

Finch Consulting Report.

Environmental Noise and Impact Assessment at Riverside Central (Reading).

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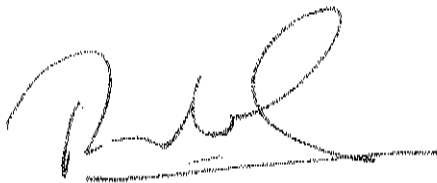
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1.0 INTRODUCTION

- 1.1 It is currently proposed to add extensions to Dukesbridge House in Reading. The proposals allow for roof and side extensions to provide a residential-led scheme with associated landscaping, public realm improvements, alterations to the existing vehicular access and car parking, and provision of cycle parking and waste storage.
- 1.2 This report presents the results of an environmental noise survey, relevant planning policy and an assessment of the noise impact to the proposed new habitable rooms.
- 1.3 The assessment has been undertaken in order to support the planning application at RIBA's Stage 2 for Phase 2 of the development. The detailed design of the development related to acoustics is outside the scope of this report.
- 1.4 To assist with the understanding of this report a brief glossary of acoustic terms can be found in Appendix 2. A more in-depth glossary of acoustic terms can be accessed at <http://www.acoustic-glossary.co.uk>.

2.0 SITE LOCATION

- 2.1 The proposed Phase 2 of the development is an extension of the Dukesbridge House building in Reading. This building is a four-storey redbrick-clad building on the banks of the River Kennet, in Reading town centre.
- 2.2 Dukesbridge House is prominently located on London/Duke Street adjacent to the pedestrianised retail pitch of Broad Street and the Oracle Shopping Centre. To the north, the area surrounding Jackson's Corner provides a range of retail, restaurant, bar and leisure uses. The River Kennet is located along the south boundary of Dukesbridge House.
- 2.3 The location of Riverside Central (Phase 2 extensions of Dukesbridge House) is shown in Figure 1 below.





**Site
Location**



Figure 1: Riverside Central Location Map

- 2.4 Figure 2 below shows the outline of the first floor of the proposed new build extensions that form the Riverside Central development.

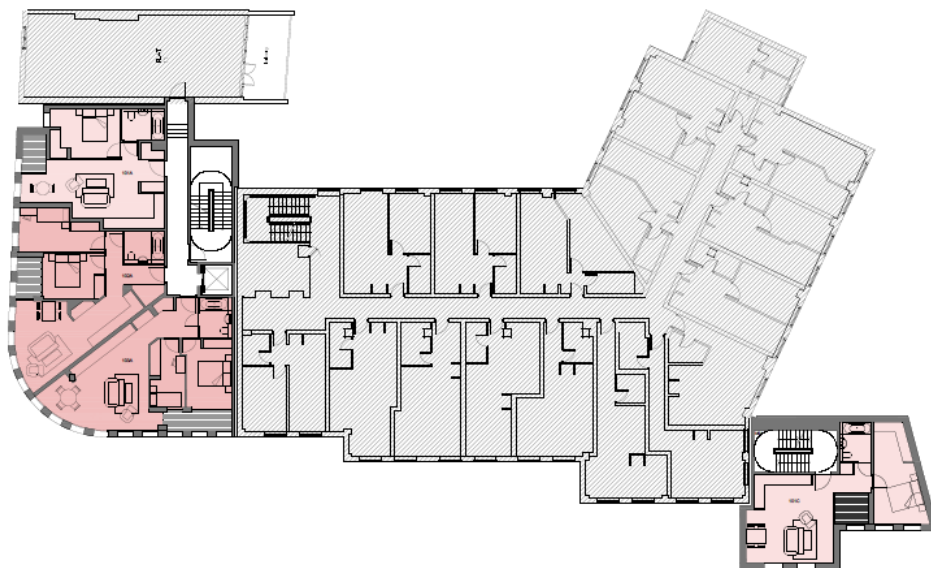


Figure 2: first floor layout of proposed extension at Riverside Central



- 2.5 Figure 3 below shows the outline of the fifth floor of the proposed new build extensions that form the Riverside Central development.

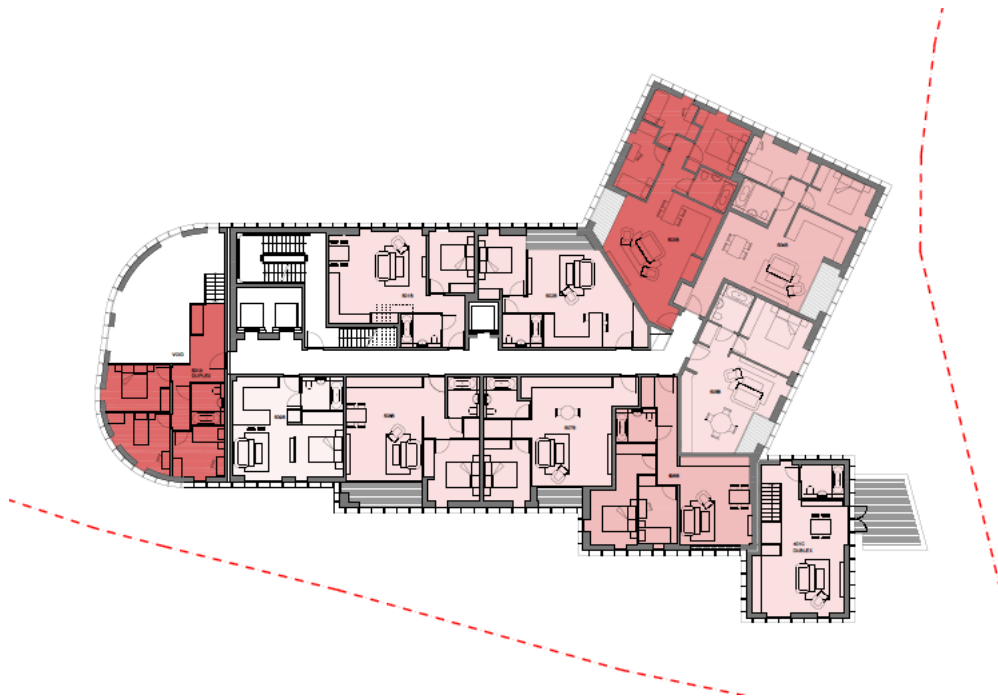


Figure 3: fifth floor layout of proposed extension at Riverside Central

- 2.6 Figure 4 below shows the outline of the seventh floor of the proposed new build extension of the Riverside Central development.

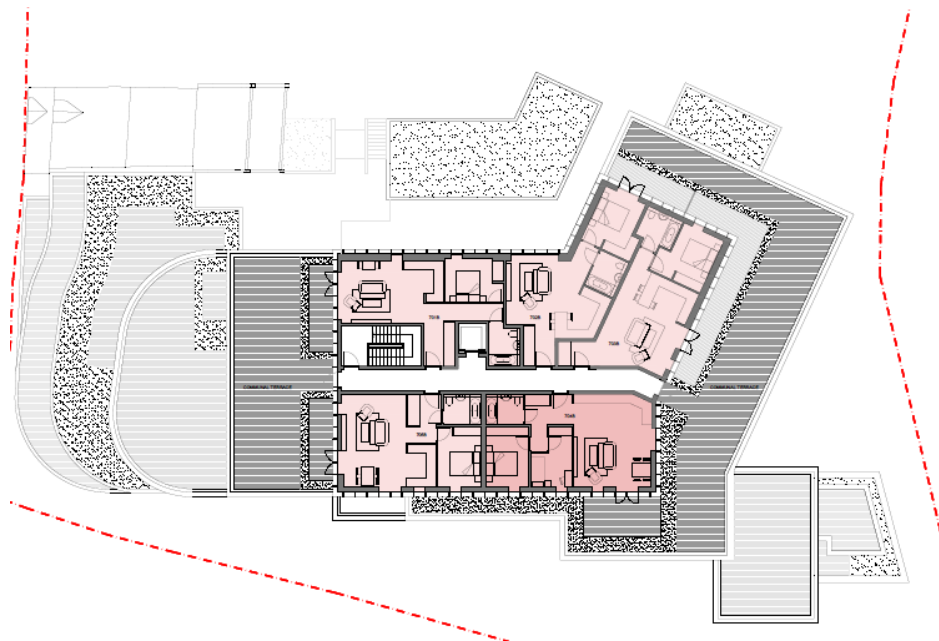


Figure 4: Seventh floor layout of proposed extension at Riverside Central



- 2.7 Figure 5 below shows an aerial photograph of the existing Dukesbridge House from a South-west view.



Figure 5: Photograph of Dukesbridge House from the South-west

- 2.8 Figure 6 below shows a computer-generated image of the proposed development from a South-west view.

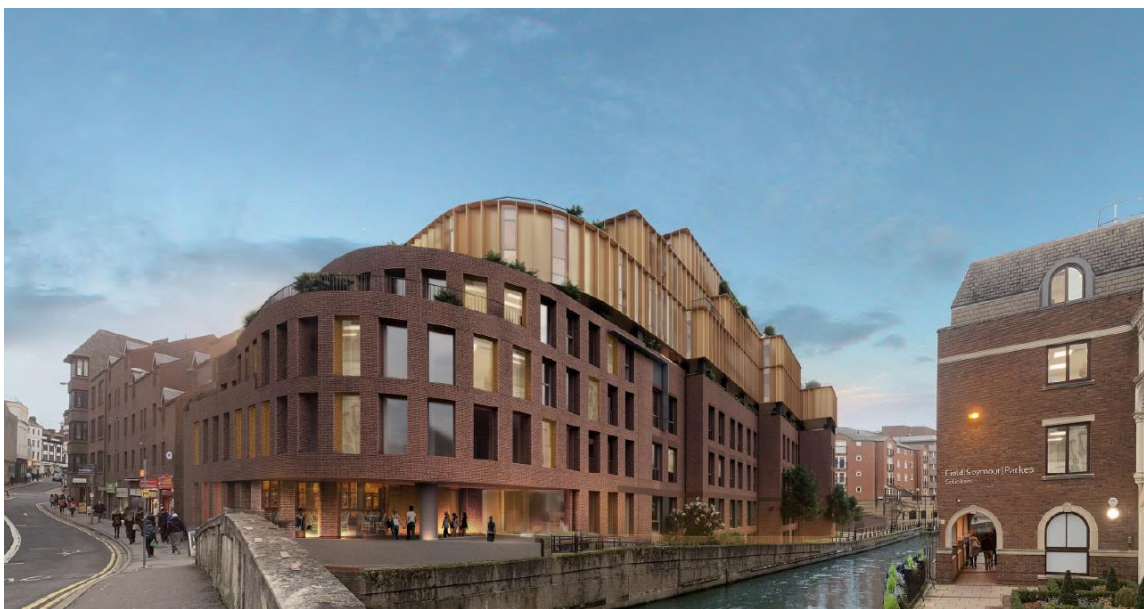


Figure 6: Computer generated image of Riverside Central (Phase 2) from a South-west view.



