Contents

Noise - Appendix 13A

13.1 Noise terminology

13.1.1. Noise is defined as unwanted sound. Human ears are able to respond to sound in the frequency range 20 Hz (deep bass) to 20,000 Hz (high treble) and over the audible range of 0 decibels (dB) (the threshold of perception) to 140 decibels (dB) (the threshold of pain). The ear does not respond equally to different frequencies of the same magnitude but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates the response of the human ear, a weighting mechanism is used. This reduces the importance of lower and higher frequencies, in a similar manner to the human ear.

13.1.2. Furthermore, the perception of noise may be determined by other factors, which may not necessarily be acoustic. In general, the impact of noise depends upon its level, the margin by which it exceeds the background level, its character and its variation over a given period of time. In some cases, the time of day and other acoustic features such as tonality or impulsiveness may be important, as may the disposition of the affected individual. Assessment of noise should give due consideration to all of these factors when assessing the significance of a noise source.

13.1.3. The most widely used weighting mechanism that best corresponds to the response of the human ear is the 'A' weighting scale. This is widely used for environmental noise measurement, and the levels are denoted as dB(A) or L_{Aeq}, L_{A90} etc, according to the parameter being measured.

13.1.4. The decibel scale is logarithmic rather than linear, and hence a 3 dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective, but as a general guide a 10 dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3 dB(A) is generally regarded as the minimum difference needed to perceive a change under normal listening conditions.

Table 13 1 Range of Sound Levels Commonly Found in the Environment

Sound Pressure Level (dB(A)	Location
140 dB(A)	Threshold of pain
110 to 130 dB(A)	Jet aircraft on take off
100 to 110 dB(A)	Burglar alarm at one metre (m) away
70 to 90 dB(A)	Inside factory
60 to 70 dB(A)	Typical high street
50 to 60 dB(A)	Inside a car
40 to 50 dB(A)	Typical office
30 to 40 dB(A)	Living room during the day
20 to 30 dB(A)	Quiet bedroom at night
0 dB(A)	Threshold of hearing

13.1.5. **Table 13.2** presents the noise terminology relevant to this assessment.

Table 13 2 Noise terminology

Noise term	Description
dB (decibel)	The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure ($2x10^{-5}$Pa).
dB(A)	A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. 'A'-weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
$L_{Aeq,T}$	L_{Aeq} is defined as the notional steady sound level which, over a stated time period (T), would contain the same amount of acoustical energy as the A-weighted fluctuating sound measured over that period.
L_{Amax}	L_{Amax} is the maximum A-weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
L_{10} and L_{90}	If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L_{10} is the level exceeded for 10% of the time, and the L_{90} is the level exceeded for 90% of the time.
Free-field Level	A sound field determined at a point away from reflective surfaces other than the ground with no significant contributions due to sound from other reflective surfaces. Generally, as measured outside and away from buildings.
Façade Level	A sound field determined at 1 m in front of a large sound reflecting object such as a building façade.
Fast	A time weighting used in the root mean square section of a sound level meter with a 125 millisecond time constant.
Slow	A time weighting used in the root mean square section of a sound level meter with a 1000 millisecond time constant.

13.2 Relevant legislation, planning policy and technical guidance

13.2.1. For wind farm developments there is no all-encompassing legislation relating to the standards associated with noise (including vibration) emission and effect. Legislation, where it does exist, tends to be either European Commission (EC) derived and focussed on specific items of noise-emitting plant or on more general nuisance, such as that addressed by the provisions of the Environmental Protection Act 1990.

13.2.2. This assessment draws from a variety of sources, including legislation, national planning policy, national planning guidance, local planning guidance, British Standards, technical guidance.

Legislation

Control of Pollution Act (1974)

13.2.3. Section 60 of the Control of Pollution Act 1974 provides the Local Authority powers for controlling noise arising from construction and demolition works, regardless of whether a statutory nuisance has been caused or is likely to be caused. These powers may be exercised either before works start or after they have started.

13.2.4. Section 61 of the Act provides a mechanism for contractors to apply for prior consent from the local authority before starting construction work. By obtaining this consent, contractors can agree on noise control measures in advance, ensuring compliance with local regulations and avoiding potential disputes.

13.2.5. Section 72 of the Act defines Best Practicable Means (BPM) to be adopted during construction activities. “Practicable” means reasonably practicable having regard among other things to local conditions and circumstances, to the current state of technical knowledge and to the financial implications. The means to be employed include the design, installation, maintenance and manner and periods of operation of plant and machinery, and the design, construction and maintenance of buildings and acoustic structures.

