LA90	-	-	-11.6	-10.0	-6.2	-2.6	-1.4	-1.4	-1.4	-1.9	-4.8	-8.3
	Site Specific Noise Limit dB LA90	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.5	43.4	46.9
	Predicted Wind Turbine Noise dB LA90	-	-	29.2	30.8	34.6	38.2	39.4	39.4	39.4	39.4	39.4	39.4
	Exceedance Level dB LA90	-	-	-10.8	-9.2	-5.4	-1.8	-0.6	-0.6	-0.6	-1.1	-4.0	-7.5

Location		Wind Speed (ms^{-1}) as standardised to 10m height											
		1	2	3	4	5	6	7	8	9	10	11	12
NAL48	Site Specific Noise Limit dB LA90	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.5	43.4	46.9
	Predicted Wind Turbine Noise dB LA90	-	-	29.2	30.7	34.6	38.1	39.3	39.3	39.3	39.3	39.3	39.3
	Exceedance Level dB LA90	-	-	-10.8	-9.3	-5.4	-1.9	-0.7	-0.7	-0.7	-1.2	-4.1	-7.6
NAL49	Site Specific Noise Limit dB LA90	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.4	44.0
	Predicted Wind Turbine Noise dB LA90	-	-	30.9	32.5	36.4	39.9	41.1	41.1	41.1	41.1	41.1	41.1
	Exceedance Level dB LA90	-	-	-9.1	-7.5	-3.6	-0.1	**1.1**	**1.1**	**1.1**	**1.1**	**0.7**	-2.9

Table 15-24: Site Specific Noise Limits Compliance Table – Night-time

Location		Wind Speed (ms^{-1}) as standardised to 10m height											
		1	2	3	4	5	6	7	8	9	10	11	12
NAL1	Site Specific Noise Limit dB LA90	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.4	49.0
	Predicted Wind Turbine Noise dB LA90	-	-	32.6	34.2	38.0	41.6	42.8	42.8	42.8	42.8	42.8	42.8
	Exceedance Level dB LA90	-	-	-10.4	-8.8	-5.0	-1.4	-0.2	-0.2	-0.2	-0.2	-0.6	-6.2
NA L2	Site Specific Noise Limit dB LA90	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.4	49.0

Location		Wind Speed (ms^{-1}) as standardised to 10m height											
		1	2	3	4	5	6	7	8	9	10	11	12
NAL3	Predicted Wind Turbine Noise dB LA90	-	-	30.1	31.7	35.5	39.1	40.3	40.3	40.3	40.3	40.3	40.3
	Exceedance Level dB LA90	-	-	-12.9	-11.3	-7.5	-3.9	-2.7	-2.7	-2.7	-2.7	-3.1	-8.7
	Site Specific Noise Limit dB LA90	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.4	49.0
NAL4	Predicted Wind Turbine Noise dB LA90	-	-	28.1	29.7	33.5	37.1	38.3	38.3	38.3	38.3	38.3	38.3
	Exceedance Level dB LA90	-	-	-14.9	-13.3	-9.5	-5.9	-4.7	-4.7	-4.7	-4.7	-5.1	-10.7
	Site Specific Noise Limit dB LA90	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.4	49.0
NAL5	Predicted Wind Turbine Noise dB LA90	-	-	30.2	31.8	35.6	39.2	40.4	40.4	40.4	40.4	40.4	40.4
	Exceedance Level dB LA90	-	-	-12.8	-11.2	-7.4	-3.8	-2.6	-2.6	-2.6	-2.6	-3.0	-8.6
	Site Specific Noise Limit dB LA90	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.4	49.0
NAL6	Predicted Wind Turbine Noise dB LA90	-	-	30.4	32.0	35.8	39.4	40.6	40.6	40.6	40.6	40.6	40.6
	Exceedance Level dB LA90	-	-	-12.6	-11.0	-7.2	-3.6	-2.4	-2.4	-2.4	-2.4	-2.8	-8.4
	Site Specific Noise Limit dB LA90	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.4	49.0
	Predicted Wind Turbine Noise dB LA90	-	-	31.7	33.3	37.1	40.7	41.9	41.9	41.9	41.9	41.9	41.9
	Exceedance Level dB LA90	-	-	-11.3	-9.7	-5.9	-2.3	-1.1	-1.1	-1.1	-1.1	-1.5	-7.1

