Compliance 4 Buildings Ltd

NOISE IMPACT ASSESSMENT

Technical Report Number: 202522513M2513C/1

Our Reference: 202522513M2513C

Client: Patel Construction UK Ltd

Site: The Vixen, Millfields Way, Haverhill, CB9 0JB

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Survey Date: 19th June 2025 and 23rd June 2025

Date of Issue: 21st July 2025

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Site Address:	The Vixen, Millfields Way, Haverhill, CB9 0JB
Client:	Patel Construction UK Ltd
Client Address:	19 Lela Avenue, Hounslow, TW4 7RU
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Date:	21st July 2025

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REVISION HISTORY:

REVISION	DESCRIPTION	DATE	PREPARED	APPROVED
Final	Final	21st July 2025	Elliot Hurst	Tony Trup

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1.0 INTRODUCTION

1.1 Background

A change of use and partial redevelopment is proposed at The Vixen, Haverhill, from a disused public house to residential. New commercial units are also proposed.

This report presents an assessment of the external noise levels, and recommendations for glazing, ventilator and internal sound insulation requirements to protect future residential occupiers against existing environmental noise and future commercial noise.

This report should be provided to the Local Authority.

2.0 SITE DESCRIPTION AND SURROUNDING AREA

2.1 Site Description

2.1.1 The development site is located at The Vixen, Millfields Way, Haverhill, CB9 0JB within the administrative boundaries of West Suffolk Council. The site comprises a vacant pub.

2.1.2 The Vixen is located next to a parade of shops with an associated car park. The surrounding area also includes residential premises.

2.1.3 The site comprises car parking, road traffic and pedestrians.

2.1.4 The site is approximately 19 metres south of Millfields Way and 14 metres north of the commercial parade of shops.

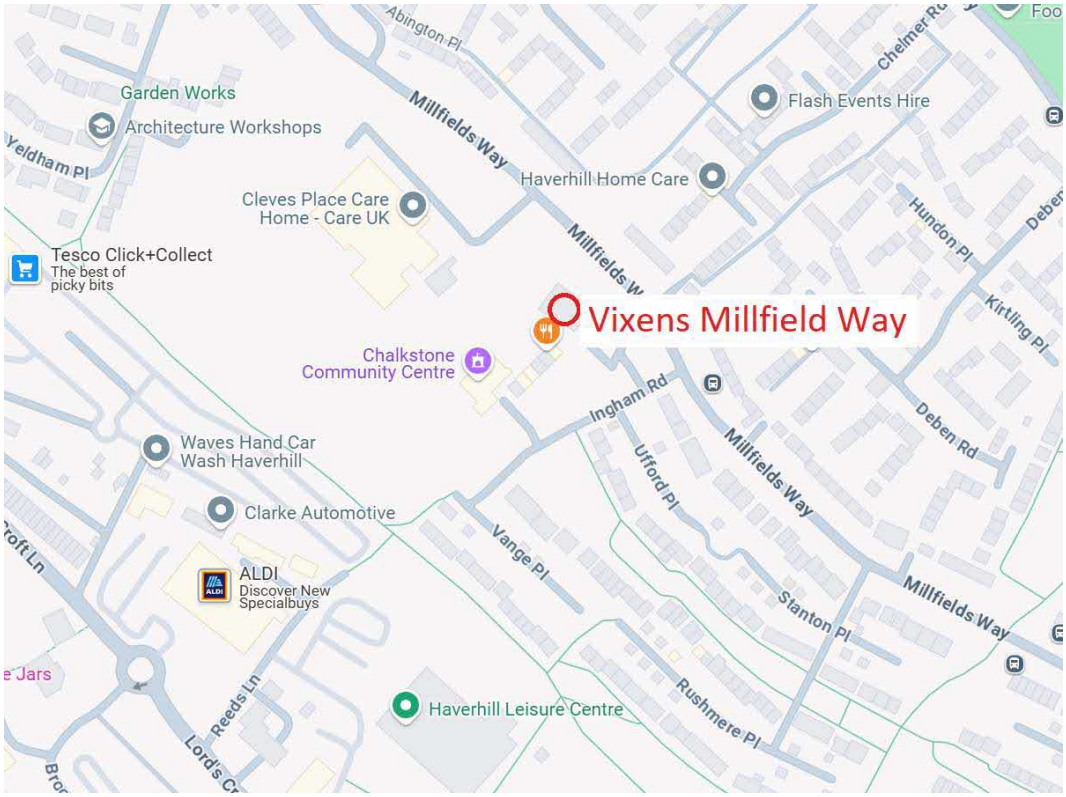

Figure 1 Site context (maps.google.co.uk)

