SHARPS REDMORE

ACOUSTIC CONSULTANTS · Established 1990

Report

Noise Assessment

House of Multiple Occupancy
Dunwell, Chapel End, Broxted

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1.0 Introduction

1.1 Sharps Redmore (SR) has been instructed to undertake an acoustic assessment for the proposed change of use of a dwelling into a house of multiple occupancy (HMO) at Dunwell, Chapel End, Broxted. The site location is shown in Figure 1.1 below.

FIGURE 1.1: Site Location

1.2 The site is located to the north-east of Stansted airport. The existing building has a section which is one storey with a pitched roof and a section which is two-storey with a flat roof and contains a total of 11no. bedrooms, 2no. sitting room / lounge and 2no. kitchens. The proposed conversion will not change any of the internal structure and keep the current room numbers and layout the same.

1.3 A guide to the acoustic terminology used in the report is included in Appendix B.

2.0 Assessment Methodology and Criteria

National Policy

2.1 The National Planning Policy Framework (NPPF), July 2021, sets out the Government's planning policies for England and "these policies articulate the Government's vision of sustainable development." In respect of noise, Paragraph 185 of the NPPF states the following:

"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) 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;

b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and

c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation".

2.2 Guidance on the interpretation of the policy aims contained within the NPPF is contained within National Planning Policy Guidance (NPPG). The NPPG introduces the concept of a noise exposure hierarchy based on likely average response. The guidance contained in the NPPG is summarised in the table below:

TABLE 2.1: Noise Exposure Hierarchy

Response	Examples of Outcomes	Increasing Effect Level	Action
No Observed Effect Level			
Not noticeable	No Effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level			
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			
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 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.	Observed Adverse Effect	Mitigate ad reduce to a minimum
Significant Observed Adverse Effect Level			
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
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

2.3 The NPPF and NPPG reinforce the March 2010 DEFRA publication, "Noise Policy Statement for England" (NPSE), which states three policy aims, as follows:

"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- *avoid significant adverse impacts on health and quality of life;*
- *mitigate and minimise adverse impacts on health and quality of life; and*
- *where possible, contribute to the improvement of health and quality of life."*

2.4 Together, the first two aims require that no significant adverse impact should occur and that, where a noise level which falls between a level which represents the lowest observable adverse effect and a level which represents a significant observed adverse effect, then according to the explanatory notes in the statement:

"… all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life whilst also taking into consideration the guiding principles of sustainable development. This does not mean that such effects cannot occur."

2.5 Taking an overview of national policy aims and guidance it is clear that when considering the impact of noise that the fact can be heard and causes impact, is not reason to refusal an application as consideration should also be given to the significance of the impact and the mitigation measures available.

Design Guidance

2.6 The current nationally recommended internal noise levels for dwellings are given in BS 8233:2014 (BS 8233) 'Guidance on Sound Insulation & Noise Reduction for Buildings'. BS 8233 recommends the following internal noise standards:

TABLE 2.2: Guideline noise values

BS 8233:2014 Table 4 – Indoor ambient noise levels for dwellings			
Activity	Location	0700 to 2300	2300 to 0700
Resting	Living room	35 dB $L_{Aeq,16hour}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16hour}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

2.7 The previous version (1999) of BS 8233 contained two guidelines for internal criteria; good and reasonable. The difference between the good and reasonable criteria was 5 dB. Whilst the 5 dB relaxation in noise criteria is not specifically referred to in the table above, Note 7 advises that "where development is considered necessary or despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved."

2.8 There is no longer a L_{AMAX} standard for bedrooms In BS 8233. However, footnote 4 to Table 4 states that "Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$ depending on the character and number of events per night. Sporadic noise events could require separate values." In this case, it is proposed that the previous BS 8233 internal standard (also referenced in World Health Organisation Guidelines for Community Noise) is applied. This is 45 dB L_{AMAX}, inside bedrooms occurring no more than 10 – 15 times per night.

Local Policy

2.9 The site falls within the administrative area of Uttlesford District Council (UDC) who have requested a noise impact assessment due to the close proximity to Stansted Airport.

