

# 35-39 Friar Street Reading

## Environmental Noise Survey and Acoustic Design Statement Report

29244/ADS1

24 May 2023

For:  
Shaviram Group  
Farley Court  
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London



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# Environmental Noise Survey and Acoustic Design Statement Report 29244/ADS1

## Document Control

| Rev | Date       | Comment                                                      | Prepared by                                                                          | Authorised by                                                                         |
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| 0   | 14/02/2022 | -                                                            |     |    |
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| 1   | 30/05/2022 | Updated to reflect proposed overheating mitigation strategy. |   |  |
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| 2   | 09/06/2022 | Updated Client info and minor error in text.                 |  |                                                                                       |
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| 3   | 24/05/2023 | Updated to address LPA comments.                             |   |  |
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## 1.0 Introduction

It is proposed to redevelop 35-39 Friar Street buildings into a residential led mixed use scheme. Hann Tucker Associates have therefore been commissioned to undertake an environmental noise survey and noise impact assessment in order to assess the suitability of the site for residential use.

This report presents the methodology and findings of our noise survey and assessment in the context of national planning policies and the policy of the Local Authority.

## 2.0 Objectives

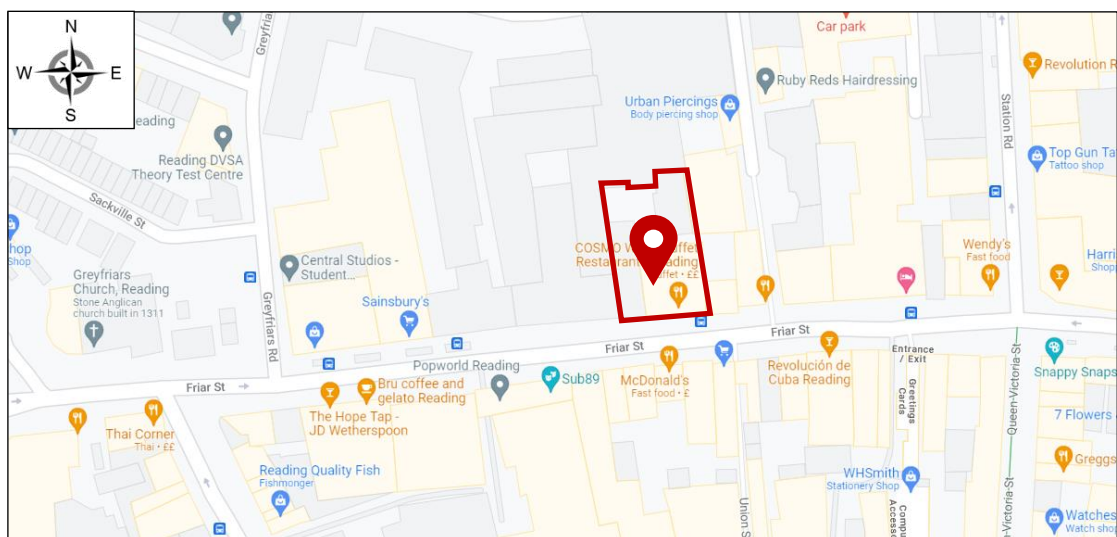
To undertake an environmental noise survey to establish the existing  $L_{Amax}$ ,  $L_{Aeq}$  and  $L_{A90}$  environmental road, rail and air traffic noise levels at selected accessible positions.

Based on the results of the survey, to undertake a noise assessment to assess the suitability of the site for residential use in accordance with the Noise Policy Statement for England (NPSE), National Planning Policy Framework (NPPF), Planning Practice Guidance (ProPG), British Standard BS8233:2014 and Local Authority requirements.

## 3.0 Site Description

### 3.1 Location

The site is located at 35-39 Friar Street, Reading, RG1 1DX. The location is shown in the Location Map below.



Location map (Map Data © 2021 Google)



The site falls within the jurisdiction of Reading Borough Council.

### 3.2 Description

The site is located in a highly urban context, between the railway station to the north and the main shopping district, Broad Street and The Oracle, to the south. The site is comprised of a number of plots on Friar Street, which includes no.35-38 (Cosmo) and no.39 (former 9 Round). Friar Street is made up of predominately retail use at ground floor with office and residential spaces above. There are also a number of clubs located along Friars Road, the closest of which is Lola Lo which is located approximately 20m from the closest edge of the site boundary across Friars Road. Building heights vary between 3 and 6 storeys with the exception of the Novotel, which rises to 13 storeys. To the eastern edge of the site is Merchants Place, which links to Garrard Street to the north, set some 5m below Friar Street.

The site is shown in the Site Plan below.



Site Plan (Imagery © 2021 Getmapping plc, Infoterra Ltd & Bluesky, Maxar Technologies, The GeoInformation Group, Map Data © 2021 Google)

### 4.0 Acoustic Terminology

For an explanation of the acoustic terminology used in this report please refer to Appendix A enclosed.



## 5.0 Methodology

The survey was undertaken by Rebeca Sanchez MSc(Hons) LArch.

### 5.1 Unmanned Survey

#### 5.1.1 Procedure

Fully automated environmental noise monitoring was undertaken from approximately 12:00 hours on Friday 4 January 2022 to 12:30 hours on Monday 7 January 2022.

During the periods we were on site the wind conditions were calm. The sky was generally overcast. We understand that generally throughout the survey period the weather conditions were dry with some periods of light rain. These conditions are considered suitable for obtaining representative measurement results.

Measurements were taken continuously of the A-weighted (dBA)  $L_{90}$ ,  $L_{eq}$  and  $L_{max}$  sound pressure levels over 15-minute periods.

#### 5.1.2 Measurement Positions

The noise level measurements were undertaken at 2No. positions as described in the table below.

| Position No | Description                                                                                                                                                                                  |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1           | The microphone was positioned on the north-west boundary, at a height of approximately 14No. metres above the ground floor level and at least 1No. metre from all other reflecting surfaces. |
| 2           | The microphone was positioned on the south-east boundary, at a height of approximately 14No. metres above the ground floor level and at least 1No. metre from all other reflecting surfaces. |



The positions are shown on the plan below.



