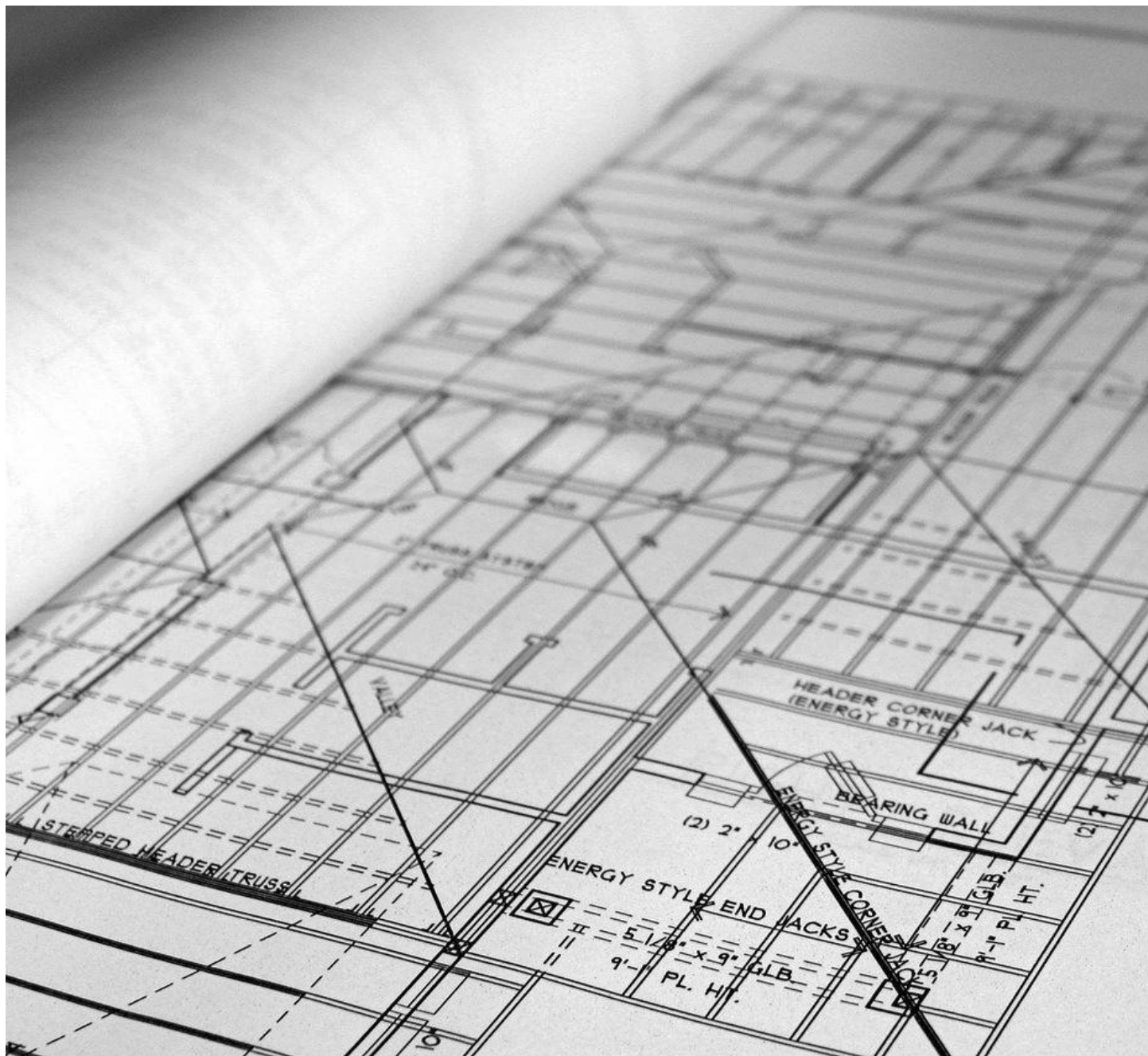




55 Newton Street, Manchester
Overheating and Acoustics Assessment

Client: AAIP Partnership

Project Number: 1752022

Date: 23rd December 2022



REPORT ISSUE & STATUS LOG

	Revision Number		
	1	2	3
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Report Prepared By

JPM Acoustics Ltd
97 Hazelhurst Road, Worsley,
Manchester, M28 2SW

Contact Details

Adam.Barr@jpmacoustics.com
www.jpmacoustics.com

1 INTRODUCTION

1.1 OVERVIEW

- 1.1.1 JPM Acoustics Ltd has been appointed by AAIP Partnership to undertake an acoustics and overheating assessment to support the partial discharge of a noise related planning condition associated with the planning approval for the change of use of 55 Newton Street, Manchester from commercial premises to a residential dwelling.
- 1.1.2 This report presents an assessment of noise levels within the proposed development during typical ventilation conditions and during the overheating condition. The assessment draws on the results of an overheating assessment and has been undertaken with due consideration to relevant British Standards and current guidance relating to noise and overheating.
- 1.1.3 This report is necessarily technical in nature. Therefore, to assist the reader, a glossary of acoustic terminology is provided in **Appendix A**.

1.2 SITE DESCRIPTION AND PROPOSED DEVELOPMENT

- 1.2.1 The development site is the existing three-storey building at 55 Newton Street in Manchester. The building is currently vacant but formerly accommodated offices and commercial space across the ground, first and second floor, with storage at basement level.
- 1.2.2 The site is bounded by Newton Street to the southeast, Bradley's Court to the northeast and by existing commercial/residential buildings on all other sides. The noise climate at 55 Newton Street is dominated by the passage of road traffic along Newton Street.
- 1.2.3 The existing building is to be refurbished to create a single dwelling. The site location and front elevation are shown in **Figure 1-1**. Proposed layout plans are included in **Appendix B**.