3.0 PLANNING POLICY AND GUIDANCE

National policy

3.1 In England, the overarching policy on noise management is set out in the Noise Policy Statement for England ('NPSE'). The NPSE contains the vision of promoting good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.

3.2 The NPSE also contains three aims:

“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.”*

3.3 In the explanatory note to the NPSE, reference is made to concepts from toxicology that had previously been applied to noise impacts (e.g. by the World Health Organisation). They are:

- No Observed Effect Level (NOEL), which is the level below which no effect can be detected;
- Lowest Observed Adverse Effect Level (LOAEL), which is the level above which adverse effects on health and quality of life can be detected.

3.4 The explanatory note goes on to introduce the concept of a Significant Observed Adverse Effect Level (SOAEL), which is the level above which significant adverse effects on health and quality of life occur.

3.5 Although for both LOAEL and SOAEL, the word 'level' is used, this does not mean that the impact can only be described as an individual noise level or exposure. It could also include factors such as the number of times the noise impact occurs, the duration of the impact, and the time of day the



impact occurs. Thus, depending on the circumstance, the noise impact could be managed by reducing how often it occurs rather than just reducing the level of impact when it does occur.

- 3.6 The NPSE states that it is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times.
- 3.7 The explanatory note confirms that the first aim of the NPSE states that significant adverse effects on health and quality of life should be avoided while taking account of the guiding principles of sustainable development.
- 3.8 The second aim refers to the situation where the impact lies somewhere between LOAEL and SOAEL. To meet this aim requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development. The explanatory note goes on to state that this does not mean that such adverse effects cannot occur.
- 3.9 With regard to land-use planning in England, the relevant policy is primarily set out in the National Planning Policy Framework ('NPPF').
- 3.10 For noise, the NPPF in Paragraph 180 states that planning policies and decisions should:

“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 so doing they should:

- *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 quality of life (See Explanatory Note to the Noise Policy Statement for England)”.*



3.11 Also in paragraph 180, point b) the NPPF states that planning policies and decisions should:

“identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason”.

3.12 The NPPF also states:

“Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or ‘agent of change’) should be required to provide suitable mitigation before the development has been completed.”

3.13 Elsewhere the NPPF states that:

“Planning policies and decisions should contribute to and enhance the natural and local environment by:preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans.”

3.14 The implementation of the policies in the NPPF is supported by a suite of web-based guidance, including the Planning Practice Guidance on Noise (‘PPG(N)'). It includes a table which summarises the noise exposure hierarchy based on the likely average response. The Noise Exposure Hierarchy is reproduced in Table 1.

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not present	No Effect	No Observed Effect	No specific measures required
Present 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



Perception	Examples of Outcomes	Increasing Effect Level	Action
Lowest Observed Adverse Effect Level			
Present 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			
Present 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 ¹
Present 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

Table 1 Summary of noise exposure hierarchy based on the likely average response (from PPG(N))

- 3.15 The PPG(N) makes it clear that noise can override other planning concerns, where justified, although it is important to look at noise in the context of the wider characteristics of a development proposal, its likely users and its surroundings, as these can have an important effect on whether noise is likely to pose a concern².
- 3.16 In clarifying how the term ‘the context of Government policy on sustainable development’ should be interpreted, some assistance can be obtained from the Government decision letter associated with the Thames Tideway Tunnel project. In that letter, it is stated that:

“The National Planning Policy Framework, the National Planning Practice Guidance on noise and the Noise Policy Statement for England are all clear that noise management

¹ When stating that noise can override other planning concerns, the original version of the PPG(N) stated that neither the NPSE nor the NPPF expects noise to be considered in isolation, separately from the economic, social and other environmental dimensions of proposed development. This is still the case.

² When stating that noise can override other planning concerns, the original version of the PPG(N) stated that neither the NPSE nor the NPPF expects noise to be considered in isolation, separately from the economic, social and other environmental dimensions of proposed development. This is still the case.



should be determined in the context of sustainable development including the environmental, economic and social benefits of the proposal.”

3.17 The PPG(N) states that local authority planning policies can include noise standards that apply to various forms of proposed development and locations in their area. The PPG(N), however, states that care should be taken to avoid these standards from being applied as rigid thresholds as specific circumstances may justify some variation being allowed.

3.18 Furthermore, as mentioned above, the explanatory note to the NPSE states that the policy does not mean that adverse effects arising from noise cannot occur.

Guidance on the effects of noise

3.19 As indicated in the NPSE, objective values associated with SOAEL will depend on the specific circumstances. More information can be derived for values associated with LOAEL from existing guidance. Relevant examples are set out below.

BS 8233:2014

3.20 This standard provides a wide range of guidance regarding sound insulation and noise reduction in buildings. In the Foreword, it states that:

“As a guide, this British Standard takes the form of guidance and recommendations. It should not be quoted as if it were a specification or a code of practice and claims of compliance cannot be made to it.”

3.21 BS 8233:2014 states that:

“for steady external noise sources, it is desirable that the internal ambient noise level does not exceed the guidelines values in Table 4.”

3.22 Table 4 from BS 8233:2014 is reproduced in Table 2. Some local authorities have used these values to represent LOAEL as far as applying the policy in the NPPF and NPSE is concerned for that situation.



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

Table 2 Desirable indoor ambient noise levels for dwellings (reproduced from Table 4 of BS 8233:2014)

3.23 These levels are accompanied by various notes including:

- the levels are based on existing guidelines issued by the World Health Organisation and assume normal diurnal fluctuations in external noise;
- the levels are based on annual average data and do not have to be achieved in all circumstances, for example, it is normal to exclude occasional events such as fireworks night and New Year's Eve;
- if relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the façade insulation or resulting noise level; if applicable, any room should have adequate ventilation (e.g. trickle ventilators should be open) during assessment;
- where a development is considered necessary or desirable, the levels in Table 2 may be relaxed by up to 5 dB and reasonable internal conditions still achieved.

3.24 BS 8233:2014 also sets out the maximum steady noise levels that can permit reliable speech communication. These are reproduced in Table 3.

Distance between talker and listener (m)	Noise Level dB	
	Normal Voice	Raised Voice
1	57	62
2	51	56
4	45	50
8	39	44

Table 3 Maximum steady noise levels for reliable speech communication (reproduced from Table 7 of BS 8233:2014)



- 3.25 The values from this table can be used to estimate the extent of the impact on speech communication from the internal noise levels.
- 3.26 BS8233:2014 (Section 7.7.3.2 Design criteria for external noise) contains the following additional guidance:

“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 & Noise 2017

- 3.27 The ProPG was prepared in 2017 by a group comprising members representing the Chartered Institute of Environmental Health (CIEH), the Institute of Acoustics (IOA) and the Association of Noise Consultants (ANC).
- 3.28 This document provides technical guidance on how to assess the impact of transportation noise on new residential development. It is designed to assist with the implementation of existing planning policy.
- 3.29 The ProPG promotes the use of ‘Good Acoustic Design’ as a primary noise management measure to optimise the acoustic environment that would be experienced by the residents. It recognises that there will be some situations where there would be a need to rely on closed windows and associated ventilation in order to achieve the desired acoustic outcome. In that situation it states that:

“special care must be taken to design the accommodation so that it provides good standards of acoustics, ventilation and thermal comfort without unduly compromising other aspects of the living environment. In such circumstances, internal noise levels can be assessed with windows closed but with any facade openings used to provide “whole



dwelling ventilation” in accordance with Building Regulations Approved Document F (e.g. trickle ventilators).”

3.30 The document also states that:

“It should also be noted that the internal noise level guidelines are generally not applicable under “purge ventilation” conditions as defined by Building Regulations Approved Document F, as this should only occur occasionally (e.g. to remove odour from painting and decorating or from burnt food).”

3.31 The document continues:

“In addition to providing purge ventilation, open windows can also be used to mitigate overheating. Therefore, should the LPA accept a scheme is to be assessed with windows closed, but this scheme is reliant on open windows to mitigate overheating, it is also necessary to consider the potential noise impact during the overheating condition. In this case a more detailed assessment of the potential impact on occupants should be provided in the ADS [Acoustic Design Statement].”

3.32 ProPG concludes that:

“It should be noted that overheating issues will vary across the country and any specific design solutions will need to be developed alongside advice from energy consultants.”

3.33 The ProPG is referenced in the PPG(N) as a document published by other organisations which may be of assistance.

WHO Environmental Noise Guidelines for the European Region (WHO 2018)

3.34 This document has been produced with two key objectives:

- *“In the general population exposed to environmental noise, what is the exposure–response relationship between exposure to environmental noise (reported as various indicators) and the proportion of people with a validated measure of health outcome…”*
- *In the general population exposed to environmental noise, are interventions effective in reducing exposure to and/or health outcomes from environmental noise?”*



- 3.35 The document also provides recommendations regarding external noise exposures that should be achieved to protect human health.
- 3.36 The noise sources covered by these guidelines are road traffic, rail traffic, aircraft and wind turbines. Recommendations are also provided regarding leisure noise.
- 3.37 The document is clear that the recommended values are not LOAELs and that meeting the recommended values would not protect every person affected. The document does, however, state that the “GDG [Guideline Design Group of WHO] stresses that the aim of the current guidelines is to define an exposure level at which effects certainly begin”.
- 3.38 The document also states that “*The current environmental noise guidelines for the European Region supersede the CNG from 1999 [WHO 1999]. Nevertheless, the GDG recommends that all CNG indoor guideline values and any values not covered by the current guidelines (such as industrial noise and shopping areas) should remain valid. Furthermore, the current guidelines complement the NNG from 2009.*”

WHO Night Noise Guidelines for Europe

- 3.39 Within these guidelines it is stated that $L_{\text{night, outside}}$ 40 dB is equivalent to the LOAEL for night noise.
- 3.40 The guidelines also suggest that $L_{\text{night, outside}}$ above 55 dB represents a situation that is considered increasingly dangerous for public health.

Individual Noise Events

- 3.41 The WHO Night Noise Guidelines (2009) state that:

“The 1999 guidelines are based on studies carried out up to 1995 (and a few meta-analyses some years later). Important new studies (Passchier-Vermeer et al., 2002; Basner et al., 2004) have become available since then, together with new insights into normal and disturbed sleep. New information has made more precise assessment of exposure-effect relationship. The thresholds are now known to be lower than L_{Amax} of 45 dB for a number of effects.”