Plan Showing Unmanned Measurement Positions (Imagery © 2021 Getmapping plc, Infoterra Ltd & Bluesky, Maxar Technologies, The GeoInformation Group, Map Data © 2021 Google)

### 5.1.3 Instrumentation

The instrumentation used during the survey is presented in the table below:

| Description                                               | Manufacturer | Type  | Serial Number | Calibration                  |
|-----------------------------------------------------------|--------------|-------|---------------|------------------------------|
| Position 1<br>Type 1<br>½" Condenser<br>Microphone        | ACO Pacific  | 7052E | 75073         | Calibration on<br>03/11/2021 |
| Position 1<br>Preamp                                      | Svantek      | SV18  | 82324         | Calibration on<br>03/11/2021 |
| Position 1<br>Type 1<br>Data Logging<br>Sound Level Meter | Svantek      | 971   | 84050         | Calibration on<br>03/11/2021 |
| Position 2<br>Type 1<br>½" Condenser<br>Microphone        | ACO Pacific  | 7052E | 67976         | Calibration on<br>07/10/2021 |



| Description                                               | Manufacturer  | Type | Serial Number | Calibration                  |
|-----------------------------------------------------------|---------------|------|---------------|------------------------------|
| Position 2<br>Preamp                                      | Svantek       | SV18 | 71473         | Calibration on<br>07/10/2021 |
| Position 2<br>Type 1<br>Data Logging<br>Sound Level Meter | Svantek       | 971  | 80232         | Calibration on<br>07/10/2021 |
| Type 1 Calibrator                                         | Bruel & Kjaer | 4230 | 1558535       | Calibration on<br>14/12/2020 |

Each sound level meter, including the extension cable, was calibrated prior to and on completion of the surveys. No significant changes were found to have occurred (no more than 0.2 dB).

Each sound level meter was located in an environmental case with the microphone connected to the sound level meter via an extension cable. Each microphone was fitted with a windshield.

## 6.0 Results

The results have been plotted on Time History Graphs 29244/TH1 to 29244/TH2 enclosed presenting the 15-minute A-weighted (dBA)  $L_{90}$ ,  $L_{eq}$  and  $L_{max}$  levels at each measurement position throughout the duration of the survey.

### 6.1 $L_{eq}$ Noise Levels

In order to compare the results of our survey with the relevant guidelines it is necessary to convert the measured  $L_{Aeq(15\text{-minute})}$  noise levels into single figure daytime  $L_{Aeq(16\text{-hour})}$  (07:00-23:00 hours) and night-time  $L_{Aeq(8\text{-hour})}$  (23:00-07:00 hours) levels.

The daytime  $L_{Aeq(16\text{-hour})}$  and night-time  $L_{Aeq(8\text{-hour})}$  noise levels for each position are presented in the table below. In order to provide representative results, periods where noise from near plant appears to have artificially elevated noise levels were removed from our calculations. These periods are 15:30 hours to 22:45 on Saturday 5 January and 11:15 hours to 22:15 on Sunday 6 January.

| Position | Daytime $L_{Aeq(16\text{-hour})}$ | Night-Time $L_{Aeq(8\text{-hour})}$ |
|----------|-----------------------------------|-------------------------------------|
| 1        | 65 dB                             | 59 dB                               |
| 2        | 62 dB                             | 60 dB                               |



## 7.0 Discussion of Noise Climate

During the periods we were on site the dominant noise sources were noted to be construction work at Position 1 and road traffic noise from Friar Street at Position 2. Although there was some occasional noise associated with pedestrian activities during the daytime, it was not considered to be dominant.

During both Friday and Saturday evening/night noise levels at Position 2 overlooking Friar Street are elevated. Review of the octave band noise levels for during these periods show an elevation in the magnitude of low frequency noise, as such these elevated noise levels are attributed to noise from nearby music/entertainment venues.

The noise from the construction work is assumed to only have affect the results during normal site working hours. However, there were some periods on Saturday and Sunday where the existing plant installation on the roof of the site became active and dominated the noise climate at the measurement position. These periods have been excluded from our calculations.

## 8.0 Relevant Planning Policies and Guidance

### 8.1 Noise Policy Statement for England

The Noise Policy Statement for England (NPSE) was published in March 2010 (i.e. before the NPPF). The NPSE is the overarching statement of noise policy for England and applies to all forms of noise other than occupational noise, setting out the long term vision of Government noise policy which is to:

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

That vision is supported by the following NPSE noise policy aims which are reflected in three of the four aims of planning policies and decisions in paragraph 123 of the NPPF (see paragraph 8.2 (b) below):

*“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.”*



The Explanatory Note to the NPSE has three concepts for the assessment of noise in this country:

**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.

None of these three levels are defined numerically and for the SOAEL the NPSE 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. The need for more research to investigate what may represent an SOAEL for noise is acknowledged in the NPSE and the NPSE asserts that not stating specific SOAEL levels provides policy flexibility in the period until there is further evidence and guidance.

The NPSE concludes by explaining in a little more detail how the LOAEL and SOAEL relate to the three NPSE noise policy aims listed above. It starts with the aim of avoiding significant adverse effects on health and quality of life, then addresses the situation where the noise impact falls between the LOAEL and the SOAEL when *“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 final aim envisages pro-active management of noise to improve health and quality of life, again taking into account the guiding principles of sustainable development which include the need to minimise travel distance between housing and employment uses in an area.

## 8.2 National Planning Policy Framework (NPPF)

The following paragraphs are from the NPPF (published July 2021):

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



- a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;
- b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

187. 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."

Paragraph 185 also references the Noise Policy Statement for England (NPSE). This document does not refer to specific noise levels but instead sets out three aims:

- "Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.
- Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.
- Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development."

### 8.3 Planning Practice Guidance on Noise

Planning Practice Guidance (PPG) under the NPPF has been published by the Government as a web based resource at <http://planningguidance.planningportal.gov.uk/blog/guidance/>. This includes specific guidance on Noise although, like the NPPF and NPSE the PPG does not provide any quantitative advice. It seeks to illustrate a range of effect levels in terms of examples of outcomes as set out in the following table:



| Perception                     | Examples of Outcomes                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Increasing effect level                   | Action                           |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|----------------------------------|
| Not noticeable                 | No effect                                                                                                                                                                                                                                                                                                                                                                                                                                                            | No Observed Effect                        | No specific measures required    |
| Noticeable and not intrusive   | Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.                                                                                                                                                                                                                                                             | No Observed Adverse Effect                | No specific measures required    |
|                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Lowest Observed Adverse Effect Level      |                                  |
| Noticeable and intrusive       | Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance.                                                                                                                                                                   | Observed Adverse Effect                   | Mitigate and reduce to a minimum |
|                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Significant Observed Adverse Effect Level |                                  |
| Noticeable and disruptive      | The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area. | Significant Observed Adverse Effect       | Avoid                            |
| Noticeable and very disruptive | Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable hard, e.g. auditory and non-auditory.                                                                                                                                                                              | Unacceptable Adverse Effect               | Prevent                          |

## 8.4 Local Planning Policy

Reading Borough Council do not have any specific policies relating to internal noise criteria for new residential developments, however we understand they have historically requested that new developments use the recommendations given in PPG24 and BS 8233:2014 guidelines.

