

**APPENDIX G - TRAFFIC FLOW DATA** 

#### Day Time (07:00 - 23:00)

Road Name	Baselir	ne 2019 ( 23:00)	(07:00-		Baseline 7:00-23:0			re Baseli nent 202 23:00)	ne + ?7 (07:00-	Dev	re Baseli velopmer ive 2027 23:00)	
	Lights	HDV	HDV%	Lights	HDV	HDV%	Lights	HDV	HDV%	Lights	HDV	HDV%
College Way	2464	123	5%	2646	132	5%	2276	114	5%	2276	114	5%
Bridge Road (east of Osborn Way Roundabout)	12689	634	5%	13628	681	5%	13618	681	5%	14156	708	5%
Bridge Road (Gyratory)	11112	556	5%	11935	597	5%	11909	595	5%	12448	622	5%
Bridge Road (west of Gytatory)	9864	493	5%	10594	530	5%	10584	529	5%	11068	553	5%
The Campus (between Bridge Road west and Digswell Road)	13403	670	5%	14396	720	5%	14370	719	5%	14424	721	5%
The Campus (between Digswell Road and College Way)	13560	678	5%	14563	728	5%	14538	727	5%	14592	730	5%
The Campus (between College Way and Bridge Road east)	10332	517	5%	11097	555	5%	11071	554	5%	11125	556	5%
Digswell Road	14249	712	5%	15304	765	5%	15302	765	5%	15356	768	5%

#### Night Time (23:00 - 07:00)

Road Name	Baselir	ne 2019 ( 07:00)	(23:00-		Baseline 3:00-07:(				07:00		/elopmer	nt +
	Lights	HDV	HDV%	Lights	HDV	HDV%	Lights	HDV	HDV%	Lights	HDV	HDV%
College Way	274	14	5%	294	15	5%	253	13	5%	253	13	5%
Bridge Road (east of Osborn Way Roundabout)	1410	70	5%	1514	76	5%	1513	76	5%	1573	79	5%
Bridge Road (Gyratory)	1235	62	5%	1326	66	5%	1323	66	5%	1383	69	5%
Bridge Road (west of Gytatory)	1096	55	5%	1177	59	5%	1176	59	5%	1230	61	5%
The Campus (between Bridge Road west and Digswell Road)	1489	74	5%	1600	80	5%	1597	80	5%	1603	80	5%
The Campus (between Digswell Road and College Way)	1507	75	5%	1618	81	5%	1615	81	5%	1621	81	5%
The Campus (between College Way and Bridge Road east)	1148	57	5%	1233	62	5%	1230	62	5%	1236	62	5%
Digswell Road	1583	79	5%	1700	85	5%	1700	85	5%	1706	85	5%

**APPENDIX H - TRAFFIC NOISE CALCULATIONS** 

Change in Noise Lev	els due to Operti	onal Traffic - Daytime	
	Future Baseline	Future Baseline + Operational Site Traffic	Change in Noise Level, dB
College Way	2779	2390	-0.7
Bridge Road (east of Osborn Way Roundabout)	14310	14299	0.0
Bridge Road (Gyratory)	12531	12505	0.0
Bridge Road (west of Gytatory)	11124	11113	0.0
The Campus (between Bridge Road west and Digswell Road)	15115	15089	0.0
The Campus (between Digswell Road and College Way)	15291	15265	0.0
The Campus (between College Way and Bridge Road east)	11652	11625	0.0
Digswell Road	16069	16067	0.0

	Future Baseline	Future Baseline + Operational Site	Change in Noise Level, dB
College Way	287	Traffic 266	-C
Bridge Road (east of Osborn Way Roundabout)	1480		(
Bridge Road (Gyratory)	1296	1389	- (
Bridge Road (west of Gytatory)	1151	1235	
The Campus (between Bridge Road west and Digswell Road)	1564	1677	
The Campus (between Digswell Road and College Way)	1582	1696	
The Campus (between College Way and Bridge Road east)	1205	1292	
Digswell Road	1662	1785	

**APPENDIX I RELEVANT POLICY & GUIDANCE** 

## **RELEVANT POLICY & GUIDANCE**

#### National Planning Policy Framework (NPPF) – July 2021

Under the NPPF: paragraph 185 of Section 15, with regard to environmental noise; Planning policies and decisions should aim to: -

- 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;
- 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.