Figure 1-1: Site Location and Front Elevation



2 LEGISLATION AND GUIDANCE

2.1 PLANNING CONDITION 8

- 2.1.1 This report has been prepared to support the partial discharge of Planning Condition 8 imposed on the proposed residential development. The wording of Planning Condition 8 is as follows:

“8) Before the development commences a scheme for acoustically insulating and mechanically ventilating the residential accommodation against noise from adjacent roads and uses shall be submitted to and approved in writing by the City Council as local planning authority.

The approved noise insulation scheme and vibration and reradiated noise mitigation measures shall be completed before any of the dwelling units are occupied.

The following noise criteria will be required to be achieved:

- Bedrooms (night time - 23.00 - 07.00) 30 dB LAeq (individual noise events shall not exceed 45 dB L_{Amax,F} by more than 15 times)*
- Living Rooms (daytime - 07.00 - 23.00) 35 dB LAeq*
- Gardens and terraces (daytime) 55 dB LAeq*

Prior to occupation a post completion report to verify that all of the recommended mitigation measures have been installed and effectively mitigate any potential adverse noise impacts in the residential accommodation shall be submitted and agreed in writing by the City Council as local planning authority. Prior to occupation any non compliance shall be suitably mitigated in accordance with an agreed scheme.”

- 2.1.2 Part 1 of the condition has previously been discharged with an agreed scheme of insulation utilising Mechanical Ventilation and Heat Recovery (MVHR), which allowed work on the site to commence. However, it is now proposed that a natural ventilation scheme is utilised for the proposed development, which is required to be agreed with Manchester City Council (MCC).
- 2.1.3 During consultation with the dealing Environmental Health Officer regarding the partial discharge of the condition, it was stated that any natural ventilation scheme would need to be supported by an Acoustics and Overheating Assessment.

2.2 BS 8233:2014: GUIDANCE ON SOUND INSULATION AND NOISE REDUCTION FOR BUILDINGS (BS 8233)

- 2.2.1 BS 8233 provides guidance for the control of noise in and around buildings and recommends internal and external noise level criteria for residential dwellings. The British Standard states that it is desirable that internal ambient noise levels do not exceed the guideline values in **Table 2-1**.

Table 2-1: Internal Desirable Guideline Values from BS 8233

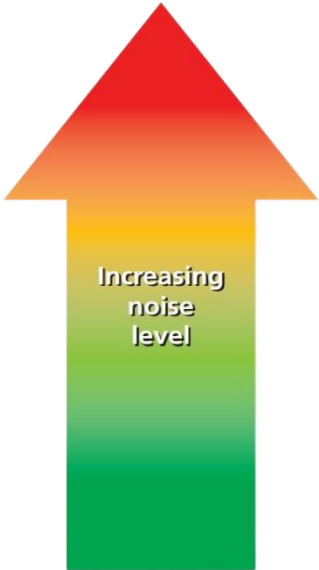
Activity	Location	Period	
		07:00 to 23:00 Hours, i.e. Daytime	23:00 to 07:00 Hours, i.e. Night-time
Resting	Living Room	35 dB L _{Aeq,16hour}	-
Dining	Dining Room/Area	40 dB L _{Aeq,16hour}	-
Sleeping (daytime resting)	Bedroom	35 dB L _{Aeq,16hour}	30 dB L _{Aeq,8hour}

- 2.2.2 BS 8233 does not provide specific criteria for one-off noise events (L_{AFmax}), however, it is common practice to adopt 45 dB L_{AFmax} as a criterion for typical events at night, based on the guidance from the World Health Organisation (WHO) *Guidelines for Community Noise 1999* and *Environmental Noise Guidelines for the European Region 2018*. Therefore, this criterion has been adopted for this assessment.

2.3 ACOUSTICS VENTILATION AND OVERHEATING - RESIDENTIAL DESIGN GUIDE

- 2.3.1 The AVO Guide is intended to be applicable to 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.
- 2.3.2 Table 3-3 of the AVO Guide provides qualitative “examples of outcomes” from various internal noise levels from transport noise during the Overheating Condition and is replicated in **Table 2-2** overleaf. The Overheating Condition is defined as “*The situation where measures are in place to mitigate overheating to meet agreed compliance criteria.*”.

Table 2-2: Guidance for the Assessment of Noise from Transport Noise Sources ^[Note 1],
Overheating Condition

Internal Ambient Noise Level [Note 2]			Examples of Outcome ^[Note 5]	
$L_{Aeq,T}$ [Note 3] during 07:00 – 23:00 [Note 6]	$L_{Aeq,8h}$ during 23:00 – 07:00	Individual Noise Events during 23:00 – 07:00 [Note 4]		
> 50 dB	> 42 dB	Normally exceeds 65 dB L_{AFmax}	Noise causes a material change in behaviour e.g. having to keep windows closed most of the time	Avoiding certain activities during periods of intrusion. Having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.
			Increasing likelihood of impact on reliable speech communication during the day or sleep disturbance at night	At higher noise levels, more significant behavioural change is expected and may only be considered suitable if occurring for limited periods. As noise levels increase, small behaviour changes are expected e.g. turning up the volume on the television; speaking a little more loudly, having to close windows for certain activities, for example ones which require a high level of concentration. Potential for some reported sleep disturbance. Affects the acoustic environment inside the dwelling such that there is a perceived change in quality of life. At lower noise levels, limited behavioural change is expected unless conditions are prevalent for most of the time. ^[Note 8]
≤ 35 dB	≤ 30 dB	Do not normally exceed $L_{AF,max}$ 45 dB more than 10 times a night	Noise can be heard, but does not cause any change in behaviour	Noise can be heard, but does not cause any change in behaviour, attitude, or other physiological response ^[Note 9] . Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.