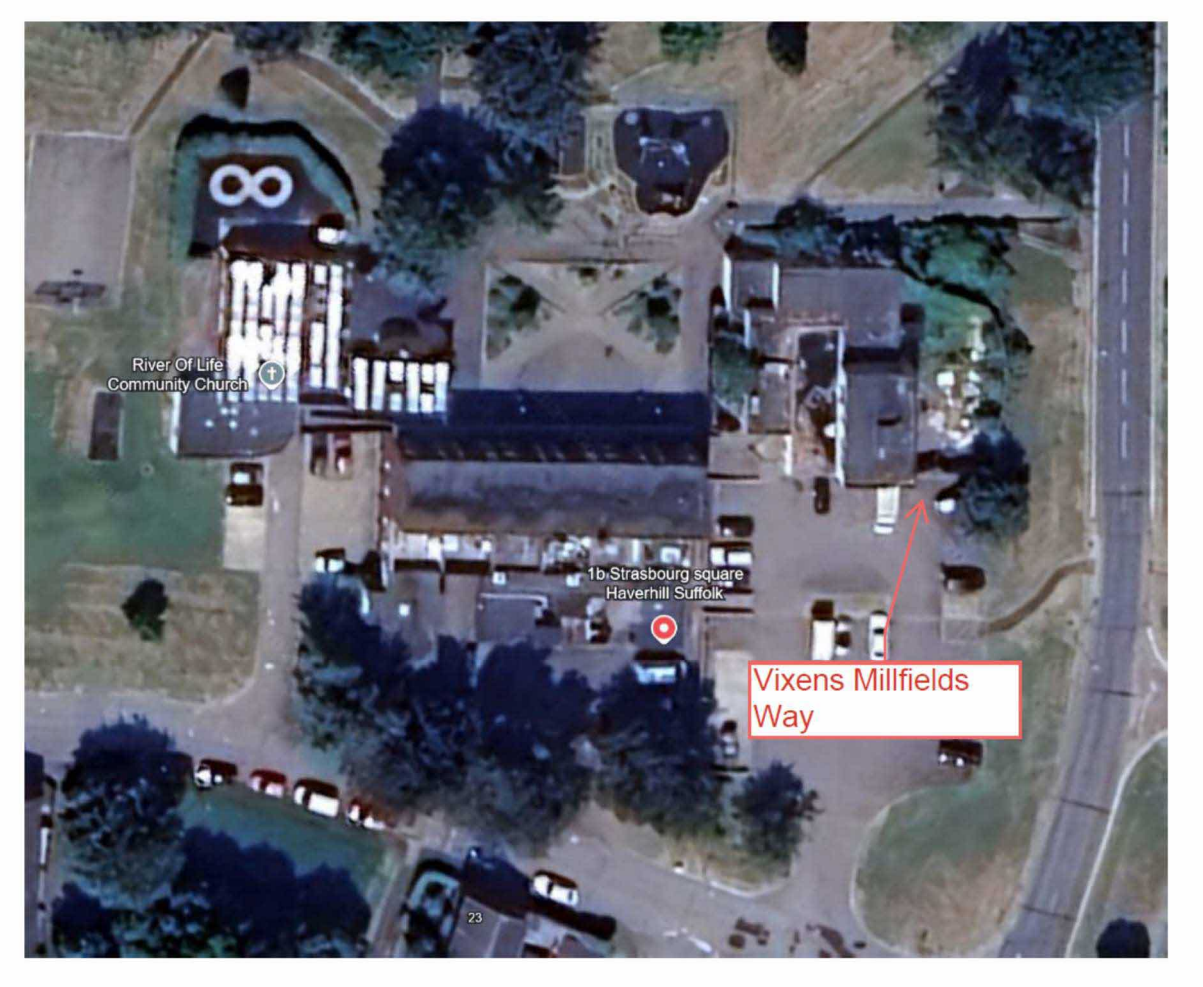

Figure 2 Satellite image

2.2 Proposals

The client proposes to convert the vacant public house to a mixed development of 9 residential flats and 3 commercial units. One commercial unit at ground floor is proposed by the client to be used as a convenience store under Class E. At the time of writing, the other two commercial units at basement level are proposed as Class E usage with undetermined commercial activity. There will be habitable rooms facing the off-site parade of shops (southwest), the car park (south) and the road (east), as well as the public space (north). See proposed floor plans in Figure 3 to Figure 6.

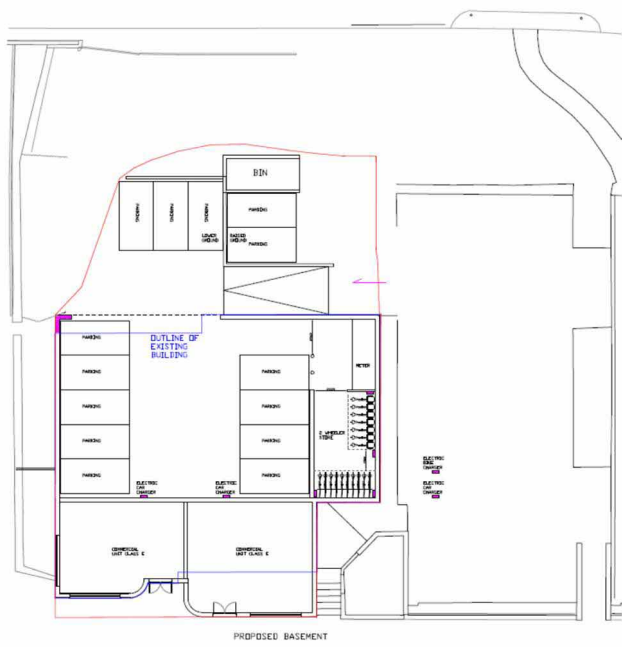

Figure 3 Proposed Basement Floor Plans (car park and commercial)

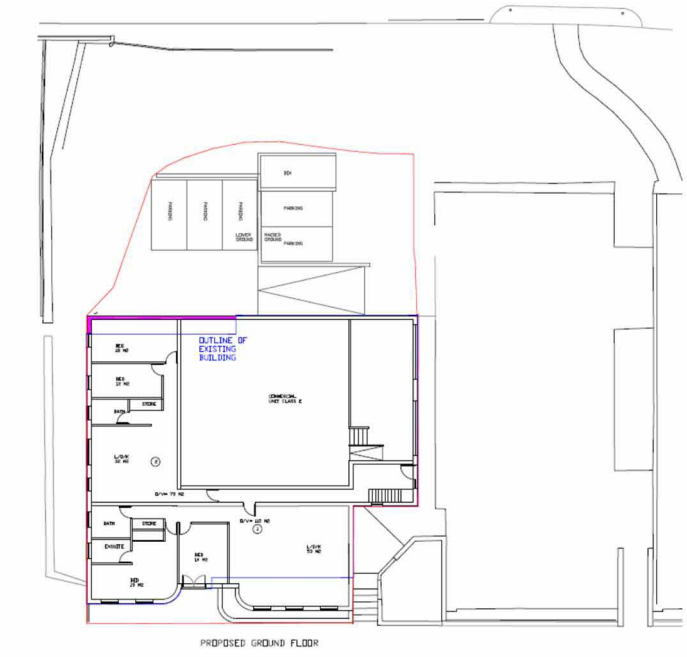

Figure 4 Proposed Ground Floor Plans

Figure 5 Proposed First Floor Plans

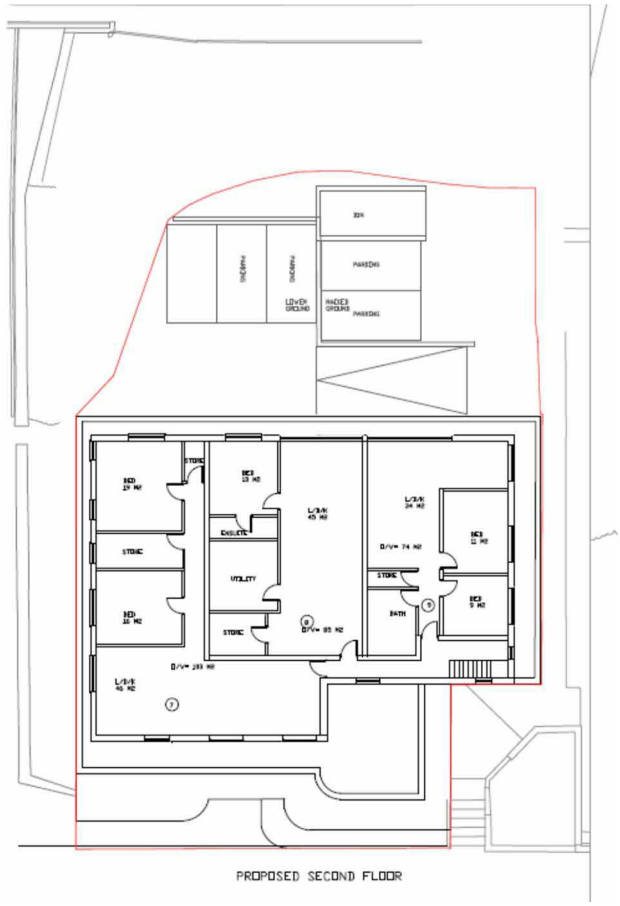

Figure 6 Proposed Second Floor Plans

3.0 CRITERIA, POLICY AND GUIDANCE

A summary of relevant national planning policy and industry guidance is presented in Appendix 2.

We understand a full planning application has been made.

The applicant has received the following guidance from West Suffolk Council Environmental Health Officer:

"*The proposed development is for residential units adjacent to commercial premises and we will require an Environmental Noise Assessment. The Environmental Noise Assessment shall be suitable and sufficient and where appropriate, shall consider the impact of vibration, and shall be undertaken by a competent person having regard to BS 7445: 2003 Description and Measurement of Environmental Noise and any other appropriate British Standards including BS 8233: 2014 Sound Insulation and Noise Reduction for Buildings. The assessment should consider the effects of noise from all potential allowable activity within the commercial unit at the ground floor and basement floors of the building, all services and plant affecting the proposed development from both the commercial units which is part of the development and any other nearby noise sources; and the impact of deliveries.*"

3.1 Targets for internal ambient noise levels from transport noise

We propose the following targets for internal ambient noise levels from external transport noise, in accordance with Table 7 of BS 8233:2014. These targets are subject to approval by the Local Authority.

Table 1 Summary targets for internal ambient noise levels, dB sound pressure levels

Location	Activity	Ventilation condition (majority of year)	
		07:00 to 23:00	23:00 to 07:00
Living room	Resting	35 dB $L_{Aeq,16hour}$	-
Dining room/area	Dining	40 dB $L_{Aeq,16hour}$	-
Bedroom	Sleeping (daytime resting)	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$ 45 dB L_{AFmax} ≤ 10 times per night

Our survey identified no existing commercial noise of note from the off-site businesses. See 5.1.