#### Noise Policy Statement for England (NPSE)

To avoid and mitigate adverse noise effects on health arising from and impacting on new development, the NPPF makes reference to NPSE. The NPSE was published in March 2010 and covers all forms of noise, other than occupational noise. For the purposes of this report, "Neighbourhood Noise" is most relevant as NPSE defined at paragraph 2.5:

"neighbourhood noise which includes noise arising from within the community such as industrial and entertainment premises, trade and business premises, construction sites and noise in the street. "

NPSE introduces three concepts to the assessment of noise in the UK:

- NOEL No Observed Effect Level This is the level below which no effect can be detected and below which there is no detectable effect on health and quality of life due to noise.
- LOAEL Lowest Observable Adverse Effect Level This is the level above which adverse effects on health and quality of life can be detected.
- SOAEL Significant Observed Adverse Effect Level This is the level above which significant adverse effects on health and quality of life occur.

NPSE does not numerically define levels for the NOEL, LOAEL or SOAEL rather it makes it clear that the noise level is likely to vary depending upon the noise source, the receptor and the time of day/day of the week, etc.

#### National Planning Practice Guidance (2014)

The purpose of the guidance is to complement the NPPF and provide advice on how to deliver its policies.

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The guidance includes a table (as shown in Table 1) that summarises "the noise exposure hierarchy, based on the likely average response" and which offers "examples of outcomes" relevant to the NOEL, LOAEL and SOAEL effect levels described in the NPSE.

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, eg 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, eg 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, eg regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, eg auditory and non-auditory	Unacceptable Adverse Effect	Prevent

Table 1: Noise Exposure Hierarchy, Based on the Likely Average Response.

### Calculation of Road Traffic Noise – 1988

For new developments, road traffic noise levels should be predicted in accordance with CRTN. This prediction method uses the traffic flow, vehicle speed, and percentage of heavy-duty vehicles (HDVs, over 3.5 tonnes), road gradient and other factors to calculate noise levels at receptor points.

# Design Manual for Road and Bridges, Volume 11 (LA111 – Noise and Vibration

Changes in noise level as a result of additional vehicles on the public highway can be assessed using methodologies presented in Design Manual for Road and Bridges (DMRB LA111),

This guidance document sets out the requirements for noise and vibration assessments from road projects. The construction, operation and maintenance of highway projects can lead to changes in noise and vibration levels in the surrounding environment.

The magnitude of change (in sound level) is defined in Table 3.54a of the guidance for short term and Table 3.54b for long term, as presented in Table 2:

Short term magnitude	Short term noise change (dB L <sub>A10,18hr</sub> or L <sub>night</sub> )
Major	Greater than or equal to 5.0
Moderate	3.0 to 4.9
Minor	1.0 to 2.9
Negligible	less than 1.0
Long term magnitude	Long term noise change (dB L <sub>A10,18hr</sub> or L <sub>night</sub> )
Long term magnitude Major	Long term noise change (dB L <sub>A10,18hr</sub> or L <sub>night</sub> )   Greater than or equal to 10.0
Major	Greater than or equal to 10.0

Table 2 (Table 3.54a and b DMRB, LA 111 - Magnitude of Change)

### Control of Pollution Act 1974

The local authority has powers under the Control of Pollution Act 1974 to control noise from construction sites. Section 60 of the Act allows a local authority to serve a notice of its requirements for the control of site noise. This notice may include specification of plant that is or is not to be used, hours during which the construction works can be carried out and levels of noise emission. Section 61 of the Act allows a contractor or developer to take the initiative and agree with the local authority the methods of construction, steps to minimise noise and hours of work.

#### The Environmental Protection Act 1990

Local authorities have a duty to deal with statutory nuisances under the Environmental Protection Act 1990. For noise to amount to a statutory nuisance, it must be "prejudicial to health or a nuisance" as outlined in Section 79 of the Act. Any proposed development should not result in a statutory nuisance being declared.