Note 1 The noise levels suggested in Tables 3-2 and 3-3 assume a steady road traffic noise source but may be adapted for other types of transport.

Note 2 The values presented in this table should not be regarded as fixed thresholds and reference can also be made to relevant dose-response relationships such as those described in a DEFRA 2014 study [15, 21, 22]. With the exception of individual noise events, the references [15,21] are based on evidence drawn from external noise levels. There is currently very little robust evidence linking internal averaged noise levels with health outcomes and occupant behaviour. Internal ambient noise levels would normally be considered for living rooms and bedrooms during the daytime. At night, the levels would normally only be applicable to bedrooms.

Note 3 A decision must be made regarding the appropriate averaging period to use. The averaging period should reflect the nature of the noise source, the occupancy profile and times at which overheating might be likely to occur. Further guidance can be found within the 2014 IEMA Guidelines.

Note 4 Refer to references [1, 17, 18, 22] for further guidance regarding individual noise events. The $L_{AF,max}$ indicator associated with the upper category is intended for road traffic; it may be more appropriate to use the "one additional noise-induced awakening" method for noise from rail traffic or aircraft.

Note 5 The potential for adverse effect will also depend on how frequently and for what duration the overheating condition occurs. Refer to Figure 3-2.

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

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

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

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

2.3.3 Based on the guidance from **Table 2-2** it is suggested that internal noise levels should not exceed 50 dB(A) during the daytime (07:00 – 23:00) or 42 dB(A) at night (23:00 – 07:00) during the Overheating Condition. In addition, $L_{AF,max}$ noise levels should not exceed 65 dB(A) more than 15-times at night.

3 BASELINE NOISE SURVEY

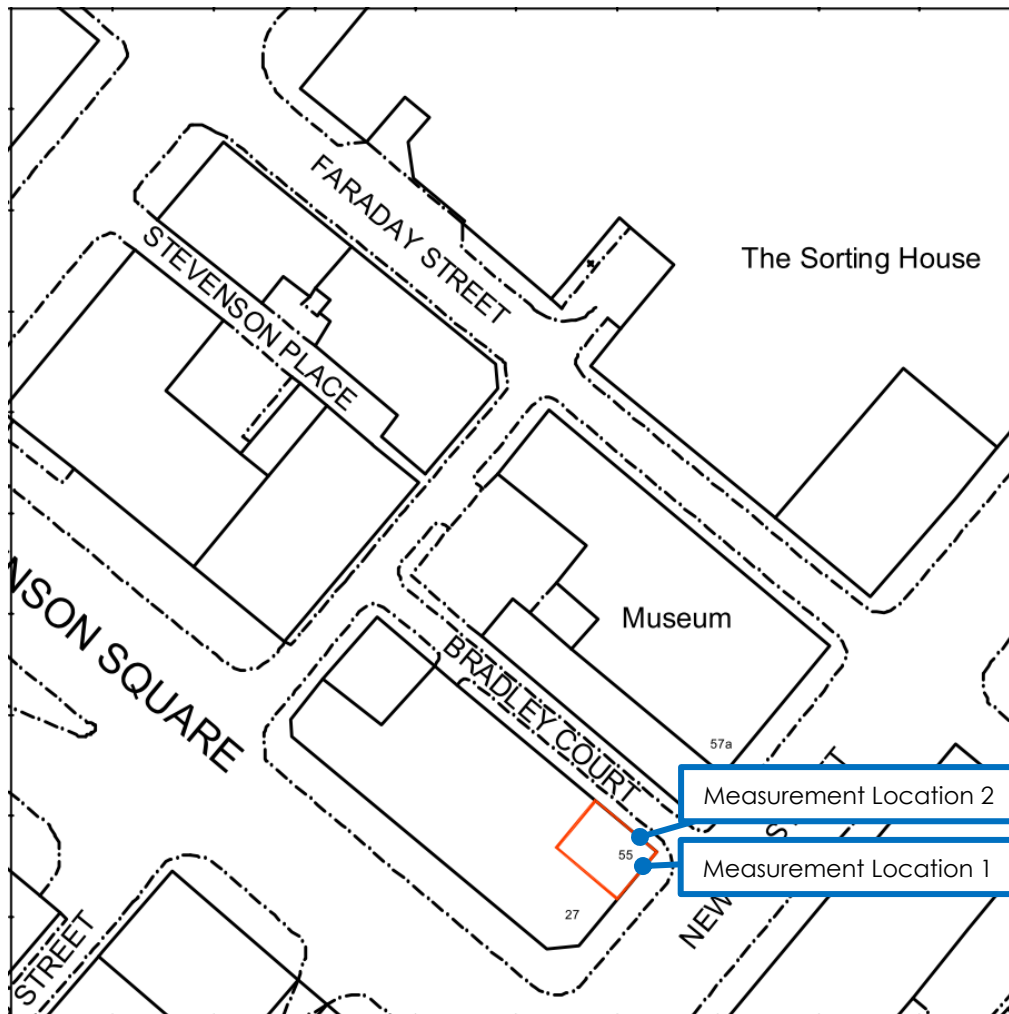
3.1 OVERVIEW

3.1.1 To inform the assessment, a baseline noise survey was undertaken on the site commencing at 12:00 on the 18th May and finishing at 11:15 on the 19th May 2021.

3.2 MEASUREMENT LOCATIONS

3.2.1 The measurement locations adopted during the baseline noise survey are shown on **Figure 3-1** below.

Figure 3-1: Measurement Locations



3.2.2 Measurement Location 1 (ML1) was on the south-eastern elevation overlooking Newton Street, the microphone was on a pole protruding approximately 1 m out of a

first floor window in façade conditions. Monitoring at ML1 was undertaken between 12:00 on 18th May and 11:15 on 19th May 2021. The location was representative of the noise environment at the elevation overlooking Newton Street.