3.2 Noise from new commercial plant

On the basis of prior experience on projects in Suffolk and the suburban context of the site, we suggest that the cumulative noise rating level of new building services plant should not exceed a level 5 dB below the representative background sound level, at the nearest noise-sensitive receptors. The assessment should be undertaken in accordance with BS 4142:2014.

In summary we propose the following targets for new building services plant:

$L_{Ar,Tr} \leq L_{A90,bg,T} - 5\ dB$

Where

$L_{Ar,Tr}$ is the cumulative noise rating level (in accordance with BS 4142) of new plant at the façade of the worst-case noise-sensitive receptors after the proposed development has been completed, and

$L_{A90,bg,T}$ is the representative background sound level at the façade of the worst-case noise-sensitive receptors. T is to be taken as 60 minutes during the day and 15 minutes at night.

This target is subject to approval by the Local Authority.

3.3 Noise from proposed commercial activities

At the time of writing, only the usage of one of the three commercial units is known (convenience store). The remaining two units are proposed as Class E speculative units.

We propose that noise from commercial activities (excluding plant noise, which is assess separately as described in 3.2) in the proposed units should not exceed a level of NR 20 within dwellings in the development during daytime hours (07:00 to 23:00), and NR 15 during night-time hours (23:00 to 07:00). Noise Ratings are defined in BS 8233:2014.

These targets are subject to approval by the Local Authority.

Prior to occupation of the remaining commercial units, a noise impact assessment should be submitted to the Landlord demonstrating how the NR 20 target will be achieved in the proposed usage. The noise impact assessment should include hard sound insulation measures to be provided during the fit-out of the commercial unit, as well as Noise Management policies and procedures to mitigate the effects of noise residential occupiers. The assessment should assume typical noise levels representative of the proposed activities in the commercial units.

4.0 SURVEY METHODOLOGY

4.1 Overview

An unattended survey was undertaken between 17:00 on Thursday 19th June 2025 and 08:00 on Monday 23rd June 2025.

Sound pressure level measurements were undertaken using Class 1 sound level meters, in general accordance with *BS7445 Description and measurement of environmental noise*.

Measurements were undertaken of the L_{Aeq}, L_{AFmax} and L_{A90} indices (along with 1/1 octave-band data) in 1-minute intervals, and the data has been processed to compute longer periods, where required for assessment or as recommended by industry guidance.

4.2 Personnel

The survey and impact assessment were undertaken by Elliot Hurst, BSc, MSc, MIOA. Elliot has substantial experience in acoustics measurement and surveying, and holds the industry-standard post-graduate diploma in Acoustics and Noise Control, as well as a Master's degree in Applied Acoustics.

The technical review was undertaken by Tony Trup, BMus, MSc, MIOA, MAES. Tony has over a decade of experience in acoustics consultancy, having previously worked at national and multidisciplinary firms. Tony has been responsible for the acoustics on luxury residential and office tower developments, and was also previously the acoustics project manager for a nationally-significant infrastructure project.

4.3 Measurement Positions

Measurements were undertaken at the positions described in Table 2 and presented in Figure 7.

Table 2 Measurement positions

POSITION 1	DESCRIPTION
UA1	Unattended measurement position at the rear of property. The microphone was attached to a pole protruding approximately 0.5 metres from the façade of the building at first floor level, facing south. The position overlooked the commercial parade, car park and play area.
UA2	Unattended measurement position at the front of property. The microphone was attached to a pole protruding approximately 0.5 metres from the façade of the building at first floor level, facing north. The position overlooked the car park and Millfields Way.

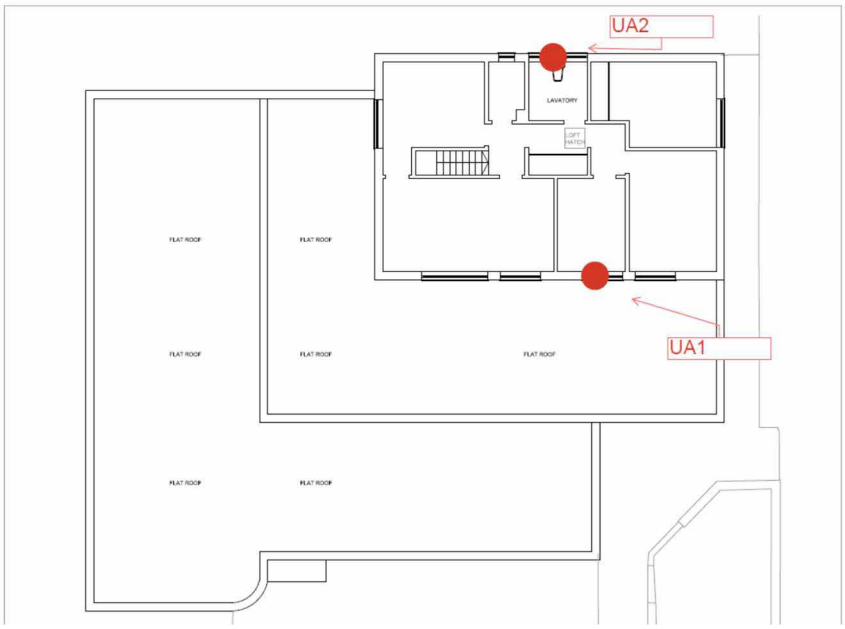

Figure 7 Measurement positions

4.4 Measurement Equipment

All equipment used during the survey(s) was calibrated at the start and end of each measurement period. No significant drift was observed.

All microphones were fitted with a wind shield for the entire measurements period.

Table 3 - Details of the Measurement Equipment Used

REFERENCE NAME	EQUIPMENT NAME	MANUFACTURER	MODEL	SERIAL	CALIBRATION DUE
E1	Environmental Sound Monitor (rear)	Svantek	971	113256	November 2025
E2	Environmental Sound Monitor (front)	Svantek	971	128778	November 2025
E3	Calibrator	Svantek	SV36	109944	June 2026

4.5 Weather

The weather during our attended measurements, and during set-up and take-down of the unattended survey, was dry. The sky was generally clear.

According to worldweatheronline.com, the ambient temperature over the survey period ranged from 13 to 29 degrees Celsius, there was only a short period of rainfall and wind speeds were generally below 5 m/s.

4.6 Subjective Impression

The subjective noise climate at the site was dominated by car parking, road traffic and pedestrians. Noise from pigeons were noted due to the vacant building façade not being fully secured.

No plant noise was noted from the Chip Shop in the nearby parade of shops, as the kitchen extraction fan and ducting were screened by the commercial and residential buildings to the south.

During our time on site, no commercial noise of note was witnessed from any of the units in the parade of shops to the southwest.

4.7 Results

All measurements were undertaken in general accordance with BS 7445: Parts 1 and 2. All sound pressure levels are in dB (re: 20µPa), using a 1 second logger using a fast time setting and refactored to produce the results..

4.7.1 Unattended survey

The following table summarises the measured sound levels during our unattended survey.

Table 4 Summary of measured sound pressure levels, dB(A)

POSITION	DATE	DAYTIME RANGE (DB) 07:00 TO 23:00	NIGHT-TIME RANGE (DB) 23:00 TO 07:00	
		$L_{AEQ,16HOURS}$	$L_{AEQ,8HOURS}$	L_{AFMAX}
UA1	19/06/2025	-	42	64
UA1	20/06/2025	50	43	61
UA1	21/06/2025	48	46	65
UA1	22/06/2025	51	46	65
UA2	19/06/2025	-	47	70
UA2	20/06/2025	55	48	68
UA2	21/06/2025	55	47	69
UA2	22/06/2025	52	49	67

The noise survey results are also plotted on time-history graphs in Appendix 5.

