Waterhouse Gardens, Manchester (Block A, B, E & F)

Acoustic Assessment Report -
Planning Condition 18 (Commercial/Amenity Noise)
Planning Condition 19 (Residential Noise Insulation)

Client:
Domis Construction Limited
Douglas House, Green St
Wigan, WN3 4DQ

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Consultants in acoustics, noise and vibration

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Document Control

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About the Tester/Author

Andrew founded Jameson Acoustics in 2022 after stepping down as board director at Hann Tucker Associates, one of the UK's largest independent acoustic consultancies.

He has over 20 years' experience delivering the acoustic design of large-scale projects covering all major building sectors, having worked with some of the largest developers in the country.

Andrew graduated with a 1st Class Honours degree in Acoustics, winning Divisional and University Awards for academic performance and his research into sound absorbing and diffusing surfaces for use in concert halls. Over his 20+ year career, he has taken the lead acoustic designer role on some of the largest building projects in the UK, including several with a project value exceeding £1B.

He is a full member of the Institute of Acoustics and the Institute of Engineering & Technology.

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1.0 Introduction

Jameson Acoustics Limited has been commissioned by Domis Construction Limited to provide acoustic design and testing services to assist in the discharge of two planning conditions associated with the Waterhouse Gardens development (Block A, B, E & F) in Manchester. The conditions are as follows.

No	Wording
18	Notwithstanding the noise and vibration section of the ES stamped as received by the City Council, as Local Planning Authority, on the 19 January 2018, (a) prior to the first use of each commercial unit and gym area within each phase as indicated on drawings A2942 198 R16, A2943 199 R16 and A2943 200 R16 stamped as received by the City Council, as Local Planning Authority, on the 19 January 2018, a scheme of acoustic insulation shall be submitted for approval in writing by the City Council, as Local Planning Authority. (b) The approved scheme shall then be implemented and a post completion survey submitted for approval in writing by the City Council, as Local Planning Authority, prior to the first use of each of the commercial units and the gym area within each phase. The measures implemented shall be retained and maintained for as long as the development remains in use. *Reason - In order to limit the outbreak of noise from the commercial premises pursuant to policies SP1 and DM1 of the Core Strategy (2007) and saved policy DC26 of the Unitary Development Plan for the City of Manchester (1995).*
19	Notwithstanding the noise and vibration section of the ES stamped as received by the City Council, as Local Planning Authority, on the 19 January 2018, (a) prior to the first occupation of the residential accommodation within each phase hereby approved, the accommodation shall be insulated in accordance with a scheme submitted for approval in writing by the City Council, as Local Planning Authority. (b) The approved scheme shall then be implemented and a post completion survey submitted for approval in writing by the City Council, as Local Planning Authority, prior to the first occupation of the residential accommodation within each phase. The measures implemented shall be retained and maintained for as long as the development remains in use. *Reason: To secure a reduction in noise from traffic or other sources in order to protect future residents from noise disturbance pursuant to policies SP1, H1 and DM1 of the Core Strategy (2007) and saved policy DC26 of the Unitary Development Plan for the City of Manchester (1995).*

2.0 Project & Assessment Overview

Block A is a standalone residential building with a L0 commercial unit, directly below apartments at L1 (party floor adjacency).

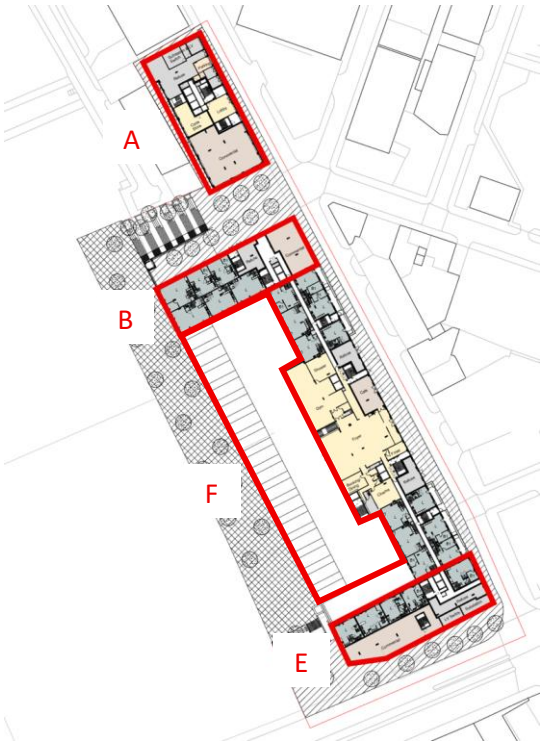
Block B is a residential block that is structurally connected to other blocks (Blocks C & D) by a common podium. This block contains 3nr commercial units at B2, B1 and L0. The B1 commercial unit sits directly below L0 apartments (party floor adjacency). The L0 commercial unit sits directly below L1 apartments (party floor adjacency).

Block E is a residential block that is structurally connected to other blocks (Blocks C & D) by a common podium. This block contains 3nr commercial units at B1 (1nr) and L0 (2nr). The B1 commercial unit sits directly below L0 apartments (party floor adjacency). The larger of the two L0 units sits adjacent to apartments at L0 (party wall adjacency) and both L0 units sit below L1 apartments (party floor adjacencies).

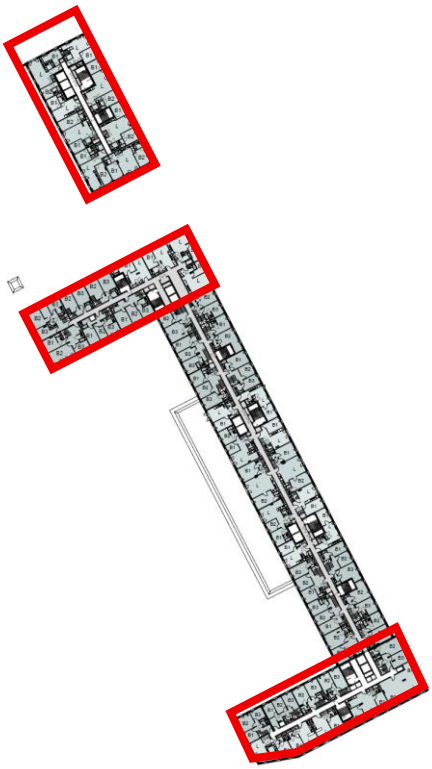
There are no amenity spaces in Blocks A, B and E.

Block F comprises a row of steel portal framed commercial units. These units are not structurally connected to any dwellings. The block also contains amenity space (spa facilities) but these are contained in a concrete subterranean unit (with no windows). This amenity facility is also structurally decoupled from any residential buildings. The amenity spaces are deemed to present no risk of external operational noise breakout or transfer.

See below the site wide ground floor and first floor plans, indicating the locations of Blocks A, B and E.

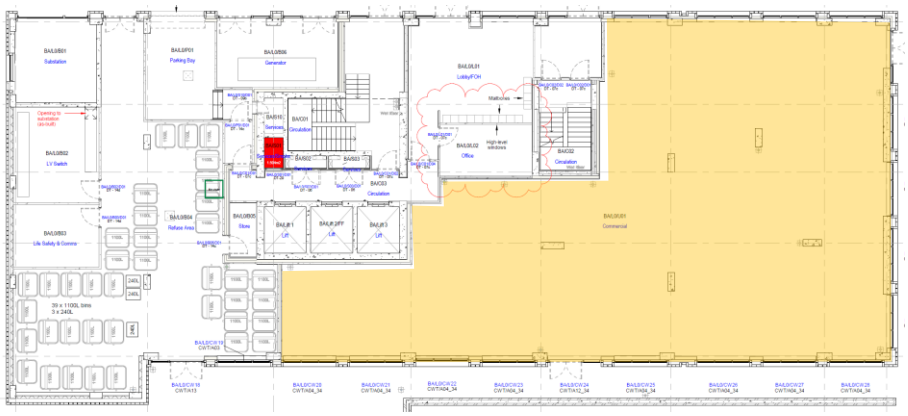


Ground floor plan

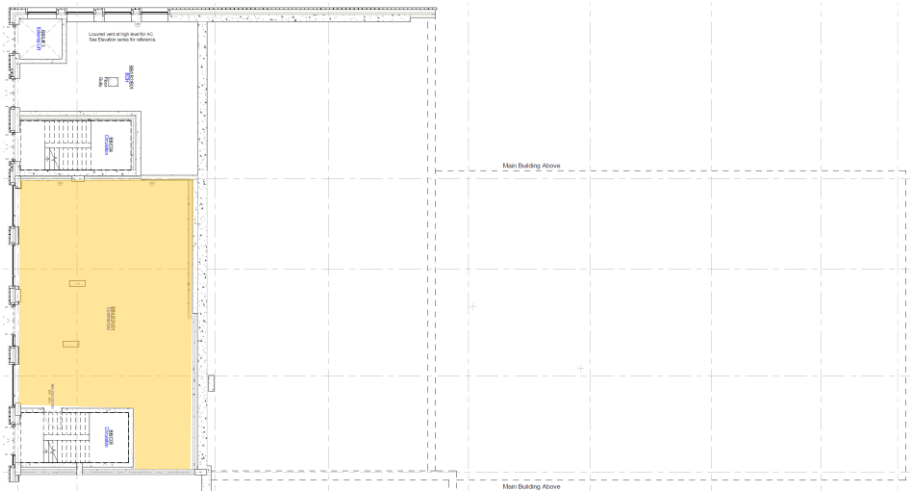


First floor plan

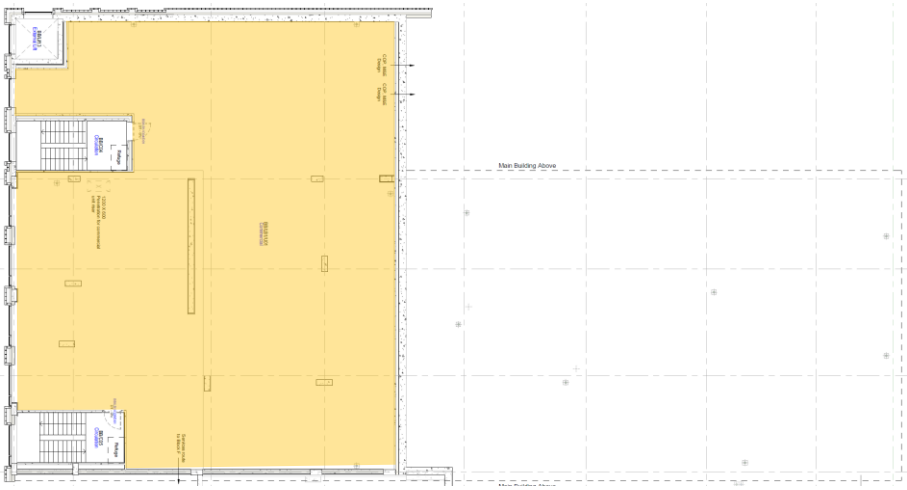
More detailed plans of the commercial units per block are shown below.



Block A – L0 commercial unit

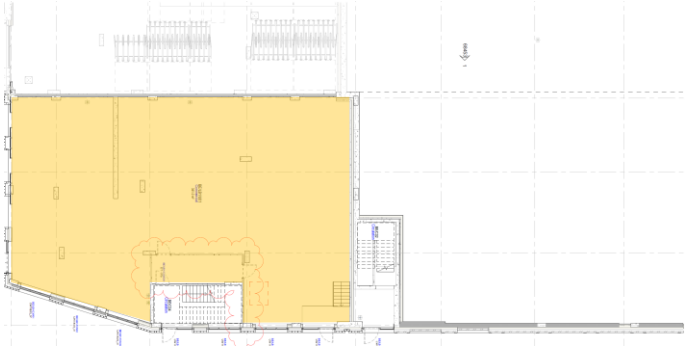


Block B – B2 commercial unit



Block B – B1 commercial unit

Block B – L0 commercial unit



Block E – B1 commercial unit

Block E – L0 commercial units

Block F –Commercial units (with mezzanine floor)

This report shall cover the following in relation to Blocks A, B, E and F:

Condition 18: Commercial/Amenity Noise Transfer

Commercial/Amenity Space	Operational noise breakout to externals	Operational noise transfer (horizontal – party wall)	Operational noise transfer (vertical – party floor)
Commercial unit	✓	✓ (where applicable)	✓ (where applicable)
Block F amenity	N/A (insignificant)	N/A	N/A

Assessments of noise transfer from the Block C gym to apartments that are within Block B are covered in our Report 22015-RP-2-R0.

Condition 19: Residential Sound Insulation Scheme

- Confirmation of design specifications for façade elements to achieve acceptable internal noise levels within dwellings, along with confirmation of ventilation provisions.

- Pre-completion noise level measurement results in selected apartments confirming acceptable internal noise levels from external traffic and music noise intrusion have been achieved.

- Pre-completion noise level measurement results in selected apartments confirming acceptable mechanical ventilation noise levels have been achieved.

3.0 PC 18 – Commercial Noise Transfer/Breakout

3.1 Acoustic Criteria

Noise Transfer:

For separating elements between commercial spaces and residential accommodation appropriate wall/floor solutions were specified based on the following.

1. 'Reasonable' assumed maximum anticipated operational sound levels in rooms as below (considered suitable to permit the majority of commercial tenant usage).

Room	Operational L_{eq} Noise Level (dB) Octave Band Centre Frequency (Hz)						
	63	125	250	500	1k	2k	4k
Commercial Unit	75	75	70	70	70	70	70

2. Walls/floors designed to achieve noise levels no greater than 5dB L_{eq} below anticipated background in each octave band in receiver space. At low frequency, noise not to exceed 47 dB L_{eq} at 63 Hz and 41 dB L_{eq} at 125 Hz absolute limits of 'virtual inaudibility'.
3. Walls/floors to achieve the minimum requirements of Building Regulations' Approved Document E.

Noise Breakout (to external):

The commercial unit facades have been designed to achieve a rating level of 5dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location. Based on survey results taken by Jameson Acoustics during demolition and construction phase noise monitoring of the site, the typical lowest external background noise levels anticipated in this area of the site in the late evening (representative of lowest daytime noise levels) and through the night-time are summarised below.

Desc.	Typical lowest background noise level, L_{90} (dB) at Octave Band Centre Frequency (Hz)							L_{A90} (dB)
	63	125	250	500	1k	2k	4k	
Daytime	57	51	49	48	46	38	27	49
Night-time	51	43	42	42	42	35	23	45

3.2 Design Specifications

3.2.1 Tenants Requirements

The approach taken is to provide shell only retail units, meaning no provisions for 'mass barrier' ceilings are provided in the base-build. Masonry party walls and floor finishes are left exposed in the commercial unit to provide the best 'base' to which tenant's can apply fit-out treatments. Party wall and floor constructions separating commercial units from dwellings are designed to achieve Building Regulations Approved Document E standards as a minimum.

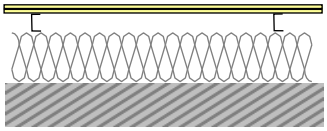
This is a common approach. Many 'low noise' tenants, e.g. cafes, clothes shops, convenience stores, etc., may not require enhanced sound insulation to meet the above noise transfer criteria. Prospective 'high noise' tenants, e.g. bars or restaurants with loud amplified music, may require enhanced sound insulation treatment but, if so, they can design in whatever solution they require as part of their fit-out works (i.e. they can design and install a solution that suits their exact needs).

Hence, the approach taken is to provide sensible base-build acoustic wall/floor solutions, set maximum operational noise limits and then advise tenants of their acoustic responsibilities. The latter is achieved by means of a detailed acoustic performance clause within lease agreements / tenant handbooks. The acoustic section, that is inserted into agreements for all retail units, including those in the basement, is presented in Appendix B.

The operational noise limits (tabulated above) have been calculated as follows…

1. All party floors comprise 225 mm thick in-situ concrete slabs, no ceilings.

2. All party walls comprise:



- 75 mm SpecWall.
- 240 mm cavity (with mineral wool thermal insulation).
- 2 x 15 mm dense plasterboard (e.g. SoundBloc).

3. Based on past test site data (floor) and SpecWall acoustic laboratory test evidence, we assigned the following apparent sound reduction performance figures to each construction, with sensible flanking limitations assigned.

Element	Est. apparent sound reduction, *R'* (dB) at OBCF (Hz)							R'_w (C_{tr}), dB
	63	125	250	500	1k	2k	4k	
Floors	36	38	48	55	63	68	68	**58 (-7)**
Walls	38	44	50	53	57	62	65	**58 (-5)**

4. The following Figures present our calculations to determine max. operational noise limits, with the lowest value per octave band taken (and rounded down to the nearest 5dB).

