

138-144 Friar Street
Reading
RG1 1EX

Noise Impact Assessment

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London
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Document Control

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Document Approvals

Role	Name	Signature	Date
Preparation and Approval	David Yates BSc(Hons) MIOA Associate		27/07/2026

For Information

Please Note

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1.0 INTRODUCTION

- 1.1 Quantum Acoustics Ltd has been commissioned by National Pub Portfolio Ltd to prepare this Noise Assessment which accompanies a planning application for purpose built shared living accommodation at 138-144 Friar Street, Reading RG1 1EX.
- 1.2 The application seeks to deliver the phased redevelopment of the site involving the demolition of Nos. 138-141 and 142-143 Friar Street, partial demolition of No. 144 Friar Street, and erection of a basement and 6-storey building to provide co-living residential accommodation (purpose-built shared living accommodation – Sui Generis use class), together with the partial retention of the former Bugle Public House as a standalone Class E commercial unit.
- 1.3 This report presents the results of noise monitoring undertaken at the site and considers the suitability of the site for residential development in the context of national and local planning policy.
- 1.4 The approach to assessment and format of this report are aligned with the guidance set out in the ANC/IAO/CIEH publication "ProPG: Planning and Noise: Professional Practice on Planning and Noise: New Residential Development". This guidance is directly referenced in the Government's "Planning Practice Guidance" on noise. Other industry standard design guidance is also referred to where appropriate.
- 1.5 This report is structured as follows:
 - **Section 2** reviews the location of the site and neighbouring land uses;
 - **Section 3** outlines the development proposals;
 - **Section 4** reviews planning policy relevant to noise and other industry standard design guidance;
 - **Section 5** presents the results of noise monitoring undertaken at the site to determine existing environmental noise levels.
 - **Section 6** assesses the results of the noise monitoring in line with a "ProPG Stage 1 Initial Site Noise Risk Assessment".
 - **Sections 7 to 10** present a ProPG "Stage 2 Full Assessment" of the scheme design proposals, including an assessment of how the scheme embeds good acoustic design

principles; assessments of indoor and external noise levels and an assessment of other considerations, including potential “agent of change” implications;

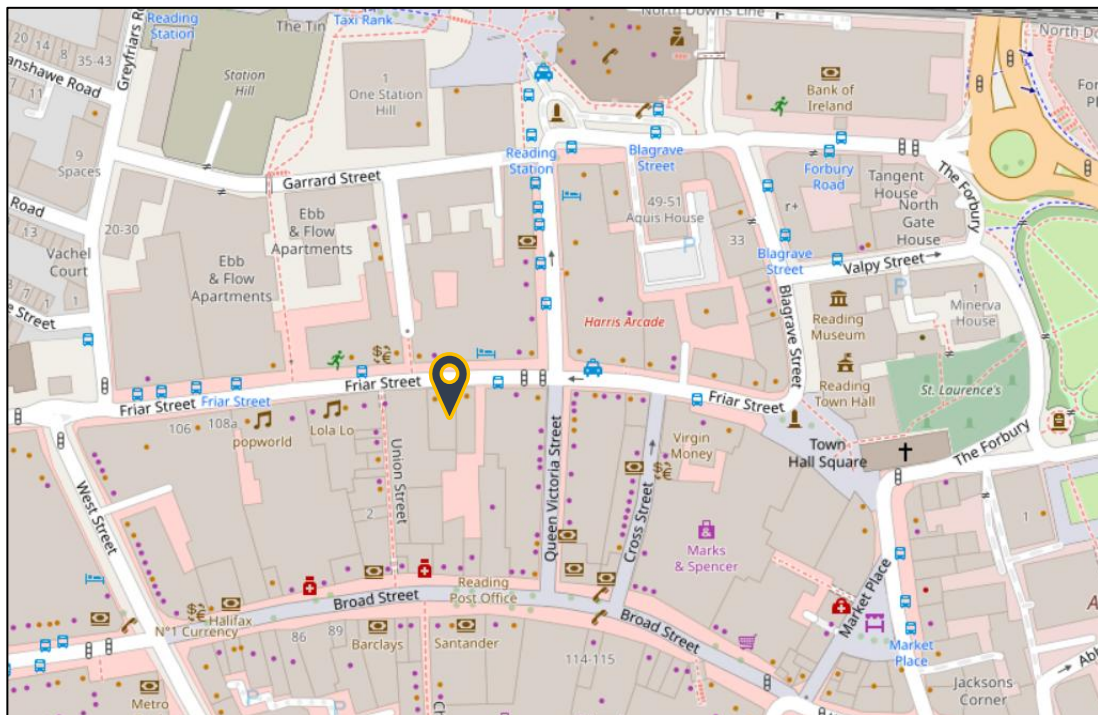
- **Section 11** considers maximum plant noise levels; and
- Conclusions are presented in **Section 12**.

1.6 A glossary of acoustic terms is presented in Appendix A.

2.0 SITE LOCATION

- 2.1 The site lies within the administrative boundary of Reading Borough Council.
- 2.2 The site is located to the south of Friar Street, as shown in Figure 2.1 below.

Figure 2.1: Site Location (OpenStreetMap Contributors 2026)



- 2.3 The existing use of the site is for retail and commercial use, with a retail shop and two former, currently vacant, Public Houses (The Bugle and Revolución de Cuba).
- 2.4 Friar Street is a busy town centre street in the heart of Reading with numerous bus routes, retail, commercial (Public Houses/bars and night-clubs), restaurants and take-aways. The night-time economy is vibrant along this street, with many bars, night-clubs and take-aways open until significantly past midnight, which means that many people walk up and down the street at all times of the day and night as well as there being frequent late-night busses and taxi services.
- 2.5 The red line boundary of the site is shown in Figure 2.2 below:

Figure 2.2: Red Line Boundary (Falconer Chester-Hall, Existing Ground Floor Plan, drawing reference P21109-FCH-BB-00-DR-A-1102, 11 August 2022)

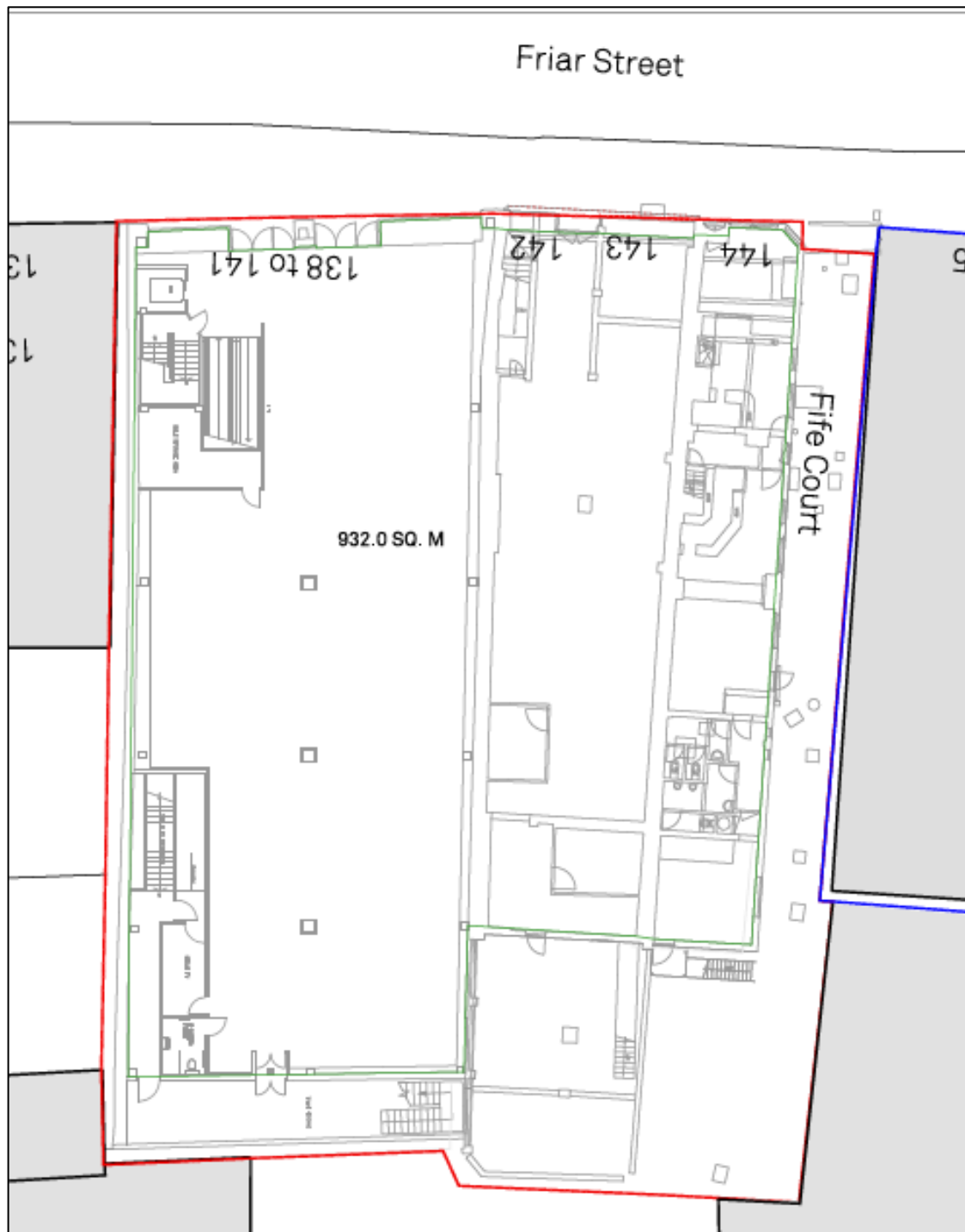


Figure 3.2: Proposed Development – Ground Floor



Figure 3.3: Proposed Development - 1st Floor



Figure 3.4: Proposed Development – 2nd Floor



Figure 3.5: Proposed Development – 3rd Floor

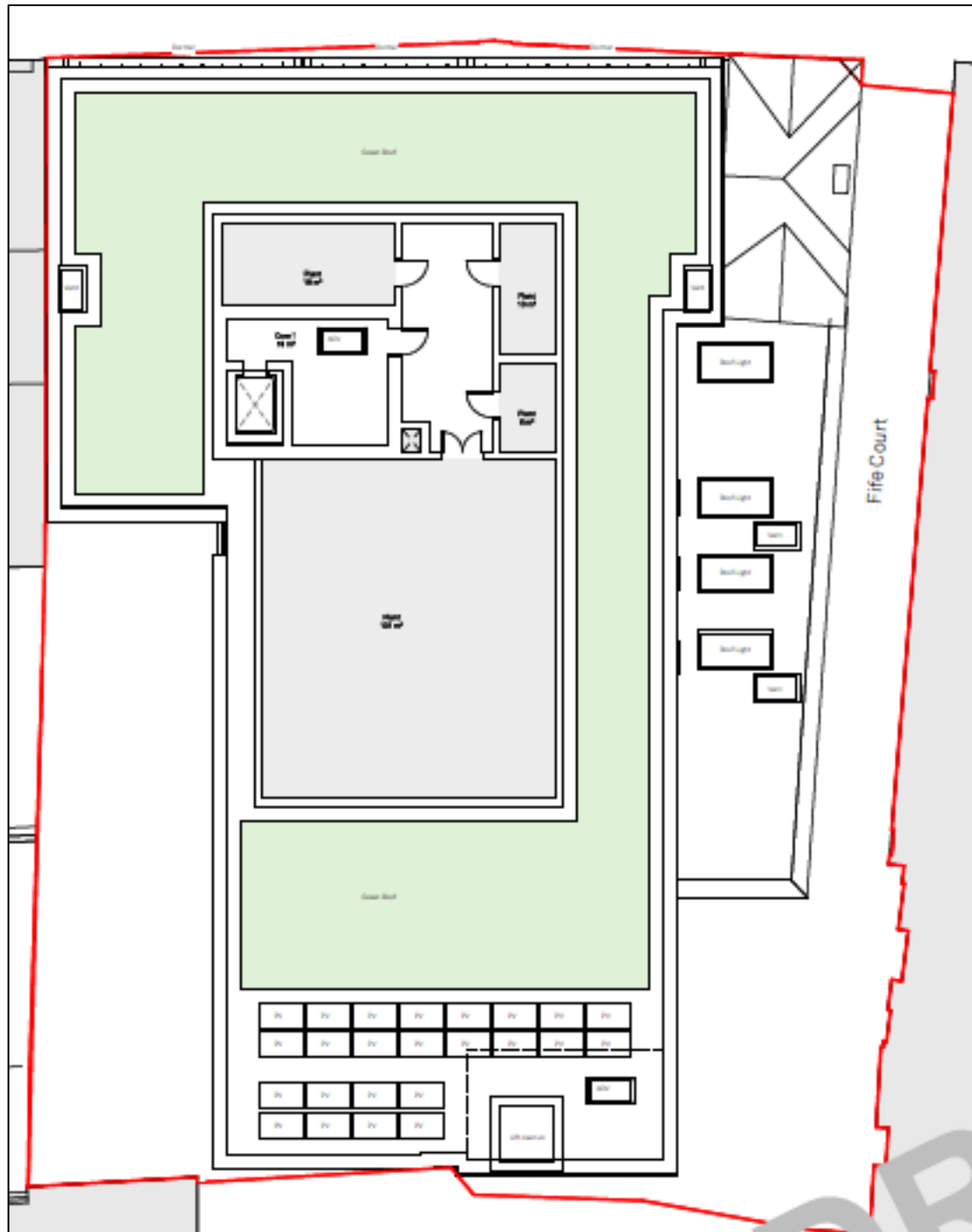


Figure 3.6: Proposed Development – 4th Floor

Figure 3.7: Proposed Development – 5th Floor



Figure 3.8: Proposed Development – Roof



4.0 PLANNING POLICY CONTEXT & DESIGN GUIDANCE

National Planning Policy

4.1 The following national planning policy is relevant to the Proposed Development:

- National Planning Policy Framework (2024).
- Planning Practice Guidance (Noise) (2019); and
- Noise Policy Statement for England (2010).