The L_{AFmax} noise levels presented are the 10th-highest measurements in 2-minute measurement intervals.

4.7.2 Proposed background noise level for plant noise emission criteria

During the day, the LA90,1hr noise level was in the range 35 to 50 dB(A). The modal value at the front and rear was 44.

We propose a LA90,1hr background noise level for daytime operation of 40 dB(A) on the basis of the wide variation in background sound levels.

During the night, the LA90,15mins noise level was in the range 27 to 49 dB(A). The modal value at the front was 37, and at the rear was 40 dB(A).

We propose a LA90,15mins background noise level for daytime operation of 35 dB(A) on the basis of the wide variation in background sound levels.

These background sound levels are subject to approval by the Local Authority.

5.0 ASSESSMENT

5.1 Noise from the existing off-site commercial units

As discussed in 4.6, there was **no commercial noise of note** witnessed during our time on site. The kitchen extract fan serving the fish and chip shop was not audible at the site, and no other commercial plant or activities were observed.

5.2 Noise from the proposed commercial units

The internal building fabric is subject to a detailed design stage, to be fully co-ordinated by an architect with input from the project acoustician. This section outlines broad recommendations suitable for the level of detail available at Planning stage, to achieve suitable internal living conditions in the proposed flats.

5.2.1 Commercial Unit Ground Level (Convenience store)

The client proposes this commercial unit to be used under Class E, as a convenience store. Our assessment assumes this store will be open during daytime hours only (07:00 to 23:00), but refrigeration plant may operate overnight. The convenience store has a wall separating it from Flat 2 and it is separated by a corridor to Flat 1. Above the convenience store are Flats 5 and 6.

Our assumed noise levels from the convenience store as presented in Appendix 3. These are based on levels measured in a similar establishment on another project.

5.2.2 Wall between Proposed Convenience Store, Flat 2 and Corridor to Flat 1

The precise build-up of this wall is unknown at this stage. Our calculations indicate that the target of NR20 from a convenience store should be achieved with a solid blockwork wall with independent lining as follows:

- High Density 215mm block wall (minimum density 2,100 kg/m^3)
- Independent lining 2 x 12.5 mm wallboard, minimum 35 mm cavity, 25 mm mineral fibre. The studs and plasterboard must not make contact with the blockwork.

5.2.3 Floor between Proposed Convenience Store and Flats 5 and 6

This floor comprises a beam and block structure of unknown make-up. Our assessment assumes that the structure meets the minimum requirements set out in Robust Details E-FC-6; namely, that it is in generally good repair and air tight, and has a minimum mass per unit area of 300 kg/m^2.

A sound-insulating ceiling should be provided to the underside of the separating floor, to the following specification:

- Minimum cavity 150 mm containing 50 mm mineral fibre insulation (or ¼ cavity depth, whichever is greater)
- 2 x 15 mm acoustic-grade plasterboard (minimum 12 kg/m^2) on metal frame (e.g. British Gypsum MF ceiling)

- No penetrations or modification to this ceiling by the commercial tenant should be permitted without comment by the Landlord's acoustician.

Our calculations indicate that the NR20 target should be achievable in flats over the proposed convenience store with this floor construction.

5.2.4 Two Speculative Commercial Units at Basement Level

At the time of writing, the intended use of the two-basement level commercial units has not been confirmed. Class E is a broad class allowing many different commercial activities which could produce different noise levels, including gyms, retail, café, office and more.

It is not possible or reasonable to expect the Applicant to construct the building to mitigate noise from the worst-case airborne and structureborne noise levels (e.g. spin studio and Olympic weightlifting gyms), as this would require significant costly structural alterations.

We recommend that the floors and walls separating these units from residential demises are constructed as recommended in 5.2.2 and 5.2.3. This would provide a **suitable baseline level of sound insulation** between commercial and residential demises. For high-risk business activities, the incoming commercial tenants should be required to fit-out their units so that noise from their activities does not exceed NR20 in residential demises during daytime hours or NR15 during night-time hours. We would recommend that incoming commercial tenants have **suitable clauses in their leases** such that they fit-out and operate the premises to mitigate the risk of noise and vibration disturbance. Each business should also adopt a **Noise Management Plan** to be approved by the Landlord prior to occupation of the commercial unit. The Noise Management Plan should include clauses relating to a detailed complaints process, best practicable means for noise management, and a defined process for receiving deliveries.

We would be pleased to advise on such clauses or a Noise Management Plan under a separate scope of works.

5.2.5 Deliveries to Commercial Units

The Landlord shall require that deliveries to the commercial units on the site will not occur before 07:00 or after 19.00 to reduce the impact of noise. No delivery should occur at the weekend or on a public holiday. All delivery drivers should be requested to turn their engines off and be advised of the delivery policies to reduce noise impact.

5.2.6 Refuse Collection

Where feasible, commercial refuse collections at the site should not occur before 07.00 or after 19.00 to reduce the potential impact of noise. All bins are to be assessed for damage on a monthly basis to prevent unnecessary noise during movement.

5.2.7 Mechanical Plant

At the time of writing, the precise specification of plant items is not known.

We therefore **recommend that planning permission is granted with a condition** that the proposed targets for cumulative plant noise rating levels in 3.2 of this report are achieved.

Plant details are to be confirmed prior to occupation of the commercial units, at which point a separate Noise Impact Assessment will be provided to the Local Authority for discharge of a condition.

All plant should incorporate suitable anti-vibration measures in accordance with CIBSE Guide B4.

Background sound levels and plant noise emission criteria are subject to approval by the Local Authority.

5.3 Internal ambient noise levels

At the time of writing, the construction of the building envelope has not been confirmed and is subject to detailed design. We therefore base our assessments on indicative constructions provided by the Client and based on our understanding of the building. The detailed design stage should be coordinated by a suitably-qualified architect and should include input from a suitably-qualified acoustician to ensure the requirements and assumptions in this report are met.

Our assessment assumes the following constructions for the building envelope.

5.3.1 External walls

5.3.1.1 External walls Ground Floor

We understand the proposed façade system is subject to detailed design at this stage. However, it is likely to comprise the existing 200mm brick wall with a 12.5 mm acoustic-grade plasterboard (10 kg/m^2 per sheet) dotted and dabbed internally.

Our assessment assumes a minimum Weight Sound Reduction Index with Spectrum Adaption term R_w+C_{tr} of 46 dB for the non-glazed elements of the façade.

5.3.1.1 External walls First Floor and Second Floor

We understand the proposed façade system at these levels is subject to detailed design at this stage. However, it is likely to comprise a new cavity brickwork system comprising brick or mid weight block cavity and wall ties.

Our assessment assumes a minimum Weight Sound Reduction Index with Spectrum Adaption term R_w+C_{tr} of 41 dB for the non-glazed elements of the façade.

5.3.2 Roof

We understand the proposed roof system is subject to detailed design at this stage. However, it is likely to comprise a timber joist system, insulation on top externally, 18mm ply on top of the joists, 200 mm joists, resilient bar system underneath and 2 x 12.5 mm standard plasterboard (8 kg/m^2 per sheet).

Our assessment assumes a minimum Weight Sound Reduction Index with Spectrum Adaption term R_w+C_{tr} of 40 dB for the non-glazed elements of the roof. This includes a small contingency added to the assumption in our calculations.