Commercial to Apt - Floor

	L		W		H					
Receive room dimensions:	4	m	3	m	2.4	m		*SPL2 = SPL1 + 10log(S/A) - SRI*		
	L		W							
Interface dimensions:	4	m	3	m						
Frequency	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**dBA**	**NR (Full)**	**NR (250-4k)**
Receive Room Criteria	47	41	26	19	15	12	9	28	22	15
Receive Room RT	0.6	0.6	0.5	0.5	0.5	0.5	0.4			
Wall/Floor SRI	36	38	48	55	63	68	68	*< 225mm concrete*		
Limiting Source Room Lp	**81**	**78**	**73**	**73**	**77**	**79**	**77**	**83**		

Commercial to Apt - Wall

	L		W		H					
Receive room dimensions:	4	m	3	m	2.4	m		*SPL2 = SPL1 + 10log(S/A) - SRI*		
	L		W							
Interface dimensions:	4	m	3	m						
Frequency	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**dBA**	**NR (Full)**	**NR (250-4k)**
Receive Room Criteria	47	41	26	19	15	12	9	28	22	15
Receive Room RT	0.6	0.6	0.5	0.5	0.5	0.5	0.4			
Wall/Floor SRI	32	36	46	52	57	62	65	*<SpecWall + IWL*		
Limiting Source Room Lp	**77**	**76**	**71**	**70**	**71**	**73**	**74**	**79**		

3.3 Pre-completion Testing

3.3.1 Overview

Jameson Acoustics has sub-contracted Building Regulations sound insulation testing to Spratt & Hamer, a UKAS accredited test organisation. Their testing has covered party walls and floors between apartments and commercial units. The following table summarises the test results.

Element	Normalised sound level difference, D_{nT} (dB) at OBCF (Hz)							$D_{nT,w}$ + C_{tr}, dB
	63	125	250	500	1k	2k	4k	
Block A (floor to L1 bed)	37	41	49	56	68	73	70	**53**
Block A (floor to L1 bed)	38	44	50	53	57	62	65	**55**
Block B (floor to L1 bed)	35	41	50	56	67	70	70	**53**
Block B (floor to L1 liv)	39	45	51	59	65	69	70	**56**
Block E (floor to L1 bed)	43	55	65	66	73	76	75	**66**
Block E (floor to L1 liv)	40	51	63	65	72	73	71	**63**
Block E (wall to L0 liv)	34	35	45	52	56	59	62	**47**

Taking the lowest value per octave band from the above, the following table presents the final operational noise limits for the commercial units with a party wall/floor adjacencies, in order to satisfy internal noise transfer requirements – these figures are again rounded down to the nearest 5dB for safety.

Commercial Unit Location	Operational L_{eq} Noise Limit – re internal noise transfer control (dB) Octave Band Centre Frequency (Hz)						
	63	125	250	500	1k	2k	4k
Any commercial unit with party wall and floor adjacency (Block E large L0 unit)	80	75	70	70	70	70	70
Any commercial unit with party floor adjacency only	80	80	75	70	70	70	70
Block F units (no party wall/floor adjacency)	To be determined by external noise breakout analysis						

These limits are not intended for use by tenants. Tenants will be expected to do their own analysis to determine their own operational noise levels. The above is presented for planning condition discharge purposes only, and the purpose of presenting the above is to demonstrate that the limits based on in-situ commissioning sound insulation testing are higher than those used at design stage, and are therefore still considered to be suitable for the majority of commercial tenants. 'High noise' tenants (those expecting to exceed the above) will still need to apply further acoustic treatment in fit-out, secured with the tenants handbook acoustic requirements.

3.4 External Noise Breakout

The windows to all commercial units have been specified and selected to achieve a minimum sound reduction performance of 30 dB $R_w + C_{tr}$. The windows are curtain walling solutions, containing the unit's entrance door.

The nearest noise sensitive windows to the commercial units will be the development's own apartment windows directly above at Level 1. For the Block B commercial unit at L0, the Dutton Arms directly opposite at a distance of 12 m also requires consideration (first floor bedroom windows). We shall therefore focus on this commercial unit…

Based on the MCC requirement to ensure operational (entertainment) noise does not exceed a level -5 dB below the prevailing background at the nearest noise sensitive windows, our assessment indicates the following maximum operational noise levels would be permissible in the worst-case commercial unit, assuming worst-case night-time operation (beyond 23:00hr). Calculations are based on the industry standard equation for noise breakout, as follows.

$$SPL_{out} = SPL_{in} - SRI + 10\log_{10}\left(\frac{S}{r^2}\right) - 14$$

, where SPL_{out} in the resultant noise level outside, SPL_{in} is the reverberant noise level inside the venue, SRI is the composite sound reduction of the façade, S is the area of the façade (m2), and r is the distance.

BLOCK B (L0) UNIT TO DUTTON ARMS – NIGHT-TIME

Desc.	dB, at Octave Band Centre Frequency, Hz							A-weighted, dB(A)
	63	125	250	500	1k	2k	4k	
SPL_{out} (limits), $L_{eq,5min}$	46	38	37	37	37	30	18	**40**
SRI, typical (pessimistic)	-20	-22	-25	-28	-32	-34	-36	*(30 dB R_w+C_{tr})*
10log(S/r^2), S=80m^2, r=12m	-3	-3	-3	-3	-3	-3	-3	-
-14	-14	-14	-14	-14	-14	-14	-14	-
SPL_{in} (max permissible)	**83**	**77**	**79**	**82**	**86**	**81**	**71**	**88**
Max permissible SPL_{in} assumed at design	*75*	*75*	*70*	*70*	*70*	*70*	*70*	-

BLOCK B (L0) UNIT TO L1 APARTMENTS – NIGHT-TIME

Desc.	dB, at Octave Band Centre Frequency, Hz							A-weighted, dB(A)
	63	125	250	500	1k	2k	4k	
SPL_{out} (limits), $L_{eq,5min}$	46	38	37	37	37	30	18	**40**
SRI, typical (pessimistic)	-20	-22	-25	-28	-32	-34	-36	*(30 dB R_w+C_{tr})*
10log(S/r^2), S=80m^2, r=4m	+7	+7	+7	+7	+7	+7	+7	-
80 degree off-axis (vertical)	-9	-10	-9	-9	-9	-9	-9	-
-14	-14	-14	-14	-14	-14	-14	-14	-
SPL_{in} (max permissible)	**82**	**76**	**78**	**81**	**85**	**80**	**70**	**87**
Max permissible SPL_{in} assumed at design	*75*	*75*	*70*	*70*	*70*	*70*	*70*	-

The results demonstrate the façade is expected to give sufficient provisional overhead from the design assumed maximum permissible internal noise levels (which were set to suit the majority of commercial tenants).

The above limits, and those presented in Section 3.3, are intended to inform the Developer's submission for planning condition discharge only. Tenants will be expected to conduct their own analysis based on the data presented herein and in various acoustic design report to set their own operational noise limits. Ultimately, tenants will be held responsible for controlling their noise output to comply with the tenants handbook requirements in Appendix B.

4.0 PC 19 – Residential Noise Insulation Scheme

4.1 Acoustic Criteria

Facades to the residential accommodation in Block A, B and E have been designed to achieve the following internal noise levels:

Area	Location	Daytime (07:00-23:00)	Night time (23:00-07:00)
Apartment/Townhouse	Living Room	35 dB $L_{Aeq,16hr}$	-
	Bedroom	35 dB $L_{Aeq,16hr}$	30 dB $L_{Aeq,8hr}$ 45 dB* L_{Afmax}

* Not to be regularly exceeded by scheduled noise events (e.g. trains, buses, etc.).

In addition, the following low frequency noise limits shall be achieved during music events at the Arena.

Area	Location	Desirable Internal Noise Level from Arena Events, $L_{eq,5min}$ at Octave Band Centre Frequency	
		63 Hz	63 Hz
Apartment/Townhouse	Living Room / Bedroom	47 dB	41 dB

All apartments are ventilated with whole-house mechanical ventilation systems (MVHR) which have been designed to maintain the 35 dB L_{Aeq} (daytime bed/liv) and 30 dB L_{Aeq} (night-time bed) noise levels during normal operation. Two boost modes exist, for which relaxations are permitted under the IOA/ANC Guide *Acoustics, Ventilation & Overheating* (AVO), as follows:

- Extract boost – extract rates are increased to remove humid air in bathrooms: noise levels in bedrooms would be unchanged (extract ducts do not serve bedrooms) and noise levels in living rooms should not exceed 35 dB L_{Aeq}.
- Summer boost – manual switch to boost supply/extract air for summer cooling: this condition effectively helps to reduce the reliance on openable windows in the summer. As such, the AVO permits a relaxation of up to +5 dB on the above L_{Aeq} limits in bedrooms and living rooms. NB: As an alternative to having the window open, the +5 dB provides far better acoustic conditions in the apartments than opening the windows.

4.2 Design Specifications

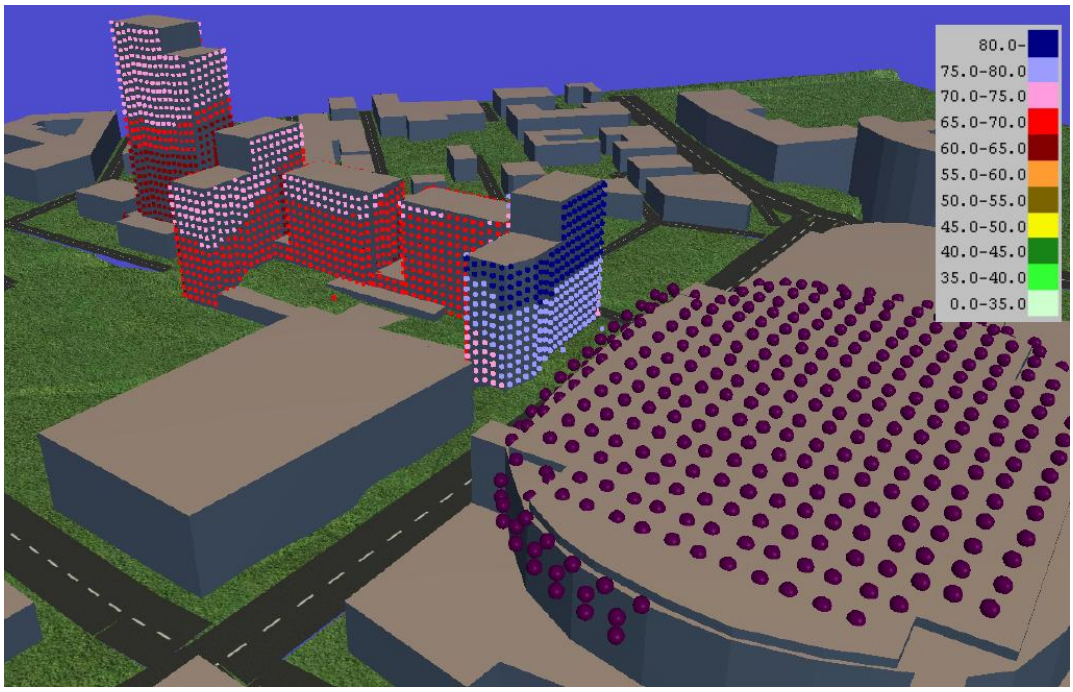
4.2.1 Facades

In Blocks A, B and E, all apartments will have facades formed from brick/SFS external walls with punched in double glazed windows.

For the window systems, the following acoustic specification informed the specification to satisfy the above noise requirements.

Façade Zone *(ref. Figure above)*	Minimum Sound Reduction, R (dB) at OBCF		Min. Overall $R_w + C_{tr}$ (dB)	Example Glass Configuration (Guidance Only)
	63 Hz	125 Hz		
PURPLE	34	23	**37**	Primary window: Gold specification Secondary window: 10.8 mm acoustic lam. with 200 mm (min) cavity depth
GOLD	25	16	**34**	13.5 (lam) / 16 arg / 10 (tough) mm
BLUE	-	-	**30**	10 / 16 arg / 6 mm

Event (music) noise levels from the Arena were surveyed and reviewed by means of noise modelling to set the above specification, as shown below.



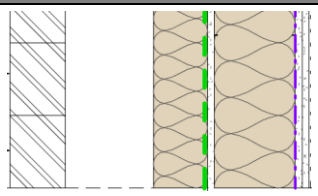
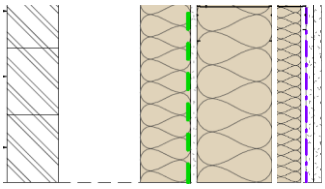
The window systems were supplied by Lancashire Double Glazing, who confirm the specification of the window systems as follows:

Gold: Aluminium frame, 8.8 [acoustic lam.] / 16 / 10 mm configuration, with a certified performance of 37 dB $R_w + C_{tr}$ and low frequency performances achieving/exceeding the low frequency figures.

Blue: Aluminium frame, 6.8 [lam.] / 14 / 8 mm [toughened] configuration, with a certified performance 33 dB $R_w + C_{tr}$.

For the secondary glazing to the purple zones, the system has been designed to satisfy the design guidance tabulated above (10.8 mm acoustic lam. glass in robust aluminium frames set with a min cavity depth of 200 mm). Primary windows to purple zones satisfy the Gold zone specification.

The specification of the external walls to the above zones is as follows.

Type	Sketch	Build-Up
Standard Brick/SFS to Residential Areas ***Blue*** *zones* ***Gold*** *zones*		• 102.5mm traditional brick. • External cavity (with mineral wool slab). • Weatherboarding. • 100-150mm SFS (full filled with mineral wool). • 2 x 15mm plasterboard.
Enhanced Brick/SFS to Secondary Glazed Residential Areas ***Purple*** *zones*		• 102.5mm traditional brick. • External cavity (with mineral wool slab). • Weatherboard. • 100-150mm SFS (full filled with mineral wool). • 10mm clearance. • 50mm IWL independent stud (with mineral wool). • 2 x 15mm dense plasterboard (e.g. SoundBloc).

The sound reduction performance of the standard construction was estimated to provide a sound reduction performance of 53 dB $R_w + C_{tr}$ with low frequency performance of 40 dB *R* at 63 Hz and 43 dB *R* at 125 Hz. In the enhanced purple zones, the estimated sound reduction performance was 59 dB $R_w + C_{tr}$ with low frequency performance of 44 dB *R* at 63 Hz and 48 dB *R* at 125 Hz. These figures exceeds the requirements to satisfy the noise limits presented in Section 4.1; windows (and associated spandrels incorporating ventilation terminations) are expected to be the weakest façade element.

NB: MVHR ventilation ductwork to all dwellings has received façade attenuators and a boxing detail to the head of windows to control traffic and music sound flanking.

4.2.2 Ventilation Systems

The MVHR units providing ventilation to apartments are by Nuaire (model MRXBOXAB-ECO). Associated noise levels for units to 1-bed, 2-bed and 3-bed dwellings were reviewed at design stage and found to satisfy the noise limits in Section 4.1 under normal and boost conditions.

4.3 Pre-completion Testing

4.3.1 External Noise Intrusion

Automated noise level measurements were taken across a selection of 'worst-case' apartments across two periods: Monday 19 May to Tuesday 27 May 2025 and Friday 11 July to Wednesday 16 July 2025.

The positions were selected to establish the typical prevailing daytime and night-time internal noise levels within living rooms and bedrooms in the worst-case areas wrt traffic noise and/or AO Arena music noise. The two periods were selected to capture live music events at the area, as listed below.

- 19 & 20 May: Kylie
- 25 May: The Lumineers
- 11 July: Kool & the Gang
- 15 July: Lynyrd Skynrd

The positions/apartments selected were as follows. Positions 1, 3, 5-7 were at low level to obtain worst-case traffic noise levels (as best as practically achievable on-site) per block, and Positions 2, 4, 8-9 were at high level to obtain worst-case Arena music noise levels (breakout from the Arena roof) per block. More measurements were taken in Block E as this is closest to the Arena.