Local Planning Policy

4.2 The following local planning policy is relevant to the Proposed Development:

- Reading Borough Local Plan (adopted November 2019);
- Emerging Reading Borough Local Plan Update (draft submitted May 2025)

Guidance

4.3 The following guidance is relevant to the Development:

- ProPG: Professional Practice Guidance on Planning and Noise: New Residential Development. (2017);
- Acoustics Ventilation and Overheating: Residential Design Guide. Ver. 1.1. (2020);
- BS 4142: 2014 + A1: 2019: "Methods for rating and assessing industrial noise and commercial sound";
- BS 8233: 2014: "Guidance on sound insulation and noise reduction for buildings"; and
- Approved Document O. The Building Regulations. (2010, as amended)

4.4 Set out below is a brief explanation of key national and local planning policies, which provide the key policy framework for determining whether the development meets the Government's overarching policy requirement for sustainable development.

National Planning Policy Framework (December 2024)

4.5 The overarching aim of the planning regime is to promote sustainable development. However, such development must be delivered in a manner that delivers compatibility with the location of the Site of land and existing neighbouring land uses. With regard to noise,

the National Planning Policy Framework sets out two primary policies which (a) seek to ensure that new noise sensitive development is adequately protected from noise and impacts from new noise generating land uses are appropriately controlled and (b) existing commercial/industrial uses and community facilities do not have unreasonable restrictions imposed on them by new noise sensitive development:

Paragraph 198:

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

- a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*
- b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and*
- c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.*

Paragraph 200:

"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 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."

Noise Policy Statement for England

- 4.6 With regard to 'adverse' impacts and 'significant adverse' impacts, the NPPF directs the reader to the advice contained in DEFRA's "Noise Policy Statement for England" (NPSE). This Policy Statement introduces the concept of a "Significant Observed Adverse Effect Level" (SOAEL), "Lowest Observed Adverse Effect Level" (LOAEL) and "No Observed Effect Level" (NOEL). These are concepts aligned with toxicology outcomes derived from guidance given by the World Health Organisation.

- **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**

- 4.7 This is the level above which significant adverse effects on health and quality of life occur.

Planning Practice Guidance

- 4.8 The application of national planning policy is amplified in the government's "Planning Practice Guidance" (PPG). This seeks to help clarify understanding the perception of noise effects, outcomes and actions that should be taken to align decision making with the NPPF. In line with the NPPF concept of basing decision making on the identification of "significant" or "other" impacts on health and quality of life, the NPPG aligns its guidance with the NPSE.
- 4.9 The following Table 4.1 summarises this guidance:

Table 4.1: Planning Practice Guidance - Noise Exposure Hierarchy

Response	Examples of outcomes	Increasing effect level	Action
No Observed Effect Level			
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
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.	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
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 hard, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

Local Planning policy

- 4.10 The Reading Borough Council Local Plan (adopted November 2019) contains the following relevant policies:

"CC8: SAFEGUARDING AMENITY

Development will not cause a detrimental impact on the living environment of existing residential properties or unacceptable living conditions for new residential properties, in terms of:

- *Privacy and overlooking;*
- *Access to sunlight and daylight;*
- *Visual dominance and overbearing effects of a development;*
- *Harm to outlook;*
- *Noise and disturbance;*
- *Artificial lighting;*
- *Vibration;*
- *Dust and fumes;*
- *Smell;*
- *Crime and safety; or*
- *Wind, where the proposals involve new development of more than 8 storeys.*

The position of habitable rooms, windows and outdoor living spaces will be particularly important. A back-to-back distance of 20 metres between dwellings is usually appropriate, although the circumstances on individual sites may enable dwellings to be closer without a detrimental effect on privacy.

As well as immediate impacts, other aspects to which this policy applies will include matters such as hours of operation of businesses, and effects of traffic movements, particularly of heavy goods vehicles (HGVs). Proposals which would generate regular movements of HGVs on residential roads will not be acceptable.

Where an otherwise acceptable development could change its character to a use that would have a greater impact on amenity without needing planning permission, conditions will be applied to restrict such changes."

"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."

"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."

"CR6: LIVING IN CENTRAL READING

Proposals for residential development within the central area will be assessed against the following criteria:

...

- ii) Proposals for new residential development within the central area will be required to demonstrate how the issue of potential noise disturbance from neighbouring land uses and other sources, and air quality implications of residential development, have been considered and if necessary, mitigated. New residential development should not be located next to existing town centre uses where those uses would give rise to unacceptable levels of noise and disturbance to the occupiers of the new scheme, unless this can be mitigated.*

..."

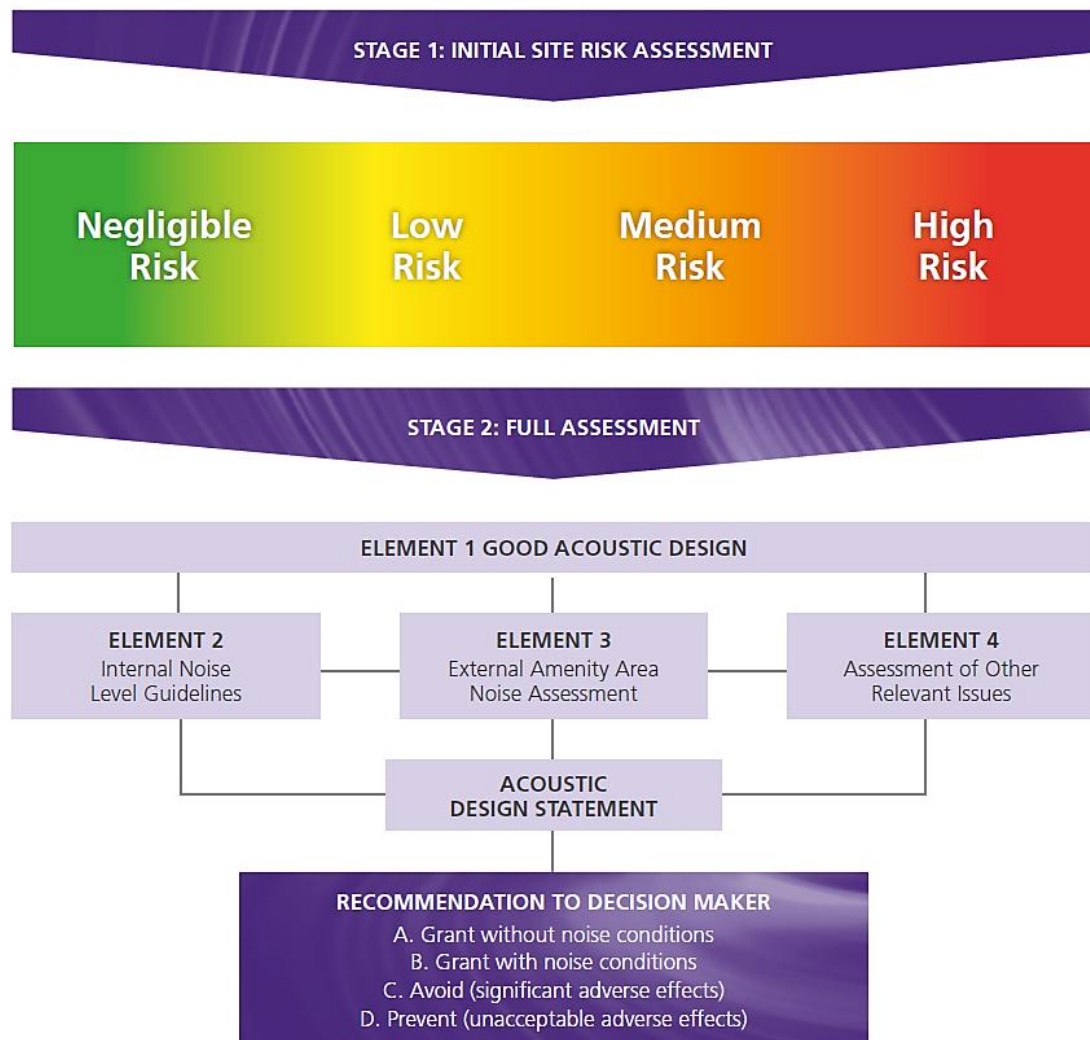
- 4.11 The updated emerging Local Plan does not contain any changes to the above policies or introduce any new, relevant policies in respect of noise for this development.
- 4.12 Quantum Acoustics have also liaised with Rebecca Moon, Principal EHO at Reading Borough Council, in respect of the control of low frequency noise levels from night-club type noise sources within habitable rooms of the proposed development. Ms. Moon advised that the criteria they set is for noise levels from music noise not to exceed NR25 in habitable rooms during the daytime (07:00 to 23:00 hours) and NR20 at night (23:00 – 07:00 hours), along with consideration of ventilation during background and overheating conditions in order to ensure that windows are not required to be opened for those purposes.
- 4.13 In addition to the above, it was agreed that the criteria at 63 Hz and 125 Hz in respect of NR25 and NR20 would be primarily assessed as the main driving factor from night-club noise. Noise in frequencies above 125 Hz tend to be affected by other noise sources such as

road traffic, and control of noise levels low frequencies for night-club noise will ensure adequate control at mid and high frequencies.

Design Guidance

- 4.14 The approach to assessment presented in this report is aligned with the Association of Noise Consultants (ANC), Institute of Acoustics (IOA) and Chartered Institute of Environmental Health (CIEH) publication "*ProPG: Planning and Noise: Professional Practice Guidance on Planning and Noise: New Residential Development*". (2017). This builds on guidance given in BS 8233: 2012 and BS 4142: 2014 + A1: 2019.
- 4.15 ProPG provides two stages of assessment, the first being an initial Site risk assessment and the second being a full assessment, as illustrated in the following Figure 4.1:

Figure 4.1: ProPG Stage 1 & Stage 2



- 4.16 Potential conflicts between acoustic ventilation and overheating have been assessed based on the guidance given in the ANC/IOA publication "*Acoustics Ventilation and Overheating: Residential Design Guide*" and the statutory requirements of Approved Documents F and O of the Building Regulations 2010 (as amended).

Low Frequency Noise Criteria

- 4.17 The location of the site on a busy street with a vibrant night-time economy indicates that the site is likely to be subject to low frequency noise arising from nearby bars and night-clubs. The operation of these premises is protected by the 'Agent of Change' principle as

outlined in the NPPF; therefore, mitigation measures must be implemented within the proposed development to ensure future residents have a reasonable living environment and therefore the future operation of the premises is protected.

- 4.18 Given the nature and times of low frequency noise emanating from the adjacent night-club which continues throughout the entire night-time period at weekends, it has been agreed with the Local Authority that a noise break-in criterion derived from NR20 in the 63 Hz and 125 Hz octave bands is appropriate for noise originating from the operation of the club within habitable rooms (living rooms and bedrooms) at night-time, with a slightly more relaxed NR25 criterion during the daytime.
- 4.19 Applying the full NR20 or NR25 curve as criteria in octave bands across the full frequency range is likely to be unenforceable as the noise levels in higher octave bands are likely to be close to or below the noise floor of sound level meters, below acceptable noise break-in from other noise sources (such as road traffic), and significantly below noise levels from internal noise sources (household appliances, mechanical ventilation systems, building services etc), making accurate measurement of noise levels at higher frequencies impossible.
- 4.20 The relevant octave and noise criteria are provided below in the table below.

Table 4.2: Noise Criteria from Music Noise

Time of Day	L _{eq} (dB) in Octave Bands Centre Frequency (Hz) from Music Noise	
	63	125
Daytime (07:00 – 23:00 hours), derived from NR25	55.2	43.7
Night-time (23:00 – 07:00 hours), derived from NR20	51.3	39.4

BS 4142:2014

- 4.21 BS 4142:2014+A1:2019 "Methods for Rating and Assessing Industrial and Commercial Sound" addresses the likelihood of adverse impact from noise generated by plant equipment. A noise rating is determined and compared with the existing local background sound level, and several cumulative acoustic feature corrections to the noise rating are available to apply where appropriate. For example, if the noise includes a distinguishable tone, impulse, intermittency or other readily distinguishable sound characteristic.

- 4.22 BS 4142:2014 seeks to determine a “representative” background sound level, stating that “...the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods”.
- 4.23 The assessment of the impact depends upon the margin by which the rating level of the specific sound source exceeds the background sound level but also promotes a consideration of the context in which the sound occurs when making an assessment. BS 4142:2014 states that an initial estimate of the impact of the specific sound is made by subtracting the measured background sound level from the rating level, while considering the following points:
- a) Typically, the greater this difference, the greater the magnitude of the impact.
 - b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
 - c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.
 - d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact.
- 4.24 Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

5.0 EXISTING BASELINE NOISE LEVELS

General

- 5.1 Automated noise monitoring at the site was undertaken between over a notional 5-day period between Thursday 11 June 2026 to Monday 15 June 2026.