Location		Wind Speed (ms^{-1}) as standardised to 10m height											
		1	2	3	4	5	6	7	8	9	10	11	12
NAL7	Site Specific Noise Limit dB LA90	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.4	49.0
	Predicted Wind Turbine Noise dB LA90	-	-	28.5	30.1	33.9	37.5	38.7	38.7	38.7	38.7	38.7	38.7
	Exceedance Level dB LA90	-	-	-14.5	-12.9	-9.1	-5.5	-4.3	-4.3	-4.3	-4.3	-4.7	-10.3
NAL8	Site Specific Noise Limit dB LA90	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.4	49.0
	Predicted Wind Turbine Noise dB LA90	-	-	28.2	29.8	33.6	37.2	38.4	38.4	38.4	38.4	38.4	38.4
	Exceedance Level dB LA90	-	-	-14.8	-13.2	-9.4	-5.8	-4.6	-4.6	-4.6	-4.6	-5.0	-10.6
NAL9	Site Specific Noise Limit dB LA90	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.8	47.9	51.1
	Predicted Wind Turbine Noise dB LA90	-	-	30.9	32.5	36.3	39.9	41.1	41.1	41.1	41.1	41.1	41.1
	Exceedance Level dB LA90	-	-	-12.1	-10.5	-6.7	-3.1	-1.9	-1.9	-1.9	-3.7	-6.8	-10.0
NAL10	Site Specific Noise Limit dB LA90	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.8	47.9	51.1
	Predicted Wind Turbine Noise dB LA90	-	-	29.9	31.5	35.3	38.9	40.1	40.1	40.1	40.1	40.1	40.1
	Exceedance Level dB LA90	-	-	-13.1	-11.5	-7.7	-4.1	-2.9	-2.9	-2.9	-4.7	-7.8	-11.0
NA L24	Site Specific Noise Limit dB LA90	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	45.0

Location		Wind Speed (ms^{-1}) as standardised to 10m height											
		1	2	3	4	5	6	7	8	9	10	11	12
NAL25	Predicted Wind Turbine Noise dB LA90	-	-	25.1	26.7	30.6	34.2	35.4	35.4	35.4	35.4	35.4	35.4
	Exceedance Level dB LA90	-	-	-17.9	-16.3	-12.4	-8.8	-7.6	-7.6	-7.6	-7.6	-7.6	-9.6
	Site Specific Noise Limit dB LA90	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	42.2	42.1	45.0
NAL33	Predicted Wind Turbine Noise dB LA90	-	-	28.1	29.7	33.6	37.1	38.3	38.3	38.3	38.3	38.3	38.3
	Exceedance Level dB LA90	-	-	-14.9	-13.3	-9.4	-5.9	-4.7	-4.7	-4.7	-3.9	-3.8	-6.7
	Site Specific Noise Limit dB LA90	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.2
NAL34	Predicted Wind Turbine Noise dB LA90	-	-	29.0	30.6	34.5	38.0	39.2	39.2	39.2	39.2	39.2	39.2
	Exceedance Level dB LA90	-	-	-14.0	-12.4	-8.5	-5.0	-3.8	-3.8	-3.8	-3.8	-3.8	-5.0
	Site Specific Noise Limit dB LA90	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.2
NAL35	Predicted Wind Turbine Noise dB LA90	-	-	27.4	29.0	32.8	36.4	37.6	37.6	37.6	37.6	37.6	37.6
	Exceedance Level dB LA90	-	-	-15.6	-14.0	-10.2	-6.6	-5.4	-5.4	-5.4	-5.4	-5.4	-6.6
	Site Specific Noise Limit dB LA90	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.2
	Predicted Wind Turbine Noise dB LA90	-	-	28.3	29.9	33.7	37.3	38.5	38.5	38.5	38.5	38.5	38.5