- 3.2.3 Measurement Location 2 (ML2) was on the north-eastern elevation overlooking Bradley's Court, the microphone was on a pole protruding approximately 1 m out of a first floor window in façade conditions. Monitoring at ML2 was undertaken between 12:00 on 18th May and 11:15 on 19th May 2021. The location was representative of the noise environment at the elevation overlooking Bradley's Court.

3.3 EQUIPMENT

- 3.3.1 The baseline noise survey was undertaken using the Class 1 specification noise measurement equipment detailed in **Table 3-1**. Measurement equipment was calibrated using a portable calibrator immediately before and after the measurements with no significant drift in calibration observed. The sound level meter, pre-amplifier and microphone were calibrated to traceable standards within 24 months prior to the measurements. The portable calibrator was calibrated within 12 months prior to the measurements.

Table 3-1: Equipment Details

Measurement Location	Item	Make & Model	Serial No.	Calibration Due
1	Sound Level Meter	Svantek 971	80344	March 2022
	Pre-Amplifier	Svantek SV18	71577	
	Microphone	ACO Pacific 7052E	69566	
2	Sound Level Meter	Svantek 971	60745	August 2021
	Pre-Amplifier	Svantek SV18	64535	
	Microphone	ACO Pacific 7052E	66815	
1 and 2	Calibrator	01 dB CAL21	34675335	November 2021

3.4 WEATHER CONDITIONS

- 3.4.1 Weather conditions during the survey were conducive to environmental noise monitoring, it being dry with negligible winds.

3.5 RESULTS

3.5.1 **Tables 3-2 to 3-5** include a summary of measured noise levels. Full survey results are included in **Appendix C**. Free-field levels have derived from façade levels by applying a -3 dB correction.

Table 3-2: Measured Sound Pressure Levels at Measurement Location 1, Free-field

Start Date and Time	Period	dB L _{Aeq,T}	dB L _{Afmax}
18/05/2021 12:00	Daytime ¹ (07:00 to 23:00)	63	-
18/05/2021 23:00	Night-time (23:00 to 00:00)	56	80 ²

¹ Includes periods between 12:00 and 23:00 on 18th May and 07:00 and 11:15 on 19th May 2021.
² 90th Percentile of L_{Afmax,15min} noise levels measured during the night-time.

Table 3-3: Octave Band Sound Pressure Levels at Measurement Location 1, Free-field

Period	Octave Band Sound Pressure Levels (L _{eq} , dB)								dB(A)
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	
Daytime	67	63	57	57	59	57	52	45	63
Night-time	63	57	51	50	52	49	46	42	56

Table 3-4: Measured Sound Pressure Levels at Measurement Location 2, Free-field

Start Date and Time	Period	dB L _{Aeq,T}	dB L _{Afmax}
18/05/2021 12:00	Daytime ¹ (07:00 to 23:00)	60	-
18/05/2021 23:00	Night-time (23:00 to 00:00)	53	78 ²

¹ Includes periods between 12:00 and 23:00 on 18th May and 07:00 and 11:15 on 19th May 2021.
² 90th Percentile of L_{Afmax,15min} noise levels measured during the night-time.

Table 3-5: Octave Band Sound Pressure Levels at Measurement Location 2, Free-field

Period	Octave Band Sound Pressure Levels (L _{eq} , dB)								dB(A)
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	
Daytime	64	62	55	54	56	53	51	44	60
Night-time	60	55	49	48	49	46	44	42	53

4 ASSESSMENT

4.1 INTERNAL NOISE LEVELS WITH WINDOWS CLOSED

- 4.1.1 A series of noise break-in calculations have been undertaken based on the current scheme drawings, included in **Appendix B**, and the measured levels from **Tables 3-2 to 3-5**. The calculations were undertaken in accordance with the 'more rigorous calculation' method from Section G.2 of BS 8233. The calculations were used to determine the minimum glazing and ventilation performances for each space.
- 4.1.2 Generally, where a barrier fully blocks line of sight between a source and receiver, a circa. 10 dB reduction would be expected. As the windows to the top floor bedroom are fully screened from Newton Street, a 10 dB reduction to the noise levels in **Tables 3-2 to 3-5** has been assumed in the break-in calculations for this space.
- 4.1.3 **Table 4-1** details the minimum glazing and ventilation sound insulation performances required for each proposed noise sensitive space and the predicted internal noise levels should the minimum sound insulation performances be achieved.

Table 4-1: Predicted Internal Noise Levels with Windows Closed and Vents Open, dB

Assessment Location, Room	Element	Required Sound Insulation Performances and Example Constructions	Predicted Daytime Level $L_{Aeq,16h}$	Predicted Night-time Level $L_{Aeq,8h}$	Predicted Night-time level L_{Amax}
Lower Ground Floor Bedroom 2	Glazing	31 dB R_w+C_{tr} 4 mm glass/ 12 mm air gap/ 10 mm glass	30	24	45
	Ventilator	40 dB $D_{n,e,w}+C_{tr}$ Acoustic trickle ventilator or through-wall ventilator			
Lower Ground Floor Bedroom 3	Glazing	27 dB R_w+C_{tr} 4 mm glass/ 12 mm air gap/ 4 mm glass	27	20	45
	Ventilator	40 dB $D_{n,e,w}+C_{tr}$ Acoustic trickle ventilator or through-wall ventilator			
Ground Floor Kitchen/Dining Room	Glazing	27 dB R_w+C_{tr} 4 mm glass/ 12 mm air gap/ 4 mm glass	40	-	-
	Ventilator	32 dB $D_{n,e,w}+C_{tr}$ Trickle ventilator or through-wall ventilator			
First Floor Lounge	Glazing	27 dB R_w+C_{tr} 4 mm glass/ 12 mm air gap/ 4 mm glass	35	-	-
	Ventilator	36 dB $D_{n,e,w}+C_{tr}$ Acoustic trickle ventilator or through-wall ventilator			
Second Floor Bedroom	Glazing	27 dB R_w+C_{tr} 4 mm glass/ 12 mm air gap/ 4 mm glass	27	19	44
	Ventilator	32 dB $D_{n,e,w}+C_{tr}$ Trickle ventilator or through-wall ventilator			