Noise levels were monitored at 2 “automated” locations, as shown in the Figure 5.1 below and described in the

- 5.2 Table 5.1 overleaf.

Figure 5.1: Location Plan



Table 5.1: Noise Monitoring Locations

Location	Description
A1	Overlooking Friar Street in a façade position at a height of approximately 4.5m, suspended from a first storey window.
A2	Overlooking the rear courtyard at the rear of the site, in a free-field location at a height of approximately 5.5m above a 1 st floor fire escape from the rear outdoor terrace area of the former Public House/bar at the site.

Instrumentation

- 5.3 Details of the equipment used for the survey are summarised in the following Table 5.2: Noise Monitoring Equipment.

Table 5.2: Noise Monitoring Equipment

Position	Manufacturer	Type	Serial Number
A1	Svantek	971A Sound Level Meter	151439
A2	Svantek	971A Sound Level Meter	143557
All	Svantek	SV33B Calibrator	125699

- 5.4 All instruments hold current laboratory calibration certificates (available on request).
- 5.5 A field calibration check on all equipment was made at the start of the survey and a further calibration check made on completion. No significant drift in the calibration of any instrument was observed.

Procedure

- 5.6 The noise monitoring equipment at both positions were configured to record the $L_{A90,T}$, $L_{Aeq,T}$, $L_{Amax,fast}$ and 1/3rd octave band sound pressure levels over consecutive 15-minute periods to provide a detailed time history profile showing fluctuations in noise levels. The equipment was also configured to undertake higher resolution logging (100ms) to assist with the identification of noise events.

Results

Automated Noise Monitoring

- 5.7 The results of the automated noise measurements are shown on the graphs presented in the following Figures 5.2 and 5.3 below and overleaf, with full resolution graphs presented in Appendix B.

Figure 5.2: Noise Monitoring Time History Graph Position A1

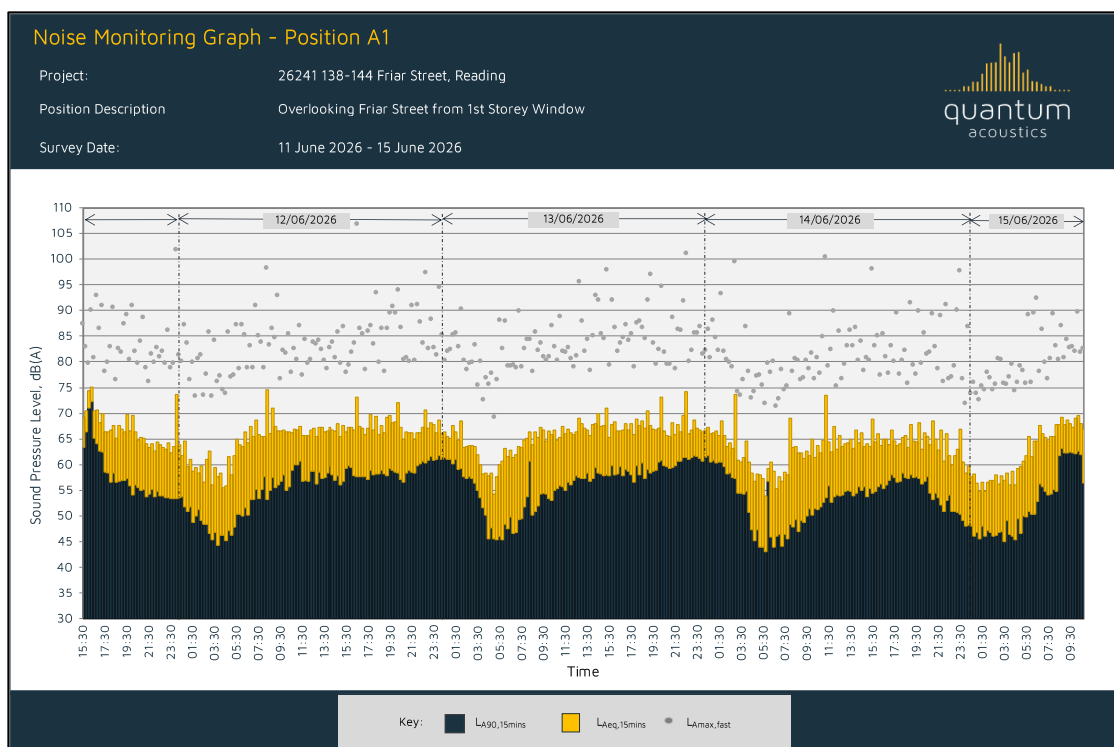
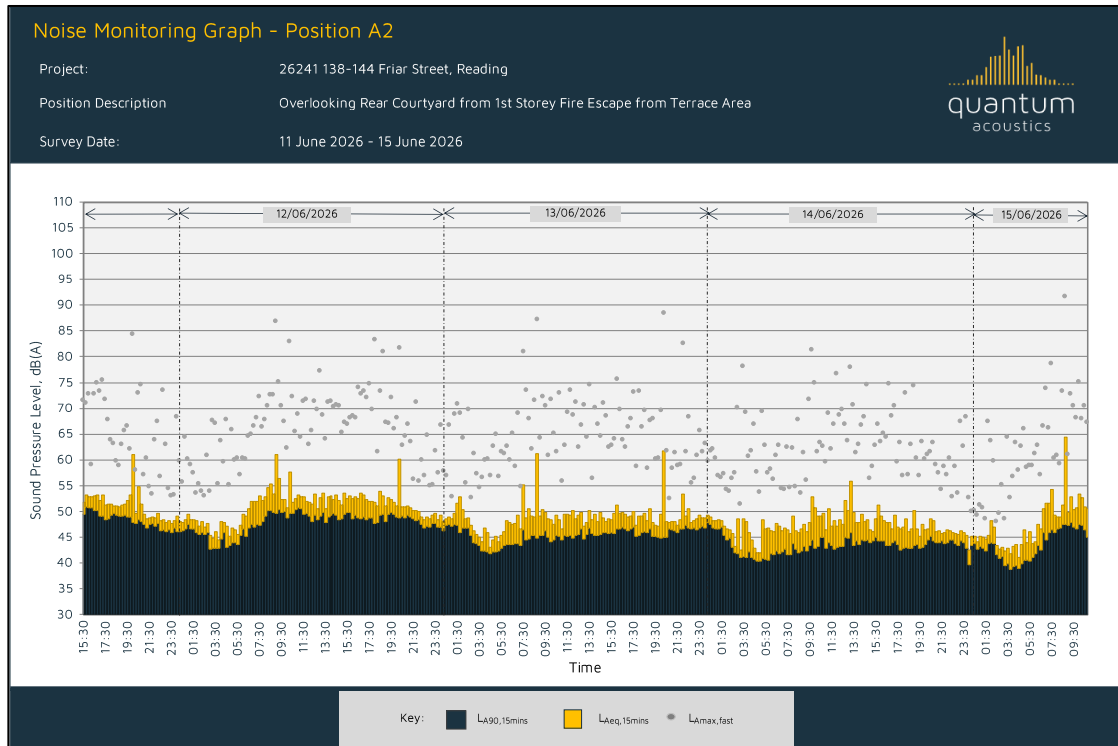


Figure 5.3: Noise Monitoring Time History Graph Position A2



Weather

- 5.8 Whilst weather conditions during the survey were not actively measured, weather conditions during the survey period were generally dry and clear with low winds and therefore suitable for the measurement of environmental noise. Cloud cover was 100% at set up and 20% at collection. Publicly available historic weather data for the survey periods indicates the following typical conditions:

Table 5.3: Summary of Weather Conditions

11 June 2026	12 June 2026
Temperature: 11 to 17°C Pressure: 1016 – 1017 hPa Humidity: 86 – 90% Average wind speed: 3 m/s Average wind direction: SW Precipitation: 0.1mm	Temperature: 12 to 20°C Pressure: 1018 – 1021 hPa Humidity range: 69 – 92% Average wind speed: 3-4 m/s Average wind direction: SW Precipitation: 0mm
13 June 2026	14 June 2026
Temperature: 11 to 21°C Pressure: 1021 – 1022 hPa Humidity: 46 – 92% Average wind speed: 2 m/s Average wind direction: W Precipitation: 0mm	Temperature: 7 to 20°C Pressure: 1018 – 1022 hPa Humidity range: 53 – 86% Average wind speed: 1 m/s Average wind direction: NW Precipitation: 0.1mm
15 June 2026	
Temperature: 12 to 20°C Pressure: 1015 – 1017 hPa Humidity: 76 – 86% Average wind speed: <1 m/s Average wind direction: E Precipitation: 0mm	

Discussion

- 5.9 Noise levels across the site were dominated by road traffic noise whilst Quantum Acoustics personnel were on site. During late night hours, music noise would be audible from nearby bar/night-club venues.
- 5.10 At the front of the site, road traffic including busses stopping and pulling away from a bus stop dominated noise levels as well as noise from people passing by on the street, which

would occur at all hours of the day and night due to the vibrant late-night economy in the vicinity of the site.

- 5.11 At the rear of the site, plant noise would potentially be audible, although was not noted whilst on site despite being visible, as well as occasional local vehicular movements and deliveries within the courtyard. As there is no evidence of plant noise being dominant, it will be treated as a part of the ambient and background noise climate in line with normal acoustic procedures.

Data Analysis

- 5.12 The measurement results from the automated surveys have been averaged to determine typical daytime ($L_{Aeq,16\text{ hour}}$) and night-time ($L_{Aeq, 8\text{ hour}}$ and $L_{Amax,fast}$) sound levels.
- 5.13 In respect of the $L_{Amax,fast}$ noise levels, the time history has been re-analysed in order to provide the L_{Amax} for every 1 minute at night. The 10th highest $L_{Amax,1min}$ across all nights of measurements has then been determined, and a representative value selected from all nights to establish a “typical 10th highest $L_{Amax,1min}$ ” for the purposes of assessment.
- 5.14 The results of this analysis are summarised in the following Table 5.4.

Table 5.4: Summary of Measured Noise Levels

Position	Daytime $L_{Aeq,16\text{ hour}}$ (dB) (07:00 – 23:00)	Night-time $L_{Aeq,8\text{ hour}}$ (dB) (23:00 – 07:00)	Night-time $L_{Amax,fast}$ (dB) (23:00 – 07:00)
A1	67	64	85
A2	52	47	64

Octave Band Data

- 5.15 In order to determine the impact of music noise at the site, the noise level data has been analysed in octave bands.
- 5.16 The audibility of low frequency noise at the site is demonstrated in the below Figures 5.4 and 5.5 for position A1 and A2 respectively. The graphs interpose a time history of the measured L_{Aeq} noise level with the time history of the measured 63 Hz octave band noise level. A clear raised section of 63 Hz octave band noise can be identified between

approximately 23:00 and 02:00 hours on the Thursday, Friday and Saturday nights of measurements, corresponding with typical night club opening hours.

Full resolution graphs are presented in Appendix B.