- 3.42 More recent research^{3, 4} some of which is contained within ProPG, has examined the probability of additional awakenings caused by individual noise events.
- 3.43 This approach combines the number of events and the maximum level of those events inside the bedroom. It may be possible to use this approach to evaluate a SOAEL in relation to individual noise events, albeit in the context of the development under consideration.
- 3.44 Paragraph A.17 in the ProPG states that based on studies *“it can be concluded that at night (2300 - 0700 hrs) a significant effect on sleep disturbance e.g. behavioural awakening, is likely to occur where the maximum sound level at the façade of a building with partially open windows is above:*
- *85 dB $L_{Amax,F}$ (where the number of events exceeding this value is ≤ 20); or*
 - *80 dB $L_{Amax,F}$ (where the number of events exceeding this value is > 20)”.*
- 3.45 In paragraph A.18, the ProPG also states *“at relatively low levels e.g. around 45 dB $L_{Amax,F}$ when sufficient number of such events take place during the night the adverse effects of individual noise events are likely to be limited to sleep disturbance in the form of changes in sleep state or perhaps some EEG awakenings”.*

Dose Response Relationship

- 3.46 As required by policy, any acoustic guidelines should not be regarded as fixed thresholds. In reality, there is a continuous relationship between the noise level and the resulting effects. WHO 2018 present dose-response relationships between environmental noise and effects on humans including annoyance, sleep disturbance and other health effects derived from systematic reviews of the evidence.

All Party Parliamentary Group for Home and Healthy Buildings – White Paper (October 2018)

- 3.47 The publication of this document followed the gathering of evidence from various sources including the Institute of Acoustics and the HEMAC [Health Effects of Modern Airtight Construction network] Noise Group. One of the recommendations in the white paper states:

³ Basner, M, Samel, A and Isermann, U Journal of the Acoustical Society of America, Volume 119, 5 (Part 1), p2772–84, 2006 – “Aircraft noise effects on sleep: application of the results of a large polysomnographic field study”

⁴ Basner, M and McGuire, S International Journal of Environmental Research and Public Health, Volume 15 (3), p519, 2018 – “WHO Environmental Noise Guidelines for the European Region: A Systematic Review on Environmental Noise and Effects on Sleep



“Maximising the occupant’s health and wellbeing must be placed at the centre of housing and building design and a holistic approach should be taken including elements of safety, space, energy efficiency, ventilation, heating, noise, air quality and lighting.”

Internal Ambient Noise Levels due to Transport Noise Sources

Introduction

- 3.48 It is suggested here that the desirable internal noise standards within Table 4 of BS 8233:2014 (Table 2 in this report) should be achieved when providing adequate ventilation as defined by Approved Document F (ADF) whole dwelling ventilation. However, it is considered reasonable to allow higher levels of internal ambient noise from transport sources when higher rates of ventilation are required in relation to the overheating condition.
- 3.49 The basis for this is that the overheating condition occurs for only part of the time. During this period, occupants may accept a trade-off between acoustic and thermal conditions, given that they have some control over their environment. In other words, occupants may, at their own discretion, be more willing to accept higher short-term noise levels in order to achieve better thermal comfort. The importance of control is relevant to daytime exposure, but not to night time exposure where the consideration is sleep disturbance.
- 3.50 It is important to note that there is no specific research available to support this view regarding human response to combined exposure to heat and noise. However, the notion that control over one’s environment moderates the response to exposure is well established in the field of thermal comfort, and underpins the adaptive thermal comfort model.
- 3.51 The suitability of higher internal ambient noise levels in the case of the overheating condition has been considered in terms of various effects such as:
- daytime annoyance;
 - daytime interference with activities (conversation/telephone);
 - night-time sleep disturbance (using average noise level parameters such as L_{Aeq});
 - night-time sleep disturbance (using parameters for individual noise events L_{Amax} /SEL).



3.52 The values in Table 4⁵ are based on the assumption of a 13 dB difference between external free-field noise levels and internal ambient noise levels.

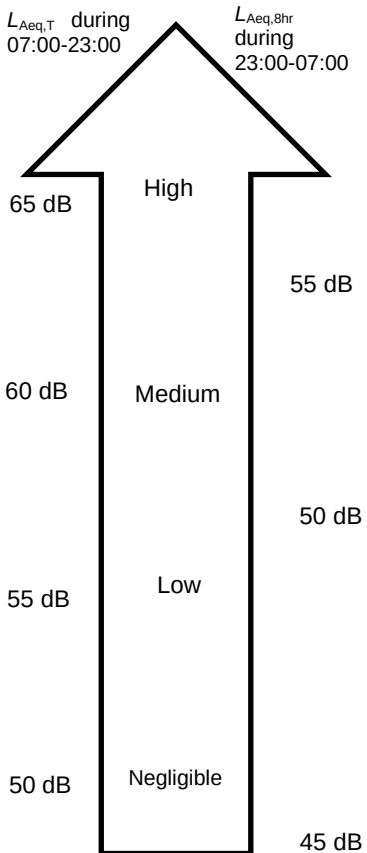
Risk Category for Level 1 Assessment	Potential Effect without mitigation	Recommendation for Level 2 assessment
	Increased Risk of Adverse effect	Recommended
		Optional
	Use of opening windows as primary means of mitigating overheating is not likely to result in adverse effect	Not Required

Table 4 Guidance for Level 1 site risk assessment of noise from transport noise sources [Note 1] relating to overheating condition

3.53 Table 4 suggests that a Level 2 assessment⁶ is not required in situations where it is expected that reasonable internal conditions, described in ProPG as BS 8233 levels relaxed by up to 5 dB, will be achieved.

3.54 For the daytime period, the upper category in Table 5⁷ is defined on the basis that $L_{Aeq,T}$ 50 dB represents the upper end of the range for reliable speech communication.

⁵ From the Association of Noise Consultant's "Acoustics Ventilation and Overheating RESIDENTIAL DESIGN GUIDE" Document, 2020

⁶ See paragraph 3.60

⁷ From the Association of Noise Consultant's "Acoustics Ventilation and Overheating RESIDENTIAL DESIGN GUIDE" Document, 2020



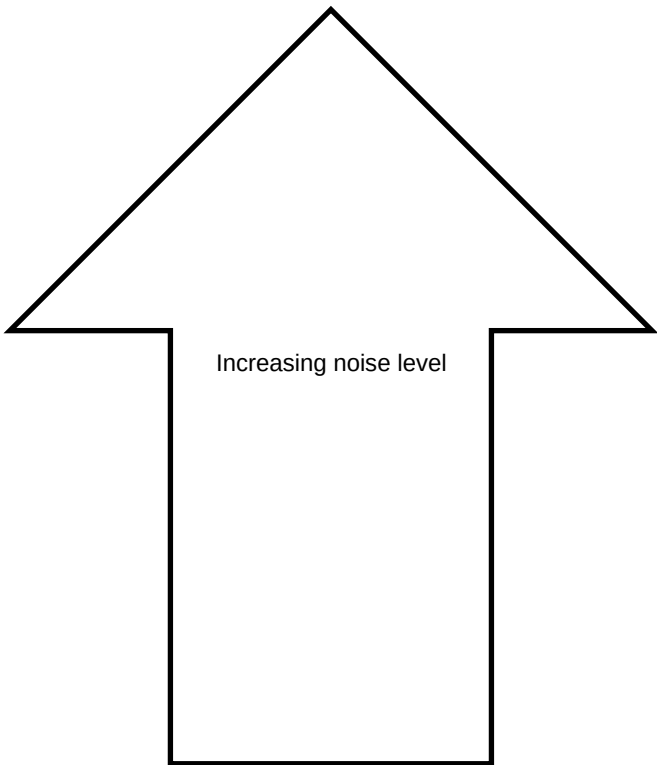
Internal ambient noise level [Note 2]				
$L_{Aeq,T}$ [Note 3] during 07:00-23:00 [note 6]	$L_{Aeq,8h}$ during 23:00-07:00	Individual noise events during 23:00-07:00 [note 4]	Examples of Outcomes [Note 5]	
>50 dB	>42 dB	Normally exceeds 65 dB L_{Amax}	Noise causes a material change in behaviour e.g. 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 ⁸
			Increasing likelihood of impact on reliable speech communication during the day or sleep disturbance at night At	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. [Note 8]
≤35 dB	≤30 dB	Do not normally exceed $L_{AF,max}$ 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 [Note 9]. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.

Table 5 Guidance for Level 2 assessment of noise from transport noise sources [Note 1] relating to overheating condition

⁸ Therefore, these numerical values represent the SOAEL.



Note 1 The noise levels suggested in Tables 4 and 5 assume a steady road traffic noise source but may be adapted for other types of transport.

Note 2 The values presented in this table should not be regarded as fixed thresholds and reference can also be made to relevant dose-response relationships such as those described in a DEFRA 2014 study. With the exception of individual noise events, the references are based on evidence drawn from external noise levels. There is currently very little robust evidence linking internal average noise levels with health outcomes and occupant behaviour. Internal ambient noise levels would normally be considered for living rooms and bedrooms during the daytime. At night, the levels would normally only be applicable to bedrooms.

Note 3 A decision must be made regarding the appropriate averaging period to use. The averaging period should reflect the nature of the noise source, the occupancy profile and times at which overheating might be likely to occur.

Note 4 The $L_{AF,max}$ indicator associated with the upper category is intended for road traffic; it may be more appropriate to use the “one additional noise-induced awakening” method for noise from rail traffic or aircraft.

Note 5 The potential for adverse effect will also depend on how frequently and for what duration the overheating condition occurs.

Note 6 The daytime levels presented in this table may not be appropriate for residential care homes or other situations where conditions for daytime resting are known to be of particular importance.

Note 7 When evaluating the potential for adverse effect, all three aspects of noise exposure (i.e. daytime, night-time and individual noise events) should be evaluated.

Note 8 BS 8233 states that where development is considered necessary or desirable, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved.

Note 9 It is known that physiological responses do occur at lower levels of $L_{AF,max}$ than 45 dB.



- 3.55 For the night-time period, the upper category in Table 5 is defined with reference to the WHO Night Noise guidelines, which state that for external levels above $L_{Aeq,T}$ 55 dB:

“adverse health effects occur frequently and a sizeable proportion of the population is highly annoyed and sleep-disturbed”.

- 3.56 The individual noise event L_{max} value associated with the upper category in Table 5 refers to the level that has been shown in Basner et al⁹ to result in longer duration awakenings that are more likely to be remembered the next day. The paper states that *“from a medical point of view, recalled awakenings ...should be prevented as much as possible”*. It is noted that the paper uses the $L_{AS,max}$ metric, whereas $L_{AF,max}$ is used here. Given that $L_{AF,max}$ is typically between 1 dB and 4 dB higher than $L_{AS,max}$, this is a conservative amendment.
- 3.57 In the case of the overheating condition, the effect of increased internal ambient noise from external noise sources will depend both on the absolute noise level and the amount of time for which the overheating condition occurs. A good design process should therefore, as a priority, seek to minimise heat gains thereby reducing the amount and duration of ventilation required to control overheating and the consequential effect from increased ingress of noise.