4.1.4 It can be seen from **Table 4-1** that the internal desirable guideline values from BS 8233, as detailed in **Table 2-1**, and the internal noise level criteria from Planning Condition 8 would be achieved in the proposed noise sensitive spaces, provided the glazing and

ventilation units achieve the stated performances. The 45 dB L_{AFmax} criterion from the WHO guidelines would also be predicted to be achieved in bedrooms at night.

- 4.1.5 It is understood that where the existing windows are proposed to be replaced, glazing with an arrangement 6.8 mm acoustic laminate/ 12 mm air gap/ 4 mm glass is proposed which would be expected to achieve a performance of 33 dB R_w+C_{tr} . It is understood that the Greenwood 2500EA/5000EA vents are proposed. For the second floor bedroom either vent could be used. For the first floor lounge either the 2500EA alone could be used or the 5000EA with the external acoustic module or 2 acoustic modules (5000EAW.AC1 or 5000EAW.AC2). For the lower ground floor bedrooms the 2500EA vent must be used with the external acoustic module or 2 acoustic modules (2500EAW.AC1 or 2500EAW.AC2).
- 4.1.6 It is understood that the existing UPVC windows facing Newton Street in the Ground Floor Kitchen/Dining Room and Bedroom 2 are to be retained. It is assumed that the existing windows have the performance of standard double glazing with an arrangement similar to 6 mm glass/12 mm air gap/6 mm glass (29 dB R_w+C_{tr}). The existing windows within Bedroom 2 do not have trickle ventilators and accounting for the lack of trickle ventilators this performance is expected to be sufficient. The performance is also suitable for the Kitchen/Dining Room, as the performance exceeds the requirements for this space from **Table 4-2**.

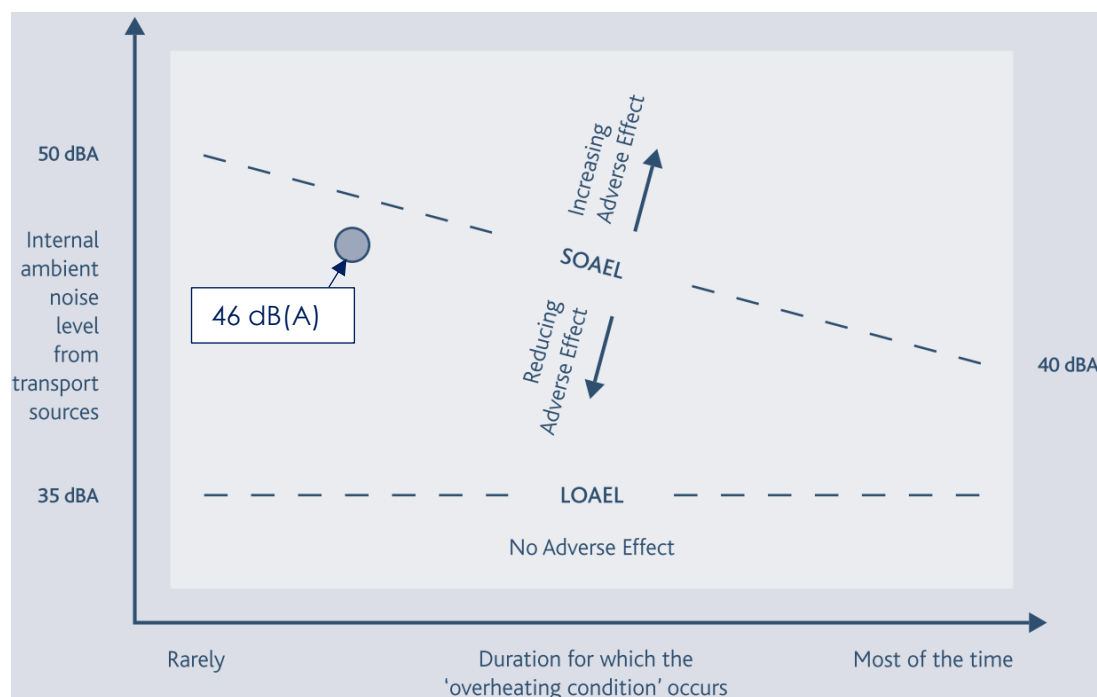
4.2 OVERHEATING ASSESSMENT

- 4.2.1 An overheating assessment has been completed by Base Energy in accordance with CIBSE Technical Memorandum 59 (TM59). The assessment indicates that on days where overheating could occur, windows would be required to be open for 1-hour during the daytime between 12:00 and 13:00 in occupied spaces, to provide sufficient cooling. The windows could remain closed during the entire night-time period (23:00 – 07:00).
- 4.2.2 Therefore, windows would only have to be opened for 1-hour per day, and only during hot periods where overheating could occur (i.e. during the summer months). For the majority of the year, windows could remain closed without occupied spaces overheating.