Environmental Protection Act (1990)

13.2.6. Section 79 of the Environmental Protection Act 1990 (as amended) declares a number of matters to be statutory nuisances, one of which is noise, the term being defined to include vibration. Under the provisions of the Act, the local authority is required to inspect its area periodically to detect any nuisance and, where a complaint of a statutory nuisance is made by a person living within its area, to take such steps as are reasonably practicable to investigate the complaint. Should it be satisfied of the existence of a statutory nuisance, the local authority is obliged to serve an abatement notice.

National planning policy

Future Wales – The National Plan 2040 (2021)

13.2.7. Future Wales - The National Plan 2040 (Future Wales) is the national development framework for Wales and outlines the development direction for Wales until 2040. It states that *“Planning Policy Wales contains the planning policy framework for addressing air quality, soundscape and noise”.*

13.2.8. Policies 17 and 18 are applicable to renewable and low carbon energy development, including Developments of National Significance (DNS) and re-powering.

13.2.9. Policy 17 confirms that The Welsh Government strongly supports the principle of developing renewable energy, but also that large-scale wind energy developments *"should demonstrate that they will not have an unacceptable adverse impact on the environment."*

13.2.10. Policy 18 states that renewable and low carbon energy development of national significance will be permitted subject to Policy 17 and stated criteria including that *"there are no unacceptable adverse impacts by way of shadow flicker, noise, reflected light, air quality or electromagnetic disturbance…"*

13.2.11. Policy 18 also states that *"The cumulative impacts of existing and consented renewable energy schemes should also be considered."*

Planning Policy Wales: Edition 12 (2024)

13.2.12. Planning Policy Wales (PPW) sets out the land use planning policies of the Welsh Government and is supplemented by Technical Advice Notes (TANs). PPW sets out the importance of considering potential noise impacts from new energy infrastructure when making planning decisions.

13.2.13. In the section, *Location of commercial, industrial and other potentially polluting development*, it states that such development should be in areas where there is low potential for public exposure, or where its impact can be minimised.

13.2.14. It states *"Further guidance on wind turbine noise assessment can be found in ETSU-R-97… and further good practice guidance published by the Institute of Acoustics."*

13.2.15. These documents are the Energy Technology Support Units R-97 document *The assessment and rating of noise from windfarms* (ETSU-R-97), and the Institute of Acoustics *A good practice guide to the application of ETSU-R-97 for the assessment and rating of wind turbine noise* (IOA GPG). Six Supplementary Guidance Notes (SPGs) to the IOA GPG were published. For this assessment, the reference to IOA GPG encompasses those SPGs.

Local planning policy guidance

Caerphilly County Borough Local Development Plan to 2021 (Adopted 2010)

13.2.16. The 2nd Replacement Local Development Plan 2020-2035 is in preparation but is not yet formally adopted. The 2021 plan therefore remains the current framework for the control of development and land use within the Caerphilly council area.

13.2.17. The Local Development Plan to 2021 includes the following policies which are relevant for noise and the Proposed Development:

> *"Amenity*
>
> *CW2 - Development proposals must have regard for all relevant material planning considerations in order to satisfy the following requirements:*
>
> *A There is no unacceptable impact on the amenity of adjacent properties or land*
>
> *B The proposal would not result in over development of the site and / or its surroundings*
>
> *C The proposed use is compatible with surrounding land-uses and would not constrain the development of neighbouring sites for their identified land-use*

D Where applicable, the viability of existing neighbouring land uses would not be compromised by virtue of their potential impact upon the amenity of proposed new residential development"

and

"Locational Constraints – Rural Development and Diversification

CW19 - Rural Development and Diversification schemes will be permitted where:

A They are consistent in scale and compatible with their rural location, including the retention and enhancement of existing natural heritage features

B That where buildings are required to deliver the scheme, existing buildings are reused where possible, or the new building relate to an existing group of buildings

C They will be complementary to, and not prejudice, the operation of the existing business"

13.2.18. The supporting text to Policy CW2 states "*Proposals for development have the potential for causing undue nuisance that adversely affect the amenity of adjoining land-uses. The effects are predominantly, though not entirely, related to residential uses. Consequently the policy will apply to all forms of development in all locations. The policy addresses two sides of the issue, firstly the adverse effects of a development on adjoining uses, and secondly whether the development of a new residential site would prejudice existing land-uses that would have detrimental effects upon the amenity of those new residents.*"

13.2.19. The supporting text to Policy CW19 states "*All proposals for rural development or diversification schemes will need to demonstrate that they are compatible with their rural location. The scale and nature of the development should not have an unacceptable impact upon the rural character or the area by way of design, noise, smell, visual or traffic impact."*

Torfaen County Borough Local Development Plan to 2021 (2013)

13.2.20. A replacement Torfaen Local Development Plan is underway, the replacement plan will be adopted in December 2028. The 2021 plan therefore remains the current framework for the control of development and land use within the Torfaen council area.