Approved Document F (ADF) Ventilation Condition

- 3.58 Recommendations for desirable internal ambient noise levels for ADF ventilation conditions are set out in Table 6.

⁹ Basner, M, Samel, A and Isermann, U Journal of the Acoustical Society of America, Volume 119, 5 (Part 1), p2772–84, 2006, “Aircraft noise effects on sleep: application of the results of a large polysomnographic field study”



Ventilation condition	Operational condition of System	Desirable internal ambient noise level from transport noise sources
Part F - Whole dwelling ventilation	Systems 1 & 2: Background ('trickle') ventilators open to provide whole dwelling ventilation in the winter period. Additional ventilation required at other times of the year – windows are assumed to be ajar for assessment [Note 2].	Guideline values from Table 4 of BS8233:2014
	System 3: Continuous mechanical extract Table 4 of BS 8233:2014 with background ('trickle') ventilators open [Note 2].	
	System 4: Continuous mechanical supply and extract with heat recovery (MVHR) – no trickle vents required.	
Part F – Purge Ventilation [Note 1]	Option 1: Opening external window(s) meeting requirements described in Appendix B of Part F.	No specific acoustic criterion needs to be met in a room using purge ventilation for the purpose of rapidly diluting indoor pollutants
	Option 2: Manually controlled fan extracting 4 air changes per hour.	

**Table 6 Indoor Ambient Noise Levels resulting from transport noise sources
- ADF ventilation condition**

Note 1 ADF has a clearly defined objective definition of purge ventilation to rapidly dilute pollutants and/or water vapour for indoor air quality purposes. This is defined as 4 air changes per hour in Appendix A of the Approved Document. This is used for occasional activities such as painting and decorating or accidental releases such as smoke from burnt food or spillage of water. Provisions for purge ventilation can also be used to improve thermal comfort. This is not controlled under the Building Regulations. Purge ventilation may form one part of a design strategy to control the risk of overheating. The level of ventilation required to control overheating will depend on the details of the individual room and dwelling and can be different than the 4 air changes per hour required to dilute pollutants/water vapour. When using provisions for purge ventilation (eg opening windows) to mitigate overheating, refer to Tables 4 and 5.

Note 2 For Systems 1 and 2, the background ventilators are sized for the winter period as described in Tables 5.2a, b of ADF. For Systems 3 and 4, the systems are sized for the winter period. If additional ventilation is



required to control excess humidity in warmer months, appropriate consideration should be given to the resulting internal ambient noise levels under this condition.

Overheating Condition

- 3.59 A two-level assessment procedure is recommended to estimate the potential impact on occupants in the case of the overheating condition.
- 3.60 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. The Level 1 assessment is sufficient for developments on 'Negligible' risk sites (as defined by Table 4). The Level 2 assessment is recommended for 'High' risk sites. For 'Low' and 'Medium' risk sites, a Level 2 assessment can optionally be undertaken to give more confidence regarding the suitability of internal noise conditions. This may be particularly appropriate for sites in the 'Medium' risk category.
- 3.61 For the purposes of the Level 1 assessment, it is assumed that a partially open window will provide an outside to-inside level difference of 13 dB. This level difference is considered representative of typical domestic rooms with simple façade openings of around 2% of the floor area.
- 3.62 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.
- 3.63 The noise levels suggested in Tables 4 and 5 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.

Local Policy

Reading Borough Council

- 3.64 Reading Borough Council adopted its new Local Plan on 4 November 2019. The Plan sets out the Council's planning policies for development in Reading up to 2036. It replaces the previous development plans, the Core Strategy, Reading Central Area Action Plan and Sites and Detailed Policies Document. In relation to Noise, the Local Plan lists the following:



EN16: Pollution and Water Resources

*“Development will only be permitted where it would not be damaging to the environment and sensitive receptors through land, **noise** or light pollution; where it would result in no deterioration in, or ideally enhance, ground and surface water quality; and where adequate water resources, sewerage and wastewater treatment infrastructure will be in place to support the proposed development prior to occupation.*

*Proposals for development that are sensitive to the effects of **noise** or light pollution will only be permitted in areas where they will not be subject to high levels of such pollution, unless adequate mitigation measures are provided to minimise the impact of such pollution.*

Development will only be permitted on land affected by contamination where it is demonstrated that the contamination and land gas can be satisfactorily managed or remediated so that it is suitable for the proposed end use and will not impact on the groundwater environment, human health, buildings and the wider environment, during demolition and construction phases as well as during the future use of the site”.

- 3.65 Paragraph 4.2.90 states “It is worth noting that there is a Professional Practice Guide on Planning and Noise available which provides guidance on design of residential developments to take account of noise, and taking account of this from the early design stage will help to reduce noise effects on future residents”.

EN17: Noise Generating Equipment

“Where noise generating equipment is proposed, the noise source specific level (plant noise level) should be at least 10dBA below the existing background level as measured at the nearest noise sensitive receptor”.

- 3.66 Paragraph 5.3.25 states that

“In some cases, in order for the internal noise levels to be reasonable and not adversely affect health it would be necessary to provide a system of ventilation that entirely removes the necessity to open windows, even in very hot weather. Similarly, in terms of air quality, mitigation of impacts on residential development may be required, including means of ventilation that remove the need to open windows, and draw in the lowest levels of pollution possible, for instance from roof sources. This should be secured through the design of the proposal, and planning condition if necessary. Such systems will require additional energy



use, which will need to be offset in order to comply with policy CC2 or H5. Section 106 agreements may be an appropriate mechanism to improve air quality or offset the subsequent environmental impact of the proposed development in the AQMAs, where it is in compliance with the CIL Regulations.”

4.0 MEASUREMENT OF NOISE

Details of Environmental Sound Survey

- 4.1 Four sound level meters were installed on site from Monday 1 April 2019 to Tuesday 2 April 2019.
- 4.2 The sound level meters were programmed to record the A-weighted L_{eq} , L_{90} , L_{10} and L_{max} noise indices and corresponding octave band frequency¹⁰ information (for L_{eq}) for fifteen-minute sample periods.

Measurement Positions

- 4.3 The measurements of incident sound pressure levels were undertaken at four locations. The approximate locations of the microphones are indicated in Figure 7 below. At Position 1, the microphone was located at the corner of the balcony of Flat 16 (extended around 1m from an external wall), directly above the external corner of an open balcony at second floor level overlooking Duke Street/London Street. In Position 2 the microphone was mounted on a pole at the south elevation and was located approximately 1m from the facade at second floor level. The microphone at Position 3 was mounted on a pole and located approximately 1m from the facade of the building at second floor level. At Position 4, the microphone was mounted on a pole and was located approximately 1m from the facade at second floor level. At the first three positions, the noise climate was subjectively dominated by local and distant road traffic. Noise levels at Position 1 were dominated by road traffic along London/Duke Street. Noise levels at Position 3 included a significant contribution from road traffic along King's Road to the north. Road traffic was subjectively lower at Position 4 and in addition at that position mechanical noise was also audible.
- 4.4 The measurement positions were not in free field conditions and therefore 3 dB has been subtracted from the recorded measurements.

¹⁰ Except at Position 3 as this sound level meter did not have this technical capability





Figure 7: On Site Sound Pressure Level Measurement Positions

Equipment

4.5 Details of the equipment used during the survey are provided in Table 7 below. The sound level meters were subjected to sensitivity checks (or a 'field calibration') before and after the survey; no significant changes (± 0.2 dB) in the levels were noted.

Position	Description	Model / serial no.	Calibration date	Calibration certificate no.
1	Class 1 Sound level meter	Norsonic SLM 140/1403413	29/01/19	30778
	Condenser microphone	Norsonic 40AF/207390		
	Preamplifier	Norsonic 1209/12821	08/11/2018	430034
	Calibrator	B & K 4231/1839133		
2	Class 1 Sound level meter	Norsonic SLM 140/6112	08/11/2018	430036
	Condenser microphone	Norsonic 1127/151737		
	Preamplifier	Norsonic 1209/20299	08/11/2018	430034
	Calibrator	B & K 4231/1839133		
3	Class 1 Sound level meter	Norsonic SLM 140/5947	01/03/2018	27908
	Condenser microphone	Norsonic 1125/355507		



Position	Description	Model / serial no.	Calibration date	Calibration certificate no.
	Preamplifier	Norsonic 1209/15793		
	Calibrator	B & K 4231/1839133	08/11/2018	430034
4	Class 1 Sound level meter	Norsonic SLM 140/5948	09/03/2018	27991
	Condenser microphone	Norsonic 1225/107390		
	Preamplifier	Norsonic 1209/15806		
	Calibrator	B & K 4231/1839133	08/11/2018	430034

Table 7: On Site Instrumentation

Weather Conditions

- 4.6 Weather conditions were determined when the sound level meters were set up and when they were collected. It is considered that the meteorological conditions were appropriate for environmental noise measurements. Table 8 below presents the weather conditions recorded on site.

Date/Time	Description	Setting up of sound level meters	Collection of sound level meters
01/04/2019 – 02/04/2019	Temperature (°C)	15	7
Cloud Cover Symbol Scale in oktas (eighths)  0 Sky completely clear  1  2  3  4 Sky half cloudy  5  6  7  8 Sky completely cloudy  (9) Sky obstructed from view	Precipitation:	0	Light shower
	Cloud cover (oktas - see guide)	0	8
	Presence of fog/snow/ice	Nil	Nil
	Presence of damp roads/wet ground	Nil	Slightly damp
	Wind Speed (m/s)	<2.4	<3.1
	Wind Direction	Northwest	West
	Conditions that may cause temperature inversion (i.e. calm nights with no cloud)	No	No

Table 8: Weather Conditions



Results

- 4.7 At the beginning and end of the survey, the dominant source of noise around the site was road traffic.

Exterior Noise Levels

- 4.8 The single figure free field equivalent noise levels are presented in time history graphs in Appendix 2. The relevant results of the survey have been summarised in Table 9 below.

Position	Measurement period	Range of recorded sound pressure levels (dB)			
		L_{Aeq} (15 minutes)	L_{Amax} (15 minutes)	L_{A10} (15 minutes)	L_{A90} (15 minutes)
1	Daytime (07.00 – 23.00 hours)	52-67	67-91	54-69	46-54
	Night-time (23.00 – 07.00 hours)	46-59	63-76	48-61	40-54
2	Daytime (07.00 – 23.00 hours)	50-58	62-83	52-61	45-52
	Night-time (23.00 – 07.00 hours)	44-55	57-70	47-57	39-51
3	Daytime (07.00 – 23.00 hours)	51-71	64-104	53-67	47-52
	Night-time (23.00 – 07.00 hours)	44-56	56-83	47-59	39-50
4	Daytime (07.00 – 23.00 hours)	44-71	56-104	45-67	42-52
	Night-time (23.00 – 07.00 hours)	42-53	49-79	43-55	41-46

Table 9: Summary of Survey Results (free field levels)

- 4.9 Table 10 below presents the incident free field noise levels at the measurement positions in terms of daytime (16 hours) and night-time (8 hours) levels measured during the monitoring periods.