4.3 INTERNAL NOISE LEVELS DURING OVERHEATING CONDITION

- 4.3.1 It can be seen from **Appendix C** that during the 12:00 – 13:00 period when windows may be required to be opened, the external façade noise levels were 62 dB at ML1 and 60 dB at ML2. This corresponds to free-field noise levels of 59 dB at ML1 and 57 dB at ML2, applying a -3 dB correction from façade to free-field noise levels.
- 4.3.2 The AVO Guide recommends that a -13 dB correction is applied to estimate internal noise levels from external free-field noise levels with partially open windows. Therefore, internal noise levels would be expected to be 46 dB internally, assuming that windows are opened on the Newton Street elevation, as a worst case. **Figure 4-1** shows an illustration of the daytime condition for a 46 dB internal noise level occurring rarely, taken from the worked example in Appendix B of the AVO Guide.

Figure 4-1: Illustration of Daytime Conditions during Overheating Condition



- 4.3.3 It can be seen from **Figure 4-1** that the internal 46 dB noise level during the daytime is below the point at which a Significant Observed Adverse Effect Level (SOAEL) would be indicated, and therefore internal conditions during overheating are deemed to be acceptable.
- 4.3.4 It should be noted that an internal noise level of 46 dB $L_{Aeq,1h}$ during the period 12:00 – 13:00 would result in an equivalent continuous daytime noise level (between 07:00 – 23:00) of 37 dB $L_{Aeq,16h}$ assuming windows remain closed at all other times. This would

result in reasonable conditions in accordance with BS 8233 for the overall daytime period. For the majority of the year, windows could remain closed and desirable conditions would be achieved during the daytime using trickle ventilators alone.

- 4.3.5 During the night-time (07:00 – 23:00) the overheating assessment has concluded that windows can remain closed, and desirable conditions could be achieved throughout the year.

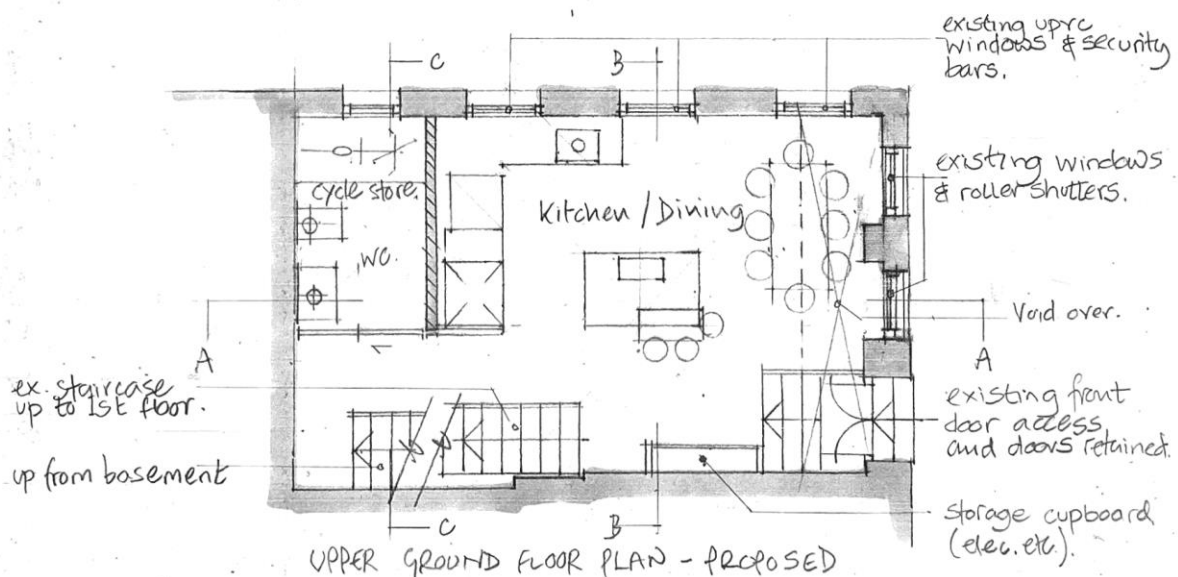
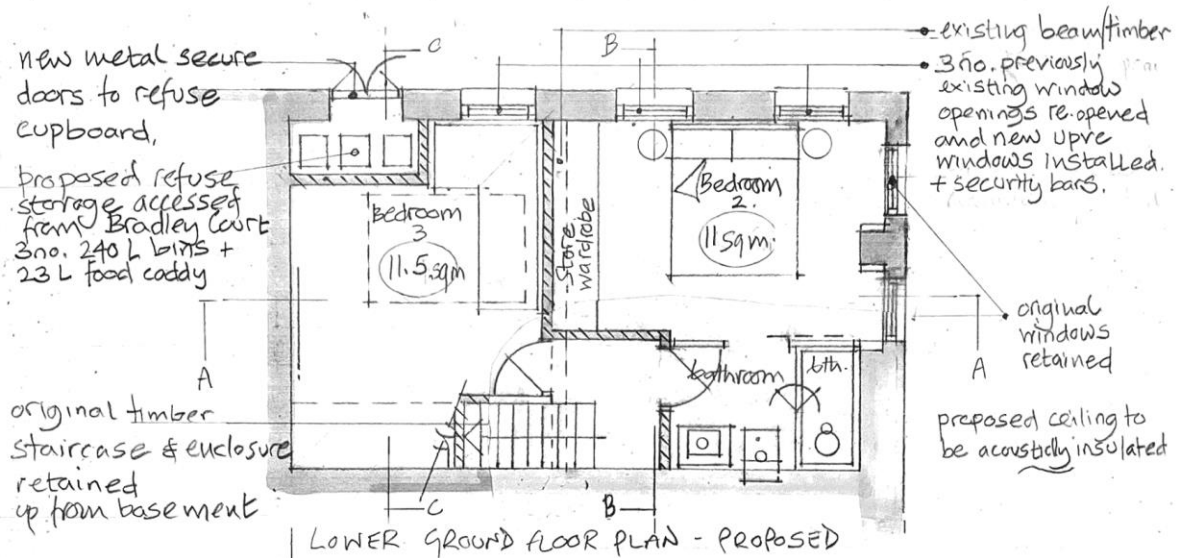
5 CONCLUSION