13.2.21. The Local Development Plan to 2021 includes the following policy which is relevant to noise and the Proposed Development:

"BW1 General Policy - Development Proposals

All development proposals will be considered favourably providing they comply with the following criteria where they are applicable:

A Amenity and Design…

vi) The proposal does not have an unacceptable impact upon the amenities of the occupiers of adjoining or neighbouring properties;…

B Natural Environment

i) The proposal does not result in unacceptable adverse effects in respect of land contamination, instability or subsidence; air, heat, noise or light pollution; landfill gas; water pollution; or flooding, from or to the proposal".

13.2.22. The supporting text to the above policy confirms that part A is included to *"promote good quality design in new development, which is also sensitive to the immediate and surrounding environment*".

13.2.23. With respect to Part B i) and consideration of the effect on environmental effects, it is stated that "*this criteria is intended to enable consideration of effects both directly from the proposal or effects to the proposal, for example through existing land uses."* It goes on to confirm that *"Development proposals can explore opportunities to mitigate the potential for noise and light pollution through impact assessments at the design stage.*"

National planning policy guidance

Technical Advice Note 11: Noise (1997)

13.2.24. The Welsh planning guidance document Technical Advice Note 11: Noise (TAN 11) states that it should be read alongside national planning policy. It highlights that these documents may be material to individual planning decisions and will be taken into account by the Secretary of State and its inspectors when determining called-in planning applications and appeals.

13.2.25. Paragraph 3 confirms that *"This note provides advice on how the planning system can be used to minimise the adverse impact of noise without placing unreasonable restrictions on development or adding unduly to the costs and administrative burdens of business."*

13.2.26. And goes on to state *"It outlines some of the main considerations which local planning authorities should take into account in drawing-up development plan policies and when determining planning applications for development which will either generate noise or be exposed to existing noise sources."*

13.2.27. In the section specific to noise from wind turbines and wind farms, the following is stated *"Detailed guidance on noise from wind turbines is contained in Planning Guidance (Wales), Technical Advice Note (Wales) 8, 'Renewable Energy', Welsh Office, 1996, Annex A, paragraphs A28-A38"*.

13.2.28. The 1996 Version of TAN 8 was updated in 2005. In the section titled *'Noise'*, the 2005 version states *"The report "The Assessment and Rating of Noise from Wind Farms" (ETSU-R-97), describes a framework for the measurement of wind farm noise and gives indicative noise levels calculated to offer a reasonable degree of protection to wind farm neighbours, without placing unreasonable restrictions on wind farm development or adding unduly to the costs and administrative burdens on wind farm developers or planning authorities. The report presents the findings of a cross-interest Noise Working Group and makes a series of recommendations that can be regarded as relevant guidance on good practice".*

13.2.29. TAN 8 has been superseded by national development framework embedded within Future Wales, but as summarised above, Future Wales recognises PPW as containing the national planning policy framework.

13.2.30. The PPW in turn continues to reference ETSU-R-97, recognising it as providing guidance on the assessment of wind turbine noise.

13.2.31. With respect to noise from construction sites, TAN 11 refers to BS 5228 Parts 1-4 stating at paragraph B20 *"Detailed guidance on assessing noise from construction sites can be found in BS 5228, parts 1-4. In particular, Part 1: 1984, "Code of practice for basic information and procedures for noise control" describes a method for predicting noise from construction sites as well as giving general advice."*

13.2.32. The current version of BS 5228 comprises BS 5228:2009+A1:2014: *Code of practice for noise and vibration control on construction and open sites - Part 1: Noise and Part 2: Vibration*.

13.2.33. An updated draft TAN 11 has been published for consultation, but is not policy. Wind turbine noise is outside the scope of the draft TAN 11 document. BS 5228-1 and BS 5228-2 continue to be referenced with respect to construction noise and vibration.