Location		Wind Speed (ms^{-1}) as standardised to 10m height											
		1	2	3	4	5	6	7	8	9	10	11	12
NAL36	Exceedance Level dB LA90	-	-	-14.7	-13.1	-9.3	-5.7	-4.5	-4.5	-4.5	-4.5	-4.5	-5.7
	Site Specific Noise Limit dB LA90	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	47.1	54.6
	Predicted Wind Turbine Noise dB LA90	-	-	27.4	29.0	32.9	36.4	37.6	37.6	37.6	37.6	37.6	37.6
NAL37	Exceedance Level dB LA90	-	-	-15.6	-14.0	-10.1	-6.6	-5.4	-5.4	-5.4	-5.4	-9.5	-17.0
	Site Specific Noise Limit dB LA90	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.2
	Predicted Wind Turbine Noise dB LA90	-	-	27.9	29.5	33.3	36.9	38.1	38.1	38.1	38.1	38.1	38.1
NAL38	Exceedance Level dB LA90	-	-	-15.1	-13.5	-9.7	-6.1	-4.9	-4.9	-4.9	-4.9	-4.9	-6.1
	Site Specific Noise Limit dB LA90	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.2
	Predicted Wind Turbine Noise dB LA90	-	-	27.4	29.0	32.8	36.4	37.6	37.6	37.6	37.6	37.6	37.6
NAL39	Exceedance Level dB LA90	-	-	-15.6	-14.0	-10.2	-6.6	-5.4	-5.4	-5.4	-5.4	-5.4	-6.6
	Site Specific Noise Limit dB LA90	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.2
	Predicted Wind Turbine Noise dB LA90	-	-	27.1	28.6	32.5	36.0	37.2	37.2	37.2	37.2	37.2	37.2
NAL40	Exceedance Level dB LA90	-	-	-15.9	-14.4	-10.5	-7.0	-5.8	-5.8	-5.8	-5.8	-5.8	-7.0
	Site Specific Noise Limit dB LA90	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.2

Location		Wind Speed (ms^{-1}) as standardised to 10m height											
		1	2	3	4	5	6	7	8	9	10	11	12
NAL41	Predicted Wind Turbine Noise dB LA90	-	-	26.5	28.1	31.9	35.5	36.7	36.7	36.7	36.7	36.7	36.7
	Exceedance Level dB LA90	-	-	-16.5	-14.9	-11.1	-7.5	-6.3	-6.3	-6.3	-6.3	-6.3	-7.5
	Site Specific Noise Limit dB LA90	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.2
NAL42	Predicted Wind Turbine Noise dB LA90	-	-	26.1	27.7	31.5	35.1	36.3	36.3	36.3	36.3	36.3	36.3
	Exceedance Level dB LA90	-	-	-16.9	-15.3	-11.5	-7.9	-6.7	-6.7	-6.7	-6.7	-6.7	-7.9
	Site Specific Noise Limit dB LA90	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.4	49.0
NAL43	Predicted Wind Turbine Noise dB LA90	-	-	31.8	33.4	37.2	40.7	42.0	42.0	42.0	42.0	42.0	42.0
	Exceedance Level dB LA90	-	-	-11.2	-9.6	-5.8	-2.3	-1.0	-1.0	-1.0	-1.0	-1.4	-7.0
	Site Specific Noise Limit dB LA90	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.4	49.0
NAL44	Predicted Wind Turbine Noise dB LA90	-	-	31.6	33.1	37.0	40.5	41.7	41.7	41.7	41.7	41.7	41.7
	Exceedance Level dB LA90	-	-	-11.4	-9.9	-6.0	-2.5	-1.3	-1.3	-1.3	-1.3	-1.7	-7.3
	Site Specific Noise Limit dB LA90	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.4	49.0
	Predicted Wind Turbine Noise dB LA90	-	-	30.1	31.7	35.5	39.1	40.3	40.3	40.3	40.3	40.3	40.3