## 8.5 World Health Organisation

The current Environmental Noise Guidelines 2018 for the European Region (ENG) supersede the Guidelines for Community Noise from 1999 (CNG). Nevertheless, the ENG recommends that all CNG indoor guideline values and any values not covered by the current guidelines (such as industrial noise and shopping areas) remain valid.



A summary of the guidance from the ENG and CNG is shown in the table below.

| Source             | CNG guideline indoors all sources | ENG guideline outdoors noise from specific source only |
|--------------------|-----------------------------------|--------------------------------------------------------|
| Road traffic noise | 35 $L_{Aeq, 16h}$                 | 53 dB $L_{den}$                                        |
|                    | 30 $L_{Aeq, 8h}$                  | 45 dB $L_{night}$                                      |
| Railway noise      | 35 $L_{Aeq, 16h}$                 | 54 dB $L_{den}$                                        |
|                    | 30 $L_{Aeq, 8h}$                  | 44 dB $L_{night}$                                      |
| Aircraft noise     | 35 $L_{Aeq, 16h}$                 | 45 dB $L_{den}$                                        |
|                    | 30 $L_{Aeq, 8h}$                  | 40 dB $L_{night}$                                      |

With regard to single-event noise indicators, Section 2.2.2 of the WHO Environmental Noise Guidelines 2018 state:

*“In many situations, average noise levels like the  $L_{den}$  or  $L_{night}$  indicators may not be the best to explain a particular noise effect. Single-event noise indicators – such as the maximum sound pressure level ( $L_{A,max}$ ) and its frequency distribution – are warranted in specific situations, such as in the context of night-time railway or aircraft noise events that can clearly elicit awakenings and other physiological reactions that are mostly determined by  $L_{A,max}$ . Nevertheless, the assessment of the relationship between different types of single-event noise indicators and long-term health outcomes at the population level remains tentative. The guidelines therefore make no recommendations for single-event noise indicators.”*

## 8.6 British Standard BS8233: 2014

British Standard 8233: 2014 “Guidance on sound insulation and noise reduction for buildings” provides guidance for the control of noise in and around buildings.

### 8.6.1 Internal Areas

BS8233:2014 Section 7.7.2 titled “Internal ambient noise levels for dwellings” states:

*“In general for steady external noise sources, it is desirable that internal ambient noise levels do not exceed the following guideline values:*

| Activity                   | Location         | Desirable Internal Ambient Criteria |                       |
|----------------------------|------------------|-------------------------------------|-----------------------|
|                            |                  | 07:00 – 23:00                       | 23:00 to 07:00        |
| Resting                    | Living Rooms     | 35 dB $L_{Aeq,16hour}$              | -                     |
| Dining                     | Dining Room/Area | 40 dB $L_{Aeq,16hour}$              | -                     |
| Sleeping (Daytime Resting) | Bedroom          | 35 dB $L_{Aeq,16hour}$              | 30 dB $L_{Aeq,8hour}$ |



*Note 1 The above table provides recommended levels for overall noise in the design of a building. These are the sum total of structure-borne and airborne noise sources. Groundborne noise is assessed separately and is not included as part of these targets, as human response to groundborne noise varies with many factors such as level, character, timing, occupant expectation and sensitivity.*

*Note 2 The levels shown in the above table are based on the existing guidelines issued by the WHO and assume normal diurnal fluctuations in external noise. In cases where local conditions do not follow a typical diurnal pattern, for example on a road serving a port with high levels of traffic at certain times of the night, an appropriate alternative period, e.g. 1 hour, may be used, but the level should be selected to ensure consistency with the levels recommended in the above table.*

*Note 3 These 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 or New Year's Eve.*

*Note 4 Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or  $L_{Amax,F}$  depending on the character and number of events per night. Sporadic noise events could require separate values.*

*Note 5 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 the resulting noise level.*

*If applicable, any room should have adequate ventilation (e.g. trickle ventilators should be open) during assessment.*

*Note 6 Attention is drawn to the Building Regulations.*

*Note 7 Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved."*

## **8.6.2 External Amenity Areas**

BS8233:2014 Section 7.7.3.2 titled "Design criteria for external noise" states:

*"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  $L_{Aeq,T}^1$ , 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.*

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

## **8.7 ProPG : Planning & Noise : 2017**

**8.7.1** The primary goal of the ProPG is to assist the delivery of sustainable development by promoting good health and well-being through the effective management of noise. It seeks to do that through encouraging a good acoustic design process in and around proposed new residential development having regard to national policy on planning and noise. It is applicable to noise from existing transport sources (noting that good professional practice should have regard to any reasonably foreseeable changes in existing and/or new sources of noise). The recommended approach is also considered suitable where some industrial or commercial noise contributes to the acoustic environment provided that is "not dominant".

**8.7.2** This ProPG advocates a systematic, proportionate, risk based, 2-stage, approach. The approach encourages early consideration of noise issues, facilitates straightforward accelerated decision making for lower risk sites, and assists proper consideration of noise issues where the acoustic environment is challenging.

**8.7.3** The two sequential stages of the overall approach are:

- Stage 1 – an initial noise risk assessment of the proposed development site; and
- Stage 2 – a systematic consideration of four key elements.

**8.7.4** The four key elements to be undertaken in parallel during Stage 2 of the recommended approach are:

- Element 1 – demonstrating a "Good Acoustic Design Process";
- Element 2 – observing internal "Noise Level Guidelines";
- Element 3 – undertaking an "External Amenity Area Noise Assessment"; and
- Element 4 – consideration of "Other Relevant Issues".



**8.7.5** The ProPG considers suitable guidance on internal noise levels found in “BS8233:2014: Guidance on sound insulation and noise reduction for buildings”. Table 4 in Section 7.7.2 of the standard suggests that “in general, for steady external noise sources, it is desirable that the internal ambient noise level does not exceed the guideline values”. The standard states (Section 7.7.1) that “occupants are usually more tolerant of noise without a specific character” and only noise without such character is considered in Table 4 of the standard.

| Activity                      | Location           | 07:00 – 23:00 Hours | 23:00 – 07:00 Hours                      |
|-------------------------------|--------------------|---------------------|------------------------------------------|
| Resting                       | Living Room        | 35dB $L_{Aeq,16hr}$ | -                                        |
| Dining                        | Dining Room / Area | 40dB $L_{Aeq,16hr}$ | -                                        |
| Sleeping<br>(daytime resting) | Bedroom            | 35dB $L_{Aeq,16hr}$ | 30dB $L_{Aeq,16hr}$<br>45dB $L_{Amax,F}$ |