Updates to TAN 11: Noise (2015)

13.2.34. This update to TAN 11 was produced in response to revisions to supporting legislation and British Standards.

13.2.35. The document highlights that PPW and TAN 11 are the appropriate documents when noise is a consideration in the planning of a new development.

13.2.36. The document endorses *"the Institute of Acoustics Good practice guide to the application of ETSU-R-97 for the assessment and rating of wind turbine noise."* And goes on to state *"The Department of Energy and Climate Change have commenced further work on amplitude modulation and any Welsh Government position on this work would be considered at the appropriate time."*

Noise and Soundscape Plan for Wales 2023-2028

13.2.37. Presents the Welsh national strategy on soundscapes. It highlights that wind turbine developments *"must respond well to their context and contribute to meeting our ambitions for low carbon energy generation."* Wind turbine development proposals must seek to minimise their impact to homes and tourism receptors; and that communities should be protected from significant cumulative impacts.

13.2.38. The document confirms current UK noise assessment guidance is ETSU-R-97 and IOA GPG. The document advises that since ETSU-R-97 was published, the context has changed, including:

- There is increased understanding of the range of physical and operational factors that influence wind turbine sound.
- Further research has been undertaken to investigate the effects of wind turbine sound exposure on individuals and communities.
- A feature of wind turbine sound known as "amplitude modulation" has been reported as impacting people beyond the extent that was considered at the time of ETSU-R-97.
- New approaches to addressing the impacts of wind turbine noise, including amplitude modulation, have been developed.
- The UK Government has introduced legislation mandating the target to reduce all greenhouse gas emissions to net zero by 2050, the achievement of which will require increased deployment of onshore wind energy generation capacity.

13.2.39. The document references the report for BEIS: *A review of noise guidance for onshore wind turbines* and states that *"current UK guidance would benefit from being updated to address a number of unresolved issues, including how to assess the impacts of amplitude modulation. As a minimum, the WSP review of ETSU-R-97 raises questions that need to be answered by professional organisations with expertise in this field."*

Technical guidance

Designing for Renewable Energy in Wales (2023)

13.2.40. This document was prepared to set out the key design objectives and considerations for the sensitive development of large-scale onshore wind and solar installations as well as ancillary development in Wales.

13.2.41. The document confirms that TAN 11 forms part of the planning framework and that it provides advice on how to use the planning system to reduce the adverse impact of noise.

13.2.42. The Section entitled 'Noise' is reproduced:

> *"Irrespective of location or scale, the design and micro-siting of wind turbines must seek to minimise their noise impact, particularly where turbines would be near homes and tourism receptors.*
>
> *The current UK wind turbine noise assessment guidance for residential receptors is set out in ETSU-R-97, a Good Practice Guide on the application of ETSU-R-97, and Supplementary Guidance Notes. The Welsh Government has endorsed the use of this guidance in Wales.*
>
> *A review of noise guidance for on-shore wind turbines has been undertaken and any changes to UK guidance arising from this review will be considered by the Welsh Government[6]"*

13.2.43. The referenced footnote 6 is a report commissioned by the UK Government and prepared by WSP (the 'BEIS Report' - see below).

Report for UK Government: A review of noise guidance for onshore wind turbines (2023) (BEIS Report)

13.2.44. Prepared by WSP for the UK Government and published in February 2023, this study sets out the findings of a detailed literature review and extensive stakeholder engagement exercise. The review was aimed at answering the question as to whether existing noise assessment guidance for wind turbine noise should be updated in view of government policies on noise and commitments to net zero.

13.2.45. The review represents only an initial step in any process of updating existing guidance as may subsequently be progressed. The review identified guidance areas that warrant consideration for updating and provides recommendations for further evidence needed to support any future updates, should they be progressed.

13.2.46. The BEIS Report itself does not provide new guidance, nor does it form, or function as, a replacement for ETSU-R-97, and it does not supersede any parts of the current policy or guidance frameworks in place, in Wales or elsewhere in the UK. The Designing for Renewable Energy in Wales document, as summarised above, confirms that any changes to UK Guidance arising from the BEIS Report will be considered by the Welsh Government, but at the present time there are no such changes in UK Guidance.

13.2.47. Until it is replaced or updated by the Welsh Government, the assessment methodology presented in ETSU-R-97 remains that which should continue to be applied in the assessment of noise from wind farms in Wales.

Energy Technology Support Units R-97 document: The Assessment and Rating of Noise from Windfarms (1996)

13.2.48. As referenced for use in PPW, this document was written by a 'Noise Working Group' (NWG) including developers, noise consultants and environmental health officers, set up in 1995 by the Department of Trade and Industry through ETSU (the Energy Technology Support Unit).