Location		Wind Speed (ms^{-1}) as standardised to 10m height											
		1	2	3	4	5	6	7	8	9	10	11	12
NAL45	Exceedance Level dB LA90	-	-	-12.9	-11.3	-7.5	-3.9	-2.7	-2.7	-2.7	-2.7	-3.1	-8.7
	Site Specific Noise Limit dB LA90	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.4	49.0
	Predicted Wind Turbine Noise dB LA90	-	-	31.6	33.2	37.0	40.6	41.8	41.8	41.8	41.8	41.8	41.8
NAL46	Exceedance Level dB LA90	-	-	-11.4	-9.8	-6.0	-2.4	-1.2	-1.2	-1.2	-1.2	-1.6	-7.2
	Site Specific Noise Limit dB LA90	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.4	49.0
	Predicted Wind Turbine Noise dB LA90	-	-	28.4	30.0	33.8	37.4	38.6	38.6	38.6	38.6	38.6	38.6
NAL47	Exceedance Level dB LA90	-	-	-14.6	-13.0	-9.2	-5.6	-4.4	-4.4	-4.4	-4.4	-4.8	-10.4
	Site Specific Noise Limit dB LA90	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.4	49.0
	Predicted Wind Turbine Noise dB LA90	-	-	29.2	30.8	34.6	38.2	39.4	39.4	39.4	39.4	39.4	39.4
NAL48	Exceedance Level dB LA90	-	-	-13.8	-12.2	-8.4	-4.8	-3.6	-3.6	-3.6	-3.6	-4.0	-9.6
	Site Specific Noise Limit dB LA90	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.4	49.0
	Predicted Wind Turbine Noise dB LA90	-	-	29.2	30.7	34.6	38.1	39.3	39.3	39.3	39.3	39.3	39.3
NAL49	Exceedance Level dB LA90	-	-	-13.8	-12.3	-8.4	-4.9	-3.7	-3.7	-3.7	-3.7	-4.1	-9.7
	Site Specific Noise Limit dB LA90	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	43.0	44.2

Location		Wind Speed (ms^{-1}) as standardised to 10m height											
		1	2	3	4	5	6	7	8	9	10	11	12
	Predicted Wind Turbine Noise dB LA90	-	-	30.9	32.5	36.4	39.9	41.1	41.1	41.1	41.1	41.1	41.1
	Exceedance Level dB LA90	-	-	-12.1	-10.5	-6.6	-3.1	-1.9	-1.9	-1.9	-1.9	-1.9	-3.1

Additional Mitigation

15.8.27 Additional mitigation will be required in the form of wind turbine mode management, applicable to a limited number of turbines for a specific range of wind speeds and directions to ensure that the Site Specific Noise Limits are met. Following confirmation of the choice of turbine to be installed onsite, an Operational Noise Management Plan will be devised and enacted to ensure that no exceedances of the noise limits will occur. This will take the form of a scheme of low noise operational modes to be used under specific wind conditions. This would form part of the oOEMP and be secured by a DCO requirement.

15.8.28 Low noise operational modes are available for the candidate wind turbines, the Vestas V172 7.2MW and Vestas V136 4.5MW, offering up to a 5 dB reduction compared to 'full mode' noise levels. The available modes reduce the turbine noise level in increments of 1 dB, allowing for flexibility of operation.

15.8.29 The Vestas turbine models were chosen for the purposes of this preliminary assessment as they are considered to be representative of the types of turbine that could be installed (which are noted in **Chapter 4: The Proposed Development**, **Chapter 7: Methodology for the Preliminary Environmental Information Report** and **Chapter 21: Shadow Flicker**). There are a number of wind turbine makes and models that may be suitable for the Proposed Development. Following grant of the DCO, the final choice of turbine would be subject to a competitive procurement / tendering process. However, the final choice of turbine would have to meet the noise limits determined and contained within any DCO requirement imposed.