Figure 5.4: L_{Aeq} and 63 HZ L_{eq} Comparison Graph Position A1

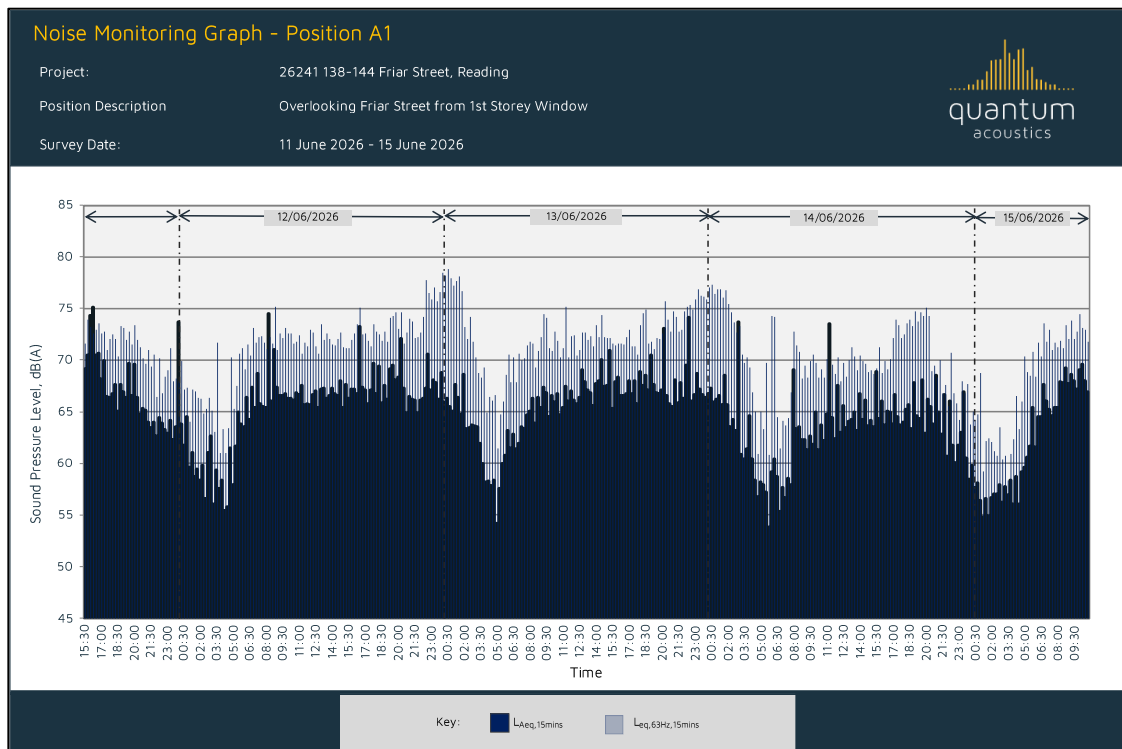
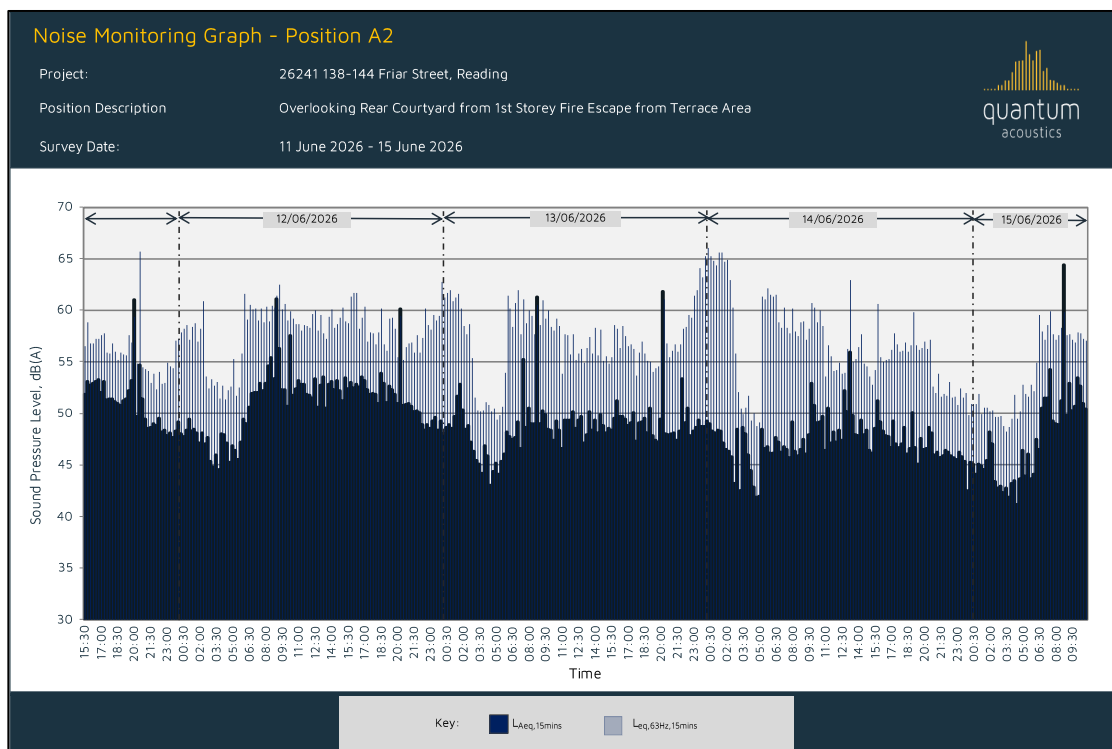


Figure 5.5: L_{Aeq} and 63 HZ L_{eq} Comparison Graph Position A2

- 5.17 A logarithmic average 15 minute daytime (07:00 – 23:00 hours) and night-time (23:00 – 07:00 hours) octave band noise L_{eq} levels are presented in Table 5.6 overleaf. In order to ensure that the worst-case period for low frequency music noise is predicted against, the night-time period truncated to 23:00 – 02:00 hours has also been presented.

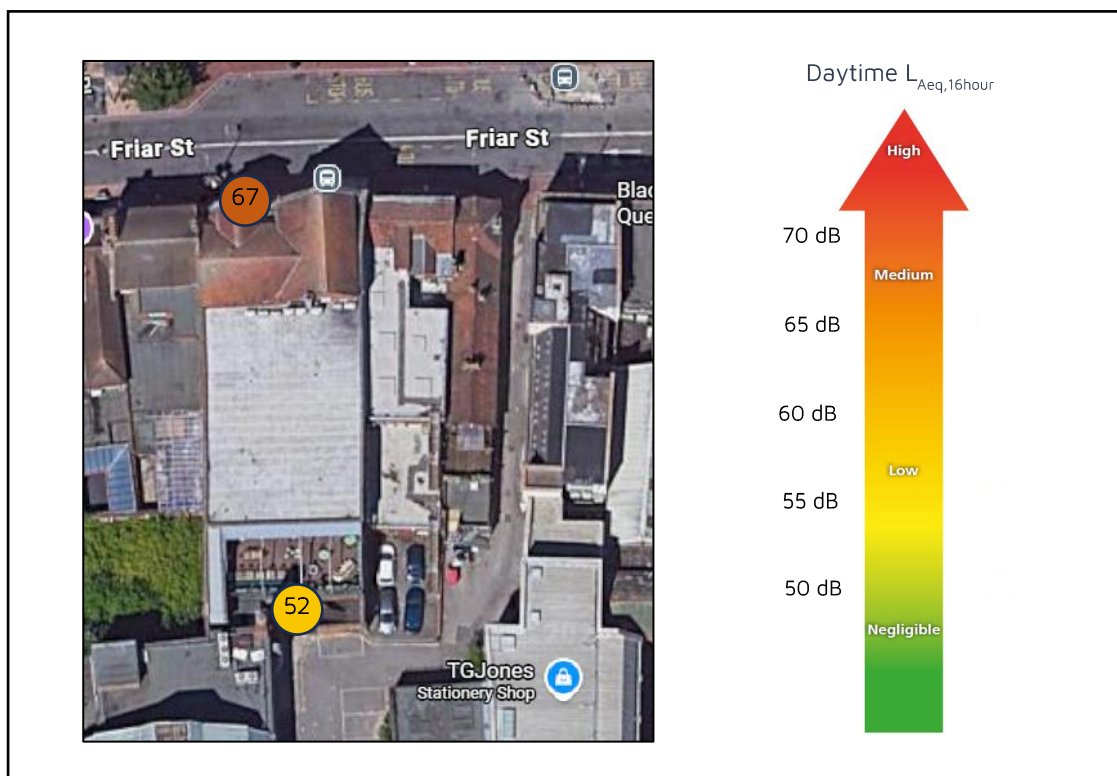
Table 5.5: Summary of Measured Octave Band Noise Levels

Position	Time Period	Measured Noise Level Leq (dB) by Octave Band (Hz)							
		63	125	250	500	1000	2000	4000	8000
A1	Daytime L _{Aeq,16hour}	72	68	66	63	62	60	57	51
	Night-time L _{Aeq,8hour}	72	65	61	60	59	57	53	46
A2	Daytime L _{Aeq,16hour}	58	55	55	49	46	41	35	28
	Night-time L _{Aeq,8hour}	59	51	49	44	42	37	32	25
A1	Night-time 23:00 – 02:00 L _{Aeq,3hour}	74	67	62	62	61	58	54	48
A2	Night-time 23:00 – 02:00 L _{Aeq,3hour}	61	52	50	45	43	38	30	24

6.0 INITIAL SITE NOISE RISK ASSESSMENT

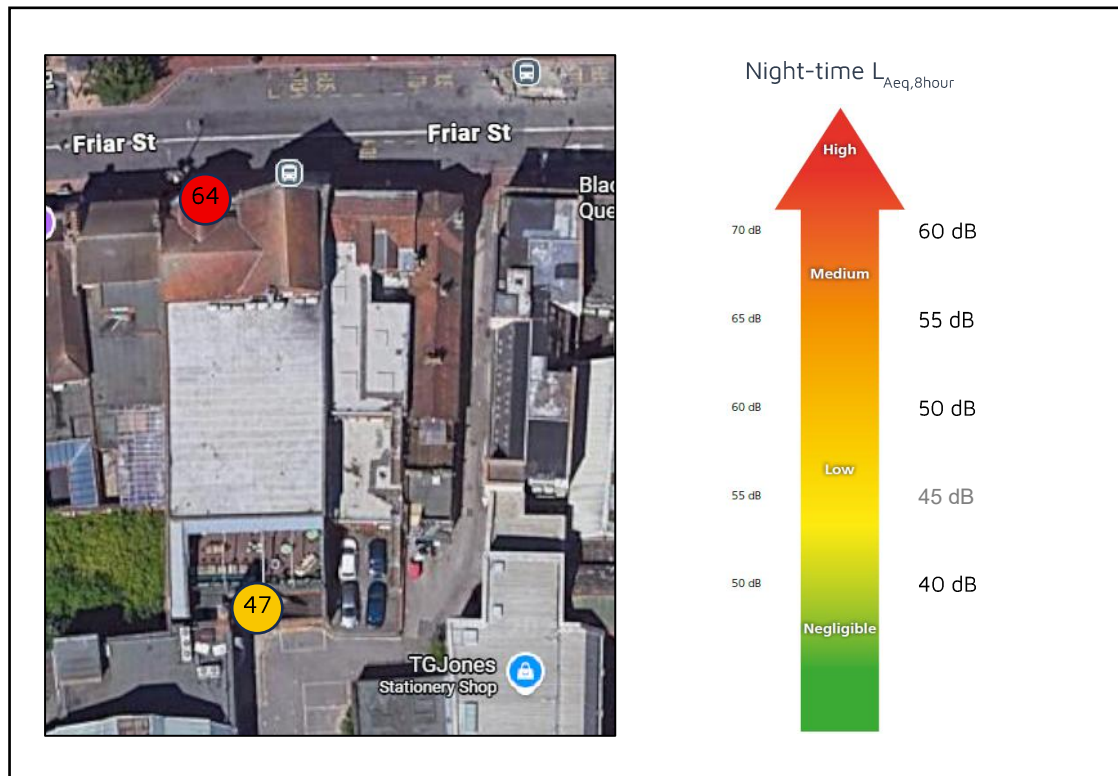
- 6.1 Based on the data collected from the site noise survey (results presented in section 5.0 above), the following ProPG Stage 1 assessment can be made.
- 6.2 For presentation purposes the measured noise levels at all locations have been plotted against the site and addressed in accordance with the ProPG "stage 1 Initial Site Noise Risk Assessment" guidance.
- 6.3 Figure 6.1 and Figure 6.2 below and overleaf present an initial risk assessment of daytime noise

Figure 6.1: Initial ProPG Daytime Noise Risk Assessment



- 6.4 Figure 6.1 identifies that the front of the risk has a *medium* risk in of noise during the daytime and the rear of the site has a *low* risk in terms of noise during the daytime.

Figure 6.2: Initial ProPG Daytime Noise Risk Assessment



6.5 Figure 6.2 identifies that the front of the risk has a *high* risk in of noise at night and the rear of the site has a *low* risk in terms of noise at night.

6.6 For “*low*” sites, the ProPG states:

“At low noise levels, the site it likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an Acoustic Design Statement (ADS) which confirms how the adverse impacts on noise will be mitigated and minimised in the finished development.”

6.7 For “*medium*” risk sites, ProPG states:

“As noise levels increase, the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised, and which clearly demonstrate that a significant adverse noise impacts will be avoided in the finished development.”

6.8 ProPG also advises in respect of “*high*” noise risk sites:

“High noise levels indicate that there is an increased risk that development may be refused on noise grounds. This risk may be reduced by following a good acoustic design process that is demonstrated in a detailed ADS. Applicants are strongly advised to seek expert advice.”

6.9 In light of the above, it is clear that careful consideration will need to be given to noise mitigation of the site. A more detailed consideration of noise impacts for the site and potential mitigation strategies, in line with a ProPG “Stage 2” assessment (which constitutes an Acoustic Design Statement) is required.

6.10 A ProPG Stage 2 “Full Assessment” requires consideration of four key elements:

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

7.0 ELEMENT 1: GOOD ACOUSTIC DESIGN

General

7.1 ProPG references a preferred hierarchy of strategies that represent a “good acoustic design process”. These include the following:

- Reducing noise “at source” and or relocating the noise source;
- Providing “buffer” zones to maximise the spatial separation between noise source and receiver locations;
- Reducing noise propagation across the site by introducing acoustic screening (e.g. barriers, earth bunds, etc.);
- Optimise the acoustic screening provided by the proposed development by creating “barrier” blocks to reduce the noise propagation across the site and may assist in protecting external amenity areas;
- Optimising the orientation and internal layout of buildings to help minimise the noise exposure of noise sensitive rooms (for example, by positioning non-habitable rooms on elevations with a greater noise risk and noise sensitive rooms on quieter elevations);
- Designing the building envelope to mitigate noise intrusion; and
- Designing an appropriate strategy for minimising noise intrusion under all building ventilation modes (including the control of summertime overheating).

“At Source” Noise Reduction

7.2 As noted previously, the dominant noise source affecting the site is road traffic noise from Friar Street, late-night music and pedestrian noise. These noise sources cannot be “removed” or “relocated” and any scope to provide “at source” mitigation (e.g. through the use of “low noise” road surface or a reduction of speed limit of the roads, or reduction in noise breakout from nearby bars) would not fall within the control of the developer. As such, there are no practicable options for providing “at source” noise control.

Buffer Zones

7.3 It is simple to appreciate that increasing the separation between a sound source and a noise sensitive receptor will reduce incident noise levels. However, relying entirely on distance to

reduce noise levels can result in an inefficient use of land, contrary to other planning policy requirements and is not considered an appropriate strategy for this site.

