163-165 Caversham Road, Reading

Noise Assessment

15th March 2017

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1. INTRODUCTION

1.1. Overview

inacoustic has been commissioned to assess the impact of noise at a proposed office to residential conversion site known as 163-165 Caversham Road, Reading, in respect of the site's suitability for residential development.

The following technical noise assessment has been produced to provide supporting information to accompany a prior approval application to Reading Borough Council and is based upon environmental noise measurements undertaken at the site.

This noise assessment is necessarily technical in nature; therefore a glossary of terms is included in Appendix A to assist the reader.

1.2. Scope and Objectives

The scope of the noise assessment can be summarised as follows:

- A sound monitoring survey was undertaken at discrete locations around the Site;
- A detailed assessment of the suitability of the Site, in accordance with relevant standards in respect of sound from the existing sources; and
- Recommendation of mitigation measures, where necessary, to comply with the requirements of the National Planning Practice Guidance in England: Noise [1] and BS8233:2014[2].

[1] Department for Communities and Local Government (DCLG), 2014. National Planning Practice Guidance for England: Minerals and Noise. DCLG.
[2] British Standard Institution. BS 4142:2014: Methods for rating and assessing industrial and commercial sound.

2. Legislation and Policy Framework

The development proposals for the Site are guided by the following policy directives and guidance:

2.1. National Policy

2.1.1. National Planning Policy Framework, 2012

The *National Planning Policy Framework* (NPPF)[3] sets out the Government's planning policies for England. Planning policy requires that applications for planning permission must be determined in accordance with the development plan, unless material considerations indicate otherwise.

The NPPF is also a material consideration in planning decisions. It sets out the Government's requirements for the planning system and how these are expected to be addressed.

Under Section 11; Conserving and enhancing the natural environment, the following is stated:

"The planning system should contribute to and enhance the natural and local environment by:

- *preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability".*

The document goes on to state:

"Planning policies and decisions should aim to:

- *avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;*
- *mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;*
- *recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established; and*
- *identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason."*

As stated above, this document makes reference to avoiding noise generation from new developments that would adversely impact on health and quality of life. The NPPF supersedes the previous noise guidance provided in *Planning Policy Guidance 24* (PPG24)[4], but does not set absolute criteria.

[3] Department for Communities and Local Government (DCLG), 2012. National Planning Policy Framework. HMSO. London.
[4] Department of The Environment, now Department of Community and Local Government: 1994: Planning and Noise Planning Policy Guidance 24, HMSO, London.

2.1.2. Noise Policy Statement for England, 2010

The underlying principles and aims of existing noise policy documents, legislation and guidance are clarified in *DEFRA: 2010: Noise Policy Statement for England* (NPSE)[5]. The NPSE sets out the *"Long Term Vision"* of Government noise policy as follows:

"Promote good health and good quality of life through the effective management of noise within the context of Government policy on sustainable development".

The NPSE outlines three aims for the effective management and control of environmental, neighbour and neighbourhood noise:

- *"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".*

The guidance states that it is not possible to have a single objective noise-based measure that defines *"Significant Observed Adverse Effect Level (SOAEL)"* that is applicable to all sources of noise in all situations and that not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available.

2.1.3. National Planning Practice Guidance in England: Noise, 2014

Further guidance in relation to the NPPF and the NPSE has been published in the *National Planning Practice Guidance in England: Noise* (NPPG Noise)[6], which summarises the noise exposure hierarchy, based on the likely average response. The following three observed effect levels are identified below:

- **Significant Observed Adverse Effect Level**: This is the level of noise exposure above which significant adverse effects on health and quality of life occur;
- **Lowest Observed Adverse Effect Level**: This is the level of noise exposure above which adverse effects on health and quality of life can be detected; and
- **No Observed Adverse Effect Level**: This is the level of noise exposure below which no effect at all on health or quality of life can be detected.