*NOTE 1 the Table provides recommended internal  $L_{Aeq}$  target levels for overall noise in the design of a building. These are the sum total of structure-borne and airborne noise sources. Ground-borne noise is assessed separately and is not included as part of these targets, as human response to ground-borne noise varies with many factors such as level, character, timing, occupant expectation and sensitivity.*

*NOTE 2 The internal  $L_{Aeq}$  target levels shown in the Table are based on the existing guidelines issued by the WHO and assume normal diurnal fluctuations in external noise. In cases where local conditions do not follow a typical diurnal pattern, for example on a road serving a port with high levels of traffic at certain times of the night, an appropriate alternative period, e.g. 1 hour, may be used, but the level should be selected to ensure consistency with the  $L_{Aeq}$  target levels recommended in the Table.*

*NOTE 3 These internal  $L_{Aeq}$  target 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 or New Year's Eve.*

*NOTE 4 Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or  $L_{Amax,F}$ , depending on the character and number of events per night. Sporadic noise events could require separate values. In 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  $L_{Amax,F}$  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 (see Appendix A).*



*NOTE 5 Designing the site layout and the dwellings so that the internal target levels can be achieved with open windows in as many properties as possible demonstrates good acoustic design. Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however any façade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the “open” position and, in this scenario, the internal  $L_{Aeq}$  target levels should not normally be exceeded, subject to the further advice in Note 7.*

*NOTE 6 Attention is drawn to the requirements of the Building Regulations.*

*NOTE 7 Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal  $L_{Aeq}$  target levels may be relaxed by up to 5dB and reasonable internal conditions still achieved. The more often internal  $L_{Aeq}$  levels start to exceed the internal  $L_{Aeq}$  target levels by more than 5dB, the more that most people are likely to regard them as “unreasonable”. Where such exceedances are predicted, applicants should be required to show how the relevant number of rooms affected has been kept to a minimum. Once internal  $L_{Aeq}$  levels exceed the target levels by more than 10dB, they are likely to be regarded as “unacceptable” by most people, particularly if such levels occur more than occasionally. Every effort should be made to avoid relevant rooms experiencing “unacceptable” noise levels at all and where such levels are likely to occur frequently, the development should be prevented in its proposed form (See Section 3.D).*

Figure 2. ProPG Internal Noise Level Guidelines (additions to BS8233:2014 shown in blue).

## **8.8 Acoustics Ventilation and Overheating – Residential Design Guide (AVO)**

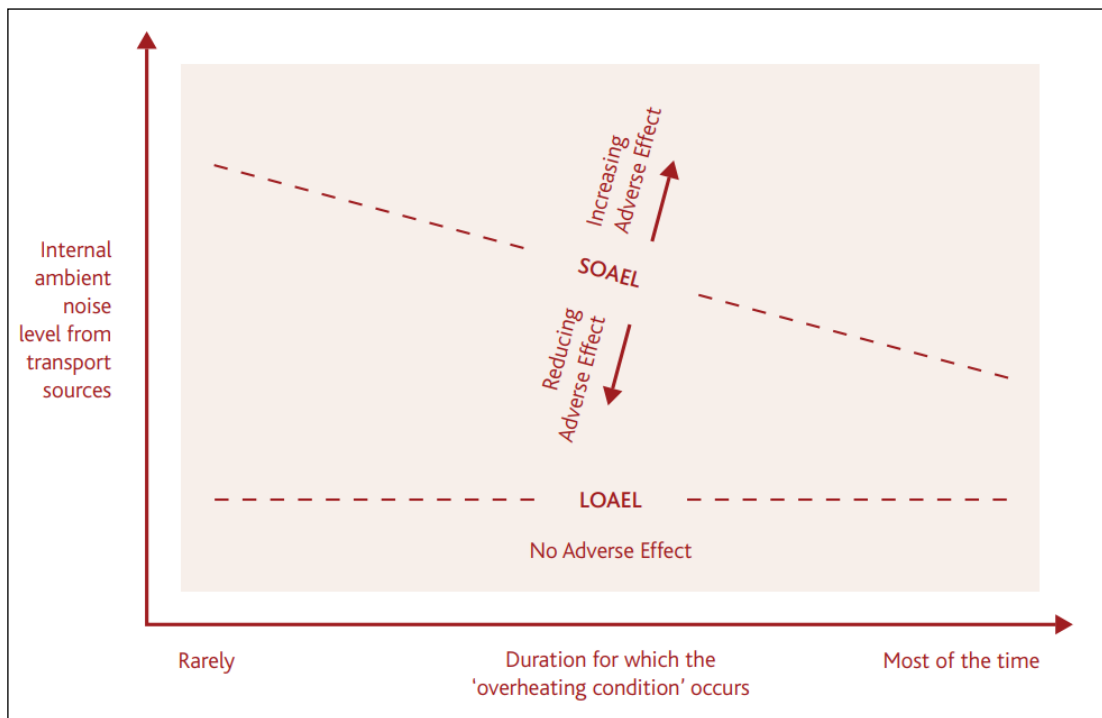
The Association of Noise Consultants (ANC) and the Institute of Acoustics (IOA) published the Acoustics Ventilation and Overheating – Residential Design Guide (AVO) in January 2020). This provides guidance on the interdependence between acoustics, ventilation and overheating.

The guidance recommends a two-level assessment to estimate the potential impact on occupants in the case of windows being open to mitigate overheating. The Level 1 assessment relates to the levels of incident environmental noise across a proposed site. The site can be put into “risk categories” depending on the levels of external noise as set out below:



© ANC 2020. Acoustics Ventilation and Overheating Residential Design Guide

The graph presented below demonstrates how the SOAEL changes depending on how often the windows are required to be open to mitigate overheating.



© ANC 2020. Acoustics Ventilation and Overheating Residential Design Guide

Based on the above, the SOAEL in a Level 2 assessment will change depending on how often the overheating condition occurs.

## 9.0 Proposed Design Target Internal Noise Levels

On the basis of BS8233:2014 we propose the following internal noise levels be adopted as design targets in the proposed habitable rooms:

| Activity                   | Location         | Desirable Internal Ambient Criteria |                       |
|----------------------------|------------------|-------------------------------------|-----------------------|
|                            |                  | 07:00 – 23:00                       | 23:00 to 07:00        |
| Resting                    | Living Rooms     | 35 dB $L_{Aeq,16hour}$              | -                     |
| Dining                     | Dining Room/Area | 40 dB $L_{Aeq,16hour}$              | -                     |
| Sleeping (Daytime Resting) | Bedroom          | 35 dB $L_{Aeq,16hour}$              | 30 dB $L_{Aeq,8hour}$ |

Note: For this site the  $L_{Aeq,T}$  noise parameter alone is considered to be sufficient given the character of the noise climate we have measured. This is consistent with Section 2.2.2 of The World Health Organisation Environmental Noise Guidelines for the European Region and Note 4 of Section 7.7.2 of BS8233:2014).

Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target noise levels may be relaxed (subject to the requirements of any planning conditions) by up to 5 dB and reasonable internal conditions still achieved.



## 10.0 Achievable Internal Noise Levels

We have predicted the levels that would be achievable in the worst-case dwellings with windows partially opened and also with windows closed.

### 10.1 Windows Partially Open

It is generally accepted that the typical noise reduction achieved with partially opened windows is around 15dBA (ref. BS 8233:2014 Annex G.1). This value is the difference between dBA levels measured outside and inside typical dwellings, therefore 3dBA should be added to free field noise levels to determine outside levels.

A simple assessment thus indicates the following noise levels may be expected within the proposed worst case habitable rooms with partially opened windows.

| Description                                             | Predicted Worst Case Internal Noise Levels with Windows Partially Opened |                                         |                                       |                                         |
|---------------------------------------------------------|--------------------------------------------------------------------------|-----------------------------------------|---------------------------------------|-----------------------------------------|
|                                                         | Position 1                                                               |                                         | Position 2                            |                                         |
|                                                         | Daytime<br>L <sub>Aeq</sub> (16-hour)                                    | Night-time<br>L <sub>Aeq</sub> (8-hour) | Daytime<br>L <sub>Aeq</sub> (16-hour) | Night-time<br>L <sub>Aeq</sub> (8-hour) |
| External free field level                               | 65 dBA                                                                   | 59 dBA                                  | 62 dBA                                | 60 dBA                                  |
| Façade correction                                       | +3 dBA                                                                   | +3 dBA                                  | +3 dBA                                | +3 dBA                                  |
| Façade noise level                                      | 68 dBA                                                                   | 62 dBA                                  | 65 dBA                                | 63 dBA                                  |
| Noise reduction for conventional thermal double glazing | -15dBA                                                                   | -15dBA                                  | -15dBA                                | -15dBA                                  |
| Predicted internal noise levels                         | 53 dBA                                                                   | 47 dBA                                  | 50 dBA                                | 48 dBA                                  |

As shown above, predicted internal noise levels with windows partially opened exceed the BS8233 design targets by 18 dB during daytime hours and 17 dB during night-time hours at Position 1, and by 15 dB during daytime hours and 18 dB during night-time hours, at Position 2.

### 10.2 Windows Closed

It is generally accepted that the typical noise reduction achieved by conventional thermal double glazing is 33dBA for road traffic noise. This value is taken from PPG24 (now superseded) and is the difference between dBA levels measured outside and inside typical dwellings, therefore 3dBA should be added to free field noise levels to determine outside levels.



A simple assessment thus indicates the following noise levels may be expected within the proposed worst case dwellings with conventional thermal double glazing.

| Description                                             | Predicted Worst Case Internal Noise Levels with Windows Closed |                                         |                                       |                                         |
|---------------------------------------------------------|----------------------------------------------------------------|-----------------------------------------|---------------------------------------|-----------------------------------------|
|                                                         | Position 1                                                     |                                         | Position 2                            |                                         |
|                                                         | Daytime<br>L <sub>Aeq</sub> (16-hour)                          | Night-time<br>L <sub>Aeq</sub> (8-hour) | Daytime<br>L <sub>Aeq</sub> (16-hour) | Night-time<br>L <sub>Aeq</sub> (8-hour) |
| External free field level                               | 65 dBA                                                         | 59 dBA                                  | 62 dBA                                | 60 dBA                                  |
| Façade correction                                       | +3 dBA                                                         | +3 dBA                                  | +3 dBA                                | +3 dBA                                  |
| Façade noise level                                      | 68 dBA                                                         | 62 dBA                                  | 65 dBA                                | 63 dBA                                  |
| Noise reduction for conventional thermal double glazing | -33 dBA                                                        | -33 dBA                                 | -33 dBA                               | -33 dBA                                 |
| Predicted internal noise levels                         | 35 dBA                                                         | 29 dBA                                  | 32 dBA                                | 30 dBA                                  |

As shown above, predicted internal noise levels with windows closed achieves BS8233 design targets. Although the predicted levels are on the higher end of the criteria, Pro:PG states that where development is considered necessary or desirable, despite external noise levels above WHO guidelines, internal L<sub>Aeq</sub> target levels may be relaxed by up to 5dB and reasonable internal conditions can still be achieved.

### 10.3 Ventilation & Overheating Assessment

The preceding sections of this report present solutions to satisfy the proposed internal ambient noise limits within dwellings during normal ventilation conditions where windows are closed but ventilators or MVHR systems (to meet Part F minimum ventilation requirements) are operational.

The aforementioned Acoustics Ventilation and Overheating – Residential Design Guide provides guidance regarding noise and overheating. Our interpretation of the information contained within the AVO guidance is as follows



| Daytime<br>L <sub>Aeq</sub> , 16 Hour | Night-time<br>L <sub>Aeq</sub> , 8 Hour | Night-time<br>L <sub>AFmax</sub>                                         | Level 1 Noise & Overheating Risk Outcome | Suggested Action                                                                                                                                                                                  |
|---------------------------------------|-----------------------------------------|--------------------------------------------------------------------------|------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ≤48 dB                                | ≤43 dB                                  | Does not normally exceed L <sub>AFmax</sub> more than 10 times per night | Negligible                               | Noise can be heard but does not cause any change in behaviour. Openable windows should be suitable                                                                                                |
| >48 dB to ≤53 dB                      | >43 dB to ≤48 dB                        | -                                                                        | Low                                      | Limited behavioural change is expected, and reasonable internal noise levels should be achieved. Openable windows likely to be suitable.                                                          |
| >53 dB to ≤63 dB                      | >48 dB to ≤55 dB                        | -                                                                        | Medium                                   | Increasing likelihood of impact on reliable speech communication. Carry out Level 2 risk assessment. Windows <u>may</u> be able to be opened for limited amounts of time to mitigate overheating. |
| >63 dB                                | >55 dB                                  | Typically exceeds 78 dB L <sub>AFmax</sub>                               | High                                     | Windows are unlikely to be able to be opened for any amount of time to mitigate overheating. Carry out Level 2 risk assessment.                                                                   |

We have undertaken a Level 1 assessment based on the AVO, to highlight the potential areas in which opening windows to mitigate overheating should be assessed in more detail. Based on the results of the environmental noise survey, the results of the Level 1 assessment indicate that north and south façades can be categorised as high-risk.

The AVO guide advises that a Level 2 Assessment should be undertaken where facades fall within the high and medium risk categories (red and yellow). This assessment should include an estimate of how frequently and for what duration the overheating condition occurs, without reliance on openable windows.