2.10 UDC have a guidance document titled "Noise Assessment Technical Guidance" dated June 2017 which detail several existing national guidance and standards, including those mentioned above, and also local policies. Local policy EN 18 is detailed below:

"Policy EN 18 – Noise Sensitive Development

Development will be permitted unless:

- *The occupiers of surrounding land or the historic and natural environment is exposed to adverse levels of noise and/or vibration (as defined within UDCs Noise Impact Technical Guidance). Potentially noisy developments shall normally be located in areas where noise will not be of significant consideration or where its impact can be minimised by mitigation.*
- *The future occupants of noise sensitive development would experience adverse levels of noise and/or vibration disturbance (as defined by UDC Noise Impact Technical Guidance).*

Specifically applicants, where reasonable and proportionate, according to the end-use and nature of the area and application, must demonstrate that:

- *Development has regard to current UDC Noise Assessment Technical Guidance and is assessed to the satisfaction of the Local Planning Authority*

Any sources of noise and vibration generated by the development are adequately mitigated to prevent loss of amenity for existing and future occupants and land uses."

2.11 With regard to maximum noise levels, UDC state in the guidance that the council typically require L_{Amax} levels to not exceed 45 dB within bedrooms at night.

2.12 Using this guidance and national guidance and standards, an assessment of internal noise has been carried out.

3.0 Noise Survey Details

3.1 A noise survey was undertaken at the site between 15:00 hours on Thursday 20th and 13:15 hours on Tuesday 25th July 2023. A microphone was installed at 1.5 metres above local ground level to measure existing ambient noise levels over 15-minute periods. The measurement location is shown in Figure 3.1 below.

FIGURE 3.1: Measurement location

3.2 Noise levels were recorded using a Norsonic 140 Class 1 sound level meter which was calibrated before and after the survey with no drift in accuracy found. Weather conditions throughout the survey were dry, sunny spells, warm and light winds. The weather was suitable for taking noise measurements.

3.3 Table 3.1 below presents a summary of the noise levels obtained and a graphical result of the survey is contained within Appendix A. Full results are available on request.

TABLE 3.1: Summary of typical noise levels – 20th to 25th July 2023 (free field)

Daytime dB $L_{Aeq,16hr}$	Night-time dB $L_{Aeq,8hr}$	Night-time dB L_{AfMax}
61	55	80

3.4 Noise levels were dominated by aircraft at Stansted airport. Based on the published noise contours[1] the site fall is within the 60 dB $L_{Aeq16hr}$ contour, which is consistent with our measured noise levels in Table 3.1 above.

[1] Environmental Research and Consultancy Department – Noise Exposure Contours for Stansted Airport 2021

4.0 Noise Assessment

4.1 The octave band levels in Table 4.1 are associated with the typical external dBA noise levels presented in Table 3.1 and have been used as part of the building envelope assessment for the proposed HMO.

TABLE 4.1: Octave Band Linear Frequency Spectra

Parameter	Octave Band Centre Frequency Hz								dBA
	63	125	250	500	1k	2k	4k	8k	
Day dB L_{eq}	63	60	62	60	56	51	39	20	**61**
Night dB L_{eq}	58	55	54	53	51	46	32	17	**55**
Night typical dB L_{fmax}	81	79	81	79	74	68	55	33	**80**

4.2 SR has been provided the following information on the existing building envelope which has been used in the calculation to determine if elements require enhancement to meet the internal requirements of BS 8233:2014.

- External walls: brick and block cavity walls with cement render externally.
- Windows: sealed unit double glazing, plus secondary double glazing internally.
- Ventilation: acoustic air ventilation bricks.
- Roof: Concrete interlocking tiles.

4.3 Having reviewed the plan drawings provided in terms of room sizes and based on the window sizes shown on the elevations, noise break-in calculations have been undertaken in accordance with the method outlined in BS 8233:2014. It has been assumed that the rooms have a height of 2.4m. Habitable rooms are defined as: Bedrooms, sitting rooms, lounges and kitchens.

4.4 The airborne sound insulation performance of wall and window elements are given in terms of R_w for laboratory requirements (measured in accordance with BS EN ISO 10140-2 2021 and rated in accordance with BS EN ISO 717-1 2020 or national equivalent).