Acoustic Screening / Barrier Blocks

- 7.4 Acoustic screens (such as bespoke noise barriers, earth bunds or fencing) can assist in minimising noise. The amount of acoustic “screening” provided by constructions is broadly determined by the simple geometric relationship of the source and receiver locations, i.e., the greater the distance that sound will need to travel “around” a screen, the greater the potential sound reduction.
- 7.5 However, whilst barriers can be utilised to achieve helpful sound reduction, providing a barrier that can obviate the line of sight between a medium rise development and adjoining road or other noise source is not practicable, i.e. barrier heights necessary to deliver acoustic screening on the upper floors are excessive. This not only raises practical issues but would also represent a significant aesthetic constraint unlikely to be acceptable from an urban town planning perspective.

Building Orientation / Internal Arrangements

- 7.6 At ground floor level a co-working area and games lounge front Friar Street, with communal facilities and residences to the rear of the building. Additionally, there is an external amenity area located at the rear of the site well screened from Friar Street.
- 7.7 Accordingly, at ground floor level the internal layout has been considered in respect of orientation to the main noise source.
- 7.8 On upper floors, 8 studio rooms on each floor face directly onto Friar Street, however the vast majority of studio rooms are located facing the rear or side of the site, well screened from the worst effects of noise from Friar Street.
- 7.9 Accordingly, the number of habitable rooms exposed to excessive noise from Friar Street has been minimised by the building orientation and internal layout arrangements.

Sound Insulation

- 7.10 Any residual sound insulation necessary to achieve appropriate internal sound levels can be delivered through the appropriate specification of the external fabric of the buildings and

acoustically appropriate forms of ventilation. More detailed acoustic performance recommendations for controlling noise intrusion are addressed in Section 9 of this report.

Conclusions

- 7.11 It is concluded that the proposed site layout follows a good acoustic design process and can embed mitigation to help minimise noise impacts, in line with the spirit of ProPG, the NPPF, NPSE, PPG, adopted and emerging local planning policy.

8.0 ELEMENT 2 – INDOOR AMBIENT NOISE LEVELS

Internal Acoustic Design Recommendations for Dwellings

- 8.1 Figure 2 in the ProPG outlines the following internal acoustic design recommendations for dwellings:

Table 8.1: ProPG Indoor Ambient Noise Level Design Guidance

Activity	Location	Daytime (07.00 to 23.00 hours)	Night-time (23.00 to 07.00 hours)
Resting	Living Room	35dB $L_{Aeq,16hour}$	--
Dining	Dining Room/Area	40dB $L_{Aeq,16hour}$	--
Sleeping	Bedroom	35dB $L_{Aeq,16hour}$	30dB $L_{Aeq,8hour}$ 45 dB $L_{Amax,F}$ (Note 4)

- 8.2 The above values are taken to be "*Lowest Observed Adverse Effect Levels*" in line with national planning practice guidance.
- 8.3 Additionally, in accordance with Council requirements due to incident music noise, 63 Hz and 125 Hz octave band L_{eq} levels should not exceed the levels presented in Table 8.2 below.

Table 8.2: Noise Criteria from Music Noise

Time of Day	L_{eq} (dB) in Octave Bands Centre Frequency (Hz) from Music Noise	
	63	125
Daytime (07:00 – 23:00 hours), derived from NR25	55.2	43.7
Night-time (23:00 – 07:00 hours), derived from NR20	51.3	39.4

Sound Insulation Requirements for Façades

- 8.4 The required level of sound insulation for a building's façade to achieve the above design targets is determined by:
- The noise levels affecting specific areas of the façade, with higher insulation needed for units facing noisy sources like roads.
 - The sound insulation properties of building elements, such as windows in masonry walls.
 - The proportion of different building elements; larger façades require more insulation.
 - The acoustics of the receiving room, with harder (reverberant) rooms needing more insulation.
- 8.5 Based on the measured incident noise levels, initial detailed calculations have been undertaken to determine the sound reduction performance requirements for windows in order to achieve the identified noise criteria for internal L_{Aeq} levels and internal low frequency noise levels. Acoustic specifications of assumed building elements are presented in Table 8.3 below and detailed calculation sheets are presented in Appendix C.

Table 8.3: Noise Reduction for External Façade Elements [dB]

Façade Element	Noise Reduction (dB) by Octave Band (Hz)							
	63	125	250	500	1000	2000	4000	8000
Wall (100mm brick with insulated steel frame)	41	50	52	55	55	55	55	55
Front Façade Glazing – (10/16/16.8 glazing, R_w 45 dB, Ctr -5 dB.)	29	31	38	43	44	50	55	55
Side and Rear Façade Glazing – (4/16/6 glazing, R_w 34 dB, Ctr -5 dB.)	22	24	21	29	43	43	45	45

- 8.6 The preliminary specifications are based on an assumption that all flats will be ventilated using a mechanical ventilation with heat recovery (MVHR) approach compliant with Approved Document F1 of the Building Regulations 2010 (as amended).
- 8.7 The acoustic performance values are to be achieved in accordance with BS EN ISO 10140-2:2021: *"Acoustics. Laboratory Measurement of Sound Insulation of Building Elements. Measurement of Airborne Sound Insulation."* and BS EN ISO 10140-4:2021: *"Acoustics. Laboratory measurement of sound insulation of building elements. Measurement procedures and requirements"* and rated in accordance with BS EN ISO 717-1: 2020: *"Acoustics. Rating of Sound Insulation in Buildings and of Building Elements – Airborne Sound Insulation"*. The sound reduction index relates to the composite performance of the complete window system including the glass, framing, mullions, transoms, seals, etc.
- 8.8 It is therefore concluded that the proposed development can be readily designed to deliver acceptable indoor noise levels for future residents.
- 8.9 Detailed design calculations should be undertaken during the detailed design stage of the project to finalise acoustic performance specifications for both windows and MVHR systems based on finalised ventilation design and construction drawings.

Purge Ventilation

- 8.10 Approved Document F1 of the Building Regulations 2010 (with amendments) mandates that residential properties must offer adequate "purge" ventilation. Purge ventilation is the process of removing high concentrations of pollutants and water vapour released from occasional activities (such as painting and decorating) or accidental releases (such as smoke from burnt food or spillage of water).
- 8.11 Since the need for purge ventilation is, by its definition "occasional" and of limited duration, this is normally achieved by giving residents the ability to open windows. Whilst noise intrusion may increase as a result of windows being open, any increase in noise levels will arise as a result of occupant choice and it is therefore concluded that any temporary increase in noise levels to deliver purge ventilation in accordance with Approved Document F1 is acceptable and compatible with the guidance of ProPG, BS 8233:2014 and ADF.

Thermal Comfort

- 8.12 The proposed dwellings will also need to implement appropriate strategies to address any potential for habitable rooms overheating during the summer. From a sustainability point of view, the preferred means of providing thermal control of the properties is through the use of openable windows to provide passive, ventilative cooling. It is, however, simple to appreciate that future occupants will experience increased noise intrusion when windows are open.

An initial "Level 1" assessment in accordance with the IOA/ANC's AVOG guidance is presented in Figure 8.1 and

- 8.13 Figure 8.2:

Figure 8.1: Daytime Initial AVOG Noise Risk Assessment

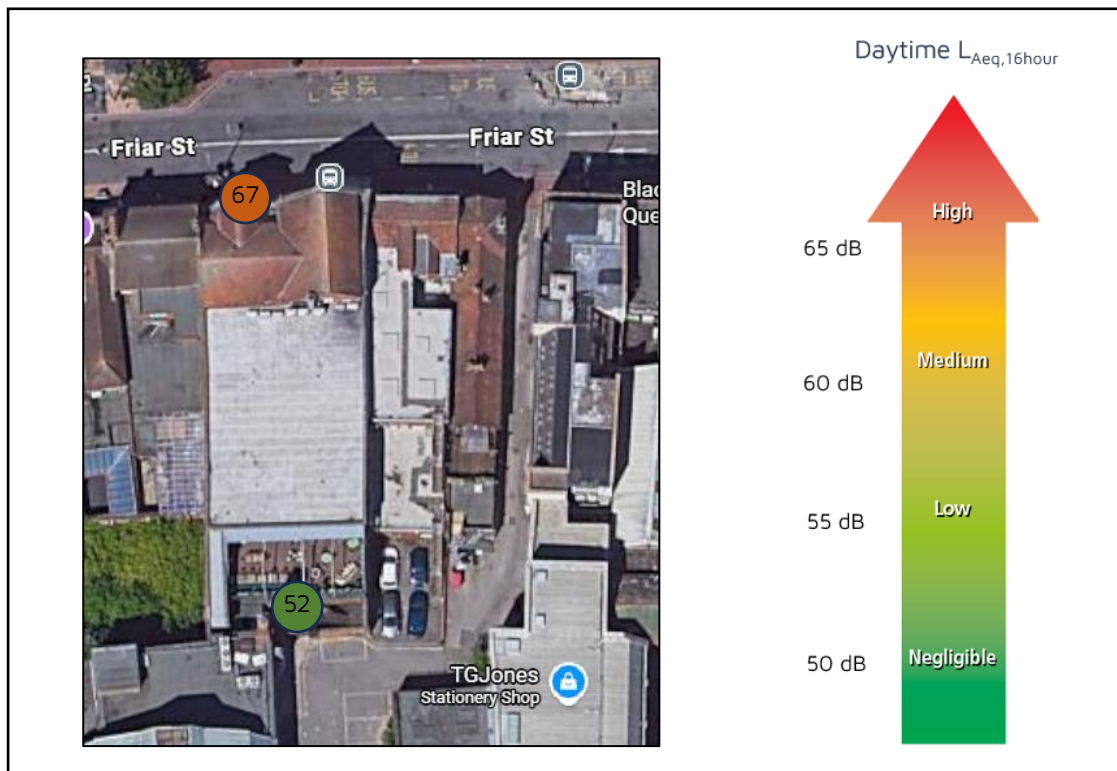
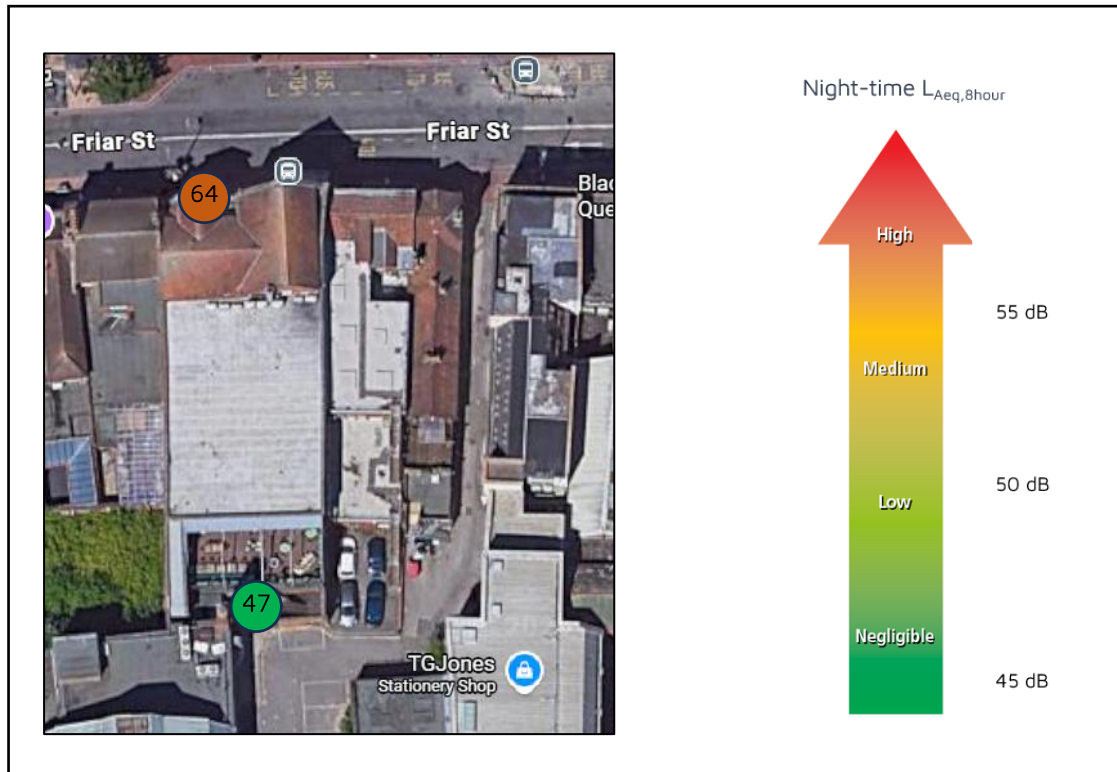


Figure 8.2: Night-time Initial AVOG Noise Risk Assessment



- 8.14 This initial Stage 1 assessment generally indicates a *high* risk in terms of noise during the daytime and at night at the front of the site. The assessment also identifies a *negligible* to *low* noise risk for both the daytime and night-time periods at the rear of the site.
- 8.15 The control of noise during overheating is a matter also now statutorily controlled by Approved Documents O of the Building Regulations 2010, as amended.
- 8.16 Requirement O1 of Approved Document O (ADO) of the Building Regulations is due take effect from 15 June 2022 requires:

"(1) Reasonable provision must be made in respect of a dwelling, institution or any other building containing one or more rooms for residential purposes, other than a room in a hotel ("residences") to –

(a) limit unwanted solar gains in summer;

(b) provide an adequate means to remove heat from the indoor environment.

(2) In meeting the obligations in paragraph (1) –

(a) account must be taken of the safety of any occupant, and their reasonable enjoyment of the residence; and

(b) mechanical cooling may only be used where insufficient heat is capable of being removed from the indoor environment without it."