13.2.49. This document presents a consensus view of the working group and was prepared to present a common approach to the assessment of noise from wind turbines. This document states that noise from wind turbines or wind farms should be assessed against site specific noise limits.

13.2.50. These limits are derived based on a set of acceptable lower limits, and an allowable exceedance above the prevailing background noise levels, including consideration to a range of prevailing wind speed conditions, relevant to the Proposed Development. The noise limits should be derived for external areas used for relaxation, or areas where a quiet noise environment is highly desirable. Separate limits are required for night-time and daytime periods. Night-time limits are derived drawing upon measured night-time background noise levels, whilst daytime limits are derived drawing upon the background noise levels measured during 'quiet daytime' periods.

13.2.51. Night-time is defined as the period 23:00 to 07:00, whilst 'quiet daytime' periods are defined as 18:00 to 23:00 on all days, as well as 13:00 to 18:00 on Saturdays and Sundays, and 07:00 to 13:00 on Sundays.

13.2.52. For the daytime, the suggested limits are 5 dB above the prevailing background noise level determined during quiet daytime periods, or 35 to 40 dB(A), whichever is the higher. The absolute criterion within the 35 to 40 dB(A) range is selected taking account of the Development Site environs (e.g. number of local receptors), the energy generation capacity of the wind farm (e.g. number of kilowatt Hours (kWh) that can be generated), and the associated duration and level of exposure.

13.2.53. During the night-time, the suggested limits are 5 dB above the prevailing night-time background noise level or 43 dB(A), whichever is the higher. The absolute criterion for the night-time is higher than that for the daytime, as the derivation of this limit is based on preventing sleep disturbance within a building whereas for the daytime, limits are based on occupation of external spaces used for relaxation.

13.2.54. It is required that the prevailing background noise levels are determined in terms of the $L_{A90,10\ min}$ noise index for both quiet daytime and night-time periods, for wind conditions ranging from 2 to 12 m/s.

13.2.55. The noise limits are calculated by undertaking a regression analysis of the $L_{A90,10\ min}$ background noise levels and the prevailing average wind speed for the same 10-minute periods, when measured or determined at 10 m above ground at the location of the proposed wind turbines. The allowable limit is then defined at +5 dB above the average noise level at each wind speed (as defined by the regression analysis), or the absolute noise level lower limit (or 'fixed element'), whichever is the higher (assuming no financial involvement with the scheme).

13.2.56. Where a property has a financial involvement in the scheme, the document allows a relaxation of the derived noise limits, stating that *"It is widely accepted that the level of disturbance or annoyance caused by a noise source is not only dependent upon the level and character of noise but also the receiver's attitude towards the noise source in general. If the residents at the noise-sensitive properties were financially involved in the project, then higher noise limits will be appropriate."*

13.2.57. The document goes on to state *"It is recommended that both the day and night-time lower fixed limits can be increased to 45 dB(A) and that consideration should be given to increasing the permissible margin above background where the occupier of the property has some financial involvement in the windfarm."*

13.2.58. The ETSU guidance states that the derived limits should be applied to noise from the proposed wind farm or wind turbines in terms of the $L_{A90,T}$ index, and that the $L_{A90,T}$ of the wind farm noise is typically 1.5 to 2.5 dB less than the $L_{Aeq,T}$ measured over the same period.

13.2.59. The derived noise limits are applicable to both the aerodynamic (e.g. 'blade swish') and mechanical (e.g. generator related) components of wind farm noise.

13.2.60. Where noise from the wind farm is tonal, a correction of between 2 and 5 dB is to be applied to the wind farm noise. Guidance is provided on how to determine the level of correction required, but typically, the need for any applicable correction is confirmed by the wind turbine manufacturers.

13.2.61. It is stated that *"The NWG is of the opinion that absolute noise limits and margins above background should relate to the cumulative effect of all wind turbines in the area which contribute to the noise received at the properties in question. It is clearly unreasonable to suggest that, because a windfarm was constructed in the vicinity in the past which resulted in increased noise levels at some properties, that residents of those properties are now able to tolerate still higher noise levels. The existing windfarm should not be considered as part of the prevailing background noise."*

13.2.62. Accordingly, where an existing wind farm contributes to the prevailing background noise levels:

- it is necessary that significantly affected measurements are discarded in the determination of the underlying baseline conditions; and
- it is necessary to either include for the contribution of that wind farm when assessing wind farm noise levels against the allowable noise limits, or correct for that contribution when deriving a limit applicable to the proposed wind farm operating in isolation.