5.4 Internal ambient noise levels / Planning requirements

5.4.1 Calculation procedure

Our calculations assume a reverberation time of 0.5 seconds at all frequencies, as this is generally considered representative of a fully furnished room in a dwelling. Any future commissioning or surveys to determine internal ambient noise levels should therefore be corrected to the same reverberation time.

Calculations have been undertaken in accordance with the Rigorous Method presented in Appendix G of BS 8233:2014.

A sample of our calculations is presented in Appendix 3.

5.5 Recommendations

Our calculations indicate that the following glazing performances could be capable of achieving the targets proposed by BS 8233:2014 and presented in Table 1.

Table 5 Sound reduction indices, dB at octave band centre frequencies, Hz

125	250	500	1k	2k	4k	Glazing rating, dB R_w+C_{tr}	Example syste	Ventilator minimum rating (open), dB $D_{n,e,w}+C_{tr}$
21	22	26	38	37	39	28	6-16-4 mm double glazing	34

Trickle vents (where proposed), should be specified with a minimum Element-normalized weighted sound level difference as shown, in the open position.

Sound Reduction Indices should be tested in an independent, UKAS-accredited testing laboratory in accordance with ISO 10140-2:2021 Acoustics –Laboratory measurement of sound insulation of building elements –Part 2: Measurement of airborne sound insulation. The sound reduction indices should be rated in accordance with ISO 717-1:2013 Acoustics –Rating of sound insulation in buildings and of building elements –Part 1: Airborne sound insulation. Full laboratory reports and test certificates shall be made available to us for comment prior to procurement.

6.0 CONCLUSIONS

This report presents an assessment of the external noise levels, and proposed commercial noise, recommendations for glazing and ventilator acoustic requirements to achieve suitable internal living conditions in the proposed dwellings.

Environmental noise intrusion

At the time of writing, the construction of the building envelope has not been confirmed and is subject to detailed design. We have therefore based our assessments on indicative constructions provided by the Client and our understanding of the existing structures. The detailed design stage should be coordinated by a suitably-qualified architect and should include input from a suitably-qualified acoustician to ensure the requirements and assumptions in this report are achieved.

Our calculations indicate that the requirements of internal ambient noise can be achieved with double glazing and trickle ventilators achieving the minimum requirements described in 5.5 and with the façade design proposed by the client. This is subject to detailed design following planning.

Existing commercial noise

No commercial noise of note was observed from the existing off-site commercial units. Mechanical plant noise was not audible and no other commercial activity noise was observed.

Noise from new items of building services plant

At this stage, the mechanical plant selections have not been made as the usage of all commercial units is not confirmed. We therefore recommend that planning permission is granted with a condition that future plant must meet the criteria proposed in this report. Plant details are to be confirmed prior to occupation of the commercial units, at which point a separate NIA will be provided for discharge of a condition.

Noise from new commercial activities

The future use of the two basement commercial units is undefined by the client. We would advise NR20 during daytime, and NR15 during the night (23:00 to 07:00) to safeguard future noise disturbances. Our assessment assumes daytime opening only for the convenience store. Recommendations have been provided to achieve a suitable level of baseline sound insulation between demises. We also recommend that incoming commercial tenants have suitable clauses included in their leases so that they fit out and operate their businesses in such a way as to mitigate noise. Each incoming business should also be required to provide a Noise Management Plan to the Landlord for approval prior to occupation.

This report should be provided to the Local Authority for acceptance.

7.0 APPENDIX

APPENDIX 1: GLOSSARY

Term	
Sound	A fluctuation in air pressure detectable by the human ear
Noise	Generally characterized as 'unwanted sound'
Decibel, dB	A logarithmic scale for quantifying sound levels, based on a reference of 20 µPa, equating to 0 dB.
Frequency, Hz	The number of air pressure variations per second. Subjectively, higher-frequency sounds are high pitched, like squealing or whistling. Lower-frequency sounds are low pitched, like rumbling. Humans can typically hear in the range from 20 Hz to 20,000 Hz.
A-weighting, dB(A)	Humans are typically more sensitive to sounds around 1,000 to 4,000 Hz, and less sensitive to very low frequency sounds. A-weighting provides a convenient way of accounting for these sensitivities. It is a weighted average of sound levels at different frequencies, with less importance given to low frequency sounds, and some emphasis on the frequencies humans are more sensitive to. In this way, it provides an indication of perceptual loudness.
L_{eq}	L_{eq} is the level of a national continuous sound that would deliver the same sound energy as the actual fluctuating sound over the same measurement period. This can be thought of as the 'average' sound level during the measurement period. The A-weighted value over time period (T) is written as $L_{Aeq,T}$
L_{90}	L_{90} is the noise level that was exceeded for 90% of the measurement period. It reflects quiet periods during that time and is often referred to as the 'background noise level'. The A-weighted value over time period (T) is written as $L_{A90,T}$.
L_{max}	L_{nax} is the maximum noise level during the measurement period. It is often reflective of singular noise events, such as sirens, or percussive sounds from a piling rig. L_{max} values are normally measured with a 'fast' time response (in 0.125s samples). The A-weighted value is then reported as L_{AFmax}.
R_w	The Weighted sound reduction index. An intrinsic measure of the airborne sound reduction capabilities of a construction measured in an acoustics laboratory.
D_w	The Weighted sound level difference. A measured in-situ performance of a construction, as installed in a building.
$D_{nT,w}+C_{tr}$	A weighted sound level difference with further corrections for reverberation time and low-frequency sound transfer. This descriptor forms the basis of the airborne sound insulation performance requirements of Approved Document E of the Building Regulations 2010 (as amended).
$L'_{nT,w}$	The standardized impact sound pressure level. This forms the basis of the impact sound insulation performance requirements of Approved Document E of the Building Regulations 2010 (as amended).
Reverberation Time, s	The time taken for sound in a room to decay by 60 dB. 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) are quantified in terms of a Noise Rating (NR) level. This is achieved by comparing the frequency contet of the sound against a series of curves defined in Annex A of BS 8233:2014.

Table 6 Glossary

APPENDIX 2: POLICY AND GUIDANCE

National Policy

National Planning Policy Framework

The National Planning Policy Framework (NPPF) December 2024 sets out the Government's planning policies for England and how these should be applied. It provides a framework within which locally-prepared plans for housing and other development can be produced. The NPPF must be taken into account in preparing the local development plans and is a material consideration in planning decisions.

The excerpts of the NPPF relevant to the proposed development are as follows:

"*187. Planning policies and decisions should contribute to and enhance the natural and local environment by:*

e)preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of... noise pollution."

"*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:*

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 ..".

"*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 facilities shoult 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."*

Planning Practice Guidance (Noise) (PPG(N))

The PPG(N) is published by the Ministry of Housing, Communities & Local Government and aims to provide guidance on the implementation of government policy in planning and noise.

In summary, it states that noise can override other planning concerns where justified, although the context of the wider characteristics of the development, its likely users and surroundings all can have an effect on whether noise is likely to pose a concern. It emphasizes that good acoustic design needs to be considered early in the planning process to ensure that the most appropriate and cost-effective solutions are identified from the outset.

The PPG(N) also includes a Noise Exposure Hierarchy Table which, in summary, emphasizes that increasing noise levels have adverse effects on behaviour, attitude, physiology, sleep and quality of life.

The PPG(N) does not contain objective targets for noise levels and thus further guidance and studies should be referred to, in order to quantify appropriate targets.

Noise Policy Statement for England

The Government's policy on noise is set out in the Noise Policy Statement for England. Its vision 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.*"

Its aims are to:

- avoid significant adverse impacts on health and quality of life;
- mitigate and minimize adverse impacts on health and quality of life; and
- where possible, contribute to the improvement of health and quality of life.