Position	Free field sound pressure levels (dB)	Free field sound pressure levels (dB)
	L_{Aeq} (16 hours)	L_{Aeq} (8 hours)
1	59	52
2	54	49
3	57	50
4	50	45

Table 10: Daytime and Night-Time Equivalent Levels (Free Field Levels)



- 4.10 Table 11 below presents the suggested incident noise levels that can be used for the assessment of environmental noise break in during the future detailed design stage (the spectrum data are taken from the results of the onsite survey).

Position /Period	Incident free field sound pressure levels (dB) at Octave Band Centre Frequencies (Hz)								A-weighted level (dB)
	63	125	250	500	1000	2000	4000	8000	
1/Daytime	62	58	57	54	55	52	48	43	59
1/Night-time	56	53	50	48	49	45	39	30	52
2/Daytime	59	54	53	50	51	46	38	31	54
2/Night-time	55	49	47	45	46	41	31	21	49
3/Daytime	No octave band filters on this sound level meter								57
3/Night-time									50
4/Daytime	58	53	51	47	45	41	36	29	50
4/Night-time	53	49	46	42	41	37	32	24	45

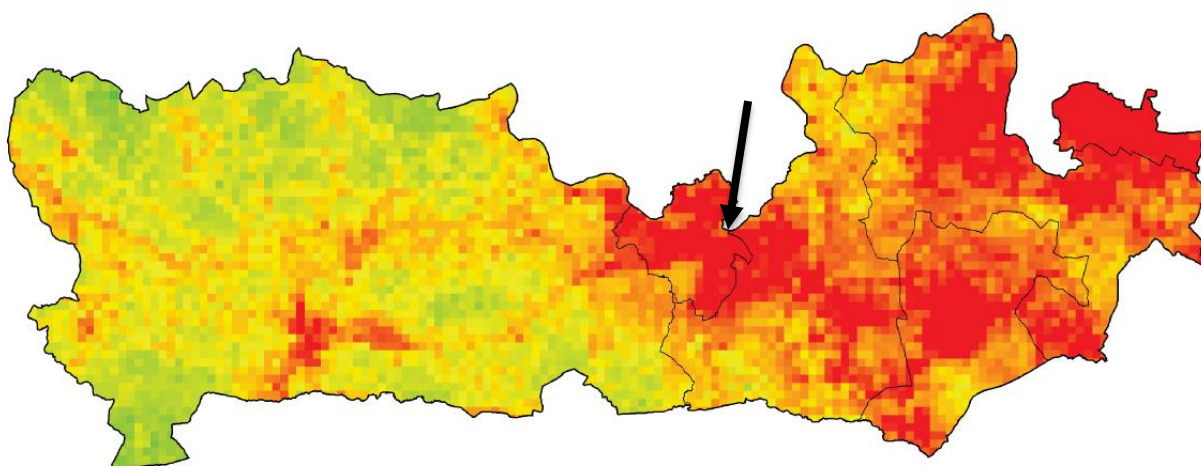
Table 11: Free Field Equivalent Facade Incident Environmental Noise Levels at Octave Band Centre Frequencies

5.0 ASSESSMENT METHODOLOGY

- 5.1 The first aim in paragraph 180 of the NPPF will be addressed largely based on the proposed assessments in Table 4 and 5.
- 5.2 In relation to the second aim (Paragraph 180, b)) in the NPPF, regarding the protection of tranquil areas, advice was sought from the Campaign to Protect Rural England. This organisation has published maps that use colours to indicate tranquillity across the country. Areas of red or reddish colour have a low level of tranquillity and areas of green colour have a high level of tranquillity. The figure below of this map for Berkshire shows that the location of the site has a low value of tranquillity and therefore it is assumed that the relevant aim of Paragraph 180 does not carry any weight in the planning decision for the proposals.



Berkshire



- 5.3 In relation to the principle of the agent of change, where a new noise sensitive development needs to be mindful of existing businesses that generate noise incident at this new development, the following is noted. The previous use of the commercial space in Dukesbridge house was a late-night drinking establishment. However, at present this unit is vacant and any proposed uses will have to comply to future planning restrictions in relation to the noise impact at the new residential premises.
- 5.4 It was noted at the site inspection that various commercial air condensers were visible around the development plus kitchen extract fans (located adjacent to Dukesbridge house). These items of plant are mostly located to the rear of shops that face on to London Street/Duke Street to the Northwest. These items of plant were slightly audible inside the proposed development only when the windows were open.
- 5.5 Larger size air conditioning units were also seen on the rooftops of office accommodation located to the South across the River Kennet. These were not audible at the site.
- 5.6 Therefore, based on the observations around the site, it is believed that there are no nearby commercial premises where the Agent of Change principle would apply.



6.0 ASSESSMENT OF NOISE IMPACT

- 6.1 The prospective development site will be considered in terms of the external noise exposure in order to identify potential adverse or significant adverse effects, in line with government planning policy in order to assess the suitability for residential development.
- 6.2 It is important to recognise that the assessment of the proposals using external noise levels can only provide an indication of risk that the occupants of any future dwellings may suffer significant adverse or adverse effects. In some cases, the level of noise exposure may be so great that it may render a site or part of a site unacceptable for development. However, in many cases it may be possible to design and construct a development in such a manner as to avoid, or reduce to a minimum, any adverse effects. Outline consideration of mitigation measures is therefore presented within this report, which could be used to inform the further design development of the site following granting of planning permission.

Transport noise impact

Ambient Internal Noise Impact

- 6.3 Based on the results of the noise survey, it is evident that the most affected new dwellings will be the ones proposed in what is called the “Subway” block overlooking London/Duke Street along the western elevation of the proposed redevelopment. The lower and ground floor of the “Subway” block will be of commercial use. The first floor will contain flats with living rooms and bedrooms along the western elevation. The bedroom in unit 102A will also contain an outdoor terrace and the external building fabric of that room will be largely glazed. The measured incident noise levels at Position 1 ought to be representative of typical incident noise levels outside the proposed bedroom in unit 102A. The measured noise levels were an $L_{Aeq, 16 \text{ hours}}$ of 59 dB during the daytime and an $L_{Aeq, 8 \text{ hours}}$ of 52 dB during the night-time. As such, the daytime road traffic impact is greater compared to the night-time impact in relation to ambient noise levels. Night-time L_{Amax} noise levels at that position were in a range from 63 to 76 dB. In accordance with the information in Table 4, the average incident noise levels at Position 1 carry a medium risk with an optional Level 2 assessment.
- 6.4 If the worst case road traffic noise impact at a new dwelling overlooking London/Duke Street is around 59 dB $L_{Aeq, 16 \text{ hours}}$ during the daytime, in order to meet the BS8233:2014 desirable internal noise levels, a level difference of around 24 dB is required. In addition, if such a level difference is achieved, external incident night-time L_{Amax} levels of around 69 dB would achieve suitable internal L_{Amax} noise levels. Whilst it is noted that higher incident noise levels than 69 dB were recorded at



Position 1, some¹¹ exceedances ought to still be considered acceptable noting that the highest recorded L_{Amax} night-time level was 76 dB at Position 1.

- 6.5 A review of Table 12 (see below) shows that this level difference can be achieved via a number of different external building fabric constructions. If typical windows are used then the ventilation solution may have to be System 4 (MVHR, whole house ventilation). However, if windows and ventilators with a higher acoustic performance are utilised then the required level difference will be achieved using any of the 4 different methods of ventilation under Approved Document F. In relation to the use of System 1, since apartments overlooking London/Duke Street are single aspect, the effective area for the ventilation may be substantial. However, as per the information in Table 12, there is a significant difference between what is required and what is achievable using uprated products and therefore the design during the post planning detailed stage can consider all relevant ventilation options.
- 6.6 Based on the information in Table 12, a level difference of 21 dB is the minimum sound level difference with typical windows and ventilators (i.e. 4mm glass/16mm airgap/4mm glass windows and trickle ventilators) utilizing System 1 from Approved Document F. Therefore, where incident noise levels are around 3 dB lower compared to the measured levels at Position 1, typical windows and ventilators would provide a suitable internal noise climate. Considering typical reductions with distance attenuation such a reduction of noise levels will occur only a few meters away (to the east) of Position 1 and away from London/Duke Street.
- 6.7 The incident noise levels at the majority of the habitable rooms will be substantially less compared to the incident noise levels at Position 1 (due to distance attenuation and screening from the layout of the dwellings) and therefore an external building fabric utilizing typical windows and ventilator will suffice in relation to the road traffic noise impact. A review of the recorded noise levels at the four locations around the site, shows that indeed incident noise levels that will allow the use of typical windows and ventilators are prevalent at the proposed roof top extension above Dukesbridge house (see levels at Position 4) and at the proposed dwellings along the eastern elevation of the site (see recorded noise levels at Position 2).
- 6.8 Therefore, the assessment has demonstrated that under whole house ventilation provisions, the external building fabric of the proposed development can be designed to offer compliance with national and local guidance in relation to noise. The most affected dwellings along the western

¹¹ It ought to be reiterated that the survey results provided the highest recorded L_{Max} noise level in 15 minute sampling periods.



elevation (the “Subway” block), will have fewer design options available but nevertheless solutions using conventional products will be available to the design team.

Ventilation System from ADF	Ventilation System from ADF	Level Difference, external free field level-internal reverberant level, dB	
		Typical Windows and Vent	Higher Acoustic performance windows and vent
1,2	L_{Aeq}	21	31
	L_{AFmax}	22	35
3 (with trickle vent)	L_{Aeq}	23	33
	L_{AFmax}	24	38
4 (no trickle vent)	L_{Aeq}	27	38
	L_{AFmax}	31	45

Table 12: Potential level differences associated with different ventilation Systems from ADF

- 6.9 An overheating assessment has not been undertaken for the development site and therefore whether this is a relevant issue is unknown at this stage. Assuming a level difference of around 13 dB for a partially open window, at the most affected habitable rooms, the likely internal noise levels will be around 46 dB $L_{Aeq, 16 \text{ hours}}$ during the daytime and around 39 dB $L_{Aeq, 8 \text{ hours}}$ during the night-time (and night-time L_{Amax} range in 50-63 dB). According to the information in Table 5, this should not result in a significant noise impact (in other words the SOAEL will not be exceeded).
- 6.10 With windows open, the internal noise levels in the majority of habitable rooms will exceed the LOAEL. Therefore with windows open, the likely road traffic noise impact at most habitable rooms is likely to be between the LOAEL and the SOAEL during the overheating condition, and therefore consideration ought to be given to a reduction of the impact (assuming an overheating assessment identifies opening windows as a mitigation measure – and it should be noted that opening windows is not always desirable due to security issues and perhaps air quality effects). Other strategies (apart from opening windows) that can assist in controlling internal temperatures include the use of low ‘G Value’ glass, brise soleil and other solar shading in addition to mechanical cooling. This latter option, however, has implications for energy consumption and sustainability, and is not considered commercially viable for all types of development. It should be pointed out that Approved Documents F and L will be updated in due course and it is hoped that these documents will address in some way issues of overheating.