[5] Department for Environment, Food and Rural Affairs (DEFRA), 2010. Noise Policy Statement for England. DEFRA.
[6] Department for Communities and Local Government (DCLG), 2014. National Planning Practice Guidance for England: Noise. DCLG.

Criteria related to each of these levels are reproduced in Table 1.

TABLE 1: SIGNIFICANCE CRITERIA FROM NPPG IN ENGLAND: NOISE

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not Noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable and Not Intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
		Lowest Observed Adverse Effect Level	
Noticeable and Intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, 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 perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
		Significant Observed Adverse Effect Level	
Noticeable and Disruptive	The noise causes a material change in behaviour and/or attitude, 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
Noticeable and Very Disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

2.2. British Standards

2.2.1. BS8233:2014

BS 8233:2014 *Guidance on sound insulation and noise reduction for buildings* draws on the results of research and experience to provide information on achieving internal acoustic environments appropriate to their functions. The guideline values provided are in terms of an average (L_{Aeq}) level.

The standard advises that, for steady external noise sources, it is desirable for internal ambient noise levels to not exceed the guidance values, as detailed below in Table 2.

TABLE 2: BS8233:2014 AMBIENT NOISE LEVELS

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq,16hour}$	-
Dining	Dining room	40 dB $L_{Aeq,16hour}$	-
Sleeping	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

BS8233:2014 goes on to suggest that where development is considered necessary or desirable, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions will still be achieved.

With regard to maximum noise levels, the standard identifies that regular individual noise events (such as passing trains or scheduled aircraft etc) can cause sleep disturbance. The standard does not provide a guideline design target, but simply goes on to suggest that a guideline value may be set in terms of SEL or $L_{Amax,F}$, depending upon the character and number of events per night. It goes on to suggest that more sporadic noise events could require separate values.

In respect of external noise levels, the guidance in BS8233:2014 suggests that "*it is desirable that the external noise level does not exceed 50dB $L_{Aeq,T}$, with an upper guideline value of 55dB $L_{Aeq,T}$ which would be acceptable in noisier environments*".

BS8233:2014 provides a much more detailed narrative on noise levels in external amenity areas and acknowledges that it may not always be necessary or feasible to ensure that noise levels remain within these guideline values.

In respect of gardens and patios, BS8233:2014 states;

"…it is *also recognized that these guideline values are not achievable in all circumstances where development might be desirable."*

BS8233: 2014 goes on to state, for areas adjoining the strategic transport network:

" …a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited".

In respect of balconies, roof gardens and terraces, BS8233:2014 states; *"Other locations, such as balconies, roof gardens and terraces, are also important in residential buildings where normal*

external amenity space might be limited or not available, i.e. in flats, apartment blocks, etc. In these locations, specification of noise limits is not necessarily appropriate. Small balconies may be included for uses such as drying washing or growing pot plants, and noise limits should not be necessary for these uses; however, the general guidance on noise in amenity space is still appropriate for larger balconies, roof gardens and terraces, which might be intended to be used for relaxation. In high-noise areas, consideration should be given to protecting these areas by screening or building design to achieve the lowest practicable levels. Achieving levels of 55 dB $L_{Aeq,T}$ *or less might not be possible at the outer edge of these areas, but should be achievable in some areas of the space".*

It is clear from the narrative of BS8233:2014, that proposed development within noisy environments should be designed to ensure that the recommended internal design standards are achieved, and that noise levels in external amenity areas are designed to effectively control and reduce noise levels, although it acknowledges that in certain circumstance meeting the external design recommendations may not be feasible, or necessary, especially where the provision of such spaces is desirable for other technical, planning or policy reasons.

3. Site Description

3.1. Site and Surrounding Area

The Proposed Development site currently comprises a ground floor retail unit, with storage/office floor above and a loft space atop that, within the retail area of Caversham Road, Reading.

The Proposed Development location can be seen in

Figure 1, overleaf.