Should the Local Authority declare a development to cause a statutory nuisance, an abatement notice can be served to the developer who has up to 21 days to appeal to Magistrates' Court, as detailed in Section 80 of the Act.

#### The Building Regulations 2010

Building Regulations approvals are required for most new buildings and for most types of works on existing buildings. Part 10 of The Building Regulations 2010 contains provisions, including power for local authorities to test building work, take samples, and provision to ensure compliance. Part E of the Regulation 'Resistance to the passage of sound' is expanded in Approved Document E, which provides robust details to control and mitigate noise within buildings. This Document is separated over four parts which include:

- E1: Protection against sound from other parts of the building and adjoining buildings;
- E2: Protection against sound within dwelling-house etc.;
- E3: Reverberation in the common internal parts of buildings containing flats or rooms for residential purposes;
- E4: Acoustic conditions in schools.

### World Health Organisation

The WHO document Guidance on Community Noise specifies additional information for noise affecting noise sensitive receptors and forms the basis of many noise limitations and design ranges for internal and external ambient noise levels. It defines noise as 'a class of sounds that are considered unwanted' (by the listener), 'that adversely affects, or may affect the physiological and psychological wellbeing of people.' Much of the research around this study is based on transportation noise. Further guidance on the recommended levels is given in the World Health Organisation (WHO) Guidelines for Community Noise. In this document it is stated that:

"To protect the majority of people from being seriously annoyed during the daytime, the outdoor sound level from steady, continuous noise should not exceed 55 dB L<sub>Aeq</sub> on balconies, terraces and in outdoor living areas. To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound level should not exceed 50 dB L<sub>Aeq</sub>."

WHO also states the following paragraph with regard to the effects of LAmax events in a night-time period:

"For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45dB L<sub>Amax</sub> more than 10-15 times per night (Vallet & Vernet 1991)."

WHO guidance 'Night Noise Guidelines for Europe' is concerned with the longer-term average noise levels that are covered by the EU Directive on Environmental Noise, although this does appear to suggest external maximum noise levels of around 57dBA outside bedrooms during the night to achieve internal maximum levels of 42dBA.

The World Health Organisation has recently published Environmental Noise Guidelines – for the European Region (2018) to provide recommendations for protecting human health from exposure to noise sources such as transportation (road traffic, railway and aircraft), wind turbine noise and leisure noise.

The guidance document defines the 'strength' of recommendation (for protecting against noise exposure) as either 'strong' or conditional', outlined below.

#### Strength of Recommendation

"A **strong** recommendation can be adopted as policy in most situations. The guideline is based on the confidence that the desirable effects of adherence to the recommendation outweigh the undesirable consequences. The quality of evidence for a net benefit – combined with information about values, preference

and resources – inform this recommendation, which should be implemented in most circumstances."

"A **conditional** recommendation requires a policy-making process with substantial debate and involvement of various stakeholders. There is less certainty of its efficacy owing to lower quality of evidence of a net benefit, opposing values and preferences of individuals and populations affected or the high resource implications of the recommendation, meaning there may be circumstances or settings in which it will not apply."

External (free-field) recommendations included in the Environmental Noise Guidelines for the European Region are presented in Table 3 for specific noise sources.

Noise Source	dB L <sub>den</sub>	dB L <sub>night</sub>	dB L <sub>Aeq, 24hr</sub> (yearly average)	Recommendation
Road Traffic	53	45	-	Strong
Railway	54	44	-	Strong
Aircraft	45	40	-	Strong
Wind Turbine	45	-	-	Conditional
Entertainment	-	-	70	Strong/Conditional

Table 3: Extract from Environmental Noise Guidelines for the European Region

## BS8233:2014 – Guidance on Sound Insulation and Noise Reduction for Buildings

Formerly a Code of Practice, the 2014 revision of BS8233 is now presented and intended as a guidance document. The standard is mainly concerned with building design from an acoustic standpoint. It does however, contain information relevant to environmental noise more specifically by stating guidance for desirable internal noise levels for dwellings and other buildings.