- 6.11 The development team ought to be aware of the possibility of the local authority granting planning permission with a condition along the following lines:

No development shall commence on site until a detailed scheme, informed by an assessment of the current noise environment including noise generated by nearby venues, for protecting the dwellings from the external noise environment of the area has been submitted to and approved, in writing, by the Local Planning Authority. The scheme itself shall be designed, specified and constructed so that the sound insulation performance of the structure and the layout of the dwellings are such that the indoor ambient noise levels do not exceed the values detailed in Table 4 of BS 8233:2014 and the LMAX value stated in Noise Statement, prepared by Finch Consulting, ref: 2196700, dated June 2020. Where opening windows will lead to an internal noise level increase of 5 dBA or greater above BS 8233:2014 recommended internal levels, the scheme shall include provision of alternative mechanical ventilation with minimum performance equivalent to a mechanical heat recovery (MVHR) system with cool air bypass as an alternative means of cooling and ventilation. Noise from the system should not result in BS8233 internal levels being exceeded.

Thereafter, the development shall not be carried out other than in accordance with the approved scheme which shall be completed before any part of the accommodation hereby approved is occupied, unless the Local Planning Authority otherwise agrees in writing.

REASON: These details are required due to insufficient information being contained within this submission and in order to safeguard the amenity of occupants in accordance with Policy CC8 of the Reading Borough Local Plan 2019.

- 6.12 Based on the results of the noise survey, the layout of the development and the typical noise reduction from a partially open window, there will be a number (the majority) of dwellings in the development where internal noise levels will be more than 5 dB higher than the relevant levels presented in BS8233:2014. If the above condition is placed within a future permission, such rooms will require mechanical ventilation. In our opinion, such a theoretical condition would not align with national policy on noise and would not align with the guidance in paragraph 55 of the NPPF. However, the design team should be made aware of this possibility, since a similar condition has already appeared in numerous decision notices by this local authority.

Ambient Outdoor Noise Impact

- 6.13 Private amenity areas (balconies and terraces) are currently proposed for the development. Based on the results of the noise surveying, incident noise levels of some of the outdoor amenity areas in the development site will exceed a level of 50/55 $L_{Aeq, 16 \text{ hours}}$ during the daytime. This is especially true for the amenity areas overlooking London/Duke Street to the west. As such, the guidance in Section 7.7.3.2 of BS8233:2014 ought to be considered in the planning decision relating to outdoor amenity space for the development.



6.14 In addition, the Local Planning Authority should also consider in its decision the guidance in PPG(N) where it is stated¹² that noise impacts may be partially offset if residents have access to one or more of:

- a relatively quiet facade (containing windows to habitable rooms) as part of their dwelling;
- a relatively quiet external amenity space for their sole use, (e.g. a garden or balcony). Although the existence of a garden or balcony is generally desirable, the intended benefits will be reduced if this area is exposed to noise levels that result in significant adverse effects;
- a relatively quiet, protected, nearby external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings; and/or
- a relatively quiet, protected, external publicly accessible amenity space (e.g. a public park or a local green space designated because of its tranquillity) that is nearby (e.g. within a 5 minute walking distance).

6.15 The residents of Riverside Central will have access to the nearby Forbury Gardens to the north of the development which is around a 5 minutes' walk from the site and also will have access to communal private amenity spaces at the development, where incident noise levels are around the proposed LOAEL. Figure 8 below shows the location of such communal space (the space located to the East).

¹² In Paragraph: 011 Reference ID: 30-011-20190722



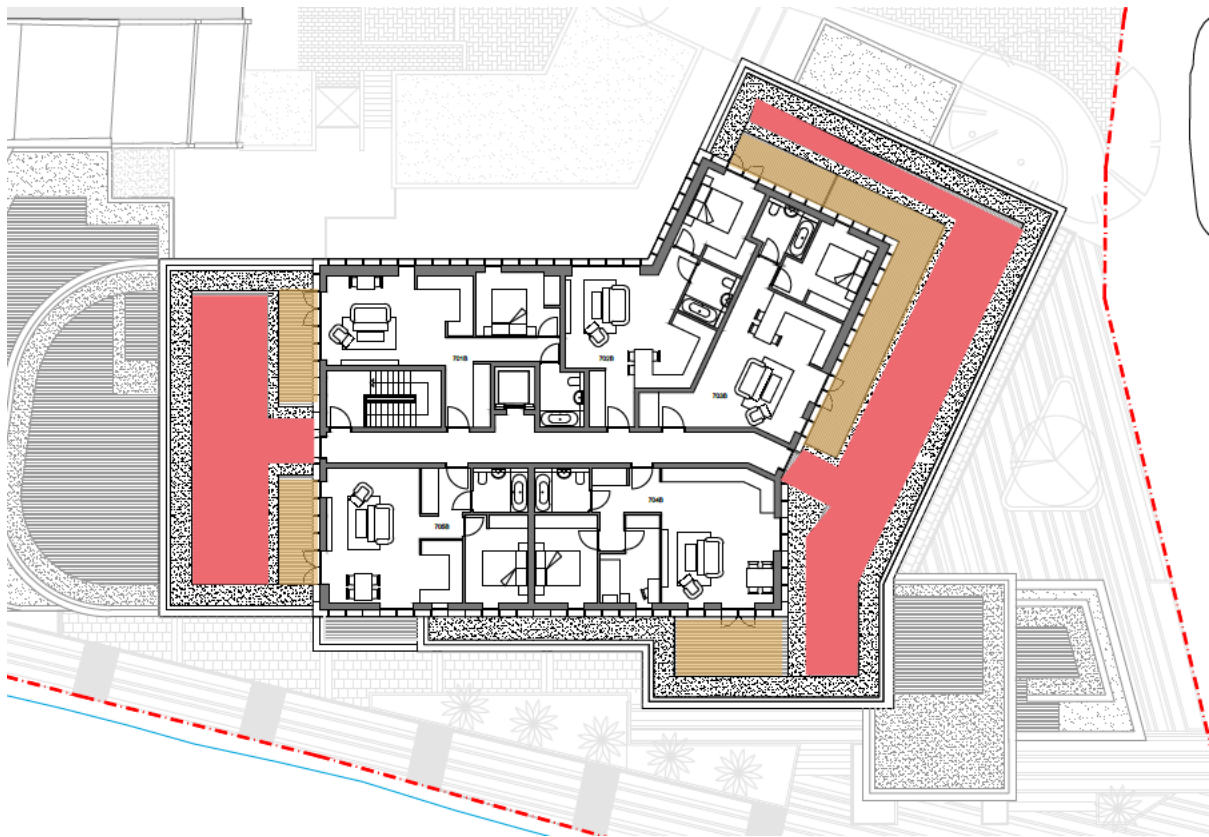


Figure 8: Proposed 7th floor of Riverside Central showing location of communal terraces (in light red colour)

7.0 SOUND INSULATION

- 7.1 The sound insulation performance of separating partitions between residential premises falls under the relevant Building Regulations (Approved Document E).
- 7.2 However, the sound insulation between residential and other uses is exempt from the Regulations and is a matter for the Local Planning Authority to consider. As per the guidance in PPG (N) “*when proposed developments could include activities that would be covered by the licensing regime, local planning authorities will need to consider whether the potential for adverse noise impacts will be addressed through licensing controls (including licence conditions). Local planning authorities should not however presume that licence conditions will provide for noise management in all instances and should liaise with the licensing authority*”.
- 7.3 The current proposals include separating partitions between residential and commercial use. At this early stage, the exact use of the commercial space is not known. The current proposals allow of the proposed commercial units with a ‘street’ frontage to be of an A1-A5 use, whilst that on the lower ground floor accessed internally or from the rear will be a gym (D2 use). Figures 9 and 10 show the location of the proposed commercial units.