- 5.1.1 JPM Acoustics Ltd has been appointed by AAIP Partnership to undertake an acoustics and overheating assessment to support the partial discharge of a noise related planning condition associated with the planning approval for the change of use of 55 Newton Street, Manchester from commercial premises to a residential dwelling.
- 5.1.2 This report presents an assessment of noise levels within the proposed development during typical ventilation conditions and during the overheating condition. The assessment draws on the results of an overheating assessment and has been undertaken with due consideration to relevant British Standards and current guidance relating to noise and overheating.
- 5.1.3 The assessment of internal noise levels with windows closed identified that, provided appropriate glazing and ventilation units are selected, as detailed in **Table 4-1**, the criteria outlined in the relevant Planning Condition can be achieved.
- 5.1.4 The assessment of internal noise levels during the Overheating Condition concluded that internal noise levels would be acceptable.
- 5.1.5 Given the results of this assessment, it is suggested that Planning Condition 8 may be partially discharged and the proposed scheme of natural ventilation should be approved in place of the previously agreed system which utilised MVHR.

APPENDIX A: TECHNICAL GLOSSARY

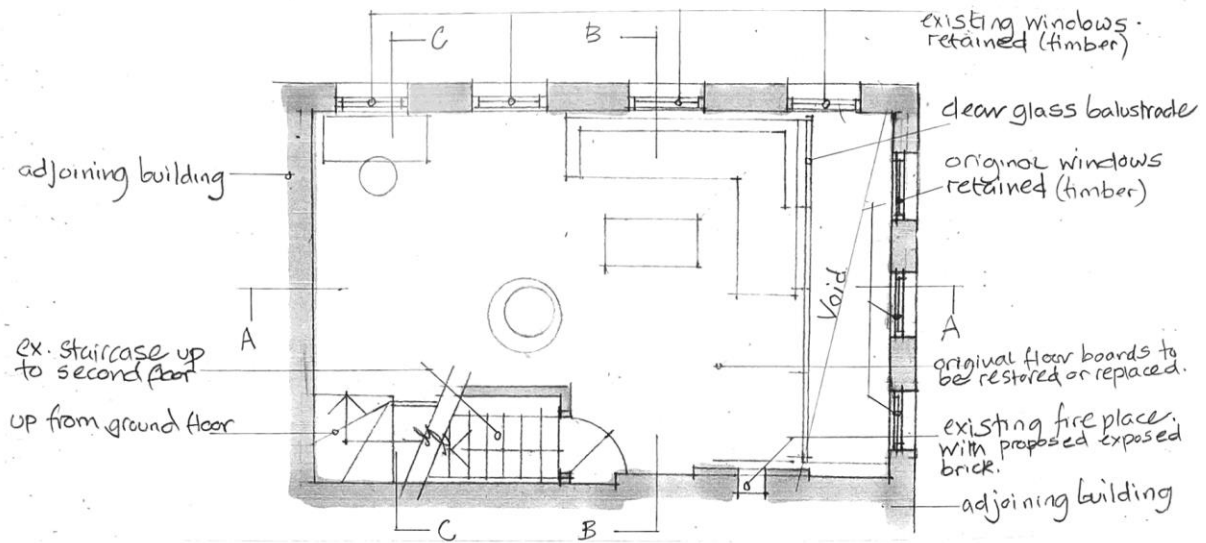
Term	Descriptions
Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of 20 μPa (20×10^{-6} Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds S_1 and S_2 is given by $20 \log_{10} (S_1 / S_2)$. The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20 μPa .
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
$L_{eq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level during the period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{90,T}$	A noise level index. The noise level exceeded for 90% of the time over the period T. L_{90} can be considered to be the "average minimum" noise level and is often used to describe the background noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5 m.
Façade	At a distance of 1 m in front of a large sound reflecting object such as a building façade.
Fast/Slow Time Weighting	Averaging times used in sound level metres.
Octave Band	A range of frequencies whose upper limit is twice the frequency of the lower limit.

APPENDIX B: SCHEME LAYOUT DRAWINGS



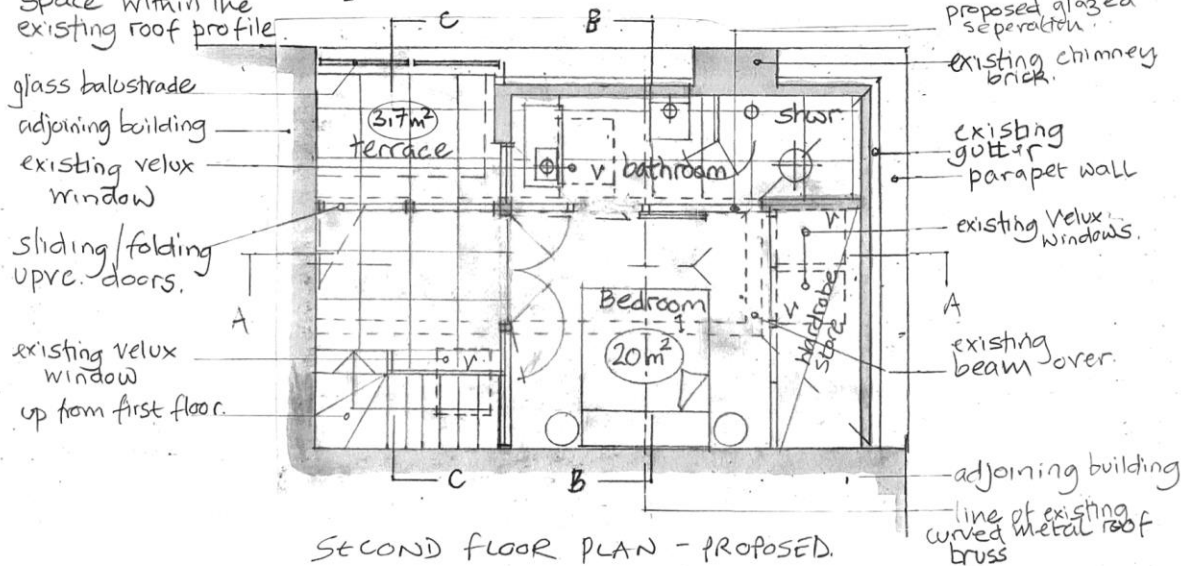
 proposed walls
 original/historic walls