Table 2 of BS8233:2014 provides suitable internal levels for spaces such as openplan offices and restaurants and notes that an upper and lower noise levels should be considered, as presented in Table 4.

Objective	Typical Situation	Design range dB LAeq,T
	Restaurant	40 - 55
Typical noise levels for	Open plan office	45 - 50
acoustic privacy in shared spaces	Night club, public house	40 - 45
	Ballroom, banqueting hall	35 - 40

Table 4: Extract from Table 2 – Indoor ambient noise levels in spaces when they are unoccupied and privacy is also important

An extract of Table 4 of the document relevant for residential development is reproduced in Table 5.

Activity	Location	07:00 to 23:00 dB L <sub>Aeq</sub> , 16hour	23:00 to 07:00 L <sub>Aeq</sub> , 8hour
Resting	Living room	35	-
Dining	Dining room / area	40	-
Sleeping (daytime resting)	Bedroom	35	30

Table 5: Extract from Table 4 – Indoor ambient noise levels in dwellings

Whilst the above criteria is for dwellings, BS8233 states that these recommendations are similar for hotel guestrooms and therefore these have been adopted as the criteria for assessment.

The guidance of BS8233:2014 with regards to external amenity spaces is as follows:

"For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB  $L_{Aeq,T}$ , with an upper guideline value of 55 dB  $L_{Aeq,T}$  which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban 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."

#### ProPG: Planning and Noise - May 2017

Guidance in ProPG Planning and Noise provides an approach which aims to inform developers, practitioners and local authorities on how potential residential sites should be assessed. ProPG states that the guidance can be used for other types of residential institution and therefore it is considered applicable to the site.

The guidance also builds upon government planning policy that noise should not be treated in isolation and there should be a holistic approach to good acoustic design.

ProPG sets out a 2-stage approach; the first of which is a risk assessment to identify the likelihood of significant adverse impact, then depending on the outcome of this risk assessment the extent of the acoustic design statement required. The graphic in Figure 1 is an extract from ProPG and indicates the level of risk associated with ranges of sound levels and provides some guidance on the likely extent of work associated with progressing a development exposed to these sound levels.

In relation to maximum noise levels, ProPG states that:

"In most circumstances in noise sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45dB L<sub>Amax,F</sub> more than 10 times a night. However, where it is not reasonably practicable to achieve this guideline then the judgement of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number, distribution, predictability and regularity of noise events."

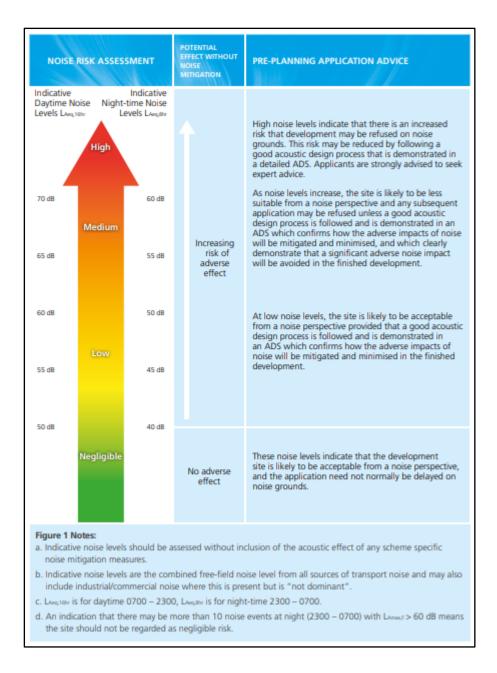


Figure 1: Extract from Figure 1 in ProPG – Initial Site Noise Risk Assessment

The second stage involves four key elements where discussion is expanded on:

- Element 1 Good Acoustic Design Process
- Element 2 Internal Noise Level Guidance
- Element 3 External Amenity Area Noise Assessment
- Element 4 Assessment of Other Relevant Issues

Having worked through the approach practitioners can present a recommendation to the decision maker.

## Acoustics Ventilation and Overheating - Residential Design Guide, January 2020

Acoustics Ventilation and Overheating (AVO) recommends an approach to acoustic assessments for new residential development taking consideration for acoustics, ventilation, and overheating. AVO states that the guidance can be used for other types of residential institution and therefore it is considered applicable to the site.