The ambient sound environment of Caversham Road comprises road traffic, with some local activity contributions.

FIGURE 1: PROPOSED DEVELOPMENT LOCATION

UK Planning Maps

Map data

163-165, Caversham Road, Reading, RG1 8BB

Map shows area bounded by: 471125.28,174240.3,471266.72,174381.7 (at a scale of 1:1250) The representation of a road, track or path is no evidence of a right of way. The representation of features as lines is no evidence of a property boundary.

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3.2. Proposed Development Overview

The Proposed Development comprises the upgrade and retention of the ground floor retail unit; the conversion of the 1st floor storage/office space to 2 No. residential apartments, comprising a 2 bedroom unit at the front and a 1 bedroom unit at the rear; plus the conversion of the loft space into a studio apartment, proposed to be developed under permitted development rules.

It should be noted that the building does not currently include any ventilation provision, beyond openable windows.

THE PROPOSED GROUND TO 2ND FLOOR LAYOUTS ARE SHOWN IN FIGURE 2 AND

Figure 3, below.

FIGURE 2: PROPOSED DEVELOPMENT LAYOUT – GROUND & 1ST FLOOR

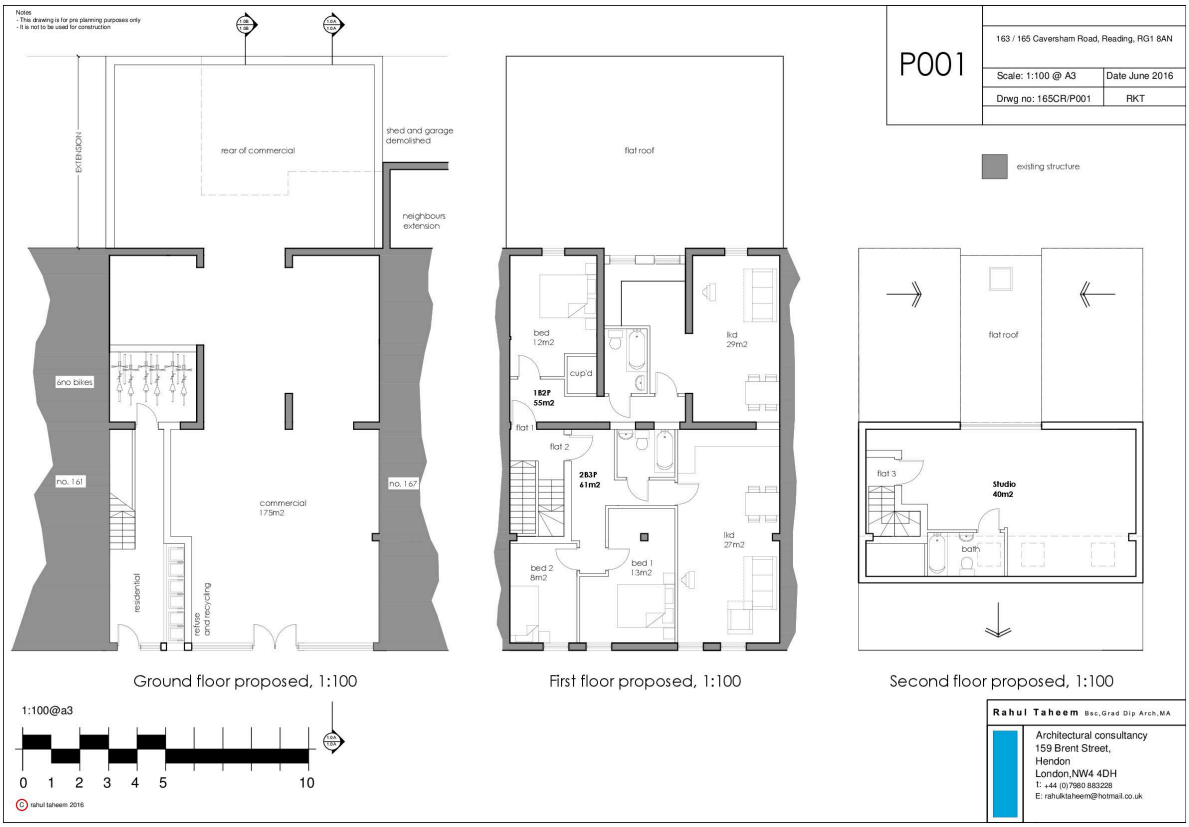

FIGURE 3: PROPOSED DEVELOPMENT LAYOUT – 2ND FLOOR

4. Measurement Methodology

4.1. General

The prevailing noise conditions in the area have been determined by an environmental noise survey conducted during both daytime and night-time periods between Thursday 9th and Friday 10th March 2017.

4.2. Measurement Details

All noise measurements were undertaken by a consultant certified as competent in environmental noise monitoring, and, in accordance with the principles of BS 7445[7].

All acoustic measurement equipment used during the noise survey conformed to Type 1 specification of British Standard 61672[8]. A full inventory of this equipment is shown in Table 3 below.

Table 3: Inventory of Sound Measurement Equipment

Measurement Position	Make, Model & Description	Serial Number	Calibration Certificate Number	Calibration Due Date
MP1	Rion NL-52 Sound Level Meter	00943360	1702076	09/02/2019
	Rion NH-52 Preamplifier	43376	1702076	09/02/2019
	Rion UC-59 Microphone	07154	1702076	09/02/2019
All	Cirrus CR:515 Acoustic Calibrator	76798	1702069	06/02/2018