15.8.30 At NALs 1, 2, 4-6, 42-45 and 49, as demonstrated in **Table 6.6** and **Table 6.7** of **Appendix 15-2: Wind Turbine Operational Noise Report**, the combined cumulative noise immission inclusive of additional mitigation (set out above) remains below, or equal to, the Total ETSU-R-97 Noise Limit.

Residual Effects

15.8.31 Following the implementation of additional mitigation in the form of wind turbine mitigation (low noise operational modes) which will be secured as part of the oOEMP, the Site Specific Noise Limits would be met at all locations during daytime and night-time periods. As such, all residual effects will be **Not Significant**.

Operational Substation Noise

15.8.32 The onsite substation (inclusive of High-Voltage Transformers, Auxiliary Transformers and Shunt Reactors) was modelled using CadnaA[36] (noise modelling software) a provided layout, candidate plant specifications and sound power level

[36] CadnaA Noise Modelling Software 2025, Datakustik

data that is typical of a substation for a wind farm of this size. Sound Power Data for the modelled plant is provided within **Technical Appendix 15-3**.

15.8.33 The predictions were undertaken in accordance with ISO 9613-2:2024. The calculation parameters used are as follows:

- Temperature was assumed to be 10°C and relative humidity as 70%;
- A ground attenuation factor of 1 (soft ground) was used, except for specific areas of developed ground (access tracks and hardstandings) which have been modelled with a ground attenuation factor of 0 (hard ground); and
- Receiver heights were set to 4m.

15.8.34 The highest predicted rating noise level from the substation was 22 dB LAeq (10 mins), occurring at SNAL02.

15.8.35 The Rating Levels have been calculated assuming all plant is operating continuously and concurrently. As detailed within **Section 6** of **Technical Appendix 15-3**, no character corrections have been assumed. The model assumes, as a worst case, that noise levels do not fluctuate and remain the same throughout the daytime and night-time assessment periods.

15.8.36 A comparison of the Rating levels against the Background Sound Levels is detailed in **Table 15-25**, with a noise contour plot shown in **Figure 15-4**.

Table 15-25: BS 4142 Initial Estimate of Impact

NML	Rating Level (dBA)		Background Sound Level (dB LA90,10min)		Difference (+/-) (dB)	
	Day	Night	Day	Night	Day	Night
SNAL01 – Holme Ends	21	21	26	24	-5	-3
SNAL02 – Well Hole Cottage	22	22	26	24	-4	-2
SNAL03 – Cloughfoot Farm	20	20	26	24	-6	-4

15.8.37 During both daytime and night-time, the Rating Level is below/equal to the Representative Background Sound Level at all SNALs during the daytime/night-time. This is an *"indication of the specific sound source having a low impact, depending on the context"*.

15.8.38 BS 4142 suggests that in instances where the existing sound environment is considered either particularly low or particularly high then absolute levels may be more relevant than the initial estimate of impact. The standard states:

"Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night."

15.8.39 The ANC BS 4142 Technical Note provides additional guidance on this, providing indicative values that could be used to describe 'low' background sound levels and 'low' rating levels. Specifically, the Technical Note states:

"BS 4142 does not define 'low' in the context of background sound levels nor rating levels. The note to the Scope of the 1997 version of BS 4142 defined very low background sound levels as being less than about 30 dB LA90, and low rating levels as being less than about 35 dB $L_{Ar,Tr}$".

15.8.40 In this case the background sound levels are below 30 dB for both daytime and night-time at all SNALs, which could be described as 'very low'. The Rating Levels are similarly 'low', remaining below 35 dB $L_{Aeq(15mins)}$ at all receptors. As such, consideration of the absolute level of sound suggests that the initial estimate of impact could be reduced.

15.8.41 The character and level of the residual sound should be compared to the character and level of the specific sound, and consideration given to whether the specific sound would be incongruous within the existing environment. **Table 15-26** compares the Specific Sound Level with the Residual Sound Level and also indicates the estimated level of change.