Section 3 involves a two-level risk assessment approach to estimate the potential impact on occupants in the case of overheating.

The Level 1 site risk assessment is based on external free-field noise levels and the assumed scenario where a partially open window is used to mitigate overheating (Table 3-2 of the guidance).

The sound level reduction from outside to inside for a partially open window is 13dB in this instance. A Level 1 site risk assessment is considered adequate if the site falls within the 'Negligible risk' category. A Level 2 assessment can optionally be undertaken to give more confidence in the case of Low or Medium risk sites, where appropriate. The Level 2 assessment is strongly recommended for 'High' risk sites.

The Level 2 assessment suggests that assessment of the adverse effect from noise exposure should include an estimate of how frequently and for what duration the overheating condition occurs (Table 3-3 of the guidance)

Figure 2 explains the two-level noise assessment procedure for overheating conditions.

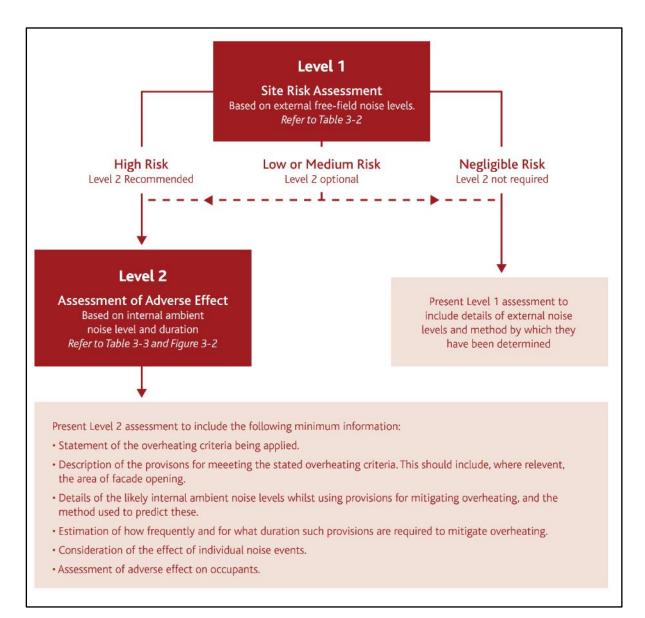


Figure 2: Two-level Assessment Procedure (Figure 3.1 of AVO Guidance)

Figure 3 shows the Level 1 site risk assessment of noise, relating to overheating conditions.

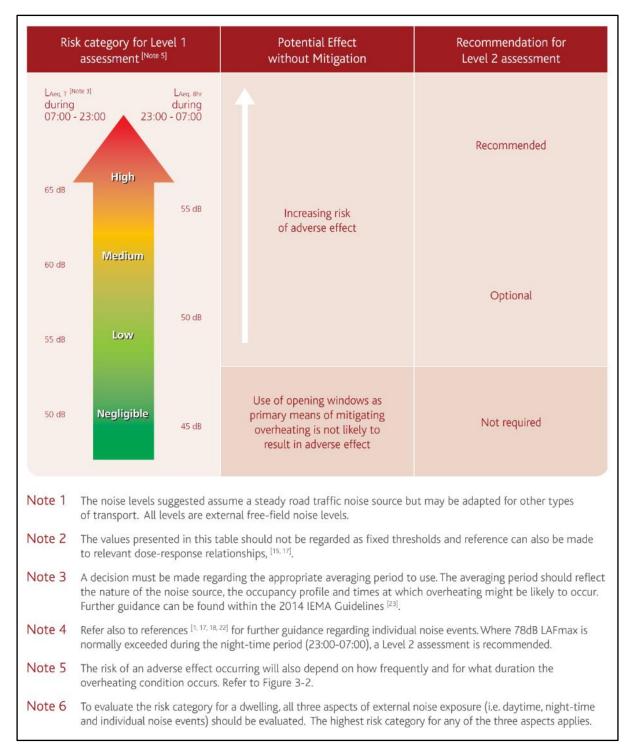


Figure 3: Level 1 Risk Assessment (Figure 3.2 of AVO guidance)