4.5 The airborne sound insulation performance of ventilation elements are given in terms of $D_{ne,w}$ for laboratory requirements (measured in accordance with BS EN ISO 10140-2 2021 and rated in accordance with BS EN ISO 717-1 2020 or national equivalent).

4.6 Selected products shall provide evidence of compliance with these standards.

External Wall

4.7 For the purpose of the assessment it has been assumed that the non-glazed elements of the façade system for all habitable rooms meet the minimum sound insulation requirements detailed in Table 4.2. This includes the bedrooms at first floor with a timber clad appearance, it is assumed that the build-up is masonry, rather than a lightweight construction.

TABLE 4.2 – Non-glazed wall specification to all habitable rooms

Octave band centre frequency Hz – R dB						
63	125	250	500	1k	2k	4k
30	35	40	45	50	55	60

Glazing Elements

4.8 The window system must be considered as the glazing element, seals and frame combined. For all habitable rooms, it has been assumed that the glazing systems already achieve, as a minimum, the sound reduction indices detailed in Table 4.3 below.

TABLE 4.3 – Glazing system specifications for all habitable rooms

Octave band centre frequency Hz – R dB							R_w dB	Typical arrangement
63	125	250	500	1k	2k	4k		
32	39	43	52	60	64	72	55	14.4mm laminated glass, 24mm argon filled air gap, 8.8mm laminated glass + 250mm airgap to secondary pane 6mm toughened secondary glass

4.9 The above sound insulation requirements are the overall performances for the window systems (including frame, seal and glass).

Acoustic Performance of Façade Ventilation

4.10 Based on the external noise levels, natural background ventilation by means of open windows would not achieve the required internal noise criteria. An open window provides around a 10-15 dB reduction in external noise levels, resulting in levels exceeding the proposed internal criteria. Alternative methods of ventilation will be required. Residents would however retain the option to have openable windows for rapid, purge ventilation and user choice as is the case with the current building.

4.11 It is not known what the current acoustic air ventilation bricks provide, however, it has been calculated that habitable rooms will require ventilators which will meet the performance in Table 4.4 below. The assessment assumes a free, or open, area of two ventilators no greater than 8mm^2. Changes to this area will affect the acoustic performance requirement of the ventilator.

TABLE 4.4 – Acoustic performance of ventilation units for all habitable rooms

Habitable Room Type	Octave Band Centre Frequency Hz							$D_{ne,w}$ dB	Example ventilator
	63	125	250	500	1k	2k	4k		
Kitchen and living/sitting rooms	35	38	36	46	45	46	46	45	Passivent Fresh TLFdb with 2540mm2/m EA
Bedrooms	36	48	46	49	54	65	65	54	Greenwood MA3051

Roof

4.12 The building has a single storey section with a pitched roof and a two storey section with a flat roof. SR has only been advised on the pitched roof element with the construction consisting of concrete tiles. SR has assumed a standard construction for a pitched roof and a light-weight construction for the flat roof section. Our initial assessment showed that both of these elements would need enhancement to be capable of achieving the internal noise criteria.

4.13 The pitched roof would require a ceiling comprising 2x 15mm dense acoustic plasterboards, whilst the flat roof section would require 2x 9mm cement particle boards and to the ceiling 2x 15mm dense acoustic plasterboard on a resilient bar. Based on these enhancements, the sound reduction, R, would need to meet the performance provided in Table 4.5 to be capable of achieving the internal ambient noise level criteria.

TABLE 4.5 – Acoustic performance of roof element for all habitable rooms

Building part	Octave Band Centre Frequency Hz						
	63	125	250	500	1k	2k	4k
Single storey – pitched roof	22	37	46	52	57	53	59
Two storey – flat roof	18	38	50	58	63	61	65

4.14 Considering the mitigation measures available, the building envelope is capable of achieving the internal noise criteria given with BS 8233:2014 for habitable rooms and noise from aircraft will not cause an adverse impact in line with the policy aims of the NPPF.

5.0 Conclusions

5.1 Sharps Redmore (SR) has undertaken an acoustic assessment for the proposed change of use of an existing house into a house of multiple occupancy (HMO) at Dunwell, Chapel End, Broxted.