The NPSE provides the policy framework to assist the implementation of the Environmental Noise Directive and the Environmental Noise (England) Regulations 2006 ('the Regulations'). Whilst the NPSE is not legislation and local authorities are not legally bound by it, it is expected that local authorities will take it into account in relevant situations.

The NPSE encourages relevant stakeholders, including Local Planning Authorities (LPAs), to review and revise existing policies and practices so that "*the policies and any noise management measures being adopted accord with the vision, aims and principles of the NPSE*".

Industry Guidance

Approved Document O

Approved Document O came into force on 15 June 2022. It introduces requirements for various types of residential premises to limit unwanted solar gains and provide an adequate means to remove heat from the indoor environment (Requirement O1 (1)). Requirement O1(2)(a) of the regulation requires that account must be taken of the safety of an occupant, and their reasonable enjoyment of the residence. There is also a requirement (O2(b)) that mechanical cooling may only be used where sufficient heat cannot be removed from the indoor environment without it.

The statutory guidance to support Requirement O1(2)(a) contains requirements relating to noise at night.

Paragraph 3.2 of ADO states,

"*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).*"

Paragraph 3.3 states,

"Windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits.

- *40dB $L_{Aeq,T}$, averaged over 8 hours (between 11pm and 7am).*
- *55dB L_{AFmax}, more than 10 times a night (between 11pm and 7am)."*

Approved Document O is only intended to relate to new-build residential development.

Approved Document O Noise Guide

The Guide (published by the Association of Noise Consultants in November 2024) explains that, the highest external noise levels that would be compliant with Approved Document O using the simplified method are as follows.

Table 7 External noise levels above which the Simplified Method of ADO cannot be used

Parameter	High Overheating Risk Location	Moderate Overheating Risk Location
$L_{Aeq,8hr}$ night-time (23:00 to 07:00)	45 dB	50 dB
L_{AFmax}, more than 10 times per night (23:00 to 07:00)	60 dB	65 dB

In locations exceeding these external noise levels, dynamic thermal modelling should be used for a more detailed assessment of solar gains and heat rejection.

The Guide also provides a method for approximating the maximum Equivalent Area of a façade opening based on the external noise levels.

On demonstrating compliance, the Guide states, *"Given the uncertainty of measuring noise levels internally and the complexity of remedial work to adapt a completed building to remove excess heat by means other than opening a window, it is recommended that determination of compliance with AD-) is completed at the design stage only."*

World Health Organization

In 1999, The World Health Organization produced a set of guidelines to provide recommendations for protecting human health from exposure to environmental noise originating from various sources called the Guidelines for Community Noise.

Night-time noise levels and environmental noise impacts upon sleep were reviewed in the Night Noise Guidelines for Europe in 2009 and the recommendations were revisited.

These were again reviewed in 2018, resulting in the Environmental Noise Guidelines for the European Region.

The Guidelines for Community Noise makes recommendations for both internal and external noise levels, whereas the two subsequent documents only revisit recommendations for external noise levels.

On internal noise levels, the Guidelines for Community Noise state,

"If negative effects on sleep are to be avoided the equivalent sound pressure level should not exceed 30 dBA indoors for continuous noise. If the noise is not continuous, sleep disturbance correlates best with LAmax and effects have been observed at 45 dB or less. This is particularly true if the background level is low. Noise events exceeding 45 dBA should therefore be limited if possible. For sensitive people an even lower limit would be preferred. It should be noted that it should be possible to sleep with a bedroom window slightly open (a reduction from outside to inside of 15 dB). The prevent sleep disturbances, one should thus consider the equivalent sound pressure level and the number and level of sound events. Mitigation targeted to the first part of the night is believed to be effective for the ability to fall asleep."

The Night Noise Guidelines recommend a lower limit than 45dB L_{Amax}.

The Guidelines for Community Noise also recommended that noise levels in outdoor living areas be 50 dB during the daytime and evening, with an upper limit of 55 dB in noisier environments.

Environmental Noise Guidelines for the European Region (2018)

The World Health Organization produced a set of guidelines to provide recommendations for protecting human health from exposure to environmental noise originating from various sources including road traffic. In forming these recommendations, systematic reviews of the expanded evidence base were conducted to assess the relationship between environmental noise and the following health outcomes: cardiovascular and metabolic effects; annoyance; effects on sleep; cognitive impairment; hearing impairment and tinnitus; adverse birth outcomes; and quality of life, mental health and well-being.

The WHO guidelines for road traffic noise can be summarized as 53 dB L_{den} average noise exposure, and 45 dB L_{night} night-time exposure.

BS 8233:2014 Guidance on sound insulation and noise reduction for buildings

BS 8233 is commonly referred to by planning authorities and acousticians looking to quantify target noise levels for residential development, both internally and externally. Table 4 of BS 8233 is reproduced below.

Activity Location 07:00 to 23:00 23:00 to 07:00

Table 8 - Reproduction of Table 4 from BS 8233 - Indoor ambient noise levels for dwellings

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

BS 8233 also 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 $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments."

ProPG Planning & Noise: New Residential Development

External noise levels

ProPG is a guidance document prepared by industry bodies to provide practitioners with guidance on a recommended approach to the management of noise within the planning system in England.

ProPG provides an outline for an initial noise risk assessment of proposed new-build residential development to be undertaken before a planning application is submitted. The indicative noise levels should be assessed without inclusion of the acoustic effect of any scheme specific noise mitigation measures.

Figure 1 of ProPG indicates that as Daytime noise levels approach approximately 70 dB $L_{Aeq,16hr}$ and night-time 60 dB $L_{Aeq,8hr}$, the site is at a high risk of adverse effects on health and wellbeing. ProPG notes:

"*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 Acoustic Design Statement.*"

ProPG describes *good acoustic design* as being a holistic design approach which considers the following, to be included in the planning submission:

- Check the feasibility of relocating, or reducing noise levels from the relevant sources
- Consider options for planning the site or building layout
- Consider the orientation of proposed buildings
- Select construction types and methods for meeting building performance requirements
- Examine the effects of noise control measures on ventilation, fire regulation, health and safety, cost, CDM etc.
- Assess the viability of alternative solutions
- Assess external amenity area noise

ProPG also notes that,

"*Using fixed unopenable glazing for sound insulation purposes is generally unsatisfactory and should be avoided; occupants generally prefer the ability to have control over the internal environment using openable windows, even if the acoustic conditions would be considered unsatisfactory when open. Solely relying on sound insulation of the building envelope to achieve acceptable acoustic conditions in new residential development, when other methods could reduce the need for this approach, is not regarded as good acoustic design. Any reliance upon building envelope insulation with closed windows should be justified in supporting documents.*"

Internal noise levels

On internal noise levels, ProPG recommends the criteria proposed by BS 8223: 2014 (see Table 8 above). It also proposes a guideline L_{Amax} noise level for individual night-time noise events of 45 dB, stating,

"*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 45 dB $L_{Amax,F}$ 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.*"

On achieving the standards of BS 8233 with open windows, ProPG states,

"*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 following].*

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 5 dB 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 5 dB, 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 highly 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."

Acoustics, Ventilation and Overheating (AVO) Residential Design Guide

The AVO Guide aims to assist designers to adopt an integrated approach to the acoustic design within the context of the ventilation and thermal comfort requirements. It is intended for the consideration of new residential development that will be exposed predominantly to airborne sound from transport sources, and to sound from mechanical services that are serving the dwelling in question. Where much of the guidance discussed in this report thus far has focused on external noise levels, the AVO Guide discusses internal conditions extensively, focusing especially on the use of open windows or mechanical ventilation and cooling. The AVO Guide is intended to be applied only to new-build residential development.