	l ambient noise lev			
L <sub>Aeq.T</sub> <sup>[Note 3]</sup> during 07:00 – 23:00 <sup>[Note 6]</sup>	L <sub>Aeq. 8h</sub> during 23:00 – 07:00	events during		ples of Outcomes <sup>[Note 5]</sup>
> 50 dB	> 42 dB	Normally exceeds 65 dB LAR.max	Noise causes a material change in behaviour e.g. having to keep windows closed most of the time	Avoiding certain activities during periods of intrusion. 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.
	Increasing noise level		Increasing likelihood of impact on reliable speech communication during the day or sleep disturbance at night	At higher noise levels, more significant behavioural change is expected and may only be considered suitable if occurring for limited periods. As noise levels increase, small behaviour changes are expected e.g. turning up the volume on the television; speaking a little more loudly; having to close windows for certain activities, for example ones which require a high level of concentration. Potential for some reported sleep disturbance. Affects the acoustic environment inside the dwelling such that there is a perceived change in quality of life. At lower noise levels, limited behavioural change is expected unless conditions are prevalent for most of the time. <sup>[Note B]</sup>
≤ 35 dB	≤ 30 dB	Do not normally exceed L <sub>AF,max</sub> 45 dB more than 10 times a night	Noise can be heard, but does not cause any change in behaviour	Noise can be heard, but does not cause any change in behaviour, attitude, or other physiological response <sup>[Note 9]</sup> . Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.

Figure 4 shows the Level 2 site risk assessment of noise, relating to overheating conditions.

Figure 4: Level 2 Risk Assessment (Figure 3.3 of AVO guidance)

The noise levels suggested in Figure 3 and Figure 4 assume a steady road traffic noise source but may be adapted for other types of transport by taking account of the differing responses to different transport sources.

#### BS6472-1:2008 – Guide to Evaluation of Human Exposure to Vibration in Buildings - Part 1: Vibration sources other than blasting

This document offers guidance on how people inside buildings respond to vibration: the judgement criteria are more stringent at higher frequencies than in the superseded standard due to changes in the vertical frequency weighting.

Assessment of building vibration with respect to human response: When the appropriately-weighted vibration measurements or predictions have been used to derive the VDV (Vibration Dose Value) for either 16hr (daytime) or 8h (night-time) at the relevant places of interest, their significance in terms of human response can be derived from Table 6, shown below:

Place and time	Low probability of adverse comment m·s <sup>-1.75</sup> 1)	Adverse comment possible m·s <sup>-1.75</sup>	Adverse comment probable m·s <sup>-1.75</sup> 2)
Residential buildings 16 h day	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential buildings 8 h night	0.1 to 0.2	0.2 to 0.4	0.4 to 0.8

Table 6: Vibration Dose Values from BS6472-1:2008

### BS4142:2014 Methods for rating industrial and commercial sound

BS4142:2014 uses a comparison between the rating and background sound levels to establish an initial estimate of the likely significance of impact. The standard notes:

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

- c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.
- d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

The context of the assessment must then be considered, which can significantly alter the outcome of the assessment. Factors that might alter the outcome of the assessment include the absolute level of sound compared to the residual sound level, the character of the sound compared to the residual, the sensitivity of the receptor etc.

#### Welwyn Hatfield District Plan

The overall aim of the Welwyn Hatfield District Plan is to secure sustainable development in the district, in order to improve quality of life. The Welwyn Hatfield District Plan seeks to translate the key objectives of sustainable development as put forward in Government policy into a series of objectives which reflect the circumstances of Welwyn Hatfield.

The plan sets a number of policies covering a range of different planning considerations. In terms of the policies relevant to the site, Policy R19 relates to noise and is reproduced below:

#### "...Policy R19 - Noise and Vibration Pollution

Proposals will be refused if the development is likely:

- (i) To generate unacceptable noise or vibration for other land uses; or
- (ii) To be affected by unacceptable noise or vibration from other land

uses.

Planning permission will be granted where appropriate conditions may

be imposed to ensure either:

- (iii) An adequate level of protection against noise or vibration; or
- (iv) That the level of noise emitted can be controlled.