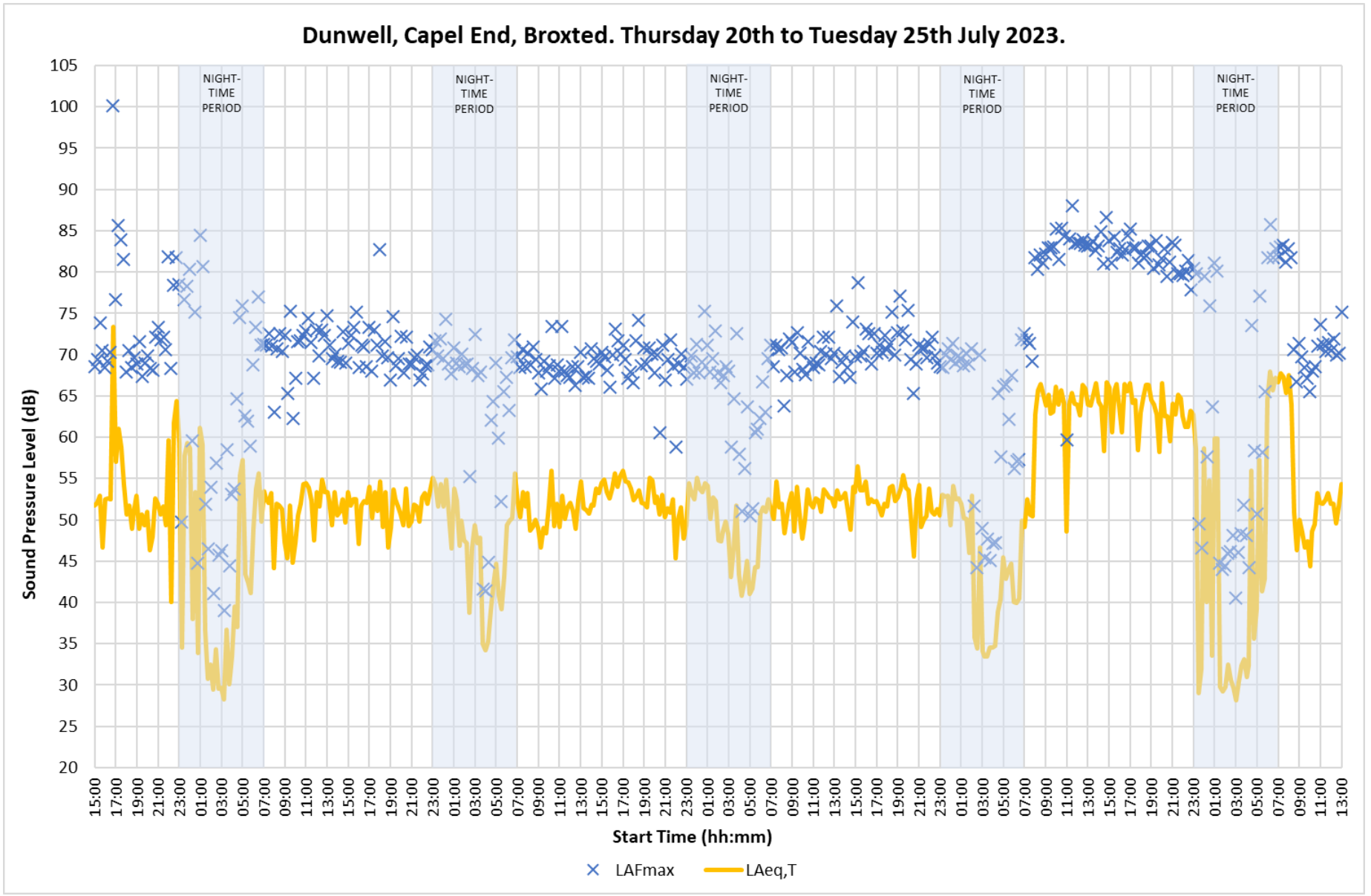
5.2 An environmental noise survey has been undertaken to measure existing daytime and night time ambient noise levels at the property.

5.3 A performance specification has been given for external wall, window and ventilation systems necessary to achieve the internal noise criteria.