13.2.63. ETSU-R-97 also details a simplified assessment methodology, which is based on the principle that if the lowest fixed element for the daytime noise limits (35 dB $L_{A90,T}$) can be met at high wind speeds, then the need to consider the limit element which is relative to the background noise levels can be discounted, because this would only be higher at such speeds.

<u>The Institute of Acoustics: A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise (2013)</u>

13.2.64. The IOA GPG presents the report of a 'Noise Working Group (NWG)' assembled in response to a request from the former Department of Energy and Climate Change. The guide is intended to represent current good practice in applying the ETSU-R-97 method to assessing the noise impact of wind turbine developments with a power rating of over 50 kilowatts (kW).

13.2.65. The document provides clarification and updated guidance on a range of matters relating to ETSU-R-97 noise assessments, including consultation with relevant stakeholders, background noise survey methodology, noise survey data analysis, derivation of noise limits, noise prediction model input data, algorithms and parameters, cumulative impact assessment procedures, assessment reporting, planning conditions and amplitude modulation. A set of supplementary guidance notes also form part of the publication and include further specific detail for different technical areas.

13.2.66. Key considerations relevant to the preparation of this assessment include:

- calculations of predicted wind turbine noise may be carried out using ISO 9613-2: Acoustics – Attenuation of sound during propagation outdoors (International Organization for Standardization, 1996) (ISO 9613-2); preferred receptor heights, meteorological and ground absorption input parameters for this calculation procedure are given;
- wind turbine sound power level source data should include appropriate uncertainty corrections. Guidance is given for determining when such uncertainty corrections have been inherently included in wind turbine source emission data;
- 'excess amplitude modulation' (i.e. where the wind turbine noise has higher variability with momentary time than the 2 to 3 dB(A) considered within ETSU-R-97) is still the subject of research; current practice (at the time of publishing of the IOA GPG) in relation to determining applications for wind turbine developments is to not impose a planning condition specific to this phenomenon; and
- a method is detailed within the IOA GPG to allow the effect of wind direction to be taken into account during noise level predictions. This method details a number of corrections based on the angle of the wind in relation to the position of the source and receiver, and the nature of the local ground (flat or complex).

13.2.67. The IOA GPG also confirms that the ETSU-R-97 noise level limits should be applied cumulatively and provides guidance on determining when a cumulative assessment is required as well as appropriate cumulative assessment methods for a variety of different scenarios. These scenarios include 'concurrent application', 'existing wind farm consented with less than total ETSU-R-97 limits', 'existing wind farms consented to the total ETSU-R-97 limits currently operating', 'permitted wind farm consented to total ETSU-R-97 limits but not yet constructed', and 'significant headroom present'.

13.2.68. In the section titled 'Cumulative Impact Assessment necessary', it is stated that:

> *"During scoping of a new windfarm development consideration should be given to cumulative noise impacts from any other windfarms in the locality. If the proposed wind farm produces noise levels within 10 dB of any existing windfarms at the same receptor location, then a cumulative noise impact assessment is necessary."*
>
> *"Equally, in such cases where noise from the proposed wind farm is predicted to be 10 dB greater than that from the existing wind farm (but compliant with ETSU-R-97 in its own right), then a cumulative noise impact assessment would not be necessary."*

13.2.69. This confirms that where noise levels from the new development are 10 dB(A) or more below the limits imposed on surrounding developments, or are 10 dB(A) or more below the levels predicted from other proposed developments, further consideration to cumulative impacts is not required.

13.2.70. Advice on appropriate assessment methods is then provided for a situation where the 10 dB difference check is not demonstrable. This includes the following:

> *"Concurrent applications*
>
> *5.4.2 Concurrent applications with no pre-existing wind farms permit the apportionment of the ETSU-R-97 limits on an energy basis to each wind farm from the outset. LPAs may wish to bring together concurrent wind farm applicants, such that apportionment can be discussed and agreed in conjunction with the applicants. Noise limits for all the wind farms operating cumulatively are derived at all noise sensitive receptors, just as they would be if one wind farm were being considered. Having derived noise limits for the cumulative effects of all the contributing wind farms, the wind farm developers can then work together to 'apportion' the*

noise limits for each wind farm operating in isolation such that the cumulative effects of all wind farms operating together cannot cause the cumulative noise limits derived in accordance with ETSU-R-97 to be exceeded. Thus the noise limits which meet with the requirements of ETSU-R-97 could only be exceeded if one or more of the wind farms were to operate above its own apportioned noise limits."