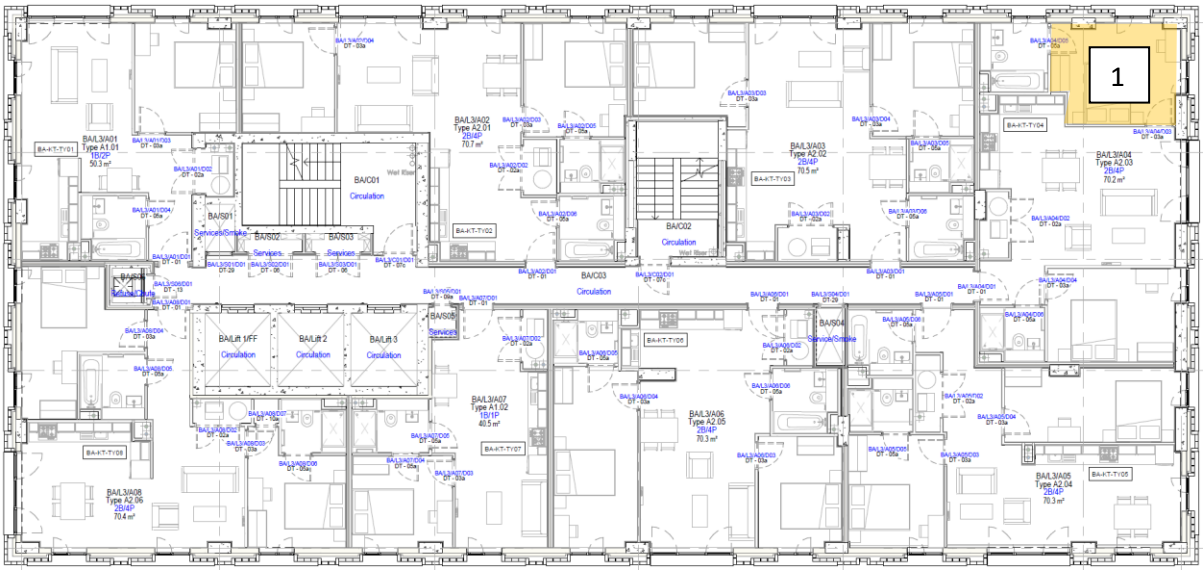
Pos	Dates (2025)	Description (*Window Spec Zone)*
1	Fri 11 Jul – Wed 16 Jul	Block A – Level 03 – A304 Bedroom (*Blue Zone)*
2	Fri 11 Jul – Wed 16 Jul	Block A – Level 18 – A1805 Bedroom (*Gold Zone)* ***– Facing Arena***
3	Fri 11 Jul – Wed 16 Jul	Block B – Level 03 – B302 Bedroom (*Blue Zone)*
4	Fri 11 Jul – Wed 16 Jul	Block B – Level 10 – B1003 Bedroom (*Gold Zone)* ***– Facing Arena***
5	Mon 19 May – Tue 27 May	Block E – Level 02 – E202 Living Room *(Purple Zone)* – ***Facing Arena***
6	Mon 19 May – Tue 27 May	Block E – Level 02 – E205 Bedroom *(Purple Zone)* – ***Facing Arena***
7	Mon 19 May – Tue 27 May	Block E – Level 02 – E207 Bedroom *(Gold Zone)* – ***Near Arena***
8	Fri 11 Jul – Wed 16 Jul	Block E – Level 09 – E905 Bedroom *(Purple Zone)* – ***Facing Arena***
9	Fri 11 Jul – Wed 16 Jul	Block E – Level 10 – E1003 Bedroom *(Purple Zone)* – ***Facing Arena***

The microphones were fitted with windshields and mounted in the centre of the rooms, at least 1.4 metres from walls at a height of 1.6-1.7 metres.

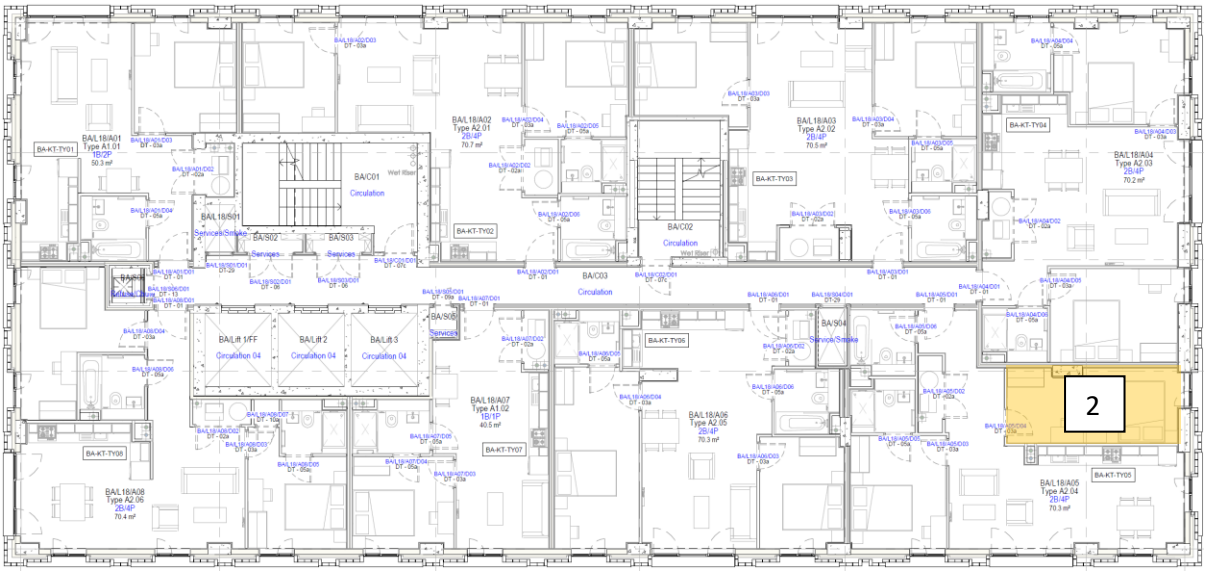
The equipment was programme to continuously log all relevant A-weighted broadband (dBA) and linear spectral noise level indices, including L_{eq}, L_{90}, L_{10} and L_{max}, over 5-minute, 15-minute and 1-hour intervals.

Windows were closed and MVHR units were switched off (to solely measure external noise intrusion).

The following plans illustrate each noise level test room.

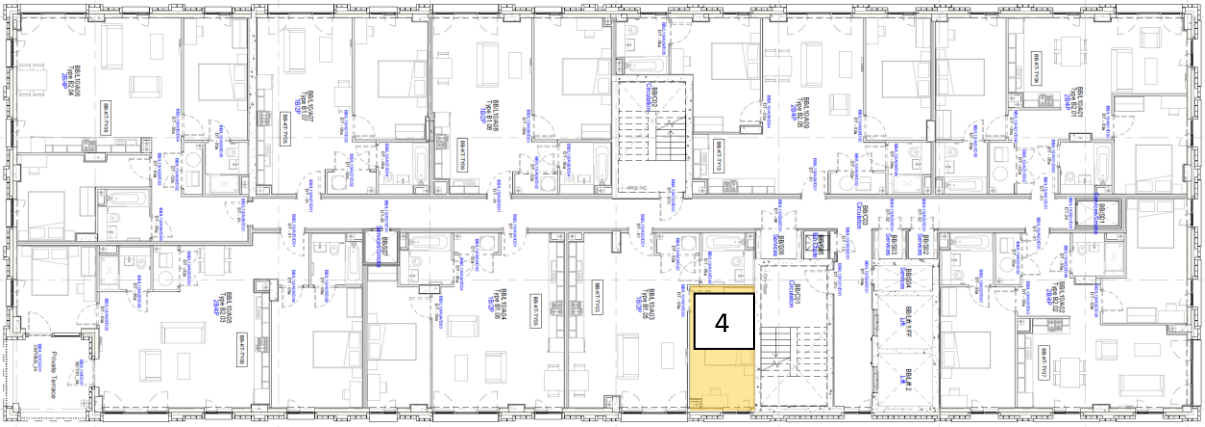


Block A Level 3 (overlooking Dutton St)



Block A Level 18 (Selected Apt with direct view of AO Arena Roof)

Block B Level 3 (overlooking Dutton St)



Block B Level 10 (Selected Apt with direct view of AO Arena Roof)

Block E Level 2 (5 & 6 Overlooking Trinity Way & AO Arena, 7 non-secondary glazing bedroom close to AO Arena)

Block E Level 9 (Selected Apt with direct view of AO Arena Roof)

Block E Level 10 (Selected Apt with direct view of AO Arena Roof)

The instrumentation used for the survey is summarised below.

Description	Description	Serial Nr	Lab Calibration Expiry	Lab Calibration Certificate Nr
Class 1 sound level meter	Svantek 971A (with Type 7152 microphone)	124663 (82835)	26 Aug 2026	1509611-1
		131635 (85533)	4 Nov 2026	1510429-1
		127647 (84398)	25 Jul 2027	1512926-1
		131642 (85571)	25 July 2027	1512926-2
		154301 (94512)	16 Jan 2027	16 Jan 2025
		154288 (94517)	16 Jan 2027	16 Jan 2025
Class 1 sound calibrator	Cirrus CR:515	57570	12 Nov 2025	1171319

The sound level meters were hand-calibrated at the beginning and end of the survey periods. No significant deviations in calibration level were noted.

Due to the nature of the survey, i.e. unmanned, it is not possible to describe the weather conditions throughout the duration of the survey period. However, on install and collection, weather conditions were considered suitable for obtaining representative internal readings. Based on internet weather reports for the full duration of the survey periods, conditions generally remain suitable for representative readings, with no significant periods of adverse weather.

The results of the surveys have been plotted on Time History Graphs 22015-ABE-G1 to G9 enclosed in Appendix C. The graphs present the uncorrected 15-minute A-weighted (dBA) L_{eq} and L_{max} levels at each position throughout the duration of the survey.

NB: Daytime results during site working hours were unduly affected by construction activity noise. These periods have been highlighted red and shall be discounted from the assessment. Similarly, some periods of measurements were unduly affected by site workers leaving windows open (evident when we collected the equipment, and clear on the survey readings as to when this happened). These have been noted on the graphs and also excluded from our analysis. At Position 4, the equipment suffered from battery failure but still managed to collate sufficient data for analysis.

The L_{Aeq} results are summarised below and compared against the internal noise requirements.

Position 1 – A304 Bedroom

Period Commencement (Day/Night of…) 2025	Ambient Noise Level (dB)	
	Daytime $L_{Aeq,16hr}$ (07:00-23:00)	Night-time $L_{Aeq,8hr}$ (23:00-07:00)
Fri 11 Jul	23*	22
Sat 12 Jul	25*	22
Sun 13 Jul	24*	22
Mon 14 Jul	23*	22
Tue 15 Jul	-	-
Upper Limit	**35**	**30**
Compliance/Exceedance	✓	✓

* not full 16-hr period (construction noise excluded).

Position 2 – A1805 Bedroom

Period Commencement (Day/Night of…) 2025	Ambient Noise Level (dB)	
	Daytime $L_{Aeq,16hr}$ (07:00-23:00)	Night-time $L_{Aeq,8hr}$ (23:00-07:00)
Fri 11 Jul	27*	25
Sat 12 Jul	28*	25
Sun 13 Jul	27	25
Mon 14 Jul	28*	26
Tue 15 Jul	30*	24
Upper Limit	**35**	**30**
Compliance/Exceedance	✓	✓

* not full 16-hr period (construction noise excluded).

Position 3 – B302 Bedroom

Period Commencement (Day/Night of…) 2025	Ambient Noise Level (dB)	
	Daytime $L_{Aeq,16hr}$ (07:00-23:00)	Night-time $L_{Aeq,8hr}$ (23:00-07:00)
Fri 11 Jul	27*	25
Sat 12 Jul	27*	25
Sun 13 Jul	28	25
Mon 14 Jul	31* (XX)	29 (XX)
Tue 15 Jul	34* (XX)	29 (XX)
Upper Limit	**35**	**30**
Compliance/Exceedance	✓	✓

* not full 16-hr period (construction noise excluded).

(XX) window left open in apartment living room (and bedroom door left ajar)

Position 4 – B1003 Bedroom

Period Commencement (Day/Night of…) 2025	Ambient Noise Level (dB)	
	Daytime $L_{Aeq,16hr}$ (07:00-23:00)	Night-time $L_{Aeq,8hr}$ (23:00-07:00)
Fri 11 Jul	28*	25
Sat 12 Jul	27*	25
Sun 13 Jul	27	25
Upper Limit	**35**	**30**
Compliance/Exceedance	✓	✓

* not full 16-hr period (construction noise excluded).

Position 5 – E202 Living Room

Period Commencement (Day/Night of…) 2025	Ambient Noise Level (dB)	
	Daytime $L_{Aeq,16hr}$ (07:00-23:00)	Night-time $L_{Aeq,8hr}$ (23:00-07:00)
Mon 19 May	25*	21
Tue 20 May	25*	21
Wed 21 May	25*	21
Thu 22 May	29*	26
Fri 23 May	26*	23
Sat 24 May	24*	22
Sun 25 May	26	22
Mon 26 May	24	21
Upper Limit	**35**	**30**
Compliance/Exceedance	✓	✓

* not full 16-hr period (construction noise excluded).

Position 6 – E205 Bedroom

Period Commencement (Day/Night of…) 2025	Ambient Noise Level (dB)	
	Daytime $L_{Aeq,16hr}$ (07:00-23:00)	Night-time $L_{Aeq,8hr}$ (23:00-07:00)
Mon 19 May	27*	21
Tue 20 May	26*	21
Wed 21 May	27*	21
Thu 22 May	25*	22
Fri 23 May	27*	23
Sat 24 May	25*	23
Sun 25 May	28	23
Mon 26 May	25	23
Upper Limit	**35**	**30**
Compliance/Exceedance	✓	✓

* not full 16-hr period (construction noise excluded).

Position 7 – E207 Bedroom

Period Commencement (Day/Night of…) 2025	Ambient Noise Level (dB)	
	Daytime $L_{Aeq,16hr}$ (07:00-23:00)	Night-time $L_{Aeq,8hr}$ (23:00-07:00)
Mon 19 May	27*	22
Tue 20 May	28*	21
Wed 21 May	27*	23
Thu 22 May	28*	23
Fri 23 May	28*	21
Sat 24 May	27*	21
Sun 25 May	30	22
Mon 26 May	27	24
Upper Limit	**35**	**30**
Compliance/Exceedance	✓	✓

* not full 16-hr period (construction noise excluded).

Position 8 – E905 Bedroom

Period Commencement (Day/Night of…) 2025	Ambient Noise Level (dB)	
	Daytime $L_{Aeq,16hr}$ (07:00-23:00)	Night-time $L_{Aeq,8hr}$ (23:00-07:00)
Fri 11 Jul	25*	19
Sat 12 Jul	21*	19
Sun 13 Jul	20	18
Upper Limit	**35**	**30**
Compliance/Exceedance	✓	✓

* not full 16-hr period (construction noise excluded).

Position 9 – E1003 Bedroom

Period Commencement (Day/Night of…) 2025	Ambient Noise Level (dB)	
	Daytime $L_{Aeq,16hr}$ (07:00-23:00)	Night-time $L_{Aeq,8hr}$ (23:00-07:00)
Fri 11 Jul	28*	24
Sat 12 Jul	26*	26
Sun 13 Jul	26	24
Mon 14 Jul	28*	27
Tue 15 Jul	31*	26
Upper Limit	**35**	**30**
Compliance/Exceedance	✓	✓

* not full 16-hr period (construction noise excluded).

The following table summarises the measured 10-15th highest internal $L_{Amax,5min}$ (night-time) noise levels in each test apartment. Note, Pos 5 living room is not subject to the maximum noise criterion at night, however, we have presented the data regardless, as this provides a good indication of compliance in adjacent bedrooms.

Position	10-15th Highest Noise Level at Night, dB $L_{Amax,5min}$ (23:00-07:00)	Upper Limit, dB $L_{Amax,5min}$ (23:00-07:00)	Compliance/ Exceedance
1 – A304 Bedroom	40	45	✓
2 – A1805 Bedroom	41	45	✓
3 – B302 Bedroom	39*	45	✓
4 – B1003 Bedroom	42	45	✓
5 – E202 Living Room	38	45	✓
6 – E205 Bedroom	37**	45	✓
7 – E207 Bedroom	35	45	✓
8 – E905 Bedroom	33	45	✓
9 – E1003 Bedroom	41	45	✓

* first three nights only (remaining nights affected by opened window in apartment)
** first three nights only (remaining nights affected by fire alarm beeps inside apartment) & excluding unduly high noise events likely to be attributed to internal activities

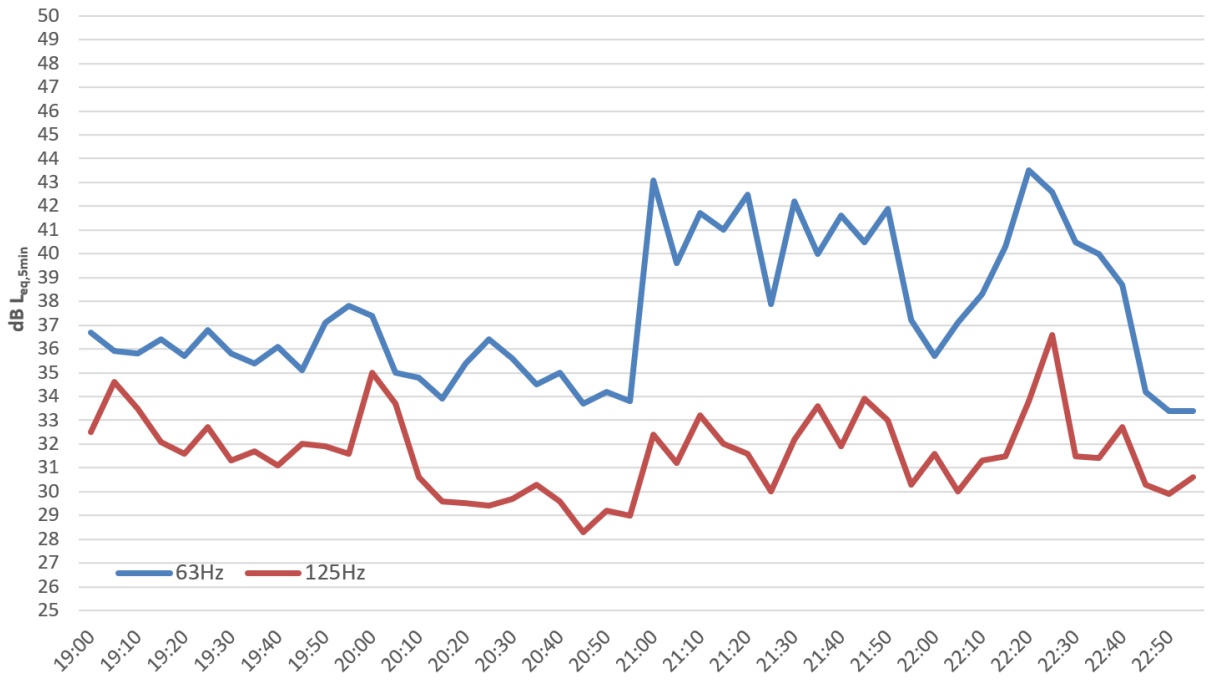
The results demonstrate that, in all tested apartments, the internal noise levels achieved the upper limits of acceptable internal noise levels from anonymous/traffic noise sources.