- 8.17 With regard to the reasonable enjoyment of the residence, paragraphs 3.2 to 3.3 of ADO require night-time noise to be taken into consideration:

3.2 In locations where external noise may be an issue (for example, where the local planning authority considered external noise to be an issue at the planning stage), the overheating mitigation strategy should take account of the likelihood that windows will be closed during sleeping hours (11pm to 7am).

3.3 Windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits. a. 40dB LAeq,T, averaged over 8 hours (between 11pm and 7am). b. 55dB LAFmax, more than 10 times a night (between 11pm and 7am)

- 8.18 It is clear that windows should not be opened on the front façade to mitigate overheating at night.
- 8.19 Additionally, whilst there is a *low* noise risk on the side and rear façades, as the noise climate contains audible low frequency music noise, in accordance with Agent of Change principles to protect the future operation of nearby businesses, it is recommended that open windows are not relied upon to control overheating at night. This will minimise the risk of noise complaints against those businesses as residents would have an alternative to opening windows and therefore letting in the music noise as well as cooler air.
- 8.20 Where thermal control cannot be maintained with closed or partially restricted window openings, allowance could be made for a "peak lopping" MVHR system (which is capable of tempering incoming fresh air to a lower temperature) as an alternative strategy for removing excess heat, in line with the requirements of Approved Document O of the Building Regulations 2010 (as amended).
- 8.21 It is important that the MVHR systems are appropriately designed to minimise noise. To that end, it is recommended that mechanical services systems are designed in line with the following indoor ambient noise levels.

Table 8.4: Indoor Ambient Noise Levels from Mechanical Services

Room	Internal Noise Level for ADF Whole Dwelling and Extract Ventilation, $L_{Aeq,T}$ dB	Internal Noise Level for Overheating Condition, $L_{Aeq,T}$ dB
Bedroom	≤ 26 dB	30 (± 5)
Living / Dining Room	≤ 30 dB	35 (± 5)

Conclusion

- 8.22 It is concluded that the proposed development can be designed to deliver acceptable indoor noise levels for future residents, for all modes of ventilation and thermal control.

9.0 ELEMENT 3: EXTERNAL AMENITY AREA NOISE LEVELS

- 9.1 As set out in Section 4 of this report a noise level of 50 dB $L_{Aeq,16hour}$ is a desirable target for noise in external amenity areas, with 55 dB $L_{Aeq,16hour}$ suggested as an upper target in ProPG/8233:2014.
- 9.2 The proposed development provides an external communal amenity space at the rear of the site at ground floor level. Given the screening provided by the massing of the building, noise levels in this amenity space should comply fully with the aspirational sound level outlined in ProPG/BS 8233.

Conclusion

- 9.3 It is therefore concluded that the Proposed Development embeds appropriate design strategies for providing access to good quality external amenity space for future residents.

10.0 ELEMENT 4: OTHER CONSIDERATIONS

Planning Policy Compliance

- 10.1 The conclusions of Elements 1 to 3 show that the development implements "good acoustic design" and both internal and external noise levels can be readily controlled in line with ProPG guidance.
- 10.2 The mitigation embedded within the site layout and any residual mitigation that will be developed at detailed design should not create a risk of any unintended adverse consequences for future residents the proposed development is therefore considered to comply fully with relevant national and local planning policy.

Compatibility With Neighbouring Land

- 10.3 As noted in earlier sections, the proposed flats will be provided with MVHR and an alternative strategy for the removal of excess heat, such that acceptable internal ventilation, noise and thermal control can be maintained without the need for windows to be opened.
- 10.4 The implementation of the above enhanced mitigation could be secured and enforced through the imposition of a suitably worded planning condition requiring such mitigation is provided prior to the occupation of the flats.
- 10.5 The above approach is fully compliant with Governmental Planning Practice Guidance and the particular requirement of paragraph 200 of the NPPF which states:

"Where a new noise sensitive receptor is introduced and there is extant industrial and/or commercial sound, it should be recommended that the industrial and/or commercial sound forms a component of the acoustic environment. In such circumstances other guidance and criteria in addition to or alternative to this standard can also inform the appropriateness of both introducing a new noise-sensitive receptor and the extent of mitigation required";

- 10.6 In light of the above, it is concluded that whilst the future operation of the bars and night-clubs essential for the night-time economy in the vicinity of Friar Street could have a noise impact on the site if it remained in use following the construction of the development, additional mitigation has been provided within the scheme design proposals to avoid any significant effect and that the "agent of change" obligation created by paragraph 200 of the NPPF.

Recommendation to Decision Maker

10.7 Section 3 of ProPG identifies that following the Stage 1 and 2 guidance will lead to one of four possible recommendations from the noise practitioner to the decision maker:

- A. Planning consent may be granted without any need for noise conditions;
- B. Planning consent may be granted subject to the inclusion of suitable noise conditions;
- C. Planning consent should be refused on noise grounds in order to avoid significant adverse effects ("avoid"); or
- D. Planning consent should be refused on noise grounds in order to prevent unacceptable adverse effects ("prevent").

10.8 The ProPG Stage 1 assessment demonstrates that the Site has a "negligible" to "low" to noise risk. The Stage 2 assessments confirm that good acoustic design is implemented within the outline scheme proposals and that additional mitigation can be developed at during the detailed design stage of the development. As such, the appropriate recommendation to the decision maker is that:

"Planning consent may be granted subject to the inclusion of suitable noise conditions"

11.0 PLANT NOISE EMISSIONS

- 11.1 At the time of preparing this assessment, detailed information relating to proposed building services plant is not available. Notwithstanding this, the Local Planning Authority can retain full control over the development through the use of an operative planning condition (e.g. specifying plant noise emission limits) and/or a pre-commencement condition which requires the submission of plant details and attendant noise control provisions to be submitted to and approved by the LPA.
- 11.2 It is understood that RBC's standard requirement for the control of noise from new building services plant installations is controlled by Planning Policy EN17:

"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."

- 11.3 Additionally, it is understood by Quantum Acoustics that whilst the specific level is required to be at least 10 dBA below the existing background sound level, RBC also require that the rating level should not exceed the background sound level when assessed in accordance with BS 4142:2014+A1:2019 (i.e. any acoustic corrections should not exceed +10 dB).
- 11.4 It is noted that the project is also targeting a BREEAM Pol 05 Credit, for which the criteria is for the rating level to not exceed a level that is 5 dB below the existing background sound level (i.e. any acoustic correction should not exceed +5 dB). Accordingly, this will be the applicable criteria in terms of rating level.
- 11.5 To determine the typical background sound level, the noise measurements from Position A2 (at the rear of the site) have been analysed as the noise levels in that location are likely to drive the criteria.
- 11.6 An analysis of the typical daytime (07:00 – 23:00 hours) and night-time (23:00 – 07:00 hours) are presented in Figures 11.1 and 11.2 overleaf respectively.

Figure 11.1: Typical Background Noise Level Analysis - Daytime

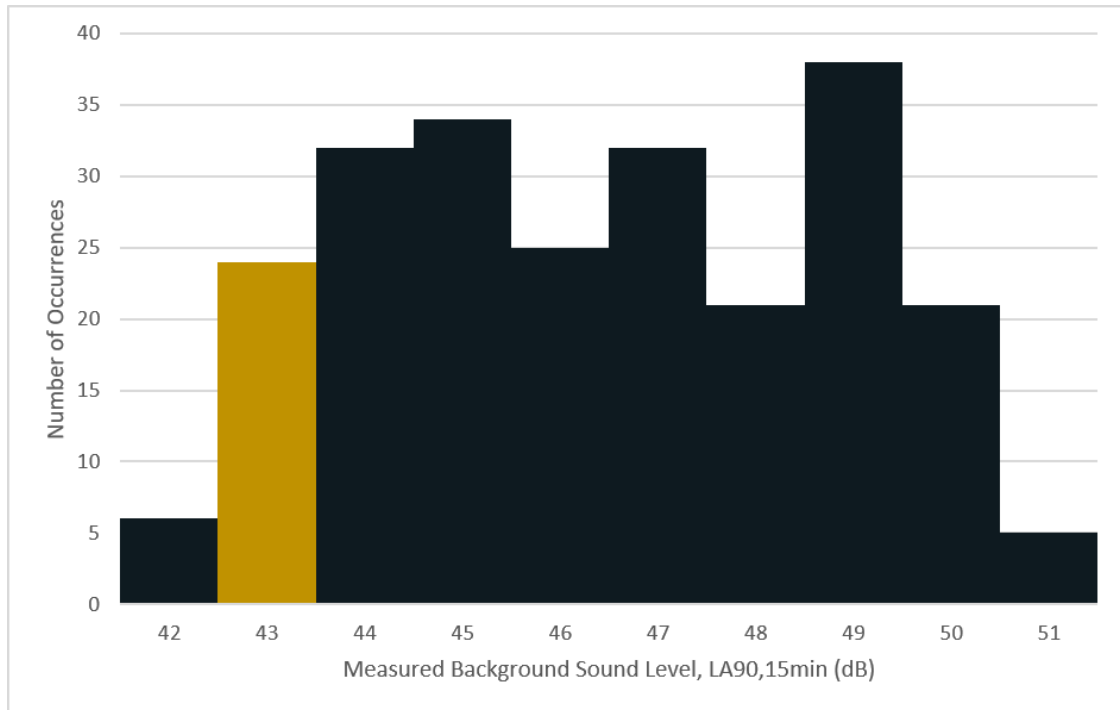
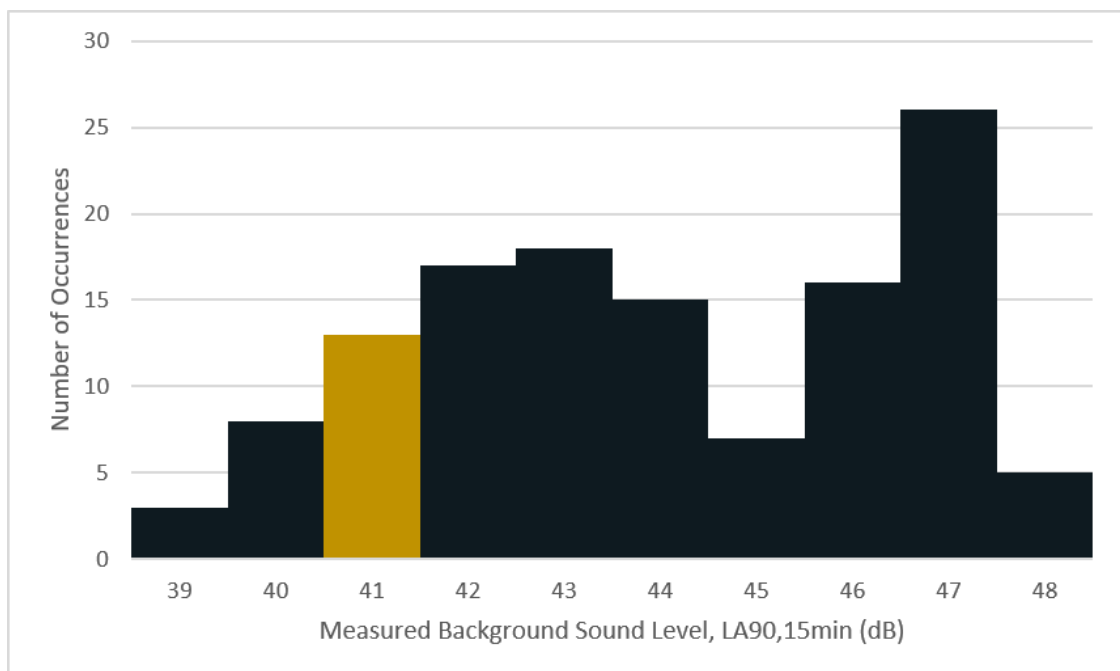


Figure 11.2: Typical Background Noise Level Analysis - Night-time



- 11.7 In order to deliver the above design criteria, the following noise emission criteria are recommended, as summarised in Table 11.3 below:

Table 11.3: Plant Noise Emission Criteria

Plant Noise Metric	Daytime Operation (07.00 to 23.00) Rating Level, $L_{A,T}$ dB	Night-time Operation (23.00 to 07.00) Rating Level, $L_{A,T}$ dB
Specific Sound Level	33	31
Rating Level	38	36

- 11.8 The above targets should be achieved at a distance of 1m from the nearest window of any adjoining noise sensitive property with all plant operating normally.
- 11.9 Specific noise control requirements necessary to deliver the above design targets will need to be assessed during the detailed design phase of the project once specific plant selections have been made.

Conclusions

- 11.10 Adoption of the environmental acoustic design targets set out above should ensure that building services installations associated with the proposed development scheme will not have an adverse noise impact on existing adjoining dwellings in the vicinity of the site. As such, the proposed development is considered to comply fully with local and national planning policy guidance.
- 11.11 No site specific or technological difficulties are envisaged with regard to the feasibility of complying with the above design targets. However, if considered necessary, the control of building services noise emissions can be readily enforced by means of an appropriate Planning Condition.