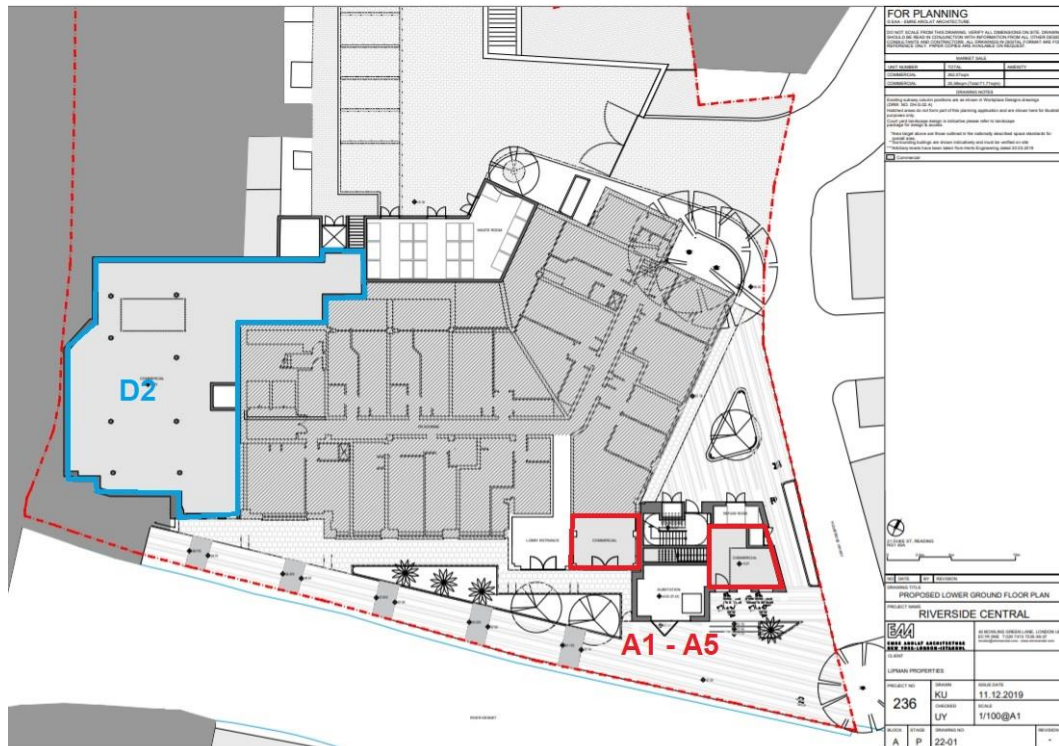


Figure 9: Location of lower ground commercial uses

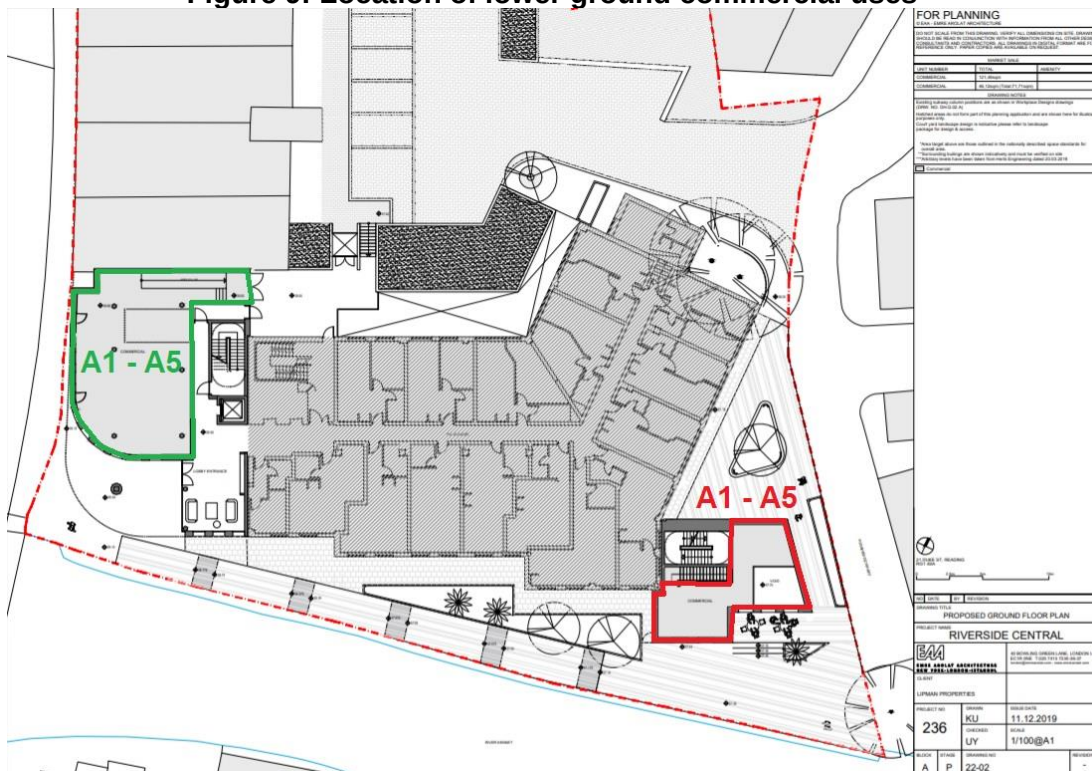


Figure 10: Location of ground floor commercial uses



- 7.4 Planning uses A1 to A5 include shops and retail outlets; professional services; food and drink; drinking establishments; and hot food and takeaway. Therefore, the local planning authority may consider placing a general condition to control any future noise impacts from the proposed commercial premises, and more detailed conditions will be captured when the future tenants apply for permission. In our experience, the most common source of noise associated with such uses is the atmospheric plant noise emissions from ventilation and/or comfort cooling plant. Conventional noise control measures are readily available in order to control such noise emissions to nearby residential premises.
- 7.5 Even though the D2 use includes a variety of uses, the current aspirations are for a gym at the proposed lower ground floor commercial area below the “Subway” block. Noise break out from gyms is highly variable (i.e. yoga vs Zumba class) and the highest level are associated with music playback and instructor instructions over a speech reinforcement system. However, the proposed location of the gym (at the lower ground floor) will result in a high level of sound reduction to the nearest proposed residential units. Re-radiated noise associated with drop weights and/or treadmill use can be controlled via a variety of floor finishes (ranging from fully sprung floating floors to layer(s) of neoprene rubber). Again, atmospheric noise impact associated with building services serving the units ought to be addressed in a similar way to the A1-A5 uses. The local planning authority may wish to condition the associated noise impacts at this stage, or in the future when a tenant submits its planning application with specific details about the generated noise/vibration impact and its control.
- 7.6 The proposals will also introduce a party wall with existing commercial premises situated to the north (of the Subway block). The current use of the adjacent commercial space is a newsagent and therefore this ought to not be associated with any adverse noise impacts to the proposed residential use of the development site.

8.0 CONCLUSIONS

- 8.1 An environmental noise survey at the proposed site was undertaken in order to review the existing incident noise levels at the proposed residential extensions at the site called Riverside Central, which are proposed to be built around the existing Dukesbridge House in Reading.
- 8.2 The assessment of the suitability of the new build proposed residential units for their intended use was undertaken in full accordance with the aims and requirements within the National Policy Statement for England (NPSE), the National Planning Policy Framework (NPPF) and the Planning Practice Guidance (PPG). The NPPF is a material consideration for planning applications when the local plan does not align closely with its aims.



- 8.3 The assessment has demonstrated that based on the surrounding noise climate, an internal noise environment that will not give rise to significant adverse effects on health and quality of life can be achieved with the provision of conventional products (glazing and ventilators) for the majority of the development and depending on the future design proposals, products with an acoustic specification may be required for the “subway” block overlooking London/Duke Street.
- 8.4 A risk of overheating assessment has not been undertaken at this stage and therefore whether opening windows form a potential mitigation measure is unknown. The assessment has shown that incident noise levels are unlikely to result in significant adverse observed effects when windows are partially open for comfort cooling purposes.
- 8.5 Incident noise levels at the proposed outdoor amenity space are not expected to result in significant adverse observed effects and the relevant guidance in BS8233:2014 and PPG(N) ought to be considered for such areas.
- 8.6 As a precaution, the local authority may wish to include relevant planning conditions in the permission, to control a) the potential noise impact from commercial use within the development and b) any potential noise impacts from proposed building services plant (excluding toilet and kitchen extracts) – and this condition can perhaps use the wording in *Policy EN17: Noise Generating Equipment* in Reading Council’s Local Plan.