Much of the discussion centres around the 'overheating condition', which is a mode of ventilation where the occupants are experiencing warmer than usual temperatures indoors and wish to reduce them, either by opening the windows, or by activating mechanical cooling.

It details a two-step method for assessing the risk of adverse effects on building occupants (see Figures 3-1, 3-2 and 3-3 of AVO Guide) during the overheating condition.

The first step of the risk assessment is made using external noise levels, and indicates that sites where the daytime noise level is approximately > 65 dB $L_{Aeq,T}$ and night-time noise level is approximately > 55 dB $L_{Aeq,8hr}$, there is a high risk of adverse effects on health and wellbeing. Sites in this category, are considered 'high risk' and it is recommended to proceed to the second step of the risk assessment.

The second step of the risk assessment considers internal noise levels during the overheating condition. Figure 3-3 of AVOG suggests that achieving the internal noise levels in BS 8233 isn't feasible in many parts of the country during overheating(particularly urban environments) with the windows open, and thus higher noise levels may be acceptable, but as they increase, there is an increasing likelihood of impact on quality of life.

Figure 3-3 of AVOG indicates that at internal daytime noise levels over 50 dB with the windows open, noise causes a material change in behaviour (e.g. having to keep windows closed most of the time), potential for sleep disturbance and diminished quality of life.

APPENDIX 3: CALCULATIONS

Flat 3 Bedroom 1F

Item / Description		Rating/Broadband/Input Rating	dB	dB(A)	Octave Band Centre Frequency, Hz 31.5	63	125	250	500	1k	2k	4k	8k
Daytime Leq			64.8	51.1 (A)	62.2	59.2	54.7	48.5	48.1	46.6	42.2	38.4	35.2
Night-time Leq			62.0	46.3 (A)	61.1	52.8	46.7	43.1	43.3	40.7	37.9	36.7	34.3
Lmax 1			70.5	64.0 (A)	65.3	63.6	61.7	56.5	63.5	60.3	50.0	47.1	50.6
Lmax 2			73.3	65.5 (A)	65.2	64.3	69.4	62.6	65.5	60.7	51.6	35.3	31.5
Lmax 3			96.7	67.0 (A)	95.9	88.4	75.7	65.2	60.2	56.1	53.7	52.6	52.4
Reverberation Time (0.5t)							0.5	0.5	0.5	0.5	0.5	0.5	
Floor Area				12.8									
Height of Room				2.5									
Volume				31.3									
Façade Structure													
Library - Type: Transmission Loss, Source: Lo	Cavity brickwork with ties, 480 kg/m2	Rw+Ctr 41	11.3 m²	11.3			-34.0	-34.0	-40.0	-56.0	-73.0	-76.0	
Glazed Area		Rw+Ctr 27	7.5 m²	7.5			-21.0	-20.0	-26.0	-38.0	-37.0	-39.0	
Composite Transmission Loss		Rw+Ctr 31	18.8 m²				-24.7	-23.7	-29.7	-41.9	-41.0	-43.0	
Façade Break In Calculations													
Facade Noise Break-In - Type: Reverberant, Receiver Room: Moderate Absorption - Area of Facad			31 m³	25.8 (A)			35.7	30.4	24.0	10.4	6.9	1.2	
Facade Noise Break-In - Type: Reverberant, Receiver Room: Moderate Absorption - Area of Facad			31 m³	20.3 (A)			27.7	25.1	19.3	4.5	2.6	-0.6	
Facade Noise Break-In - Type: Reverberant, Receiver Room: Moderate Absorption - Area of Facad			31 m³	37.8 (A)			42.7	38.5	39.5	24.1	14.7	9.8	
Facade Noise Break-In - Type: Reverberant, Receiver Room: Moderate Absorption - Area of Facad			31 m³	41.4 (A)			50.4	44.6	41.5	24.5	16.3	-2.0	
Facade Noise Break-In - Type: Reverberant, Receiver Room: Moderate Absorption - Area of Facad			31 m³	43.2 (A)			56.7	47.2	36.2	19.9	18.4	15.3	

Flat 9 KLD 2F

Item / Description		Rating/Broadband/Input Rating	dB	dB(A)	Octave Band Centre Frequency, Hz 31.5	63	125	250	500	1k	2k	4k	8k
Daytime Leq			64.5	55.4 (A)	60.8	58.9	54.9	52.1	50.1	49.6	50.1	43.9	37.9
Night-time Leq			56.3	49.4 (A)	52.5	49.9	45.2	44.3	44.0	43.2	42.2	42.1	39.9
Lmax 1			69.9	70.9 (A)	48.4	50.6	38.1	38.5	30.9	50.1	68.2	64.2	54.5
Lmax 2			68.8	69.3 (A)	51.0	53.6	42.3	39.1	35.4	42.0	60.0	66.9	60.8
Lmax 3			75.1	68.9 (A)	69.3	64.2	68.4	66.9	66.7	66.0	55.8	46.8	47.1
Reverberation Time (0.5t)							0.5	0.5	0.5	0.5	0.5	0.5	
Floor Area				34.2									
Height of Room				2.5									
Volume				83.7									
Façade Structure													
Library - Type: Transmission Loss, Source: Lo	Cavity brickwork with ties, 480 kg/m2	Rw+Ctr 41	13.4 m²	13.4			-34.0	-34.0	-40.0	-56.0	-73.0	-76.0	
Glazed Area		Rw+Ctr 27	10.9 m²	10.9			-21.0	-20.0	-26.0	-38.0	-37.0	-39.0	
Transmission Loss Double Leaf: (1x18mm Ply) - 180mm Timber Staggered Stud (Ern		Rw+Ctr 33	34.2 m²	34.2			-21.3	-31.0	-38.8	-38.6	-40.1	-46.1	
Composite Transmission Loss		Rw 37	58.6 m²	58.6			-22.3	-26.2	-32.4	-39.6	-40.3	-44.2	
Façade Break In Calculations													
Facade Noise Break-In - Type: Reverberant, Receiver Room: Moderate Absorption - Area of Facad			84 m³	28.2 (A)			39.0	32.3	24.0	16.4	16.2	6.1	

Commercial Noise Wall and Floor Construction

Item / Description		Rating/Broadband/Input Rating	dB	dB(A)	Octave Band Centre Frequency, Hz 31.5	63	125	250	500	1k	2k	4k	8k
Convenience Store Noise		NR 68	77.8	70.5 (A)	66.3	71.6	71.8	70.7	70.4	64.0	58.8	54.9	47.4
Room To Room Noise Transfer - Room Absorption: Moderate		8 m²	36 m³	20.8 (A)		29.0	30.2	26.1	17.8	8.3	-1.8	-11.7	
		NR 16		20.8		29.0	30.2	26.1	17.8	8.3	-1.8	-11.7	
Floor	E-FC-6					34.0	50.0	60.0	55.0	63.0	68.0	87.0	
						29.0	45.0	55.0	50.0	58.0	63.0	82.0	
						-29.0	-45.0	-55.0	-50.0	-58.0	-63.0	-82.0	
Room To Room Noise Transfer - Room Absorption: Moderate		16 m²	39 m³	18.7 (A)		40.6	24.8	13.8	18.4	4.0	-6.1	-29.1	
		NR 15				40.6	24.8	13.8	18.4	4.0	-6.1	-29.1	