5.4 Having regard to the mitigation measures that can be included within the scheme it is concluded that noise will not cause adverse impact to future residents in line with the policy aims of the NPPF and UDC Local Plan.

APPENDIX A

NOISE SURVEY GRAPH


Dunwell, Capel End, Broxted. Thursday 20th to Tuesday 25th July 2023.
Sound Pressure Level (dB)
105
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
NIGHT-TIME PERIOD
NIGHT-TIME PERIOD
NIGHT-TIME PERIOD
NIGHT-TIME PERIOD
NIGHT-TIME PERIOD
15:00 17:00 19:00 21:00 23:00 01:00 03:00 05:00 07:00 09:00 11:00 13:00 15:00 17:00 19:00 21:00 23:00 01:00 03:00 05:00 07:00 09:00 11:00 13:00 15:00 17:00 19:00 21:00 23:00 01:00 03:00 05:00 07:00 09:00 11:00 13:00 15:00 17:00 19:00 21:00 23:00 01:00 03:00 05:00 07:00 09:00 11:00 13:00
Start Time (hh:mm)
LAFmax
LAeq,T

APPENDIX B

ACOUSTIC TERMS

Acoustic Terminology

1. Noise, defined as unwanted sound, is measured in units of decibels, dB. The range of audible sounds is from 0 dB to 140 dB. Two equal sources of sound, if added together will result in an increase in level of 3 dB, i.e. 50 dB + 50 dB = 53 dB. Increases in continuous sound are perceived in the following manner:

   1 dB increase - barely perceptible.

   3 dB increase - just noticeable.

   10 dB increase - perceived as twice as loud.

2. Frequency (or pitch) of sound is measured in units of Hertz. 1 Hertz (Hz) = 1 cycle/second. The range of frequencies audible to the human ear is around 20Hz to 18000Hz (or 18kHz). The capability of a person to hear higher frequencies will reduce with age. The ear is more sensitive to medium frequency than high or low frequencies.

3. To take account of the varying sensitivity of people to different frequencies a weighting scale has been universally adopted called "A-weighting". The measuring equipment has the ability automatically to weight (or filter) a sound to this A scale so that the sound level it measures best correlates to the subjective response of a person. The unit of measurement thus becomes dBA (decibel, A-weighted).

4. The second important characteristic of sound is amplitude or level. Two units are used to express level, a) sound power level - L_w and b) sound pressure level - L_p. Sound power level is an inherent property of a source whilst sound pressure level is dependent on surroundings/distance/directivity, etc. The sound level that is measured on a meter is the sound pressure level, L_p.

5. External sound levels are rarely steady but rise or fall in response to the activity in the area - cars, voices, planes, birdsong, etc. A person's subjective response to different noises has been found to vary dependent on the type and temporal distribution of a particular type of noise. A set of statistical indices have been developed for the subjective response to these different noise sources.

6. The main noise indices in use in the UK are:

   L_{A90}: The sound level (in dBA) exceeded for 90% of the time. This level gives an indication of the sound level during the quieter periods of time in any given sample. It is used to describe the "background sound level" of an area.

   L_{Aeq}: The equivalent continuous sound level in dBA. This unit may be described as "the notional steady noise level that would provide, over a period, the same energy as the intermittent noise". In other words, the energy average level. This unit is now used to measure a wide variety of different types of noise of an industrial or commercial nature, as well as aircraft and trains.

   L_{A10}: The sound level (in dBA) exceeded for 10% of the time. This level gives an indication of the sound level during the noisier periods of time in any given sample. It has been used over many years to measure and assess road traffic noise.

   L_{AMAX}: The maximum level of sound measured in any given period. This unit is used to measure and assess transient noises, i.e. gun shots, individual vehicles, etc.

7. In the open, known as free field, sound attenuates at a rate of 6 dB per each doubling of distance. This is known as geometric spreading or sometimes referred to as the Inverse Square Law. As noise is measured on a Logarithmic scale, this attenuation in distance = 20 Log (ratio of distances), e.g. for a noise level of 60 dB at ten metres, the corresponding level at 160 metres is:

$$60 - 20 \text{ Log } {}^{160}/_{10} = 60 - 24 = 36 \text{ dB}.$$