The sound measurement equipment used during the survey was field calibrated at the start and end of the measurement period. A UKAS accredited calibration laboratory has calibrated the field calibrator used within the twelve months preceding the measurements. A drift of less than 0.2 dB in the field calibration was found to have occurred on all sound level meters.

The weather conditions during the survey were conducive to environmental noise measurement it being dry, with little or no discernable wind.

The microphone was fitted with a protective windshield for the measurement, which is described in

Table 4.

Table 4: Measurement Position Descriptions

Measurement Position	Description
MP1	An unattended daytime and night-time measurement of sound at a point 1-metre from the Caversham Road façade of the building, at 1st floor level.

[7] British Standard 7445: 2003: Description and measurement of environmental noise. BSI
[8] British Standard 61672: 2003: Electroacoustics. Sound level meters. Part 1 Specifications. BSI.

The summarised results of the environmental noise measurements are presented in Table 5, with full, tabulated results presented under Appendix B. Spectral measurement results are set out in Table 6.

TABLE 5: SUMMARY OF NOISE MEASUREMENT RESULTS (UNCORRECTED FAÇADE LEVELS)

Measurement Position	Period	Noise Level, dB			
		$L_{Aeq,T}$	L_{A90}	L_{A10}	L_{Amax}
MP1	Daytime	72	63	74	81
	Night-Time	68	48	70	81

TABLE 6: SPECTRAL NOISE MEASUREMENT RESULTS (UNCORRECTED FAÇADE LEVELS)

Parameter	Linear Measured Level - dB				
	125Hz	250Hz	500Hz	1kHz	2kHz
L_{eq} Day	74	71	68	68	65
L_{eq} Night	70	67	64	64	61
L_{FMax} Night	83	80	77	77	74

5. Noise Assessment

5.1. Facade Requirements

In order to achieve appropriate noise levels within internal living rooms, the dwellings themselves typically need to be considered with regard to the level of façade mitigation required in order to achieve internal noise levels of <35 dB(A) in habitable rooms during the day and <30 dB(A) during the night.

The glazing and ventilation elements are typically the weakest acoustic link in the construction of a building facade. Therefore, in order to assess the acoustic performance of the proposed dwellings, it is appropriate in the first instance to explore the level of protection that will be afforded by the performance of the glazing elements.