Where façades fall within the high and medium risk categories (red and yellow), habitable rooms should be designed so as to avoid the reliance on openable windows to satisfy overheating targets. This may be achieved by use of solar rated glazing, black out blinds, or through fenestration design. In addition, the AVO guide (Table B-5) suggests mitigation measures in the form of attenuated or plenum windows, attenuated louvres or vents for overheating and sound attenuating balconies. This can be assisted with mechanical ventilation too, such as MVHR with a manual summer boost function. Air conditioning can also be considered, however, the introduction of mechanical solutions should be considered carefully; not only with regard to cost and maintenance, but sustainability and the environment, which are likely to be more prominent drivers for any new development with the LPA's jurisdiction.

## 10.4 Assessment of Low Frequency Music Noise

The above assessment of internal noise levels is based on the measured survey data but only assumes noise emissions from anonymous sources such as road traffic.

As discussed in Sections 3.2 and 7.0 there is evidence of music and patron noise associated with the nearby bar/club venues along Friar Street. It is therefore necessary to carry out a secondary assessment, in particular with regards to the low frequency component of the measured incident noise during Friday and Saturday evening/night.

### 10.4.1 Criteria

We understand that Reading Borough Council do not provide standard guidance on suitable criteria for the assessment of existing music/entertainment noise on new residential premises. As such we propose to adopt the following which are based on music/entertainment noise not exceeding a level more than approximately 5dB below the BS 8233:2014 internal noise target in bedrooms with a relaxation at 63Hz and 125Hz based on research presented in Defra Contract NANR45.

| Location     | Music Noise Limit |                 |                             |
|--------------|-------------------|-----------------|-----------------------------|
|              | 63Hz              | 125Hz           | Broadband<br>(250Hz – 4kHz) |
| Bedrooms     | 47 dB Leq,15min   | 41 dB Leq,15min | NR 20 Leq,15min             |
| Living Rooms | 52 dB Leq,15min   | 46 dB Leq,15min | NR 25 Leq,15min             |

The proposed limits outlined for living rooms have been relaxed by 5dB with reference to the limits for “inaudibility”. This is on the basis that the primary function of bedrooms is for sleeping, and living rooms are for resting/relaxing, therefore it is considered that living rooms be less



sensitive to noise impact from music/entertainment premises. This is ultimately subject to formal agreement by Reading Borough Council.

#### 10.4.2 Incident Noise Levels

Based on detailed review of the measured noise data at Position 2 overlooking Friar Street, the following table shows the worst case (highest magnitude low frequency) typical incident noise level measured during a period of music/entertainment noise activity (ca. 01:00hrs on Sunday morning).

| Worst Case Incident Music/Entertainment Noise |                         |                            |
|-----------------------------------------------|-------------------------|----------------------------|
| L <sub>eq</sub> @ 63Hz                        | L <sub>eq</sub> @ 125Hz | Broadband L <sub>Aeq</sub> |
| 73                                            | 66                      | 65                         |

#### 10.4.3 Preliminary Façade Performance Specification

This section aims to provide preliminary façade noise mitigation guidance for critical façade elements, with consideration to all external noise sources.

The information presented below is intended as planning guidance only, with the aim of demonstrating that solutions are available to suitably mitigate noise intrusion and to inform the acoustic design at an early stage. Detailed acoustic façade specifications shall be produced as the design develops.

Based on the prevailing noise levels incident on the facades overlooking Friar Street, the following table presents preliminary acoustic performance specification for windows for the proposed facades.

| Required Sound Level Difference (dB, D) |                         |                            |
|-----------------------------------------|-------------------------|----------------------------|
| L <sub>eq</sub> @ 63Hz                  | L <sub>eq</sub> @ 125Hz | Broadband L <sub>Aeq</sub> |
| 26                                      | 25                      | 35                         |

The sound reduction requirements at low frequency are likely to be achievable with an uprated acoustic double-glazed system. The exact specification and configuration would be subject to design development however, our calculations indicates that conventional glazed solutions should be available to suitably control music/entertainment noise ingress to habitable rooms during normal ventilation conditions.



## **11.0 Mitigation Measures**

At this stage of the design scheme the precise details of the glazing to be used are not known, nor are the precise details of the ventilation.

### **11.1 Glazing**

The external envelope of the proposed residences will incorporate suitably specified glazing so as to achieve the proposed design target internal noise levels presented above.

The predicted worst case internal noise levels with windows closed meet the proposed criteria. It is thus demonstrated that acceptable internal noise levels are achievable with conventional double glazing.

### **11.2 Background Ventilation**

The predicted worst case internal noise levels with windows partially opened exceed the proposed target levels (as is often the case). The minimum mitigation available to future occupants would be to close their window. Ventilation (incorporating suitable acoustic attenuation) will be provided to comply with the requirements of the Building Regulations Approved Document F whole dwelling ventilation and appropriate thermal design should be undertaken to avoid the need to rely on openable windows to deal with overheating. The occupants will thus have the option of keeping windows closed for most of the time and opening windows for purge ventilation.



This form of mitigation is supported within the Pro:PG which advises the following:

- 2.34 Where the LPA accepts that there is a justification that the internal target noise levels can only be practically achieved with windows closed, which may be the case in urban areas and at sites adjacent to transportation noise sources, 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 façade openings used to provide “*whole dwelling ventilation*” in accordance with Building Regulations Approved Document F (e.g. trickle ventilators) in the open position (see Supplementary Document 2). Furthermore, in this scenario the internal  $L_{Aeq}$  target noise levels should not generally be exceeded.
- 2.35 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).

Where ventilation is provided through the façade it shall be suitably acoustically attenuated to ensure the achievement of the proposed target internal noise levels is not compromised.

### 11.3 Purge Ventilation/Overheating

With reference to the aforementioned AVO guidance, habitable rooms should be designed so as to minimise the reliance on openable windows to satisfy overheating targets. We understand that on this scheme, for all Southern facing apartments for which an overheating condition is predicted to occur, the scheme will utilise a combination of triple glazing, and specialist acoustically attenuated openable panels (designed by others) that is intended to minimise the duration of the overheating condition and provide a suitable means of increasing airflow without compromising internal noise levels.

Furthermore, it is understood that for Southern facing apartments at Level 6 and above, due to the increased solar gains and larger glazed elements, there will still be some reliance on openable windows to fully mitigate overheating necessary, albeit for a heavily reduced duration.

It is understood that the initial design of the building and means of mitigating noise during the overheating condition have been considered and steps to minimise the reliance on openable windows for overheating mitigation have been adopted.