Proposals should be in accordance with the Supplementary Design Guidance..."

#### Welwyn Hatfield Draft Local Plan Submission (August 2016)

The role of the Local Plan is to set out the Council's planning framework for the borough, identifying how much and what type of development is needed and where it should or should not be accommodated.

Whilst the Local Plan has not currently been adopted, it is expected that this will happen in the near future. The Local Plan contains policies in relation to noise, Policy SADM 18 is considered applicable to the site, the relevant sections of this policy are reproduced below:

#### "...Policy SADM 18

#### **Environmental Pollution**

When considering development proposals, the Council will adopt the approach set out below to ensure that pollution will not have an unacceptable impact on human health, general amenity, critical environmental assets or the wider natural environment....

#### ...Noise and Vibration

A Noise and Vibration Impact Assessment will be required for proposals with the potential to cause disturbance to people or the natural environment due to noise and/or vibration and for proposals that are considered to be sensitive to noise and/or vibration.

Proposals that would result in or be subject to noise pollution and/or vibration that is:

*i.* Very disruptive and would have an unacceptable adverse effect on human health or the natural environment will not be permitted.

- *ii.* Disruptive and would have a significant adverse effect on human health or the natural environment will be refused unless the need for, and benefits of, the development significantly outweigh the harm and all feasible solutions to avoid and mitigate that harm have been fully implemented.
- iii. Intrusive and would have an adverse effect on human health or the natural environment will be resisted unless the need for, and benefits of, the development outweigh the harm and all feasible solutions to avoid and mitigate that harm have been fully implemented...."

**APPENDIX J - ACOUSTIC TERMINOLOGY** 

#### ACOUSTIC TERMINOLOGY

The effects of noise on human beings may be expressed in terms of physiological damage and annoyance. It is, however, only the annoyance impacts that need to be considered in detail when addressing environmental noise impacts. Annoyance also includes the immediate effects of activity interference, for example sleep disturbance and speech interference.

The practice has become to measure sound levels in decibels (dB). The decibel scale is logarithmic rather than linear and it is useful to bear in mind that a noise level change of 3dB would be equivalent to doubling the energy level (for example doubling the volume of traffic) and that an increase of 10 dB is perceived, subjectively, as a doubling of loudness. The human ear responds differently to sounds of different frequency. The ear perceives high frequency sound of a given sound pressure level more loudly than a low frequency sound at the same level. The A-weighted sound level, dB(A), takes this response into consideration is commonly used for measurement of and environmental noise in UK. It thus indicates the subjective human response to sound.

Environmental noise levels vary continuously from second to second, it is clearly impractical to specify the sound level continuously and thus time averaging is required. In practice human response has been related to various units which include allowance for the fluctuating nature of sound with time. For the purpose of this report these include:

#### LAeq,T : the equivalent A-weighted continuous sound level.

This unit relates to the equivalent level of continuous sound for a specific time period T, for example 16 hours for daytime noise. It contains all the sound energy of the varying sound levels over the same time period and expresses it as a continuous sound level over that period. The unit is used for assessing traffic and industrial noise for planning purposes and in particular for PPG24.

# LA10,T : the A-weighted level of sound exceeded for 10% of the time period T.

This unit is used for traffic noise measurement and is the preferred unit for prediction of traffic noise in the publication, 'Calculation of Road Traffic Noise'.

# LA90,T : the A-weighted level of sound exceeded for 90% of the time period T.

This unit is commonly used to represent the background noise and is used in assessing the effects of industrial noise in UK.

# LAmax : the maximum A-weighted level of sound over a period of measurement.

## LAr,T : the rating level.

The specific Noise plus any adjustments for the characteristic features of the noise. Used for comparison between background levels with the noise source off.

## SEL : the Sound Exposure Level.

Sound exposure level abbreviated as SEL and LAE, is the total noise energy produced from a single noise event condensed into a 1 second time period.

### **Rw : weighted sound reduction index.**

A laboratory-measured value as defined in ISO717 Part 1.

### DnTw :

The equivalent of Rw, but measured onsite as oppose to in a laboratory