Windows do not reduce noise equally across the entire frequency spectrum, so the frequency content of the sound will influence the overall sound reduction performance of a given window and by extension, the resulting noise levels within the receiving room.

Many glazing manufacturers test their products under laboratory conditions using a typical road traffic noise frequency spectrum source. The resultant measured noise attenuation, in dB, gives a very useful guide to in-situ sound reduction performance of the window for situations where road traffic noise dominates. This performance index is known as the R_{TRA}.

Table 1 in Annex 6 of PPG 24, which is now superseded, but does contain some useful and relevant information, provides examples of typical noise reductions for a dwelling façade with windows set in a brick/block wall. The table shows various levels of noise reduction provided by different glazing configurations and for different noise sources. The values shown are the level difference (in dBA) between the outside and the inside of a typical dwelling and to represent worst case, it is assumed that the outside level is a façade measurement and that the relative contribution though any ventilation elements is negligible.

For a R_{TRA}, PPG24 states that standard thermal double glazing will provide a façade sound insulation performance of 33 dB(A), which for free-field noise levels as predicted in this case would be 30 dB(A). As an example of a glazing unit that could achieve the above performance, the glazing manufacturer SG states that its 4/12/4 double glazed window unit has an R_{TRA} of 27 dB. This is considered to be a reliable performance expectation in the context of what would be installed in the quietest facades of the development. The 4/12/4 notation refers to a glazing unit comprising a 4 mm pane of glass and a 4 mm pane of glass, separated by a 12 mm air gap.

The Building Regulations recommend on ventilation that habitable rooms in dwellings have background ventilation. Internal noise levels should be considered in the context of room ventilation requirements and where the target internal noise levels will only be achieved when windows are closed, an alternative means of ventilation will be required to comply with the requirements of the Building Regulations Approved Document F.

In order to achieve the target daytime and night-time internal noise levels, it is necessary to determine the minimum acoustic performance requirements of both the glazing and ventilation system. It is assumed that the default choice of glazing for the habitable rooms of the proposed development will be thermal double glazing and the default choice for ventilation will be a hit and miss, window-mounted trickle vent system.

As already stated; in order to provide a robust assessment and a high quality living environment for future residents, providing internal noise levels of <35 dB(A) by day and <30 dB(A) by night as defined in BS 8233 has been adopted as the design target for the proposed development.

To determine the glazing and ventilation requirements in order to provide an adequate level of protection against external noise intrusion, $L_{Aeq,16hour}$ daytime, $L_{Aeq,8hour}$ night-time and typical L_{AFMax} noise levels have been determined at the building façade.

Accordingly, the required composite $R_w + C_{tr}$ sound reduction performance for the noise-affected building facades throughout the development, to provide appropriate internal noise levels during both daytime and night-time periods, as described, is identified in Table 7.

TABLE 7: REQUIRED SOUND LEVEL DIFFERENCE OUTSIDE TO INSIDE

Index	Free-Field Noise Level, dB		Target Internal Noise Level, dB		Required Sound Level Difference, dB
	Day	Night	Day	Night	
First Floor					
$L_{Aeq,T}$	69	65	35	30	35
L_{AFMax}	-	78	-	45	33
Second Floor – Loft Conversion					
$L_{Aeq,T}$	66	62	35	30	32
L_{AFMax}	-	75	-	45	30

Table 7 identifies that the sound reduction requirements for the proposed development are largely driven by meeting the adopted target night-time $L_{Aeq,8\text{-}hour}$ internal noise level limit of 30 dB.

It should also be noted that the sound reductions detailed in Table 7 apply to habitable rooms such as living rooms, dining rooms and bedrooms only. For non-habitable rooms such as kitchens, bathrooms, stairways, halls, landings, lower performance standards would be permissible.

Based upon the latest layout proposals, calculations have been carried out to determine the likely required acoustic performances for the external façade elements, in order to provide appropriate internal noise levels in rooms during both the daytime and night-time periods.