Table 15-26: Residual (Existing) and Ambient (Future) Sound Levels, dB $L_{Aeq(15mins)}$

NML	Specific Sound Level		Residual Sound Level		Ambient Sound Level		Change (+/-)	
	Day	Night	Day	Night	Day	Night	Day	Night
SNAL01 – Holme Ends	21	21	40	32	40	32	0	0
SNAL02 – Well Hole Cottage	22	22	40	32	40	32	0	0
SNAL03 – Cloughfoot Farm	20	20	40	32	40	32	0	0

15.8.42 At all receptors the increase in noise level for both day or night is 0 dB. To put this into context, it is generally considered that an overall change in noise level of 3 dB is just perceptible. Therefore, for all SNALs, the overall noise level increase is likely to be imperceptible. As such, consideration of the character and level of residual sound does not materially change the initial estimate of impact.

15.8.43 BS 4142 suggests that the sensitivity of the receptor may be lessened if design measures that secure good internal and/or outdoor acoustic conditions are already implemented within the receptor. An example of this could be where a residential building has been fitted with non-openable windows in an already high noise environment. This is not relevant to this assessment, where it is assumed that all nearby NSRs do not incorporate any specific noise control measures. As such, the sensitivity of the receptor remains high, and this contextual element does not materially affect the initial estimate of impacts.

15.8.44 The Stage 1 Initial Estimate of Impact indicated that the Rating Level at all SNALs is equal to or below the background sound level, which suggests the initial estimate of impact was an *"indication of the specific sound source having a low impact, depending on the context".* Detailed consideration of the context suggests that the initial estimate of impacts could be reduced even further, however the outcome is not changed from the initial estimate as it had already concluded low impact.

15.8.45 Accordingly, the BS 4142 assessment concludes that there would be no adverse impacts on residential receptors from the operation of the Proposed Development, and, when considering the high sensitivity of receptors, as such the effects would be Not Significant.

Additional Mitigation

15.8.46 **Section 7** of **Appendix 15-3: Operational Substation Noise Impact Assessment** presents proposed DCO requirements which define appropriate noise level limits as described above.

Residual Effects

15.8.47 With the inclusion of the proposed DCO requirements to define appropriate specific noise limits as detailed, residual effects will be **Not Significant**.

Next Steps

15.8.48 The construction and decommissioning noise assessment will be reviewed following further design refinement and refinement of the construction/decommissioning programme.

15.8.49 The construction traffic noise assessment will be reviewed following any updates to the traffic data to align with the final design.

15.8.50 The operational wind turbine assessment will be reviewed following further design refinement and, where required, updated to ensure that the assessment in the ES reflects the layout at submission based on locations representing the maximum parameters.

15.8.51 The assessment summarised in this section considers indicative plant considered typical of a substation of this size. Following further design refinement, this assessment may be updated to consider specific candidate items of plant.

15.8.52 Preliminary assessment conclusions will be reviewed following PEIR consultation.

15.9 Conclusions

15.9.1 An assessment has been undertaken to consider the effects of noise resulting from the construction, operation and decommissioning of the Proposed Development.

15.9.2 **Table 15-27** presents a summary of the preliminary assessment of likely significant effects, with further information. It also includes the next steps to be undertaken as part of the EIA.

Table 15-27: Summary of Preliminary Assessment of Likely Significant Effects

Element	Additional Mitigation	Residual Effect	Next Steps
Construction Noise	CEMP	**Not Significant**	Review following PEIR Consultation
Construction Traffic Noise	Not required	**Not Significant**	Review following PEIR Consultation
Operational Wind Farm Noise	Targeted Mode Management for specific winds speeds and directions	**Not Significant**	Review following PEIR Consultation

Element	Additional Mitigation	Residual Effect	Next Steps
Operational Substation Noise	Not required	**Not Significant**	Review following PEIR Consultation
Decommissioning Noise	DEMP	**Not Significant**	Review following PEIR Consultation
Decommissioning Traffic Noise	Not required	**Not Significant**	Review following PEIR Consultation

Calderdale
energy park