12.0 CONCLUSIONS

- 12.1 Quantum Acoustics has undertaken an environmental noise survey to establish the existing noise levels characterising the proposed development site. The noise survey work concludes that the site is dominated by road traffic noise including busses stopping and pulling away from a bus stop adjacent to the site during the daytime as well as music noise and noise from people passing the site leaving bars and night-clubs at night. At the rear of the site, music noise is likely to be audible as well as plant noise and occasional delivery noise.
- 12.2 The potential risk of the site has been assessed in line ProPG Stage 1 and Stage 2 assessments.
- 12.3 The Stage 1 assessment concludes that the site has a *medium* noise risk during the daytime and a *high* noise risk at night at the front of the site, with a *low* noise risk during the daytime and night-time at the rear of the site.
- 12.4 The Stage 2 assessment concludes:
- The scheme proposals embed a good acoustic design process to mitigate noise levels;
 - The proposed development can be designed to deliver appropriate internal noise levels for all modes of ventilation;
 - The proposed development embeds appropriate design strategies for providing access to good quality external amenity space;
 - The required mitigation strategies should not create any unintended adverse consequences for future residents the proposed development is therefore considered to comply fully with relevant national and local planning policy; and
 - The operation of nearby bars and night-clubs can be protected in accordance with the Agent of Change principle by careful consideration of low frequency noise break-in. Example specifications to achieve the internal noise level criteria have been provided.
- 12.5 Environmental noise criteria are proposed for controlling noise emissions from proposed building services installations.
- 12.6 It is concluded that the Proposed Development should not raise any residual significant adverse impacts on health and/or quality of life for future occupiers of the Proposed Development or existing neighbouring dwellings, and that the Proposed Development follows an intelligent, design led approach to reduce and minimise noise.

- 12.7 It is also concluded that the Proposed Development can be satisfactorily integrated with existing commercial and community uses.
- 12.8 In light of the above, it is concluded that the proposed development complies fully with noise related national, adopted and emerging local planning policies.

APPENDIX A

Glossary of Acoustic Terminology

General

Vibrations in the air, water or other media cause pressure variations in the surrounding air. These pressure changes are perceived by the human ear as “sound”.

Measurement Units

Given the huge range of pressure fluctuations detectable or tolerated by the human ear, sound is quantified on a logarithmic scale with values expressed in “decibels”. Values are based on a reference sound pressure level of 20µPa, thus a sound pressure of 20µPa would equate to 0dB and a pressure of 200Pa would equate to 140dB.

Frequency

The number of cycles or vibrations per second, measured in Hertz (Hz). Higher frequencies are perceived as higher-pitched. Noise audible to the human ear typically covers a frequency range of 20Hz to 20,000Hz.

A-Weighting

The human ear is typically more sensitive to sound in towards the middle of the audible range and less sensitive to lower and higher frequencies. In order to take account of these differences, a frequency weighting is often applied to the sound measurement which adjusts the measurement value to reflect the way the human ear will perceive the sound. The use of “A-weighting” therefore gives a measure of subjective “loudness”. A-weighted sound levels are expressed in dB(A).

Comparison of Sound Levels

The subjective perception of sound is illustrated by reference to various relatable noise sources below:

Sound Pressure Level, dB(A)	Typical Noise Source
160	Space rocket taking off
140	Military jet taking off (at 30m)
100	Dancefloor of nightclub
90	Heavy goods vehicle driving past
80	Busy urban road
70	Vacuum cleaner
60	Busy office
55	Normal speech at 1m
40	Whispered conversation at 2m
30	Bedroom at night (BS 8233: 2014)
20	Remote country location
0	Threshold of hearing

Variation of Sound with Time

The magnitude of most sounds varies with time. Environmental noise is normally measured with a “fast” time weighting which best replicates the way sound fluctuations are perceived.

Acoustic Terminology

A number of noise metrics are routinely used to assist in characterising a noise environment. These include:

- L_{90} is the noise levels that is exceeded for 90% of the measurement period. It reflects the quiet periods during that time and is often referred to as the "background noise level". It is often used as a basis for setting noise emission criteria. The A-weighted value over time period (T) is written as $LA_{90,T}$.
- L_{eq} is the level of a notional continuous sound that would deliver the same sound energy as the actual fluctuating sound over the measurement period. This may be thought of as the "average" level during the measurement period. The A-weighted value over time period (T) is written as $LA_{90,T}$.
- L_{max} is the maximum noise level during the measurement period. For environmental noise purposes, L_{max} values are normally measured with a "fast" time response. The A-weighted value is then reported as $L_{Amax,fast}$ (or $L_{Amax,F}$)

Addition of Sound Levels

The use of a logarithmic scale does not allow the simple arithmetic addition of sound levels – they need to be added logarithmically. This means that two noise sources, each generating a sound level of 50dB(A) will generate a combined sound level of 53dB(A) – not 100dB(A),

Subjective Perception of Sound Level Changes

Subjectively, the human ear:

- Cannot perceive a sound level change of less than 3dB(A);
- Will perceive a sound level change of 4-5dB(A) as "noticeable";
- Will perceive a sound level change of 10dB(A) as a doubling (or halving) of loudness

Sound Insulation

The sound insulation performance of building constructions can be described using a number of metrics:

- R_w is the "weighted sound reduction index" and is an intrinsic measure of the sound reduction capabilities of a construction measured in an acoustics laboratory.
- D_w is the "weighted sound level difference". This is a measured of the in-situ performance of a construction, as installed in a building.
- $D_{nT,w} + C_{tr}$ is a weighted sound level difference to which further corrections (standardisation and the addition of "+ C_{tr} " correction). This descriptor forms the basis of the airborne sound insulation performance requirements of Approved Document E of the Building Regulations 2010 (as amended).
- $L'_{nT,w}$ is the standardised impact sound pressure level and forms the basis of the impact sound insulation performance requirements of Approved Document E of the Building Regulations 2010 (as amended).

Reverberation Time

This is the time taken for sound in a room to decay by 60dB. Reverberation times are lower in smaller rooms with lots of soft furnishings, and longer in large rooms with hard finishes.

Noise Rating Level

As an alternative to expressing a sound level in dB(A), noise from some sources (e.g. building services system) are quantified in terms of a Noise Rating (NR) level. This is achieved by comparing the frequency content of the sound against a series of curves defined in Annex A of BS 8233: 2014.

Appendix B

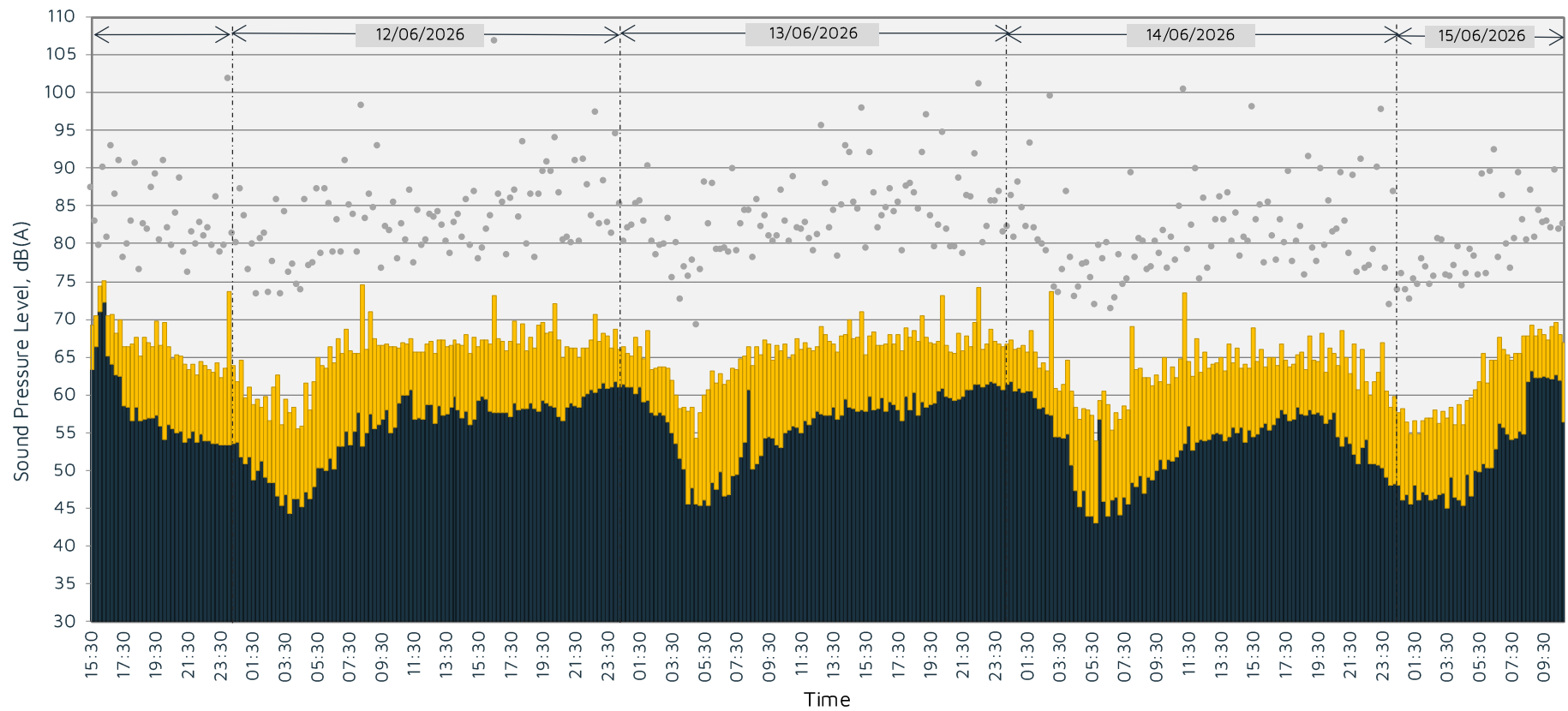
Noise Measurement Graphs

Noise Monitoring Graph - Position A1

Project: 26241 138-144 Friar Street, Reading

Position Description: Overlooking Friar Street from 1st Storey Window

Survey Date: 11 June 2026 - 15 June 2026



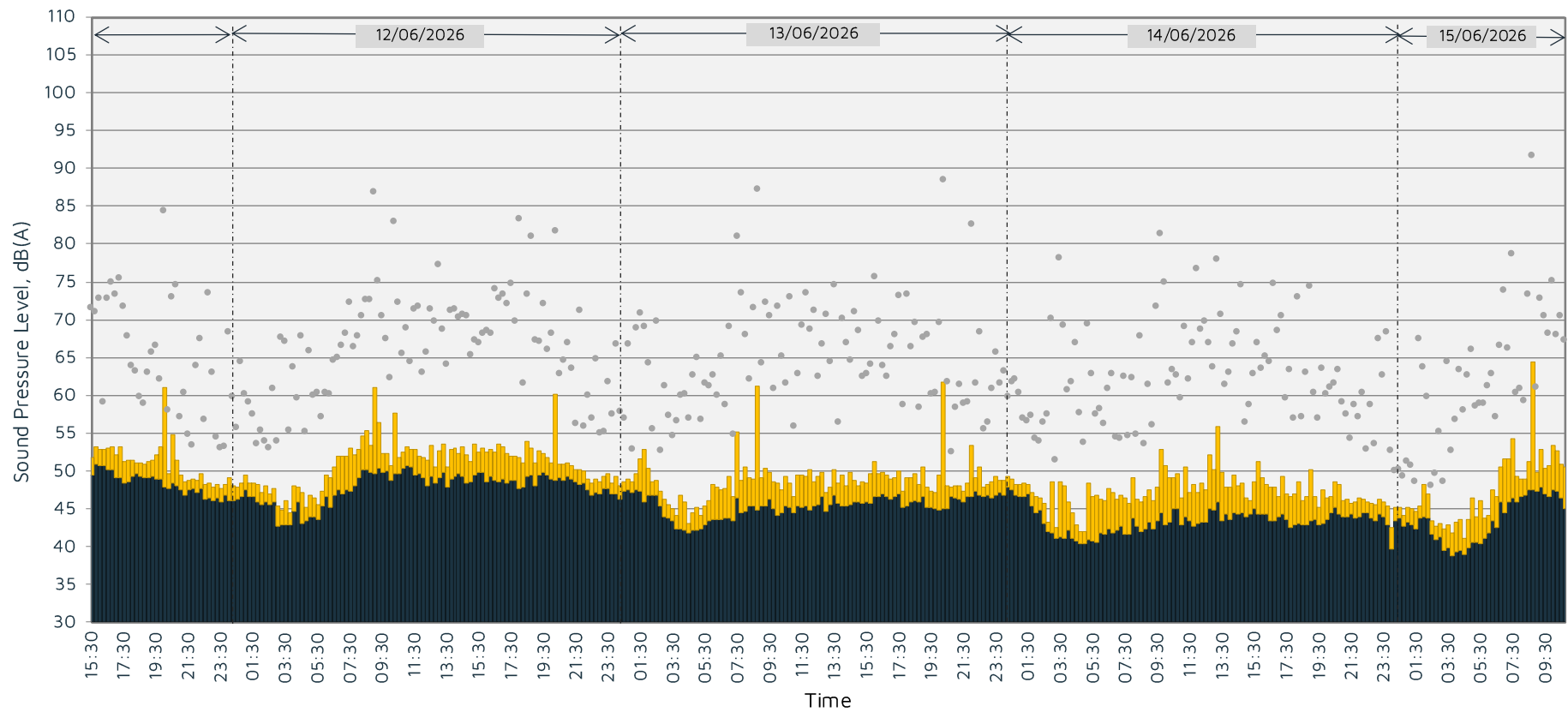
Key: L_{A90,15mins} L_{Aeq,15mins} L_{Amax,fast}

Noise Monitoring Graph - Position A2

Project: 26241 138-144 Friar Street, Reading

Position Description: Overlooking Rear Courtyard from 1st Storey Fire Escape from Terrace Area