Ultimately the potential exceedance of internal noise level within the apartments for which some reliance of openable windows to mitigate overheating remains should be appraised by the Local Planning Authority with consideration given to the financial and environmental implications of remaining alternative strategies (i.e. mechanical comfort cooling).

## 11.4 Planning Condition

The Local Planning Authority may expect to be provided with details of the sound insulation treatments when available. Therefore in granting consent it would be appropriate for a planning condition to be imposed along the following lines, (based on the example condition 1 drawn from PPG24).

## 12.0 External Amenity Area

Noise levels in external amenity areas should ideally not be above the range of 50-55dB  $L_{Aeq,16hr}$ , as stated in BS8233:2014. The design has achieved the lowest practicable noise levels. It is acknowledged that noise levels in some gardens may be above this noise level. However in addition to these gardens all dwellings will have access to Forbury Gardens Public Park, where noise levels will be below the range of 50-55dB  $L_{Aeq,16hr}$  as stated in BS8233:2014.

It should be noted that BS8233:2014 states: *"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."*

## 13.0 Demolition/Construction

Noise arising during the demolition/construction of the Proposed Development could result in temporary effects to the neighbouring receptors from the works themselves and machinery used, as well as the associated construction traffic movements. The demolition and groundworks (e.g. piling) are likely to create the greatest impact.

During the works, noise related to demolition/construction activities will be controlled to limit noise emissions. 'Best Practicable Means' will be used to control and reduce levels in accordance with the Control of Pollution Act. For example, noise can be minimised through the use of appropriate non- percussive piling techniques. In addition, the CEMP will contain specific approaches for working relating to demolition/construction phases. Given the temporary nature of demolition and construction, permanent significant effects are not expected.



With respect to vibration, there is the potential for vibration from demolition and piling. Vibration can be minimised through the use of appropriate non- percussive piling techniques. As above, the CEMP will contain specific approaches for work relating to demolition/construction phases. As such, significant effects are not considered likely.

In addition to noise from the construction works themselves, demolition / construction traffic will contribute to existing traffic levels on the surrounding road network. This will lead to increased road traffic noise at receptors adjacent to construction traffic routes and may result in adverse effects. The temporary increase in traffic is considered unlikely to be significant in terms of total flow or construction duration. In addition, a CLP shall be implemented to ensure that vehicle movements are appropriately managed. As such, significant effects are not considered likely.

## **14.0 Conclusions**

A detailed environmental noise survey has been undertaken in order to establish the currently prevailing environmental noise climate around the site.

The environmental noise impact upon the proposed dwellings has been assessed in the context of national and local planning policies.

Appropriate target internal noise levels have been proposed. These are achievable using conventional mitigation measures.

Mitigation measures, including the use of suitably specified glazing, acoustically attenuated ventilation and appropriate thermal design have been recommended to reduce to a minimum the adverse impact on health and quality life arising from environmental and music/entertainment noise.

The assessment shows the site, subject to appropriate mitigation measures, is suitable for residential development in terms of noise.

## Appendix A

The acoustic terms used in this report are defined as follows:

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| dB                | Decibel - Used as a measurement of sound level. Decibels are not an absolute unit of measurement but an expression of ratio between two quantities expressed in logarithmic form. The relationships between Decibel levels do not work in the same way that non-logarithmic (linear) numbers work (e.g. 30dB + 30dB = 33dB, not 60dB).                                                                                                                                                                                                                                                                      |
| dBA               | <p>The human ear is more susceptible to mid-frequency noise than the high and low frequencies. The 'A'-weighting scale approximates this response and allows sound levels to be expressed as an overall single figure value in dBA. The <sub>A</sub> subscript is applied to an acoustical parameter to indicate the stated noise level is A-weighted</p> <p>It should be noted that levels in dBA do not have a linear relationship to each other; for similar noises, a change in noise level of 10dBA represents a doubling or halving of subjective loudness. A change of 3dBA is just perceptible.</p> |
| L <sub>90,T</sub> | L <sub>90</sub> is the noise level exceeded for 90% of the period <i>T</i> (i.e. the quietest 10% of the measurement) and is often used to describe the background noise level.                                                                                                                                                                                                                                                                                                                                                                                                                             |
| L <sub>eq,T</sub> | L <sub>eq,T</sub> is the equivalent continuous sound pressure level. It is an average of the total sound energy measured over a specified time period, <i>T</i> .                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| L <sub>max</sub>  | L <sub>max</sub> is the maximum sound pressure level recorded over the period stated. L <sub>max</sub> is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the L <sub>eq</sub> noise level.                                                                                                                                                                                                                                                                                                                                              |
| L <sub>p</sub>    | Sound Pressure Level (SPL) is the sound pressure relative to a standard reference pressure of $2 \times 10^{-5}$ Pa. This level varies for a given source according to a number of factors (including but not limited to: distance from the source; positioning; screening and meteorological effects).                                                                                                                                                                                                                                                                                                     |
| L <sub>w</sub>    | Sound Power Level (SWL) is the total amount of sound energy inherent in a particular sound source, independent of its environment. It is a logarithmic measure of the sound power in comparison to a specified reference level (usually $10^{-12}$ W).                                                                                                                                                                                                                                                                                                                                                      |