For music noise, the following graphs present a time history trace of each event recorded at Positions 2, 4, 5, 6, 7, 8 and 9, which all either have a full view of the Arena roof (upper level apartments in Blocks A, B and E), or are close to the Arena (all in Block E).

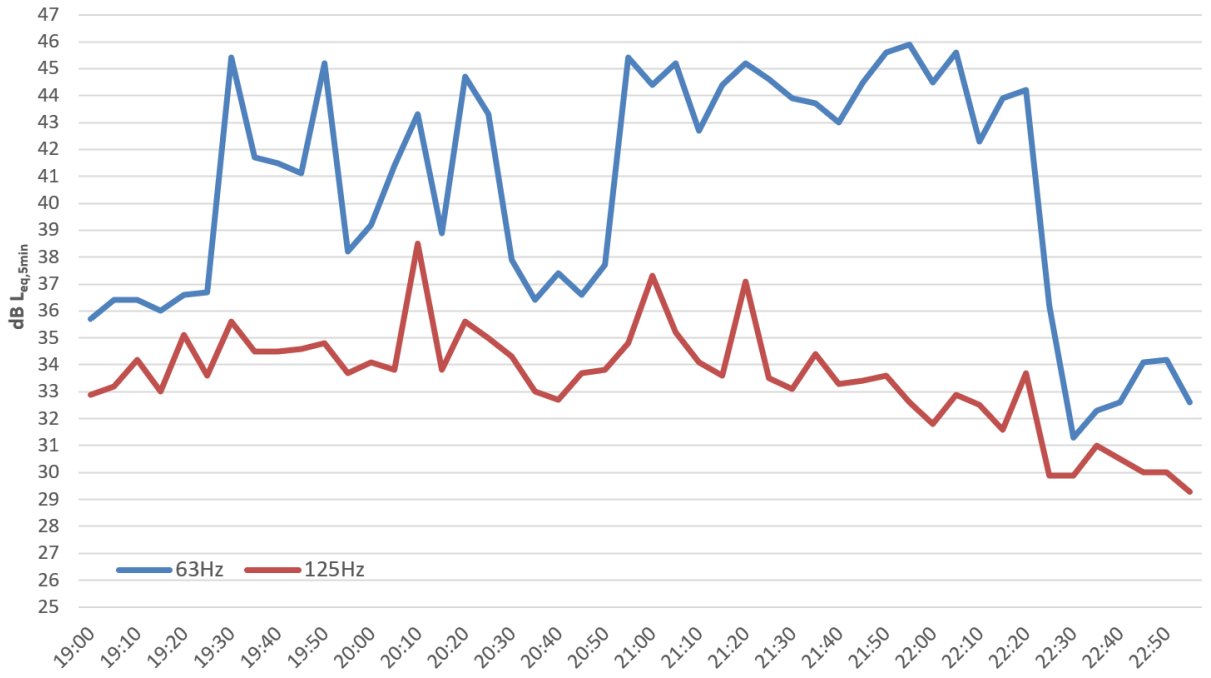
The graphs present total noise levels recorded. There is no correction applied for residual (i.e. traffic) noise contributions. A correction has, however, been apply to account for typical reverberation times in bedrooms and living rooms (obtained from Spratt & Hamer internal wall/floor sound insulation test sheets). The test

rooms were all finished but unfurnished, and the correction is to a reference reverberation time of 0.5 seconds for furnished apartments in accordance with BS 8233.

Position 2 – Block A Level 18 (A1805 Bedroom)

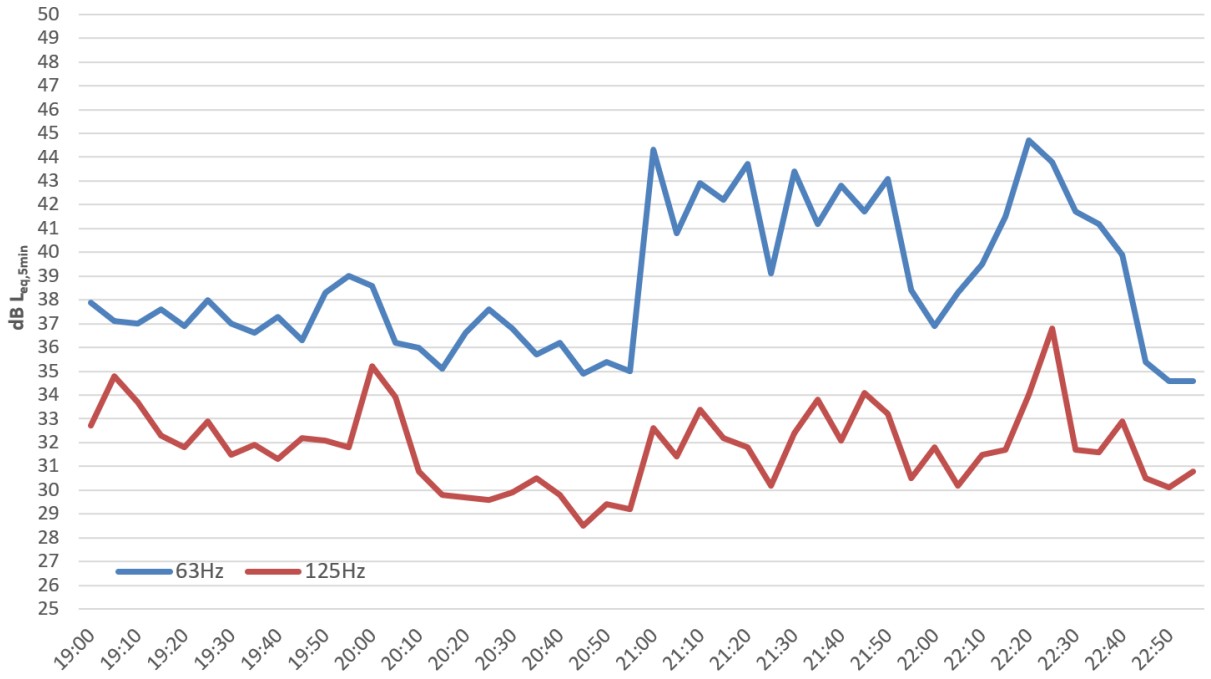


11th July – Kool & The Gang



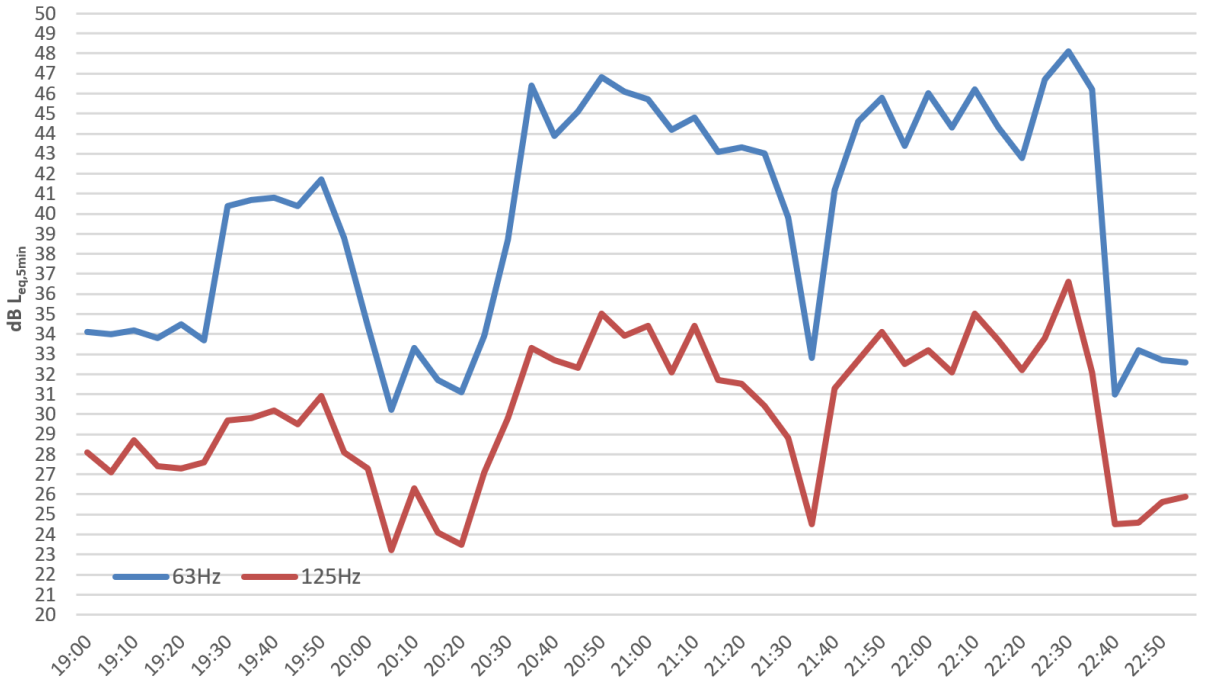
15th July – Lynyrd Skynrd Live

Position 4 – Block B Level 10 (B1003 Bedroom)

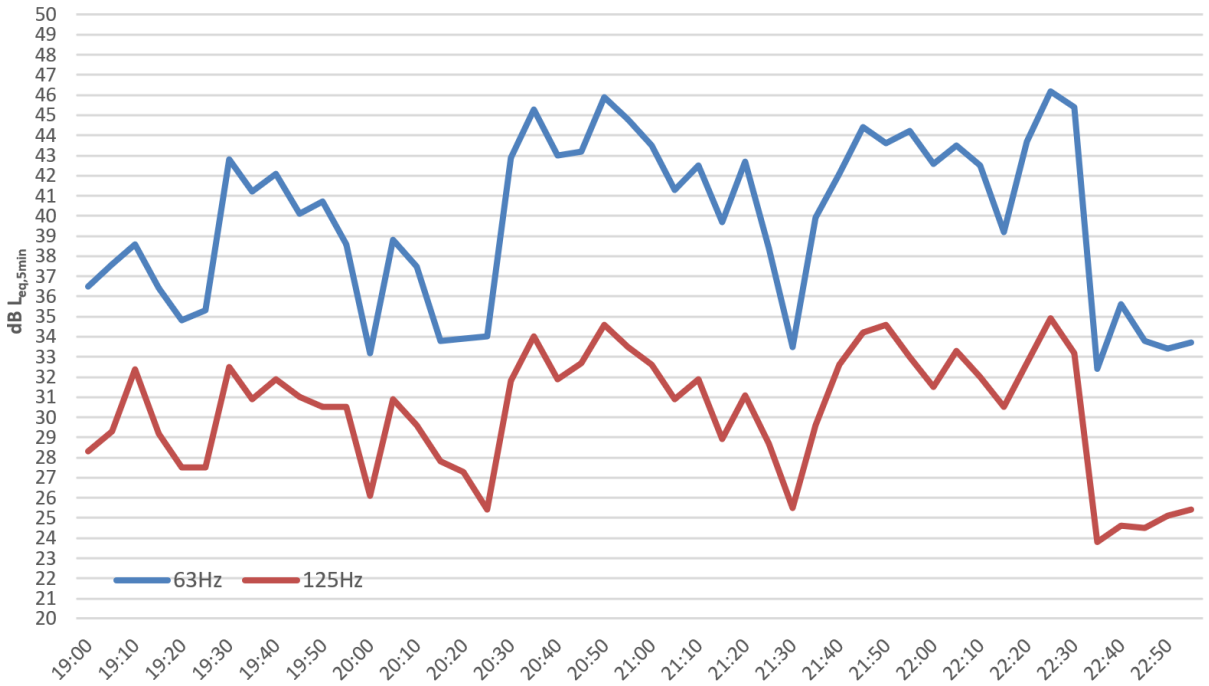


11th July – Kool & The Gang

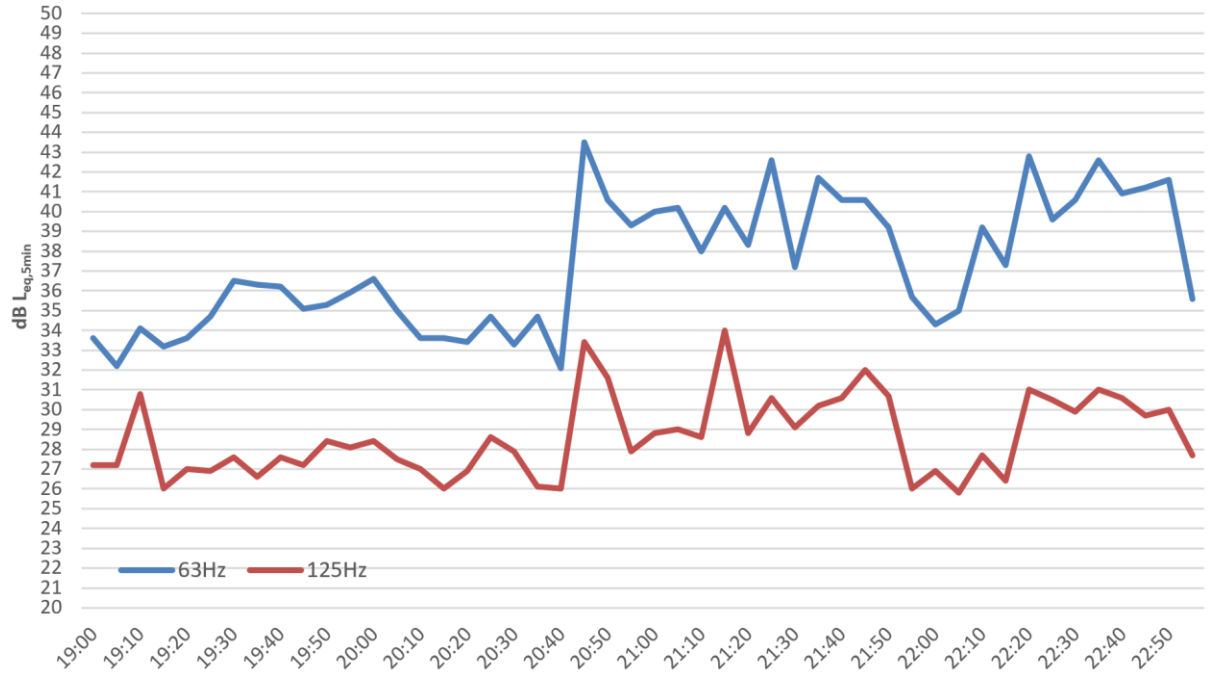
Position 5 – Block E Level 2 (E202 Living Room)