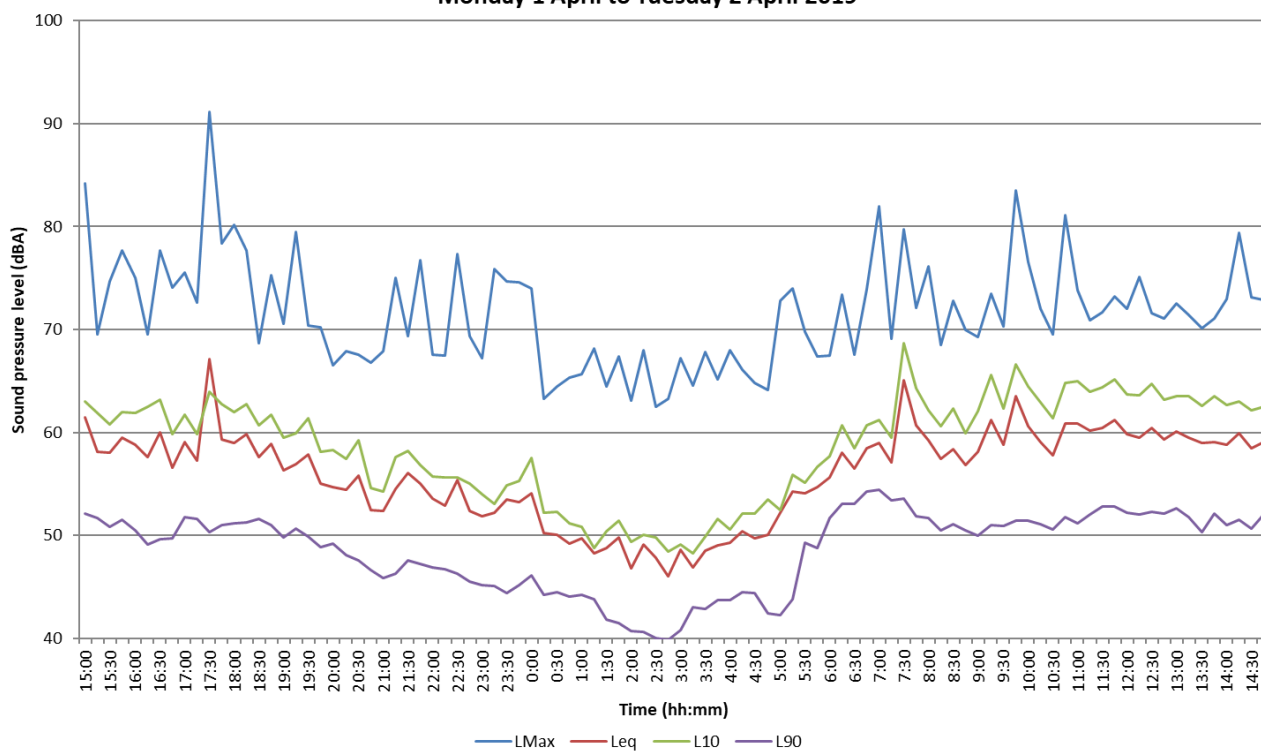


APPENDIX 1

RESULTS OF NOISE SURVEY



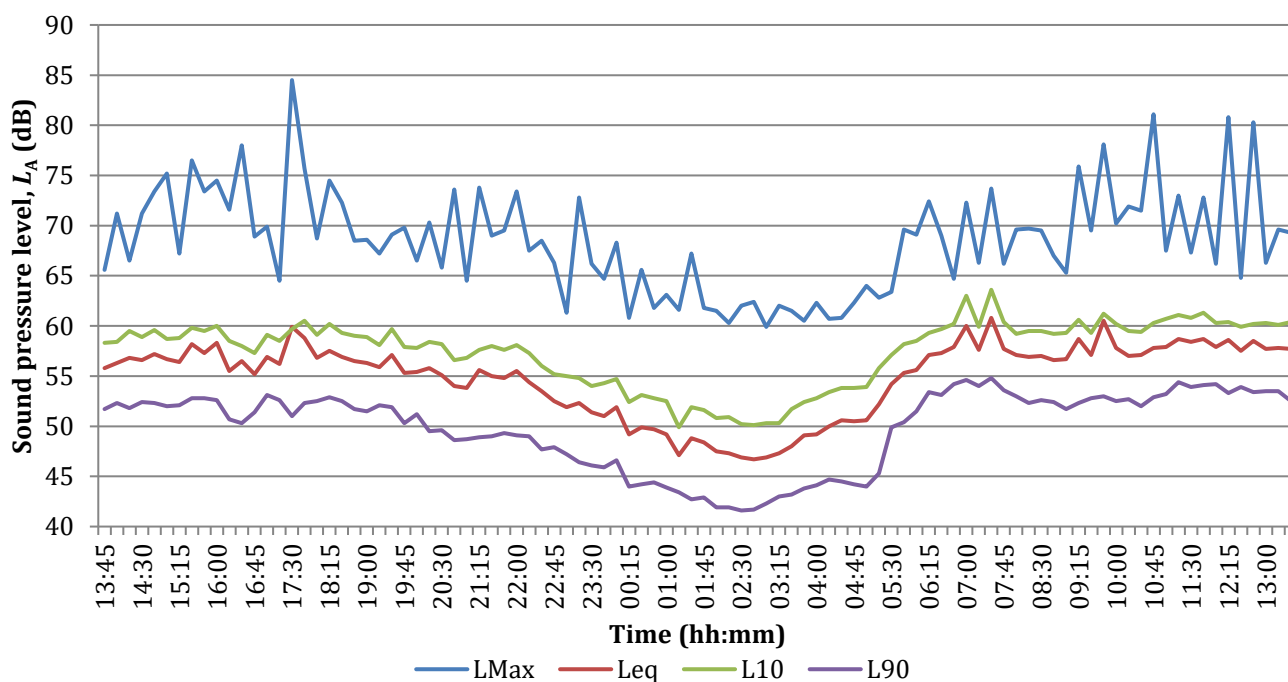
Dukesbridge House, Reading
Environmental Noise Survey At Position 1
Monday 1 April to Tuesday 2 April 2019



Dukesbridge House, Reading

Environmental Noise Survey At Position 2

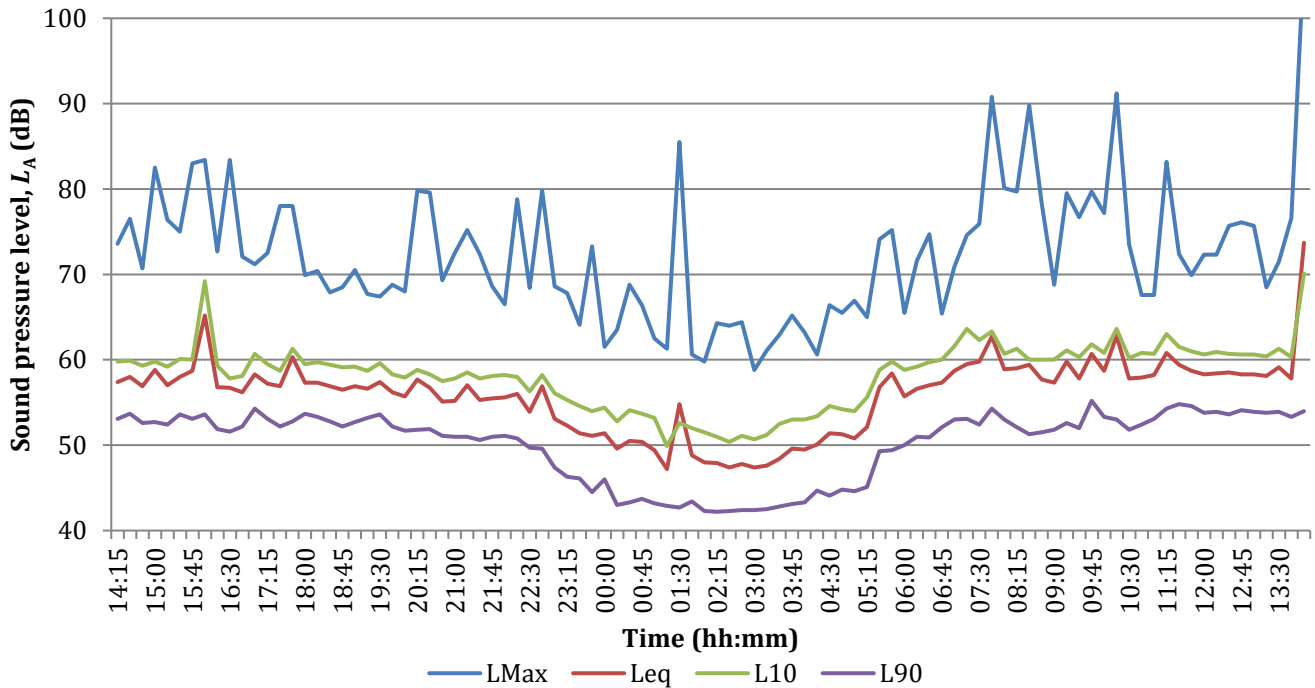
Monday 1 April to Tuesday 2 April 2019



Dukesbridge House, Reading

Environmental Noise Survey At Position 3

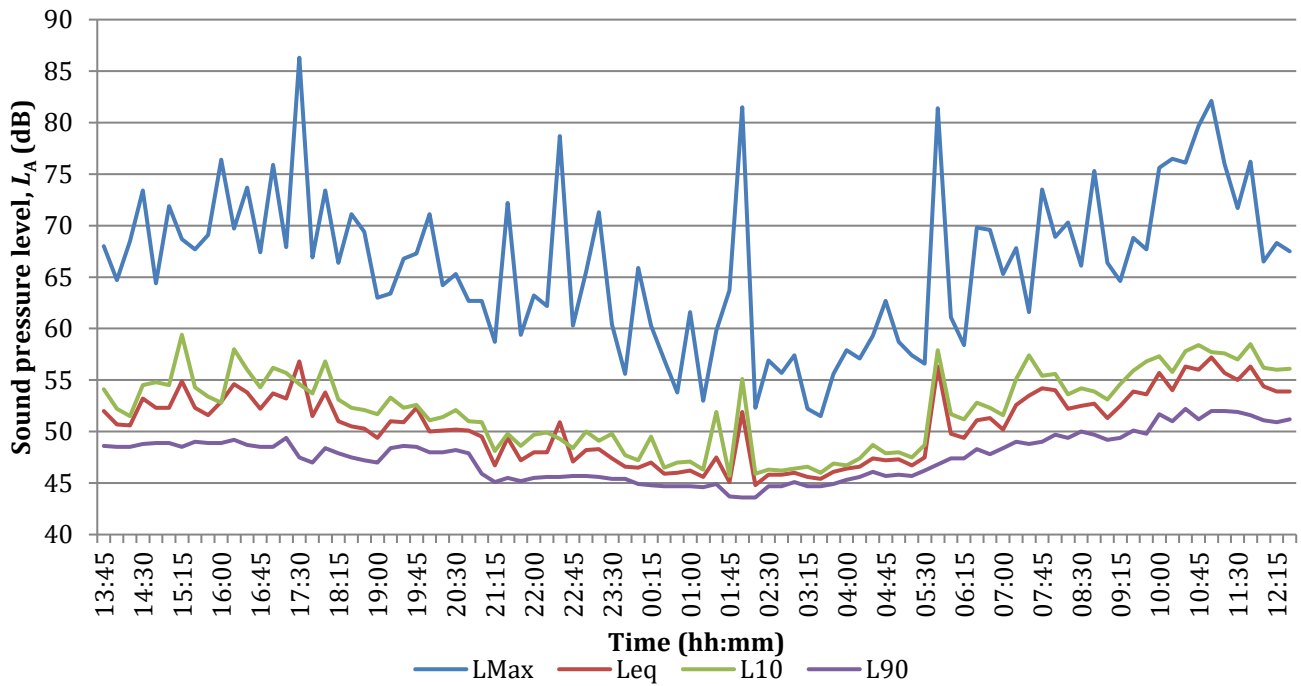
Monday 1 April to Tuesday 2 April 2019



Dukesbridge House, Reading

Environmental Noise Survey At Position 4

Monday 1 April to Tuesday 2 April 2019



APPENDIX 3

GLOSSARY



GLOSSARY OF TERMS

Decibels

It is convenient when quantities have a large range to express them in decibel units. The decibel (dB) is a relative unit, showing how much larger or smaller the quantity is relative to a reference value, which is defined as zero on the decibel scale. Decibels are intended to make a large range more readily comprehensible.

A quantity expressed in decibels is commonly called a 'level'.

Many quantities in acoustics are expressed in decibels (see below).

Frequency Weightings

Sounds that would be measured as equal by a sound measuring instrument may not sound equally loud to a human listener, depending on their character, particularly the frequency content (pitch).

Various 'frequency weightings' have been developed that can be used to modify the measured sound in order to produce a value that more closely corresponds to perceived loudness.

One such frequency weighting, the 'A' weighting, has become almost universally used in assessing the effect of prolonged exposure to noise on human health, and features in most Regulations, guidelines and Standards in this area.

A different frequency weighting, the 'C' weighting, has in a similar way become standardised for the measurement and assessment of short-duration sounds for their effect on human health. The 'C' weighting is also used in some methods for assessing the performance of hearing protection.

A sound that has been measured with the 'A' weighting applied is commonly referred to as 'A-weighted'. Similarly, one will see 'C-weighted' where the 'C' weighting has been applied.

Note that sometimes a sound pressure level that has been measured with the 'A-weighting' or 'C-weighting' applied can be found expressed in units of 'dB(A)' or 'dB(C)'. This nomenclature is no longer standard practice.



Quantities and Symbols

Parameter	Description
Ambient Noise Level	The totally encompassing sound in a given situation at a given time, usually composed of a sound from many sources both distant and near ($L_{Aeq,T}$).
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s_1 and s_2 is given by $20 \log_{10} (s_1/s_2)$. 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 $20 \mu\text{Pa}$. The threshold of normal hearing is in the region of 0 dB and 140 dB is the threshold of pain. A change of 1 dB is only perceptible under controlled conditions.
dB(A), L_{Ax}	Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) that differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).
Fast Time Weighting	Setting on sound level meter, denoted by a subscript F, that determines the speed at which the instrument responds to changes in the amplitude of any measured signal. The fast time weighting can lead to higher values than the slow time weighting when rapidly changing signals are measured. The average time constant for the fast response setting is 0.125 (1/8) seconds.
Free-field	Sound pressure level measured outside, far away from reflecting surfaces (except the ground), usually taken to mean at least 3.5 metres
Façade	Sound pressure level measured at a distance of 1 metre in front of a large sound reflecting object such as a building façade.
$L_{Aeq,T}$	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 recorded during a noise event with a 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.
$L_{10,T}$	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. $LA_{10,18h}$ is the A –weighted arithmetic average of the 18 hourly $L_{A10,1h}$ values from 06:00-24:00.