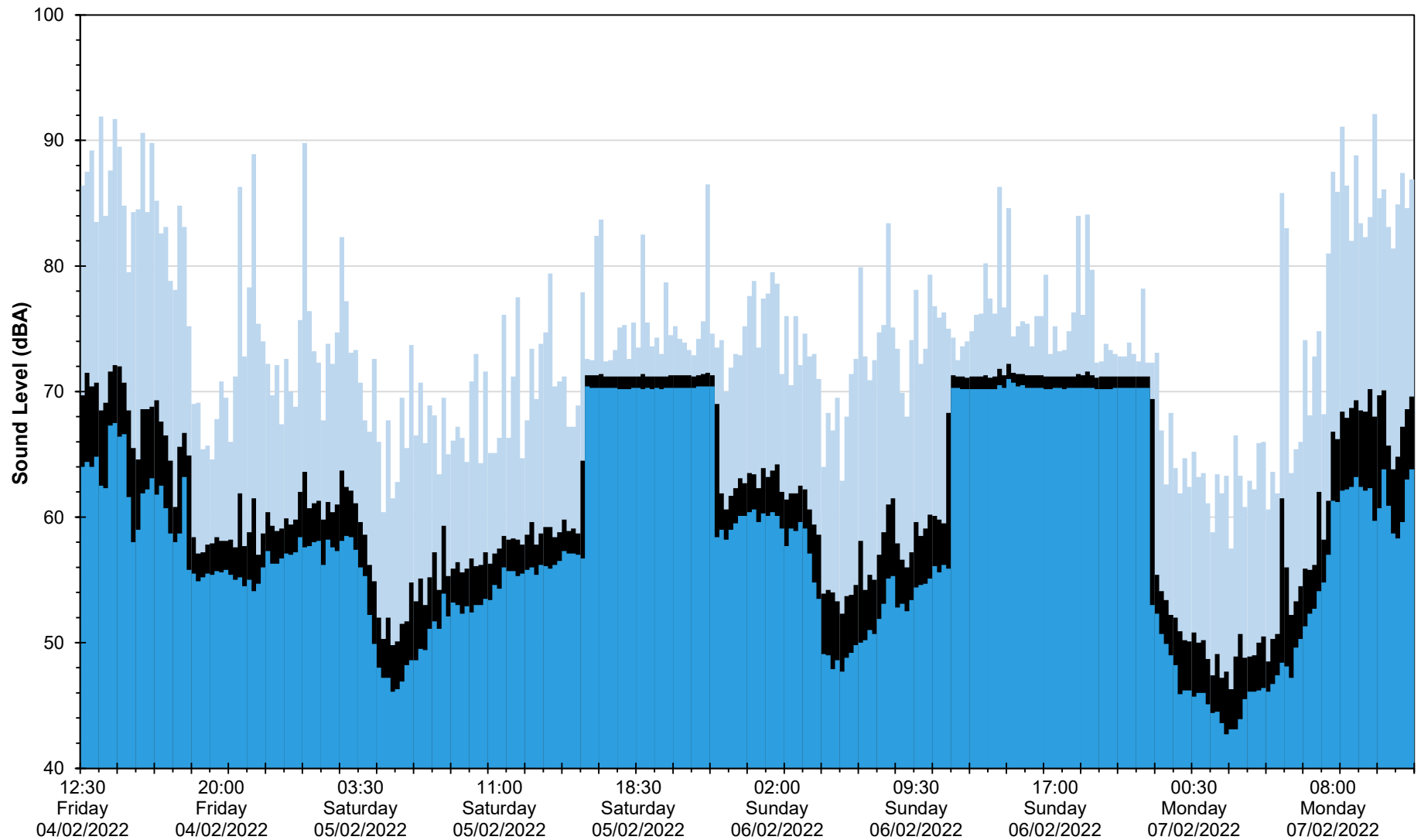
# 35-39 Friars Road, Reading

Position 1

$L_{eq}$ ,  $L_{max}$  and  $L_{90}$  Noise Levels  
Friday 4 February 2022 to Monday 7 February 2022

$L_{max}$   $L_{eq}$

$L_{90}$



Date and Time

29244/TH1

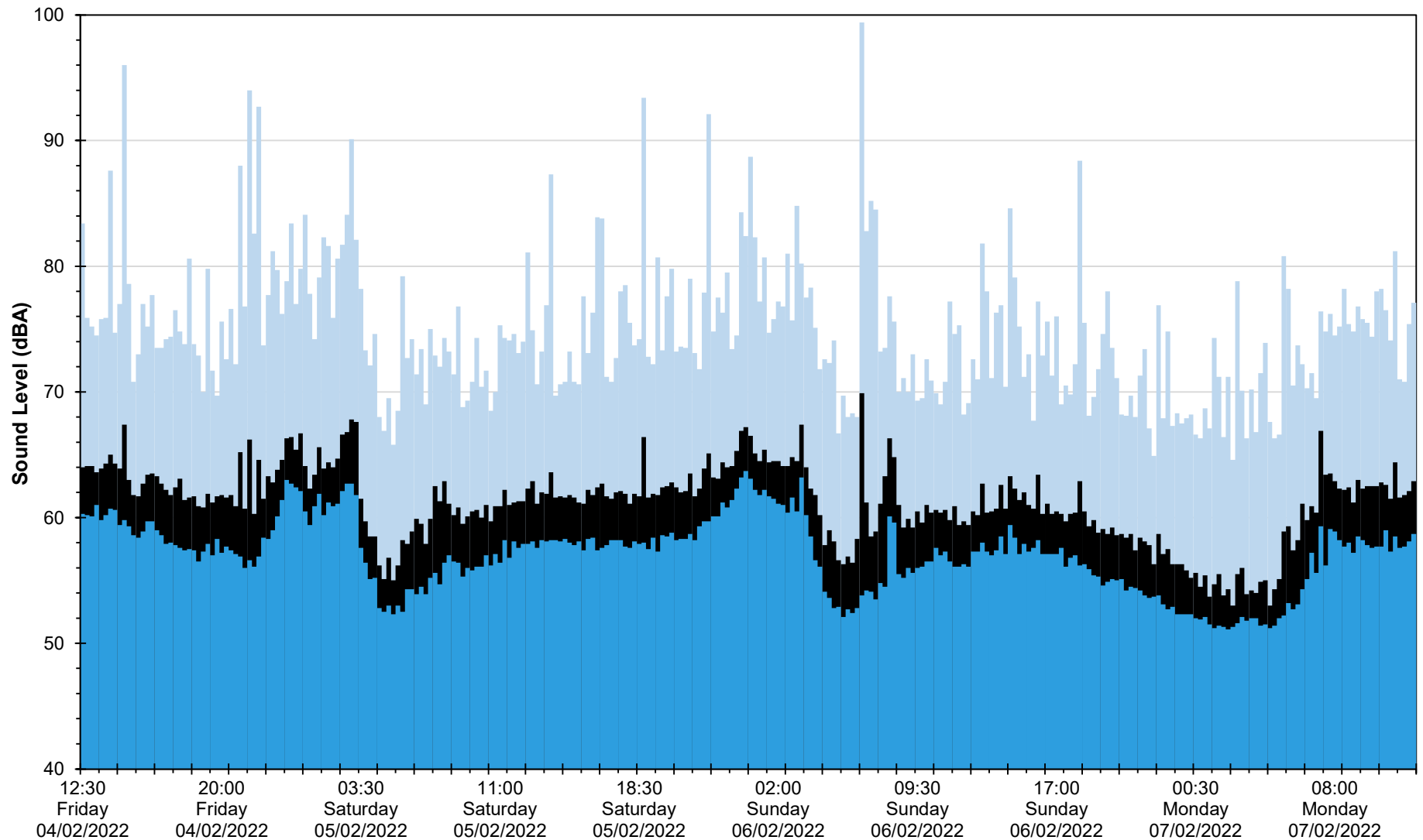
# 35-39 Friars Road, Reading

## Position 2

$L_{eq}$ ,  $L_{max}$  and  $L_{90}$  Noise Levels  
Friday 4 February 2022 to Monday 7 February 2022

$L_{max}$   $L_{eq}$

$L_{90}$



Date and Time

29244/TH2