19th May 2025 – Kylie

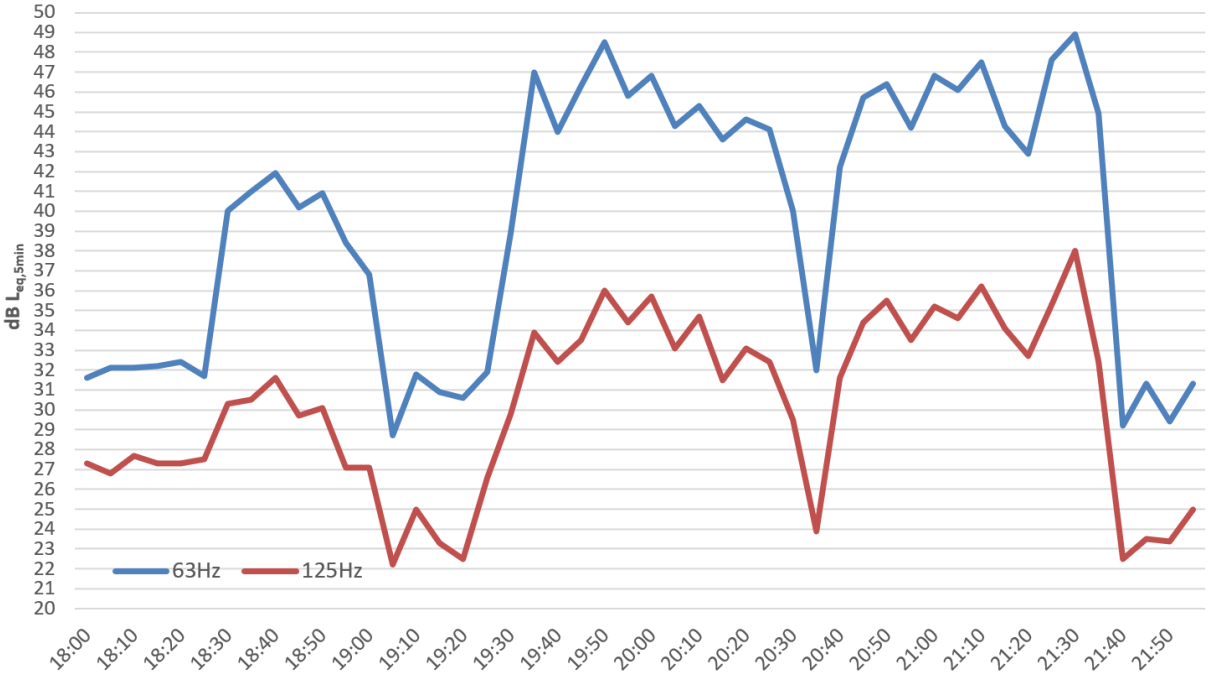


20th May 2025 – Kylie

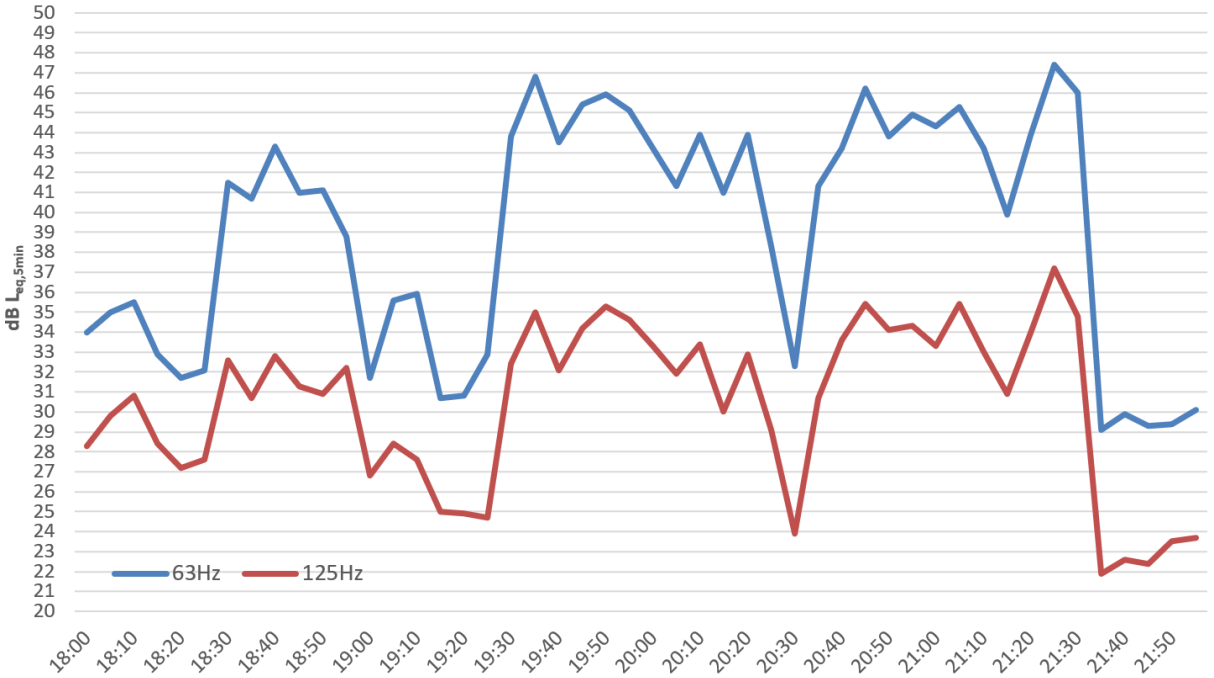


25th May 2025 – The Lumineers

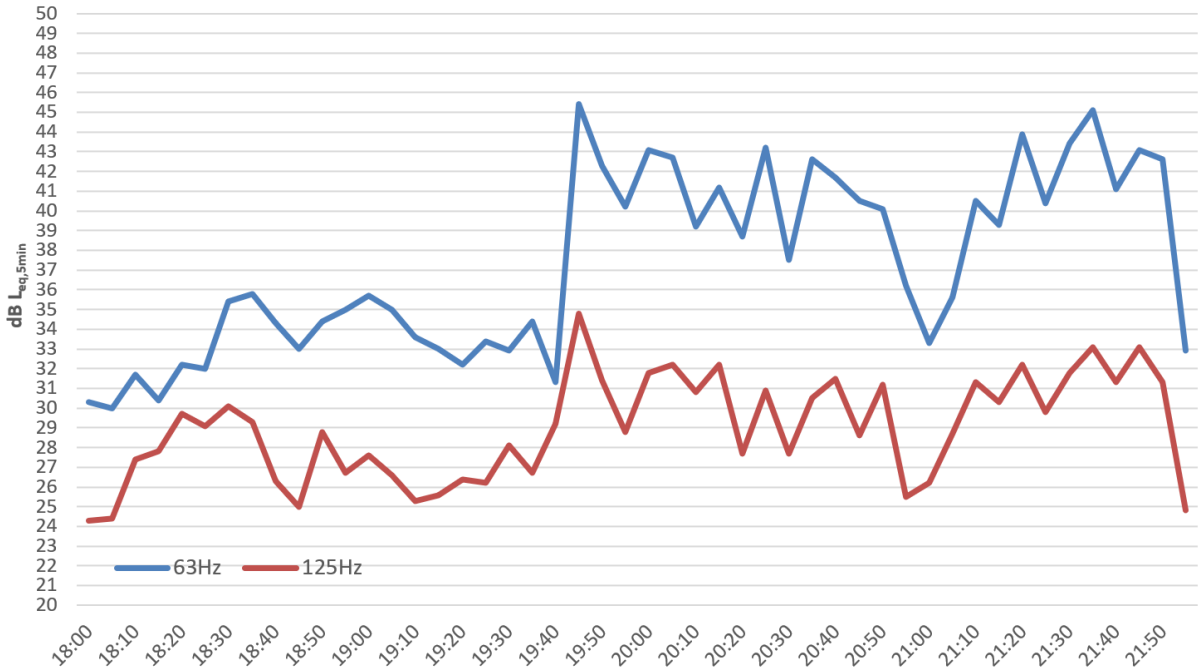
Position 6 – Block E Level 2 (E205 Bedroom)



19th May 2025 – Kylie



20th May 2025 – Kylie

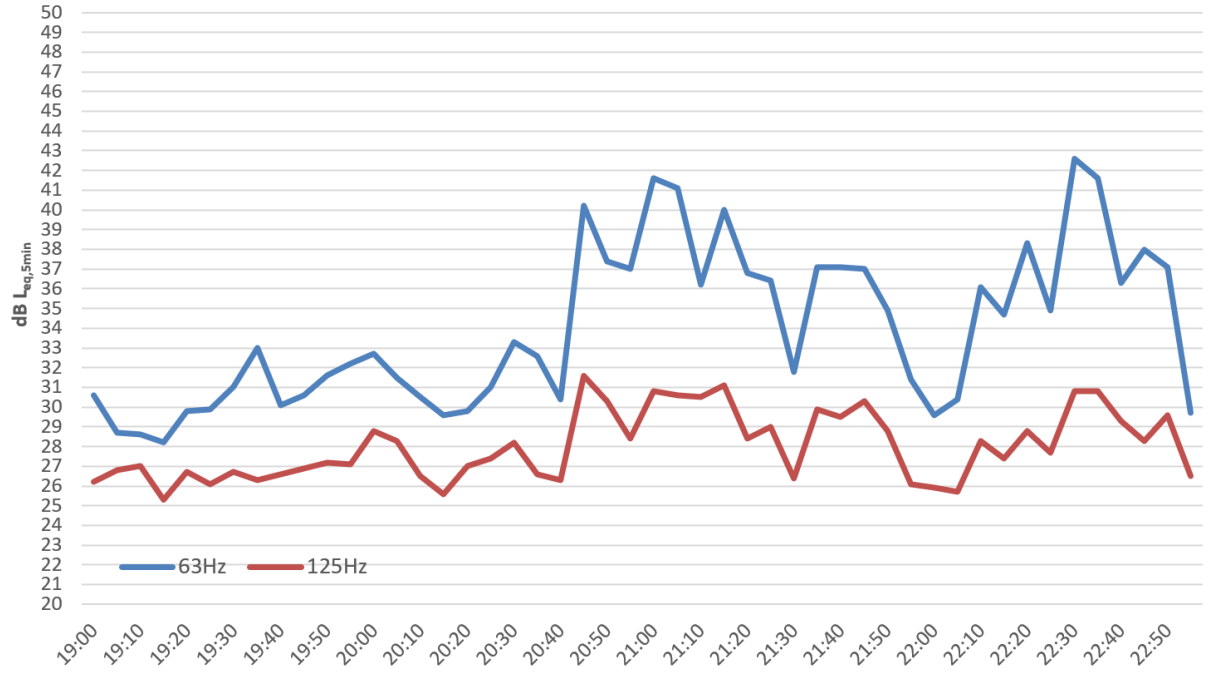


25th May 2025 – The Lumineers

Position 7 – Block E Level 2 (E207 Bedroom – no secondary glazing)

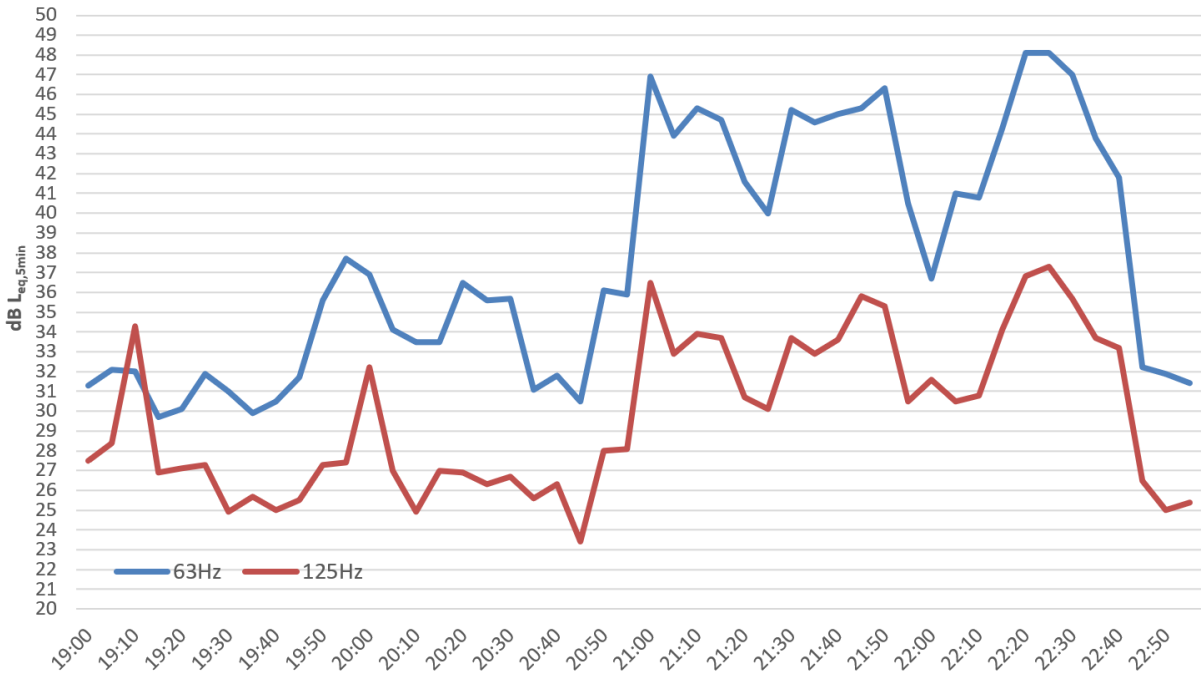
19th May 2025 – Kylie

20th May 2025 – Kylie



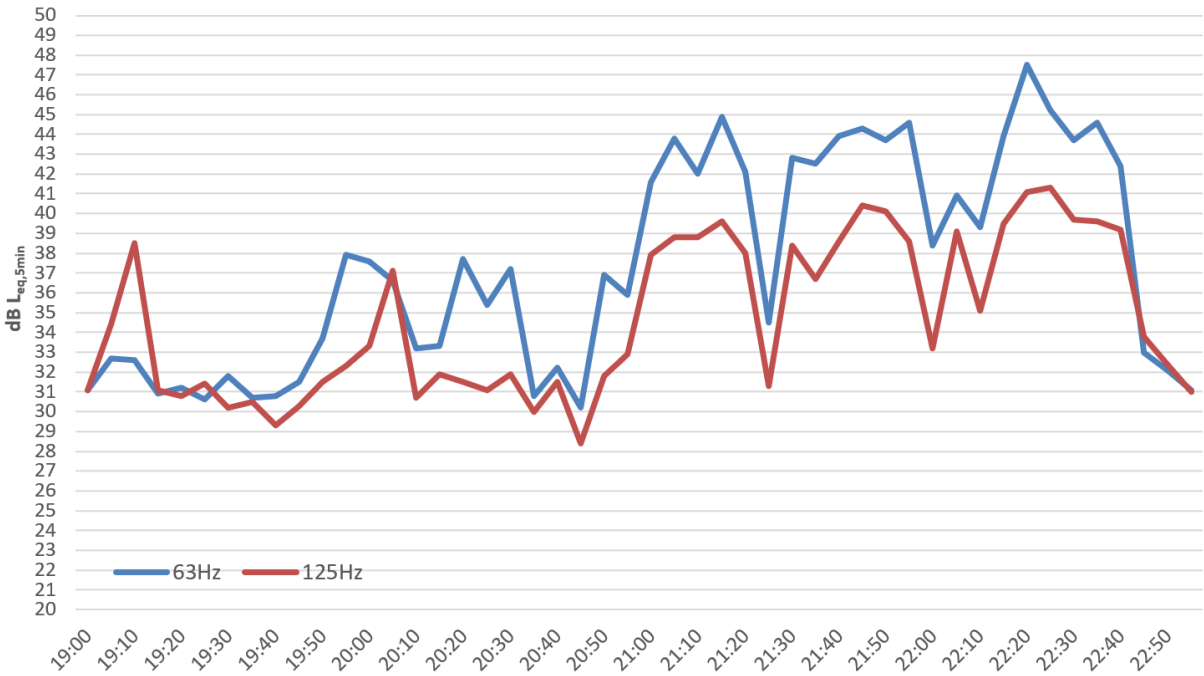
25th May 2025 – The Lumineers

Position 8 – Block E Level 9 (E905 Bedroom)

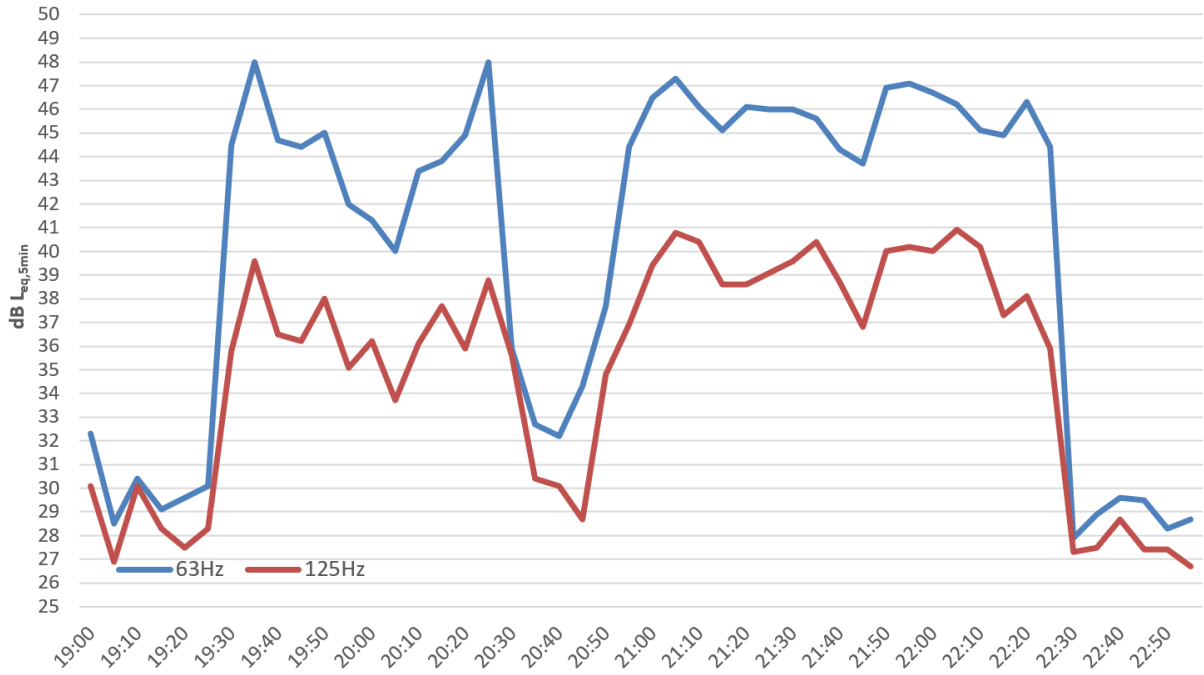


11th July – Kool & The Gang

Position 9 – Block E Level 10 (E1003 Bedroom)



11th July – Kool & The Gang



15th July – Lynyrd Skynrd Live

The results demonstrate that the typical highest $L_{eq,5min}$ noise levels comply with the limits of 47 dB $L_{eq,5min}$ at 63 Hz and 41 dB $L_{eq,5min}$ at 125 Hz. There are some instances where noise levels in the 63 Hz octave band creep above the limit, but not in all test rooms. Any exceedance is minor (within 1-2 dB) and is usually limited to one or two 5-min periods during the louder, larger production events (e.g. Kylie).