TABLE 8: MINIMUM ACOUSTIC PERFORMANCES FOR GLAZING AND VENTILATION

Example Glazing	Frequency, Hz				
	125	250	500	1000	2000
	Sound Reduction Performance, R_w				
First Floor – East Facade					
10.8/12/8.4 Double Glazing	28	29	39	44	50
Second Floor – East Façade (Roof)					
10.8/12/8.4 Double Glazing	28	29	39	44	50

Example Ventilation	Frequency, Hz				
	125	125	125	125	125
	Element Normalised Level Difference (D,n,e) dB				
First Floor – East Facade					
Passivent AL-dB 450/40	44	43	36	40	42
Second Floor – East Façade (Roof)					
Passivent AL-dB 450/40	44	43	36	40	42
Assumed Walls/Roof	Frequency, Hz				
	125	125	125	125	125
	Sound Reduction Performance, R_w				
First Floor – East Facade					
Brick/Block Cavity	41	45	45	54	58
Second Floor – East Façade (Roof)					
Slated roof, 25mm plasterboard ceiling, 100mm mineral wool	27	37	43	48	52

The above mitigation measures demonstrate that appropriate internal noise levels are achievable throughout the development with the use of suitable façade treatments.

Other units may be suitable and it is the responsibility of the glazing manufacturer to recommend and provide appropriate systems. The above analysis is provided to demonstrate that a design solution is feasible at the proposed development for the purposes of obtaining a grant of planning permission and not necessarily for the purposes of detailed design or glazing procurement.

The detailed design of the proposed properties will affect both the required sound reduction performance and the appropriate selection of glazing and ventilator units.

6. Conclusion

inacoustic has been commissioned to assess the impact of noise at a proposed office to residential conversion site known as 163-165 Caversham Road, Reading, in respect of the site's suitability for residential development.

This technical noise assessment has been produced to provide supporting information to accompany a prior approval application to Reading Borough Council and is based upon environmental noise measurements undertaken at the site.

The suitability of the site for residential development has been assessed, based on the development proposals and the measured noise levels. Where the measured levels indicate that noise may be a determining factor in the granting of planning permission, mitigation measures have been proposed to ensure satisfactory acoustic conditions are met.

Specific consideration has been given to the internal noise criteria for the proposed residential properties, as quoted within BS8233:2014.

In light of the above, which demonstrates that the site is predicted to meet the requirements of the relevant British Standard and planning guidance, it is considered that noise does not present a constraint to the change of use to residential apartments at the site.

7. APPENDICES

7.1. Appendix A – Definition of Terms

Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of 20μPa ($20x10^{-6}$ Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log10 (s1 / s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
$L_{eq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level during the period T. L_{max} is sometimes used for the assessment of occasional loud noises, 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.
$L_{90,T}$	A noise level index. The noise level exceeded for 90% of the time over the period T. L_{90} can be considered to be the "average minimum" noise level and is often used to describe the background noise.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m
Facade	At a distance of 1m in front of a large sound reflecting object such as a building façade.
Fast Time Weighting	An averaging time used in sound level meters. Defined in BS 5969.

In order to assist the understanding of acoustic terminology and the relative change in noise, the following background information is provided.

The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. In order to express these fluctuations in a manageable way, a logarithmic scale called the decibel, or dB scale is used. The decibel scale typically ranges from 0 dB (the threshold of hearing) to over 120 dB. An indication of the range of sound levels commonly found in the environment is given in the following table.

TABLE 9: TYPICAL SOUND LEVELS FOUND IN THE ENVIRONMENT

Sound Level	Location
0dB(A)	Threshold of hearing
20 to 30dB(A)	Quiet bedroom at night
30 to 40dB(A)	Living room during the day
40 to 50dB(A)	Typical office
50 to 60dB(A)	Inside a car
60 to 70dB(A)	Typical high street
70 to 90dB(A)	Inside factory
100 to 110dB(A)	Burglar alarm at 1m away
110 to 130dB(A)	Jet aircraft on take off
140dB(A)	Threshold of Pain

The ear is less sensitive to some frequencies than to others. The A-weighting scale is used to approximate the frequency response of the ear. Levels weighted using this scale are commonly identified by the notation dB(A).