Survey Date: 11 June 2026 - 15 June 2026



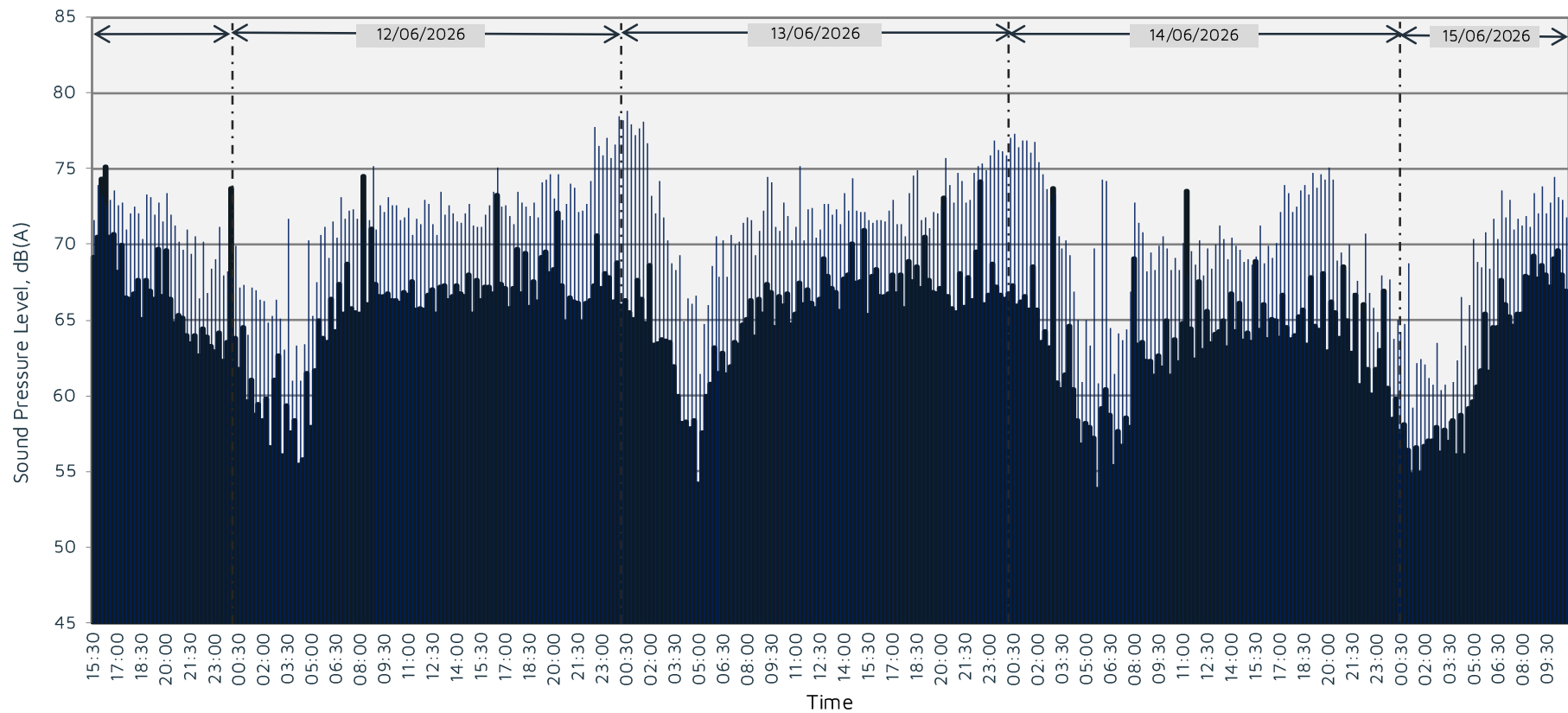
Key: $L_{A90,15mins}$ $L_{Aeq,15mins}$ $L_{Amax,fast}$

Noise Monitoring Graph - Position A1

Project: 26241 138-144 Friar Street, Reading

Position Description: Overlooking Friar Street from 1st Storey Window

Survey Date: 11 June 2026 - 15 June 2026



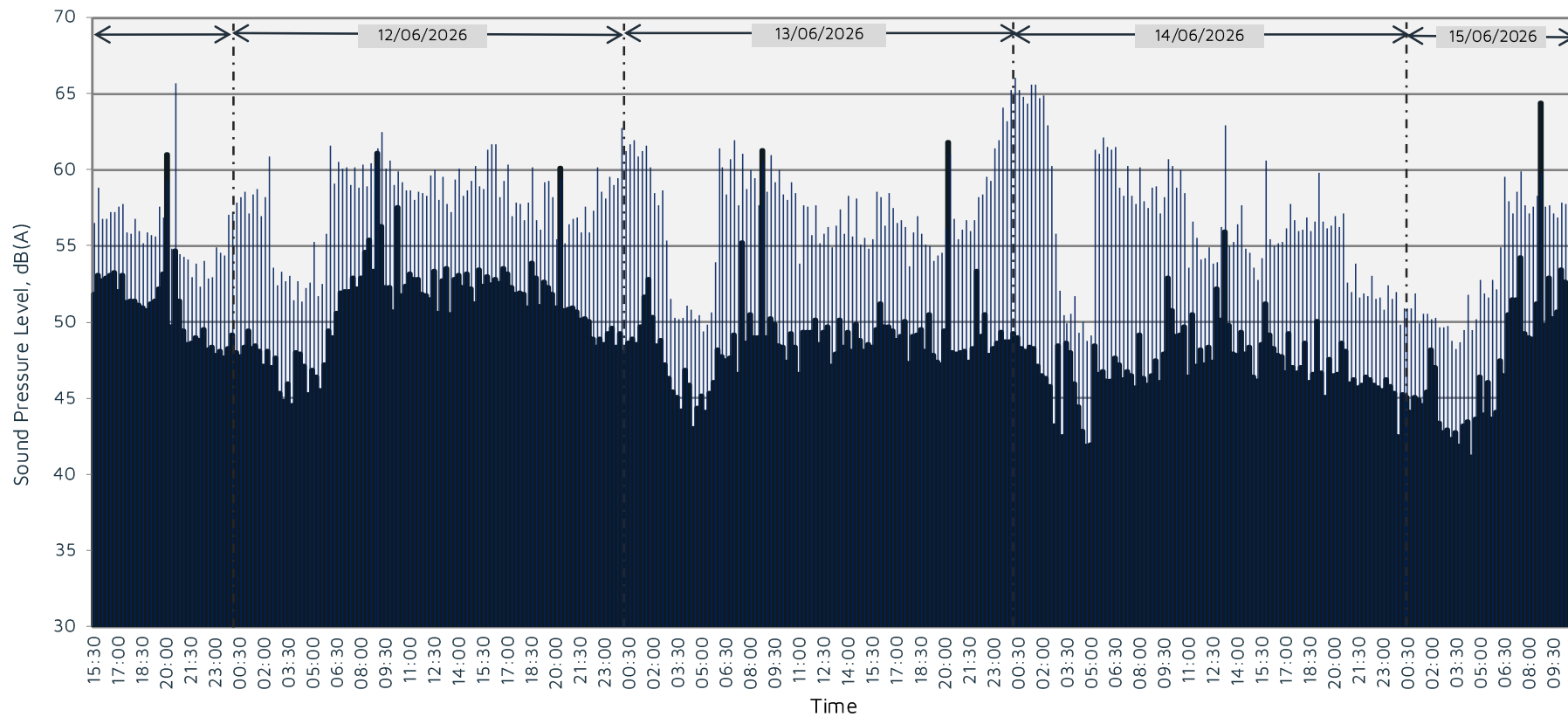
Key:  $L_{Aeq,15mins}$  $L_{eq,63Hz,15mins}$

Noise Monitoring Graph - Position A2

Project: 26241 138-144 Friar Street, Reading

Position Description: Overlooking Rear Courtyard from 1st Storey Fire Escape from Terrace Area

Survey Date: 11 June 2026 - 15 June 2026



Key: LAeq,15mins Leq,63Hz,15mins

APPENDIX C

Detailed Noise Break-In Calculation Sheets

QA21+QA27 Building Fabric Analysis - BS 8233:2014 Detailed Calculation Method

Note: Daytime is 0700 hrs - 2300 hrs and Night-time is 2300 hrs - 0200 hrs to capture music noise. The L_{max} identified is the spectrum for the 10th highest $L_{AFmax,5min}$ measured during the night-time.

138-144 Friar Street, Reading - Front Façade

Room details:

	Meters (m)
Length	7
Width	2.8
Height	2.4

	m²
Area of window	3.5
Area of ceiling	19.6
Area of wall	3.22

	m²
Total Façade and Ceiling Area	26.32
Total Surface Area	86.24

Daytime L_{eq}

Night-time L_{eq}

Night-time L_{max}

Measured External Free-Field Noise Levels (dB)								
Frequency (octave bands)								dBA
63	125	250	500	1000	2000	4000	8000	
72.1	67.7	65.9	63.1	62.1	60.3	56.5	50.5	67
74.4	66.7	61.9	61.9	60.9	58.4	54.4	47.6	66
85.9	77.7	78.5	83.1	79.8	74.1	75.2	71.2	85

Room type	Living Room/Bedroom
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Drop down menu

Average Absorption Coefficients for the Room								
Frequency (octave bands)								
63	125	250	500	1000	2000	4000	8000	
0.1	0.18	0.25	0.27	0.31	0.32	0.32	0.35	

Absorption Area of Room (m²)	8.62	15.52	21.56	23.28	26.73	27.60	27.60	30.18
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		R _w for each Façade Element							
		Frequency (octave bands)							
		63	125	250	500	1000	2000	4000	8000
Vent	NO TRICKLE VENT	99	99	99	99	99	99	99	99
Window	10/16/16.8- R _w 45, R _w + C _{tr} 40	29	31	38	43	44	50	55	55
Wall	70mm Brick and Insulated Steel Frame	41	50	52	55	55	55	55	55
Ceiling	450mm concrete solid	37	40	47	54	55	55	55	55

Drop down menu

Drop down menu

Drop down menu

Drop down menu

	Predicted Internal Noise Levels (dB)								
	Frequency (octave bands)								dBA
	63	125	250	500	1000	2000	4000	8000	
Daytime L _{eq}	45	36	25	17	14	9	4	-2	24
Night-time L _{eq}	47	35	21	15	13	7	2	-5	24
Night-time L _{max}	59	46	38	37	32	23	23	19	39

NR25	55.2	43.7	35.2	29.2	25.0	21.9	19.5	17.7
NR20	51.3	39.4	30.6	24.3	20.0	16.8	14.4	12.6

QA21+QA27 Building Fabric Analysis - BS 8233:2014 Detailed Calculation Method

Note: Daytime is 0700 hrs - 2300 hrs and Night-time is 2300 hrs - 0200 hrs to capture music noise. The L_{max} identified is the spectrum for the 10th highest $L_{AFmax,5min}$ measured during the night-time.

138-144 Friar Street, Reading - Rear Façade

Room details:

	Meters (m)
Length	7
Width	2.8
Height	2.4

	m²
Area of window	3.5
Area of ceiling	19.6
Area of wall	3.22

	m²
Total Façade and Ceiling Area	26.32
Total Surface Area	86.24

Daytime L_{eq}

Night-time L_{eq}

Night-time L_{max}

Measured External Free-Field Noise Levels (dB)								
Frequency (octave bands)								dBA
63	125	250	500	1000	2000	4000	8000	
57.9	54.6	55.4	48.9	45.9	41.2	34.6	27.8	52
60.7	51.8	50.4	45.1	42.7	37.9	30.4	23.9	48
71.7	58.1	57.7	56.9	57.6	59.3	57.1	52.5	64

Room type	Living Room/Bedroom
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Drop down menu

Average Absorption Coefficients for the Room								
Frequency (octave bands)								
63	125	250	500	1000	2000	4000	8000	
0.1	0.18	0.25	0.27	0.31	0.32	0.32	0.35	

Absorption Area of Room (m²)	8.62	15.52	21.56	23.28	26.73	27.60	27.60	30.18
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R _w for each Façade Element									
Frequency (octave bands)									
63	125	250	500	1000	2000	4000	8000		
Vent	NO TRICKLE VENT								Drop down menu
	99	99	99	99	99	99	99	99	
Window	4/16/6 - R _w 34, R _w + C _{tr} 29								Drop down menu
	22	24	21	29	43	43	45	45	
Wall	70mm Brick and Insulated Steel Frame								Drop down menu
	41	50	52	55	55	55	55	55	
Ceiling	450mm concrete solid								Drop down menu
	37	40	47	54	55	55	55	55	

	Predicted Internal Noise Levels (dB)								
	Frequency (octave bands)								dBA
	63	125	250	500	1000	2000	4000	8000	
Daytime L_{eq}	36	28	30	15	-1	-6	-14	-21	22
Night-time L_{eq}	39	25	25	11	-5	-10	-18	-25	18
Night-time L_{max}	50	31	32	23	10	12	8	3	28

NR25	55.2	43.7	35.2	29.2	25.0	21.9	19.5	17.7
NR20	51.3	39.4	30.6	24.3	20.0	16.8	14.4	12.6



www.quantumacoustics.co.uk

+44 (0)203 376 7000

hello@quantumacoustics.co.uk

London Office: 141 Lower Marsh, London SE1 7AE

Southern Office: Ash House, Tanshire Park, Elstead, Surrey GU8 6LB

Northern Office: Peter House, Oxford Street, Manchester M1 5AN