We expected this to be acceptable. The design approach for this, and all of our other residential schemes in Manchester, consider the typical highest incident music noise levels (determined through statistical analysis) and not the absolute highest. This is to avoid overdesign, and to provide assurance in design (given that the absolute level over a long survey period may not necessarily be caused entirely by the music event). There is inevitably always going to be some tolerance in the measurements at this low frequency band, noting that even in some of the top-rated acoustic laboratories in the UK, the measurement tolerance in the 63 Hz band can be as much as +/- 3 dB.

4.3.2 Ventilation System Noise Levels

For Blocks C & D, internal noise level measurements were taken in 3nr sample apartments with MVHR units operating at trickle (normal) duty and in summer boost mode. In order to ensure we cover at least 10% of the complete development overall, a further 52nr sample apartments have been tested across Blocks A, B and E. The test apartments captured typical 1-bed and 2-bed units. Measurements were taken between 08:00-22:00hr on Friday 11 July 2025. Extraneous noise from construction works were excluded as far as reasonably possible. Each measurement was taken over a period of at least 30 seconds, and long enough until the L_{eq} level had settled.

All apartments across the scheme have the same MVHR unit specified depending on unit size (1-bed = Eco2 model, 2-bed = Eco3 model).

The results of the testing are summarised below. These values are the total noise levels in test rooms (i.e. due to traffic noise intrusion and the operation of the MVHR system).

NB: The limits are as follows (trickle being representative of 'background ventilation' rates in line with Part F, with +5 dB applied for 'summer boost' in line with AVO):

Living room: Trickle duty 35 dB L_{Aeq}
Summer boost 40 dB L_{Aeq}

Bedroom: Trickle duty 30 dB L_{Aeq}
Summer boost 35 dB L_{Aeq}

The colour of the text indicates either compliance in **green** or minor exceedance in **orange**. NB: For minor bedroom exceedances, it is expected that residual (traffic, with MVHR off) noise levels would reduce at night, making the system compliant provided the noise level is within 3 dB of the limit and the residual closest matches the total noise level.

Apartment	Room	Measured, dB L_{Aeq}		
		Trickle duty	Summer boost	Residual (MVHR Off)
Block A				
906	Living Room	33*	35	32*
	Bedroom	31* *(compliant when corrected for residual)*	34	31*
903	Bedroom 1	29	30	28
	Bedroom 2	27	30	26
1106	Living Room	29	36	28
	Bedroom	31* *(compliant when corrected for residual)*	32	30*
1107	Living Room	29	33	31
	Bedroom	29	33	29
1101	Living Room	32	38	32
	Bedroom	30	34	28
1203	Bedroom 1	32* *(compliant when corrected for residual)*	34	32*
	Bedroom 2	31* *(compliant when corrected for residual)*	35	30*
1204	Living Room	28	32	29
	Bedroom	27	31	29
1302	Living Room	34	37	35
	Bedroom	31* *(compliant when corrected for residual)*	35	31
1306	Living Room	29	35	Not measured
	Bedroom	30	32	Not measured
1301	Living Room	32	36	33
	Bedroom	29	32	30

Apartment	Room	Measured, dB L_{Aeq}		
		Trickle duty	Summer boost	Residual (MVHR Off)
1305	Living Room	34	38	33
	Bedroom	31* *(compliant when corrected for residual)*	34	32
1304	Living Room	34	35	Not measured
	Bedroom	31	33	Not measured
706	Living Room	29	33	27
	Bedroom	27	31	26
703	Living Room	32	32	26
	Bedroom	27	30	26
Block B				
302	Bedroom 1	27	34	24
	Bedroom 2	29	34	24
304	Bedroom	27	31	28
307	Living Room	32	35	31
	Bedroom	28	30	29
408	Bedroom	30	32	30
406	Living Room	28	35	28
	Bedroom	28	35	27
404	Living Room	33	36	33
	Bedroom	30	35	28
402	Living Room	28	33	27
	Bedroom	26	35	26
506	Living Room	31	38	31
	Bedroom	30	35	31
503	Living Room	33	37	28
	Bedroom	29	35	30
601	Living Room	28	33	25
	Bedroom	26	34	25
606	Living Room	31	37	30
	Bedroom	31* *(compliant when corrected for residual)*	34	31
Block E				
1002	Living Room	31	35	32
	Bedroom	30	34	27
1003	Living Room	31	36	32
	Bedroom	29	35	26
1004	Living Room	32	35	33
	Bedroom	26	35	27
1005	Living Room	30	34	32
	Bedroom	26	34	28
1001	Living Room	30	35	32
	Bedroom	29	33	30

Apartment	Room	Measured, dB L_{Aeq}		
		Trickle duty	Summer boost	Residual (MVHR Off)
1009	Living Room	31	35	33
	Bedroom	32* *(compliant when corrected for residual)*	33	32
901	Living Room	32	35	33
	Bedroom	29	32	27
903	Living Room	30	35	27
	Bedroom	29	32	26
904	Living Room	31	34	30
	Bedroom	31* *(compliant when corrected for residual)*	31	30
907	Living Room	31	32	27
	Bedroom	29	32	30
908	Living Room	28	32	30
	Bedroom	29	31	31
909	Living Room	32	33	31
	Bedroom	31* *(compliant when corrected for residual)*	34	31
801	Living Room	34	34	33
	Bedroom	29	30	24
802	Living Room	29	32	28
	Bedroom	27	32	26
804	Living Room	30	32	30
	Bedroom	28	31	30
806	Living Room	30	33	32
	Bedroom	30	32	31
809	Living Room	34	35	34
	Bedroom	29	31	29
701	Living Room	27	30	Not measured
	Bedroom	26	31	Not measured
702	Living Room	33	35	31
	Bedroom	27	31	27
703	Living Room	31	34	31
	Bedroom	29	31	28
704	Living Room	28	32	29
	Bedroom	29	31	25
707	Living Room	35	37	34
	Bedroom	31* *(compliant when corrected for residual)*	35	33
709	Living Room	35	37	34
	Bedroom	31* *(compliant when corrected for residual)*	35	32

Apartment	Room	Measured, dB L_{Aeq}		
		Trickle duty	Summer boost	Residual (MVHR Off)
609	Living Room	33	38	Not measured
	Bedroom	28	33	Not measured
602	Living Room	30	35	28
	Bedroom	28	30	27
604	Living Room	34	35	34
	Bedroom	30	31	30
606	Living Room	32	36	32
	Bedroom	30	32	30

* exceedance due to daytime residual noise level in bedroom – when this reduces at night, total value would be compliant

The results demonstrate compliance with the MCC noise requirements for normal conditions and the AVO guidance for summer boost conditions in all test cases.

Many of these repeat tests across such a large project, when MVHR systems are the same specification throughout, felt unnecessary. It would be our suggestion that MCC consider reducing the MVHR test provision for such large projects. Whilst we undertook the testing during the day, technically the bedroom tests should be taken at night-time, but this would be an arduous undertaking for any acoustician across so many units, with a high cost to clients for out of hours testing.

7.0 Conclusion

Jameson Acoustics Limited has been commissioned by Domis Construction Limited to provide acoustic design and testing services to assist in the discharge of two planning conditions associated with the Waterhouse Gardens development (Block A, B, E & F) in Manchester.

The report confirms the design intent/specifications for the control of operational noise transfer and breakout from the commercial units and the noise insulation scheme for residential apartments, and the results of associated pre-completion testing demonstrates compliance with design criteria, set in line with MCC requirements, in all cases.

Appendix A – Acoustic Terminology

dB Decibel - Used as a measurement of sound level. Decibels are not an absolute unit of measurement but an expression of ratio between two quantities expressed in logarithmic form.

dB(A) The human ear is more susceptible to mid-frequency noise than the high and low frequencies. The 'A'-weighting scale approximates this response and allows sound levels to be expressed as an overall single figure value in dBA. The $_A$ subscript is applied to an acoustical parameter to indicate the stated noise level is A-weighted (e.g. $L_{Aeq,T}$ in dB). Noise levels in dBA do not have a linear relationship to each other; for similar noises, a change in noise level of 10dBA represents a doubling or halving of subjective loudness. A change of 3dBA is only just perceptible.

$L_{Aeq,T}$ $L_{Aeq,T}$ is the equivalent continuous sound pressure level. It is an average of the total sound energy measured over a specified time measurement period, *T*.

$L_{10,T}$ L_{10} is the noise level exceeded for 10% of the measurement period *T* (i.e. the quietest 10% of the measurement) and has, for many years, been used in the assessment of road traffic noise.

$L_{90,T}$ L_{90} is the noise level exceeded for 90% of the measurement period *T* (i.e. the quietest 10% of the measurement) and is often used to describe the 'background' noise level.

L_{max} L_{max} is the maximum sound pressure level recorded over the measurement period, *T*. L_{max} is often used in assessing scheduled environmental noise 'events' (such as train passbys), particularly at night where such events may cause sleep disturbance.

R_w The weighted sound reduction index, R_w, is a single figure description of sound reduction as defined in BS EN ISO 717-1. It is single-number quantity which characterizes the airborne sound insulating properties of a material or building element over a range of frequencies. The R_w is calculated from sound insulation measurements taken in an acoustic laboratory. Sound insulation ratings derived from site measurements are invariably lower than the laboratory figures and are referred to as the apparent weighted sound reduction index, R'_w.

$D_{n,e,w}$ The weighted element-normalised level difference, $D_{n,e,w}$, is a single figure description of the sound insulation performance of small building elements, such as a trickle ventilator.

C_{tr} C_{tr} is correction term applied against the sound insulation single-number values (e.g. R_w) to provide a weighting against low frequency performance. The reference values used within the C_{tr} calculation are based on urban traffic noise.

Appendix B – Tenant Handbook Acoustic Section

JA: 22015
Waterhouse Gardens, Manchester
10 July 2025

Tenants Handbook
Acoustic Section

X Acoustics

All designs, works, materials, installations and tolerances are to be fully in accordance with the following:

- Building Regulations.
- British Standard BS 8233: 2014.
- British Standard BS 4142: 2014+A1: 2019.
- CIBSE Guides by Chartered Institution of Building Services Engineers.
- Planning Conditions and other requirements of the Local Authority.
- Statutory noise nuisance legislation.
- Manufacturer's installation instructions on acoustic matters.
- Other relevant British Standards and Codes of Practice.

Where more than one standard is applicable, the more onerous shall be achieved. Any relaxation of the acoustic criteria described herein must be agreed in writing by the Landlord or their Acoustic Consultant.

Tenants are warned that in some cases the acoustic criteria contained herein will be difficult to achieve. Tenants are advised to engage an acoustic consultant at an early stage to identify and address the implications of these acoustic criteria.

X.1 Atmospheric Noise Emissions

Tenants shall control noise from all of their sources (including mechanical services, amplified speech/music and activities) such that the total atmospheric noise emissions from the development:

a) Do not cause a statutory noise nuisance.

b) Comply with the planning conditions and other requirements of the Local Authority, including:

- Site-wide non-emergency plant noise emissions to be assessed in accordance with BS 4142:2014+A1:2019 and achieve a noise rating level, $L_{Ar,Tr}$, not higher than 5 dB below the prevailing background noise level, L_{90}, at 1m from nearby noise sensitive receptors (site cumulative, i.e. with consideration for landlord and other tenant plant).
- Amplified speech/music and activities, $L_{eq,5min}$, to achieve a level not higher than 5 dB below the prevailing background noise level, L_{90}, in each octave band (63 Hz-4 kHz) at 1m from nearby noise sensitive receptors (site cumulative, i.e. with consideration for landlord and other tenant amplified speech/music and activities).

c) Noise from plant, amplified speech/music and activities to be controlled to a level not exceeding 55 dB L_{Aeq} or a level not higher than 5 dB above the prevailing background noise level, L_{A90}, on public pavements around the site (measured between 1-2 metres from building façade and 1.5-1.8 metres above ground).

All of the above criteria relate to the total noise levels from all sources within the development. Tenants shall therefore make appropriate allowances for contributing noise from other sources within the development. In the case of noise from amplified music and activities this shall be calculated according to the tenant's demise area relative to the total relevant tenant areas, unless otherwise agreed. In the case of mechanical services this shall be calculated on a pro-rata basis according to the tenant's plant/louvre area relative to the total plant/louvre area, unless otherwise agreed.

No other equipment shall be installed without the Landlord's consent.

The tenant shall employ an acoustic consultant to assess their design and shall make a full submittal of the acoustic performance of the proposed installation for landlord approval prior to commencing installation.

X.3 Noise and Vibration Transfer to Internal Areas

Tenants shall control noise and vibration transfer from all their sources (including mechanical services, amplified speech/music and activities) to internal areas beyond their demise such that:

(a) It does not cause a nuisance, disturbance or annoyance.
(b) It does not exceed any acoustic criteria specifically agreed between the Landlord and other Tenants.
(c) It does not exceed the following Noise Rating (NR) levels.

Area	Criteria for Mechanical Services	Criteria for Music & Activities
Residential accommodation	5 dB below prevailing background L_{90} per octave band (63Hz-4kHz) *[e.g. typically equivalent to NR 15 L_{eq}]*	5 dB below prevailing background L_{90} per octave band (63Hz-4kHz) *[e.g. typically equivalent to NR 15 $L_{eq,5min}$]* with absolute low frequency noise limits, $L_{eq,5min}$, of 47 dB at 63 Hz & 41 dB at 125 Hz
Residential amenity, admin offices, or other landlord front of house / circulation spaces	NR 25 L_{eq}	NR 25 $L_{eq,5min}$
Other retail units, landlord back of house Landlord's Areas and Other Occupied Areas	NR 35 L_{eq}	NR 35 $L_{eq,5min}$
Car Park, Service Yards/Loading bays	NR 50 L_{eq}	NR 50 $L_{eq,5min}$

NB: Peak maximum noise levels, $L_{max,f}$, not to exceed a level 5 NR curves higher than those stipulated above.

(d) It does not give rise to audible tones or rattles.
(e) Vibration transfer from M&E services to internal occupied areas shall not exceed 0.01m.s^{-2} peak based on the W_b weighting as defined within BS 6472-1: 2008 '*Guide to Evaluation of Human Exposure to Vibration in Buildings*'.

Criterion (a) is ultimately the overriding requirement. Provided (a) is complied with in full, some relaxation of (b) (c) (d) and (e) may be permissible, but only at the Landlord's discretion. Compliance with (b) (c) (d) and (e) would however, in most cases, be considered as evidence tending to demonstrate compliance with (a).

X.4 Relevant Base-Build Acoustic Reports

Prospective tenants shall refer to the following documentation to assist in their analysis. Reports available upon request.

- Jameson Acoustics, *Acoustic Design Report*, 22015-RP-1-R4.
- Jameson Acoustics, *Acoustic Assessment Report (Planning Conditions 18, 19)*, 22015-RP-2-R0.
- Jameson Acoustics, *Plant Noise Assessment Report*, 22015-RP-3-R0.