In accordance with logarithmic addition, combining two sources with equal noise levels would result in an increase of 3 dB(A) in the noise level from a single source.

A change of 3 dB(A) is generally regarded as the smallest change in broadband continuous noise which the human ear can detect (although in certain controlled circumstances a change of 1 dB(A) is just perceptible). Therefore, a 2 dB(A) increase would not be normally be perceptible. A 10 dB(A) increase in noise represents a subjective doubling of loudness.

A noise impact on a community is deemed to occur when a new noise is introduced that is out of character with the area, or when a significant increase above the pre-existing ambient noise level occurs.

For levels of noise that vary with time, it is necessary to employ a statistical index that allows for this variation. These statistical indices are expressed as the sound level that is exceeded for a percentage of the time period of interest. In the UK, traffic noise is measured as the L_{A10}, the noise level exceeded for 10% of the measurement period. The L_{A90} is the level exceeded for 90% of the time and has been adopted to represent the background noise level in the absence of discrete events. An alternative way of assessing the time varying noise levels is to use the equivalent continuous sound level, L_{Aeq}.

This is a notional steady level that would, over a given period of time, deliver the same sound energy as the actual fluctuating sound.

To put these quantities into context, where a receiver is predominantly affected by continuous flows of road traffic, a doubling or halving of the flows would result in a just perceptible change of 3 dB, while an increase of more than 25%, or a decrease of more than 20%, in traffic flows represent changes of 1 dB in traffic noise levels (assuming no alteration in the mix of traffic or flow speeds).

Note that the time constant and the period of the noise measurement should be specified. For example, BS 4142 specifies background noise measurement periods of 1 hour during the day and 15 minutes during the night. The noise levels are commonly symbolised as $L_{A90,1hour}$ dB and $L_{A90,15mins}$ dB. The noise measurement should be recorded using a 'FAST' time response equivalent to 0.125 ms.

7.2. Appendix B – Tabulated Measurement Results

TABLE 10: FULL NOISE MEASUREMENT RESULTS

Time & Date	L_{Aeq} (dB)	L_{A90} (dB)	L_{A10} (dB)	L_{AFmax} (dB)
09/03/17 12:00	71.9	63.9	74.3	80.2
09/03/17 13:00	72.8	63.9	74.6	82.4
09/03/17 14:00	72.3	65.5	74.2	80.8
09/03/17 15:00	71.7	64.8	74.2	81.6
09/03/17 16:00	69.7	62.8	71.6	80.9
09/03/17 17:00	70.0	61.6	71.1	77.2
09/03/17 18:00	70.3	63.1	72.5	79.3
09/03/17 19:00	70.7	63.3	73.3	79.0
09/03/17 20:00	70.3	61.9	73.2	79.1
09/03/17 21:00	70.0	60.6	72.9	79.7
09/03/17 22:00	69.7	60.5	72.8	78.5
09/03/17 23:00	68.6	53.0	72.1	80.1
10/03/17 00:00	66.5	47.8	69.9	78.6
10/03/17 01:00	65.3	43.0	67.7	79.9
10/03/17 02:00	63.1	39.6	64.0	78.8
10/03/17 03:00	65.3	41.9	66.2	80.3
10/03/17 04:00	65.7	42.9	67.1	80.8
10/03/17 05:00	69.3	51.4	72.8	80.9
10/03/17 06:00	73.5	62.7	76.4	83.1
10/03/17 07:00	73.2	66.2	75.2	81.7
10/03/17 08:00	71.5	63.7	73.9	79.8
10/03/17 09:00	74.9	66.3	76.5	83.9

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