APPENDIX 4: PHOTOS

Photo 1: UA1

Picture 2: UA2

APPENDIX 5: FIGURES

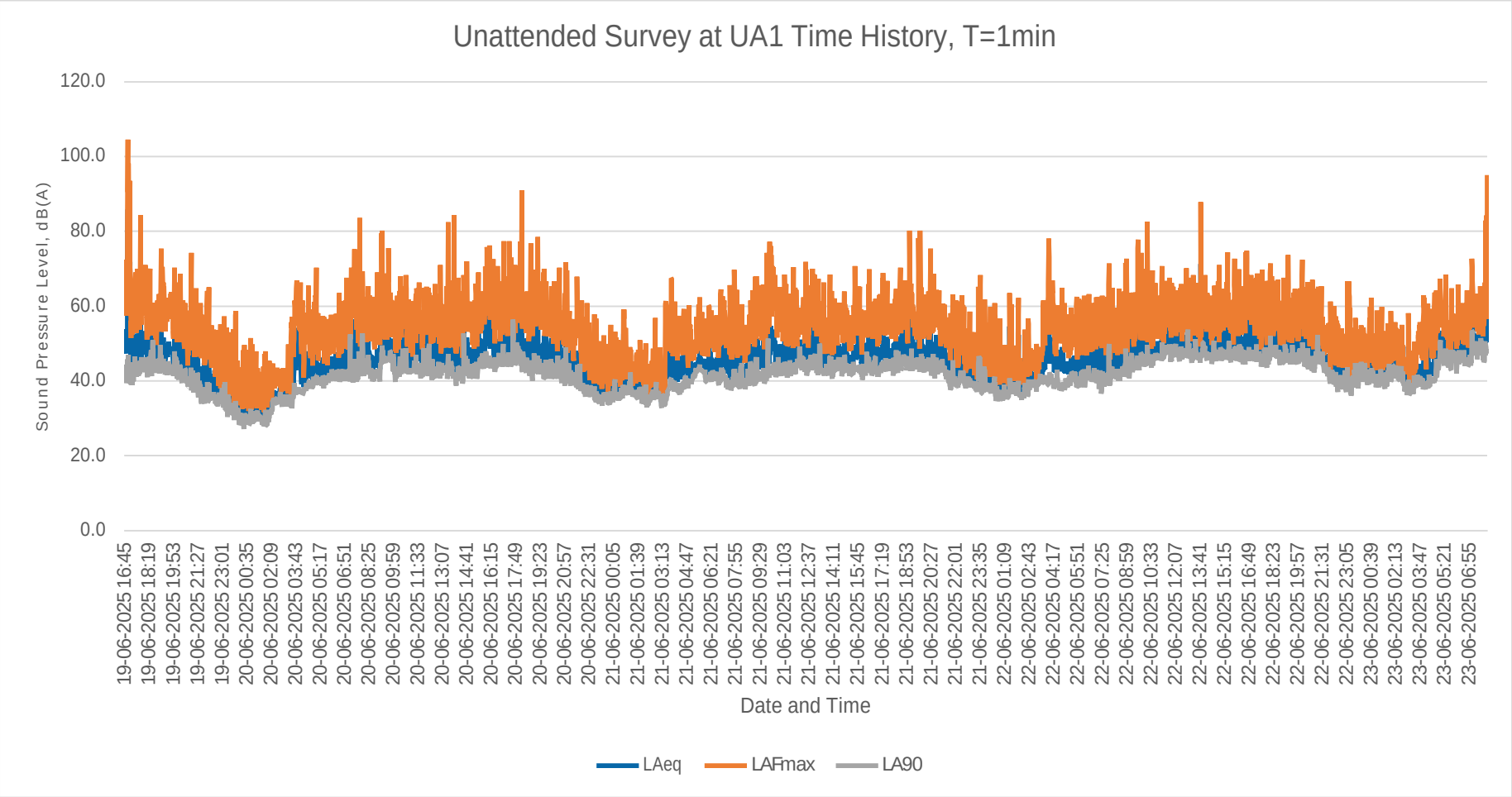

Figure 8: Unattended Survey at UA1

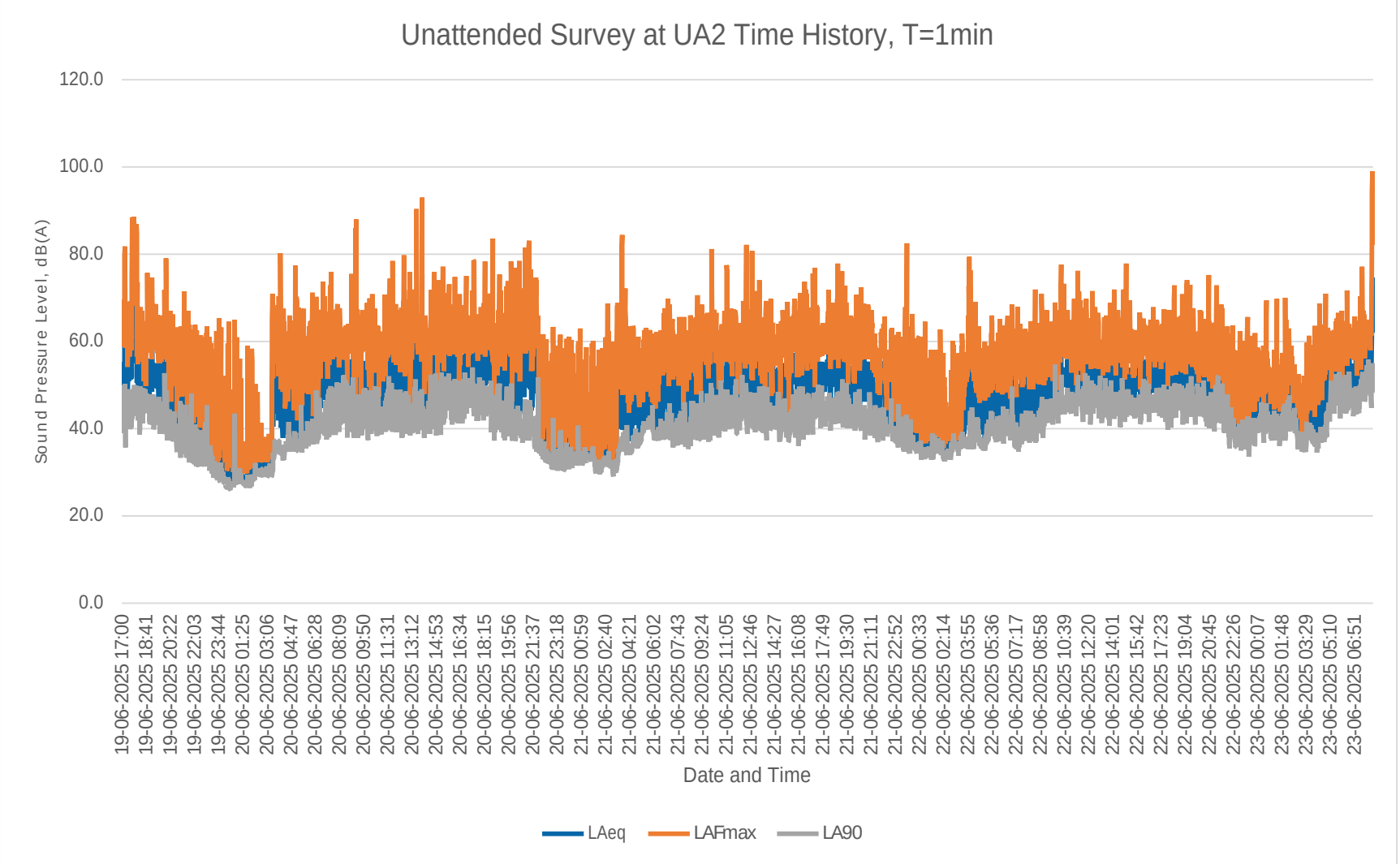

Figure 9: Unattended Survey at UA2 Time History

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