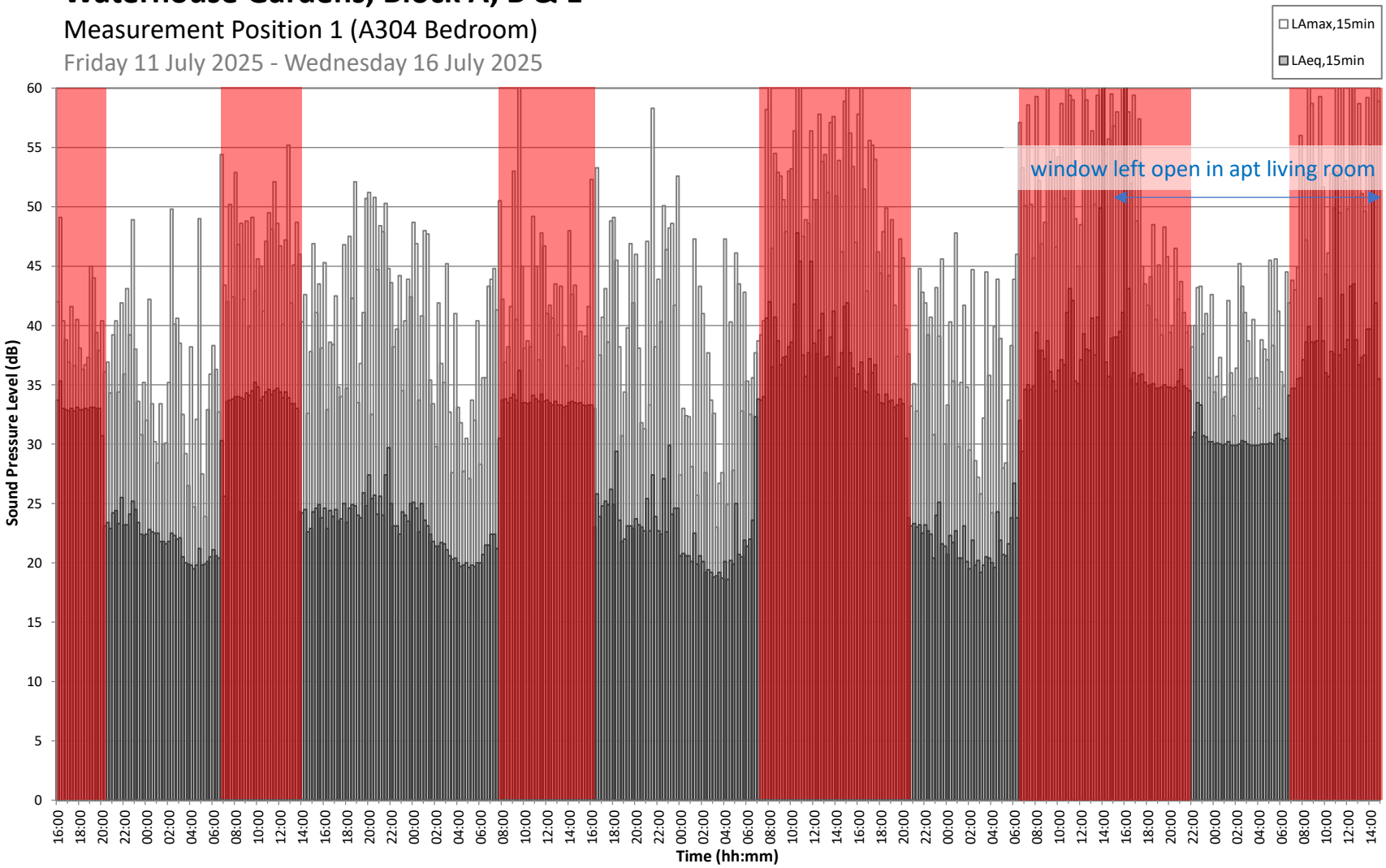
Appendix C – Time History Graphs

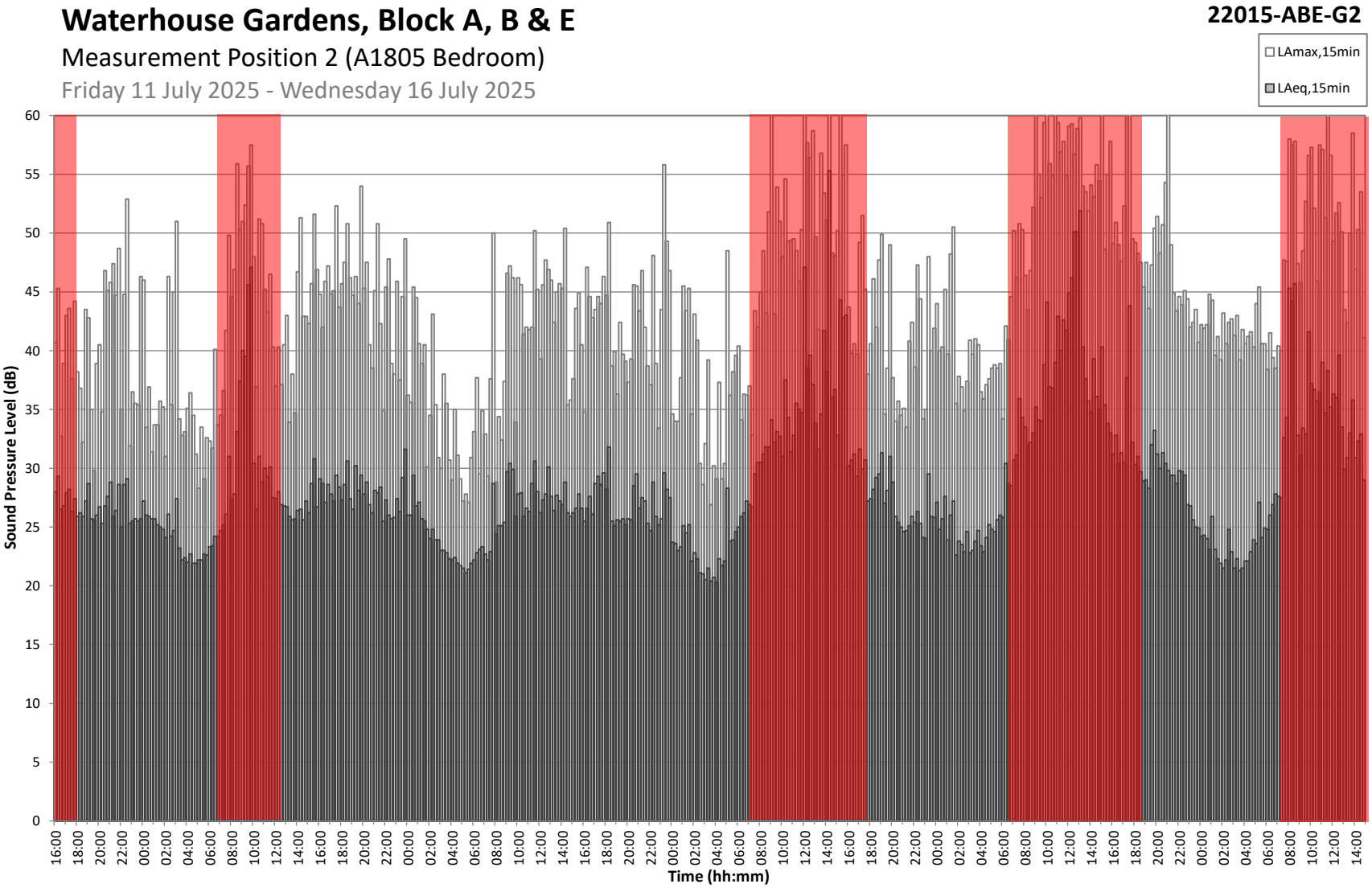
Waterhouse Gardens, Block A, B & E

Measurement Position 1 (A304 Bedroom)

Friday 11 July 2025 - Wednesday 16 July 2025

22015-ABE-G1



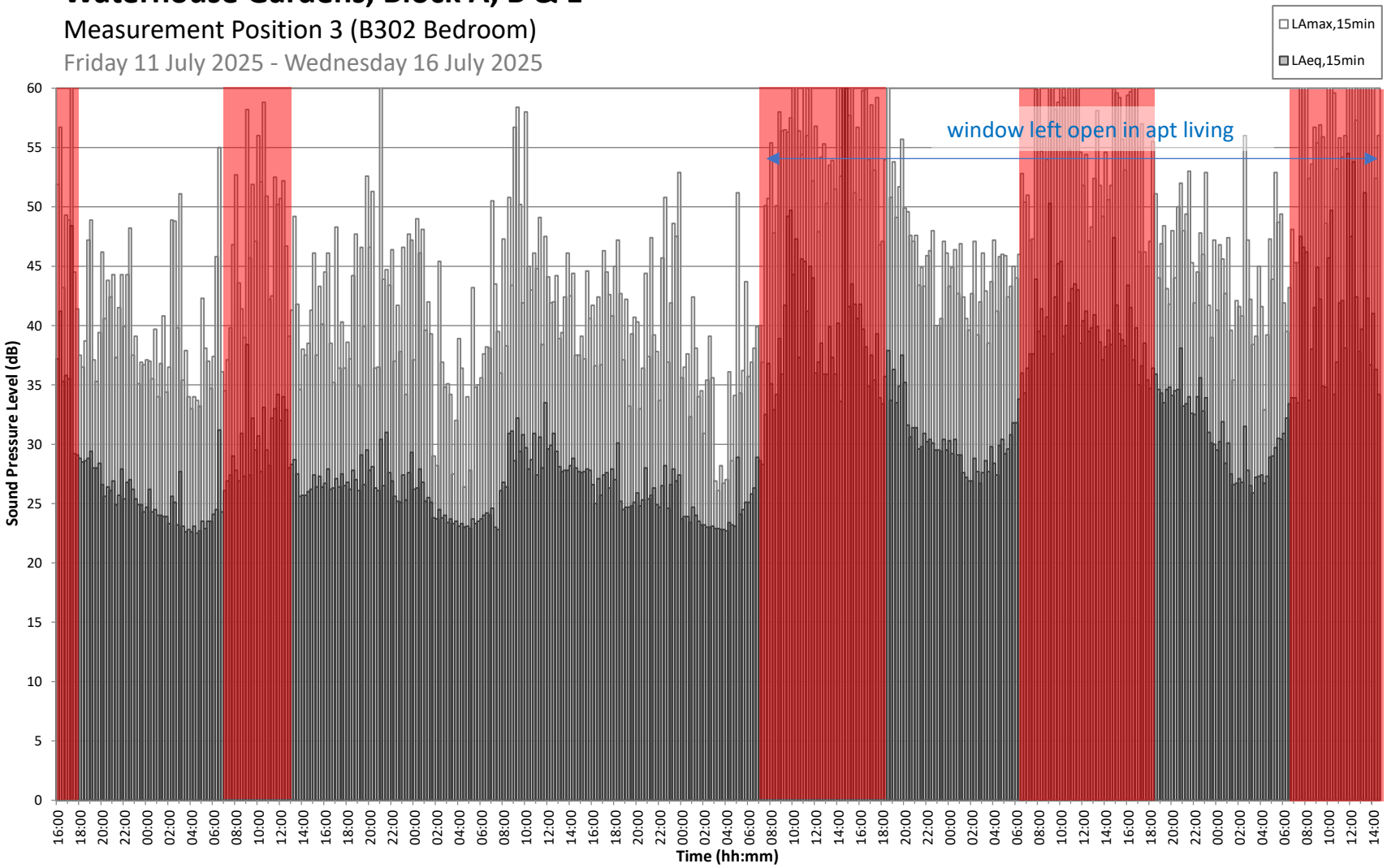

Waterhouse Gardens, Block A, B & E
Measurement Position 2 (A1805 Bedroom)
Friday 11 July 2025 - Wednesday 16 July 2025
22015-ABE-G2
LAmax,15min
LAeq,15min
Sound Pressure Level (dB)
Time (hh:mm)

Waterhouse Gardens, Block A, B & E

Measurement Position 3 (B302 Bedroom)

Friday 11 July 2025 - Wednesday 16 July 2025

22015-ABE-G3

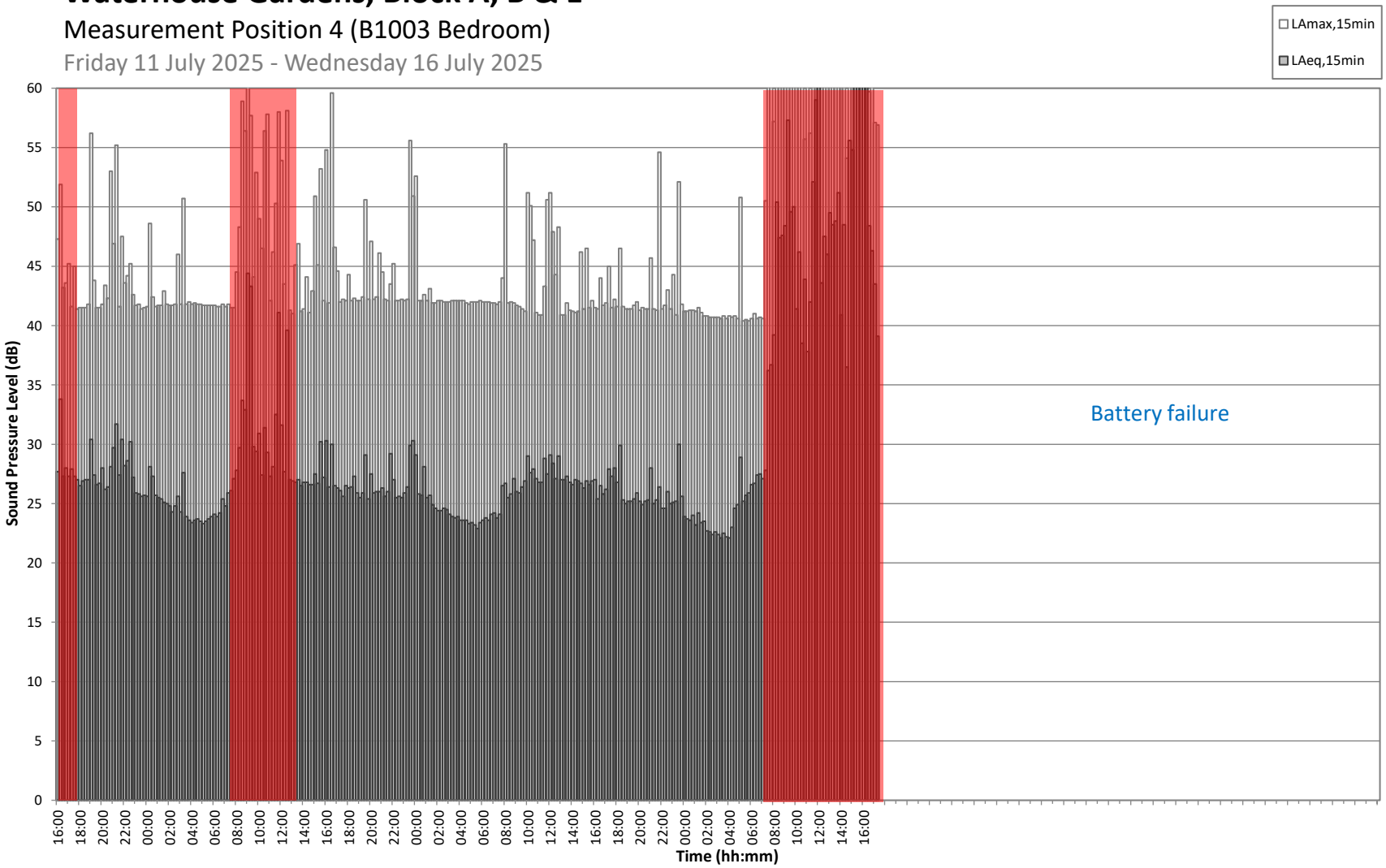


Waterhouse Gardens, Block A, B & E

Measurement Position 4 (B1003 Bedroom)