"Existing wind farm/s consented with less than total ETSU-R-97 limits

If an existing wind farm is consented to noise limits of less than the total ETSU-R-97 limits, a future wind farm applicant can then use these limits as a base within their predictions. Whether the existing wind farm is currently operating or not is immaterial to the assessment, as it will not be able to exceed its own conditions. It is becoming more common to apply noise limits which are less than total ETSU-R-97 limits because of cumulative considerations.

This should be undertaken in consultation with the LPA and relevant applicant(s). An example of this in practice is the apportionment of the ETSU-R-97 noise limit between concurrent applications. It may be the case that conditioning the scheme to the exact predicted noise levels (at all wind speeds) for the candidate turbine presented within the submitted noise impact assessment may constrain the applicant in future turbine procurement options. Therefore, a constant margin above the predicted noise levels (or below the total ETSU-R-97 limits) could be chosen which provides the applicant with procurement options but in combination with the neighbouring wind farm/s can still achieve the ETSU-R-97 limits."

"Existing wind farm/s consented with less than total ETSU-R-97 limits

If an existing wind farm is consented to noise limits of less than the total ETSU-R-97 limits, a future wind farm applicant can then use these limits as a base within their predictions. Whether the existing wind farm is currently operating or not is immaterial to the assessment, as it will not be able to exceed its own conditions. It is becoming more common to apply noise limits which are less than total ETSU-R-97 limits because of cumulative considerations.

This should be undertaken in consultation with the LPA and relevant applicant(s). An example of this in practice is the apportionment of the ETSU-R-97 noise limit between concurrent applications. It may be the case that conditioning the scheme to the exact predicted noise levels (at all wind speeds) for the candidate turbine presented within the submitted noise impact assessment may constrain the applicant in future turbine procurement options. Therefore, a constant margin above the predicted noise levels (or below the total ETSU-R-97 limits) could be chosen which provides the applicant with procurement options but in combination with the neighbouring wind farm/s can still achieve the ETSU-R-97 limits."

"Significant presented headroom

In cases where there is significant headroom (e.g. 5 to 10 dB) between the predicted noise levels from the existing wind farm and the total ETSU-R-97 limits, where there would be no realistic prospect of the existing wind farm producing noise levels up to the total ETSU-R-97 limits, agreement could be sought with the LPA as to a suitable predicted noise level (including an appropriate margin to cover factors such as potential increases in noise) from the existing wind farm to be used to inform the available headroom for the cumulative assessment without the need for negotiation or cumulative conditioning. This may be the case particularly at low wind speeds."

"Permitted wind farm, consented to total ETSU-R-97 limits, but not yet constructed

This situation replicates the above, in that the second wind farm developer will have to predict the noise impact from the existing wind farm. To ensure that predictions are as accurate as possible the existing wind farm developer would have had to have chosen their wind turbine to be installed. If the existing wind farm developer had yet to choose their wind turbine, it is recommended that a worst case scenario be undertaken utilising the highest sound power level data (or a combined "envelope") for wind turbines that would fit within the dimensional confines and noise limits of the permission granted."

13.2.71. In addition to the above, under the section titled 'Existing wind farm/s consented to the total ETSU-R-97 limits, currently operating', the principle of a 'controlling property' is described, i.e. in complying with the noise limits at one property (which for example may be close to a given wind farm), there would be limit headroom at another property (which for example may be at a greater distance from that wind farm). This principle can equally be applied where the limit in question is less than the total allowable ETSU-R-97 limit.

Practice Guidance: Planning Implications of Renewable and Low Carbon Energy (2011)

13.2.72. This practice guidance is a tool to support Local Planning Authorities (LPAs) in dealing with applications for renewable and low carbon energy development.

13.2.73. It highlights that careful design of wind turbine development is required to ensure acceptable noise levels are achieved at noise-sensitive properties; increases in noise levels can be minimised by ensuring sufficient separation distances between turbines and receptors.

13.2.74. It advises that operational noise levels meet ETSU-R-97 limits. For construction and decommissioning activity it recommends restricting working hours and adopting good practice measures for reducing noise in line with BS 5228-1 and BS 8233.