Friday 11 July 2025 - Wednesday 16 July 2025

22015-ABE-G4

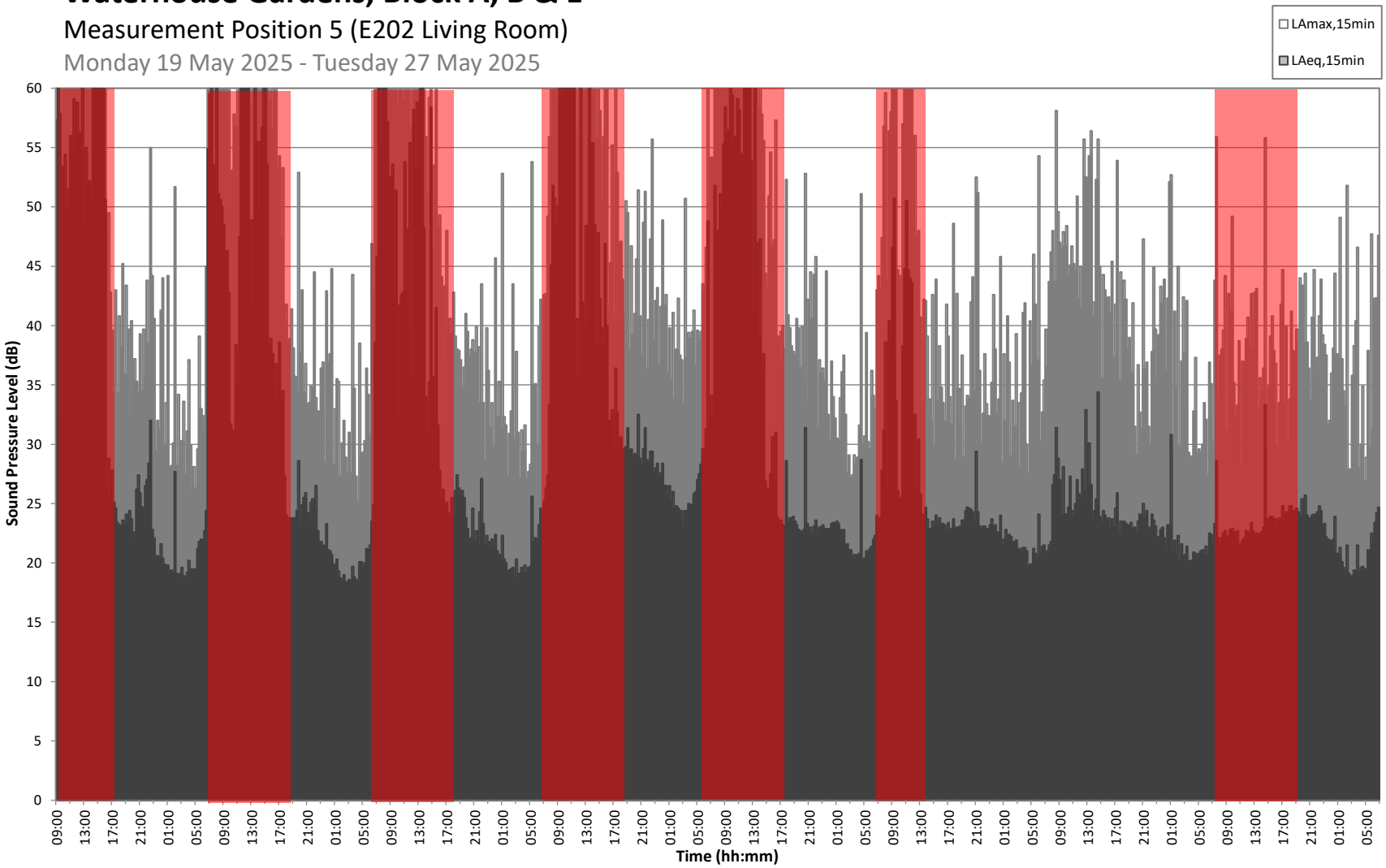


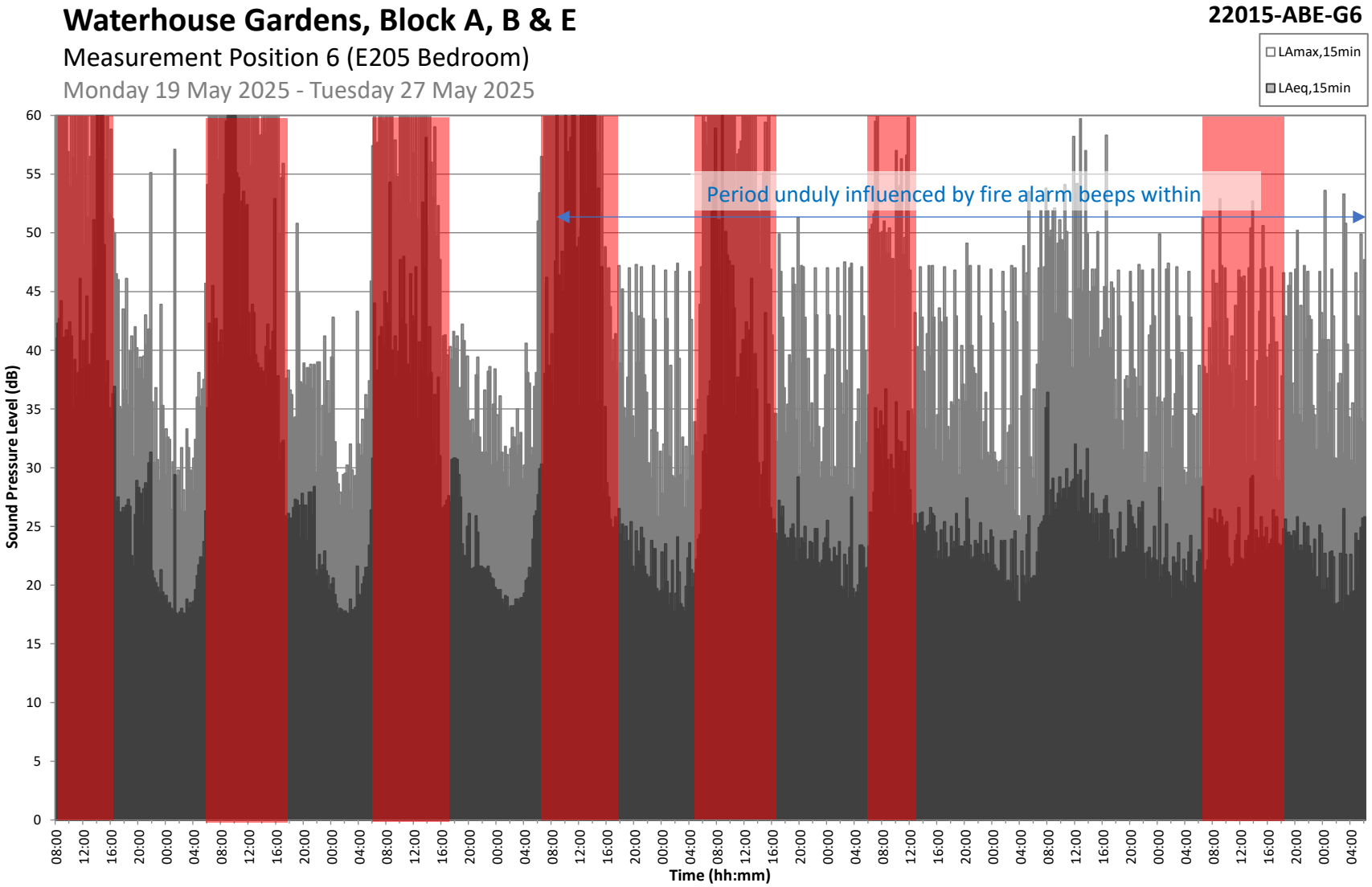
Waterhouse Gardens, Block A, B & E

Measurement Position 5 (E202 Living Room)

Monday 19 May 2025 - Tuesday 27 May 2025

22015-ABE-G5



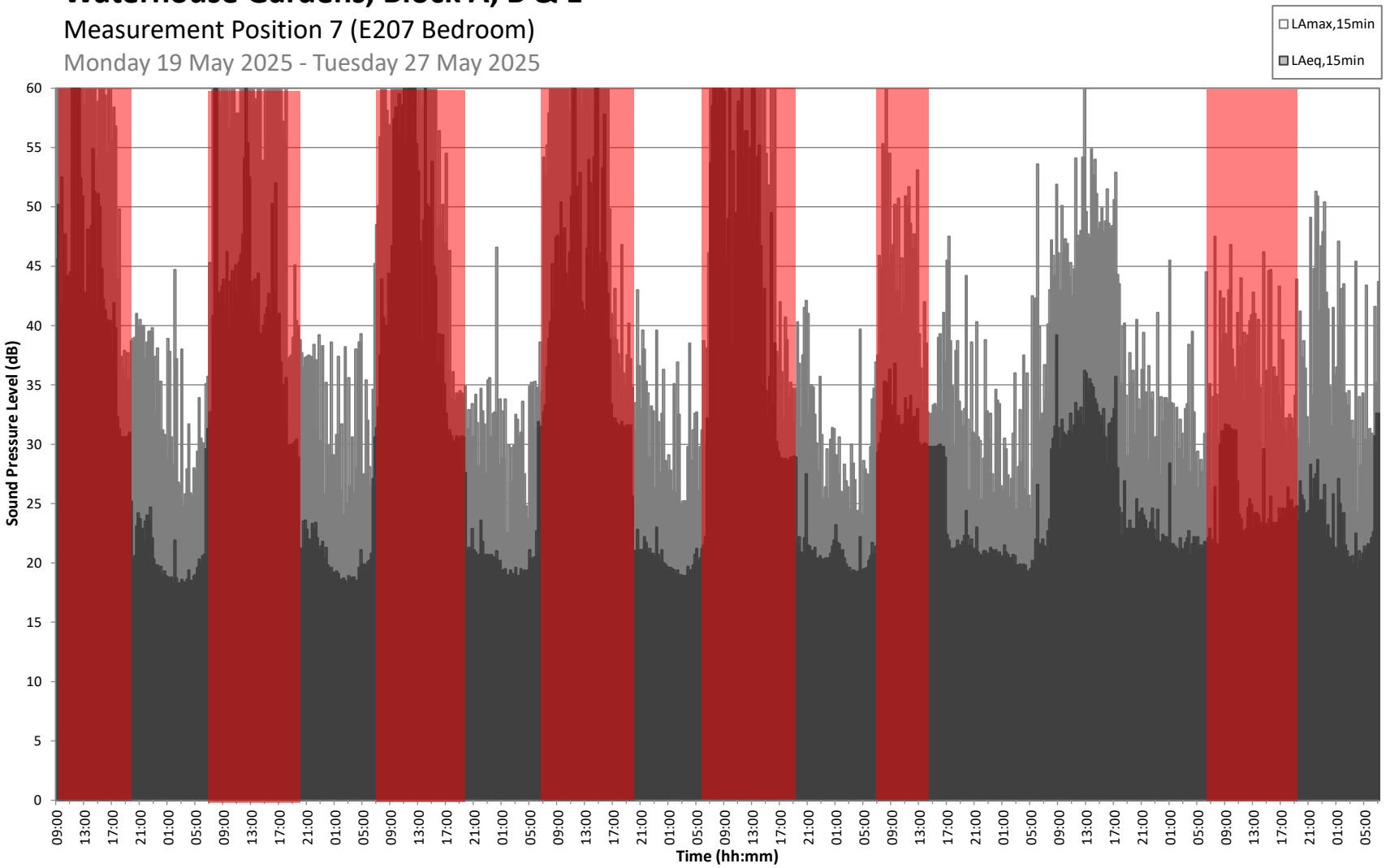

Waterhouse Gardens, Block A, B & E
Measurement Position 6 (E205 Bedroom)
Monday 19 May 2025 - Tuesday 27 May 2025
22015-ABE-G6
LAmax,15min
LAeq,15min
Period unduly influenced by fire alarm beeps within
Sound Pressure Level (dB)
Time (hh:mm)

Waterhouse Gardens, Block A, B & E

Measurement Position 7 (E207 Bedroom)

Monday 19 May 2025 - Tuesday 27 May 2025

22015-ABE-G7

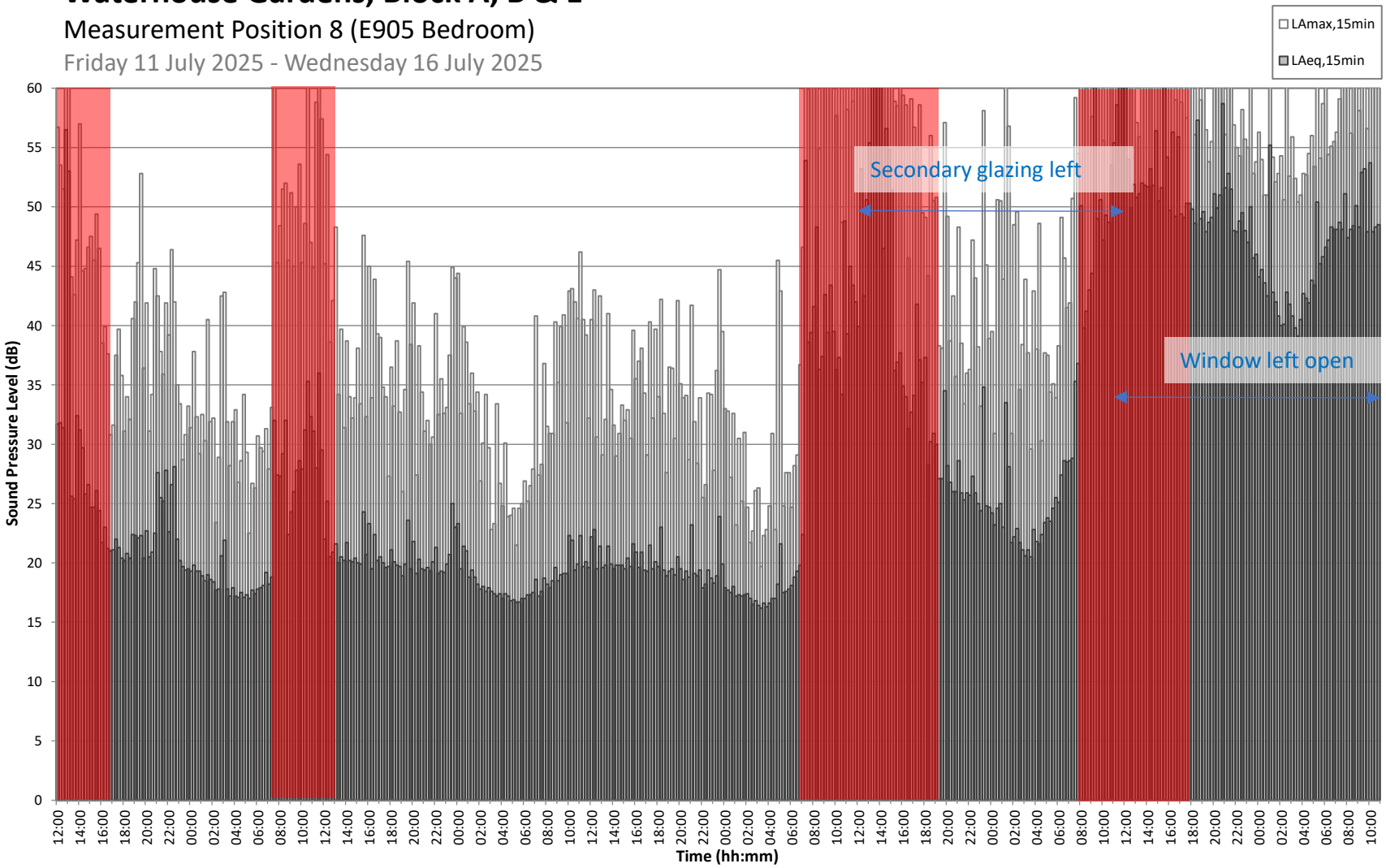


Waterhouse Gardens, Block A, B & E

Measurement Position 8 (E905 Bedroom)

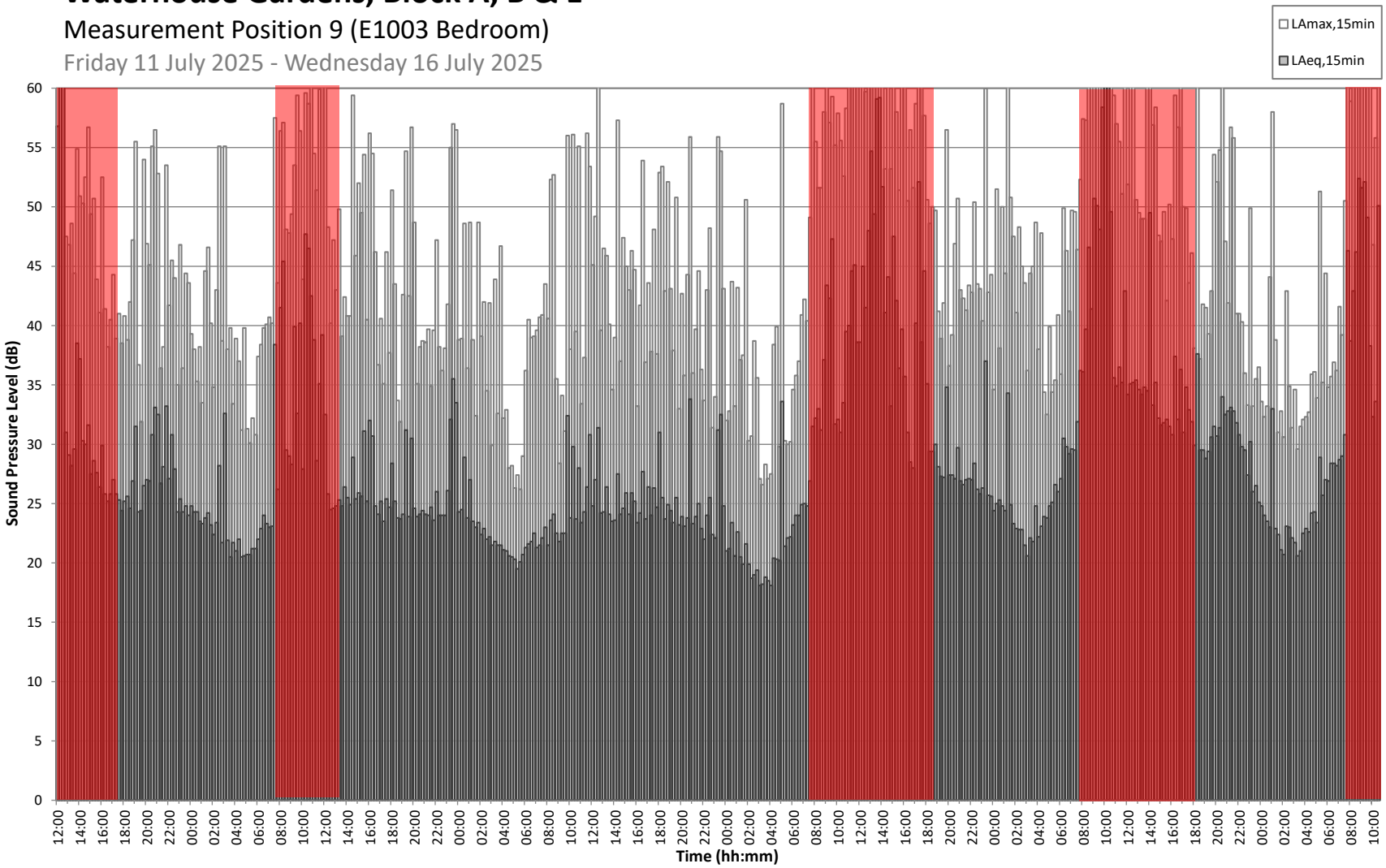
Friday 11 July 2025 - Wednesday 16 July 2025

22015-ABE-G8



Waterhouse Gardens, Block A, B & E

22015-ABE-G9

Measurement Position 9 (E1003 Bedroom)

Friday 11 July 2025 - Wednesday 16 July 2025