British Standard 5228-1 (2014)

13.2.75. British Standard 5228-1:2009+A1:2014: *Code of practice for noise and vibration on construction and open sites – Part 1 Noise* (BS 5228-1) sets out techniques to predict the likely noise effects from construction works, based on detailed information on the type and number of plant being used, their location and the length of time they are in operation.

13.2.76. The noise prediction methods can be used to establish likely noise levels in terms of the $L_{Aeq,T}$ over the core working day. This standard also documents a database of information, including previously measured sound pressure level data for a variety of different construction plant undertaking various common activities.

13.2.77. Three example methods are presented for determining the significance of construction noise impacts. In summary, these methods adopt either a series of fixed noise level limits, are concerned with ambient noise level changes as a result of the construction operations or a combination of the two.

13.2.78. With respect to absolute fixed noise limits, those detailed within *Advisory Leaflet 72: 1976: Noise control on building sites* are presented. These limits are presented according to the nature of the surrounding environment, for a 12-hour working day. The presented limits are:

- 70.0 dB(A) in rural, suburban and urban areas away from main road traffic and industrial noise; and
- 75.0 dB(A) in urban areas near main roads and heavy industrial areas.

13.2.79. The above noise level limits are applicable at the façade of the receptor in question (not free-field).

13.2.80. The standard goes on to provide methods for determining the significance of construction noise levels by considering the change in the ambient noise level that would arise as a result of the construction operations. Two example assessment methods are presented, these are the 'ABC method' as summarised within **Table 13.3** and the '5 dB(A) change' method.

Table 13 3 Example threshold of potential significant effect at dwellings

Assessment category and threshold value period	Category (A)[A] threshold, $L_{Aeq,T}$	Category (B)[B] threshold, $L_{Aeq,T}$	Category (C)[C] threshold, $L_{Aeq,T}$
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
NOTE 1: A potential significant effect is indicated if the $L_{Aeq,T}$ 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 $L_{Aeq,T}$ noise level for the period increases by more than 3 dB due to site noise. NOTE 3: Applied to residential receptors only.			
A) Category A: threshold values to use when ambient levels (when rounded to the nearest 5 dB) are less than these values. B) Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as Category A values. C) Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than Category A values. D) 19.00-23.00 weekdays, 13.00-23.00 Saturdays and 07.00-23.00 Sundays.			

Source: BS 5228-1, Section E3.2, Table E.1.

13.2.81. With respect to the '5 dB(A) change' method, the guidance states *"Noise levels generated by construction activities are deemed to be significant if the total noise (pre-construction ambient plus construction noise) exceeds the pre-construction ambient noise by 5 dB or more, subject to lower cut-off values of 65 dB, 55 dB and 45 dB L_{Aeq}, from construction noise alone, for the daytime, evening and night-time periods, respectively; and a duration of one month or more, unless works of a shorter duration are likely to result in significant impact."*

British Standard 8233 (2014)

13.2.82. British Standard 8233:2014 *Guidance on sound insulation and noise reduction for buildings* (BS 8233) provides guidance on the control of noise in and around buildings. It suggests appropriate criteria for different situations, which primarily are intended to guide the design of new buildings, or refurbished buildings undergoing a change of use.

13.2.83. The noise level criteria recommended in BS 8233 for residential spaces is detailed in **Table 13.4.**

Table 13 4 Indoor ambient noise levels for dwellings

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq,16h}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16h}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16h}$	30 dB $L_{Aeq,8h}$

Source: BS 8233, Table 4.

Calculation of Road Traffic Noise (1988)

13.2.84. The Calculation of Road Traffic Noise (CRTN) provides a calculation methodology for using road traffic flow data to calculate road traffic noise levels. This methodology produces noise levels in terms of L_{A10}, either over a 1-hour or an 18-hour period.

13.2.85. The factors which may influence road traffic noise levels at source can be divided into two groups:

- road related factors - gradient and surface type; and
- traffic related factors - flow, speed and the proportion of heavy-duty vehicles.

13.2.86. The propagation of noise is also covered in CRTN and can influence the noise levels at receptor locations.

Design Manual for Roads and Bridges, LA 111, Noise and Vibration (2020)

13.2.87. The Design Manual for Roads and Bridges, LA 111, *Noise and vibration* (DMRB LA 111) provides comprehensive guidelines for assessing and managing noise and vibration impacts from road projects. It outlines methodologies for evaluating baseline noise and vibration levels, predicting impacts from construction and operation, and determining the significance of these impacts. The document also includes strategies for mitigating adverse effects on nearby communities and the environment.