CLIENT	A A I P	55 NEWTON STREET	SCALE 1:50 @ A3	LIFE DESIGNS
SITE ADDRESS		MANCHESTER M11 1ET	DATE May. 2021	ARCHITECTURE
PROJECT TITLE	Proposed conversion of office into single dwelling		JOB No. 290 DWG No. PL 02 REV.	E. info@lifedesigns.co.uk M (0034) 608 372 748



FIRST FLOOR PLAN - PROPOSED

form new terrace amenity space within the existing roof profile.

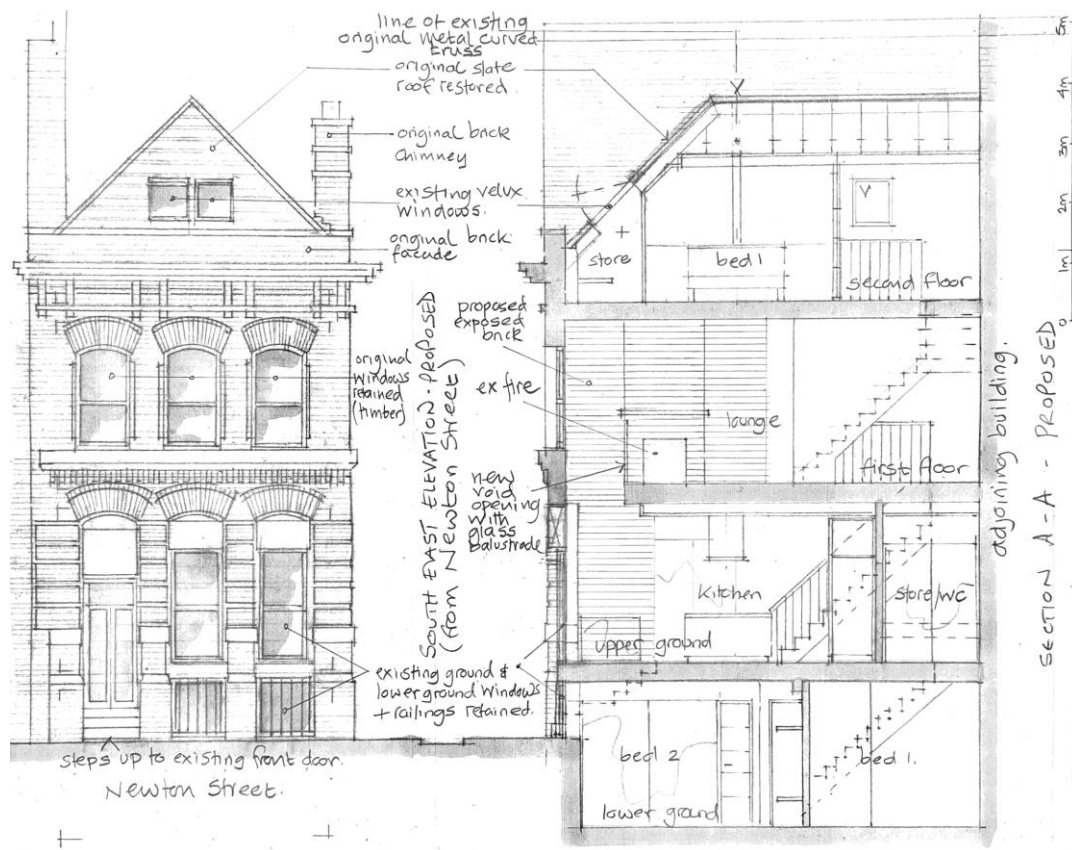


SECOND FLOOR PLAN - PROPOSED

////// proposed walls

—— original/historic walls

CLIENT SITE ADDRESS	AAIP 55 NEWTON STREET MANCHESTER M11ET	SCALE 1:50 @ A3 DATE May 2021	LIFE DESIGNS ARCHITECTURE
PROJECT TITLE	proposed conversion of office into single dwelling	JOB No. 290 DWG No. PL 03 REV.	E.info@lifedesigns.space M.(0034) 608 392 748



APPENDIX C: FULL SURVEY RESULTS

Table B-1: Results from Measurement Location 1, Façade, dB

Start Date and Time	L _A F _{max}	L _A eq,T	L _A 90,T	Octave Band Sound Pressure Levels (L _{eq})							
				63	125	250	500	1 k	2 k	4 k	8 k
18/05/2021 12:00	80	62	54	71	67	59	57	58	54	49	42
18/05/2021 12:15	80	62	54	71	66	59	57	58	55	49	47
18/05/2021 12:30	81	62	55	73	70	62	57	57	54	49	43
18/05/2021 12:45	76	62	54	71	65	59	58	58	54	48	41
18/05/2021 13:00	104	79	53	71	66	61	65	76	73	67	57
18/05/2021 13:15	76	61	53	71	66	59	57	58	54	48	41
18/05/2021 13:30	79	63	54	72	71	61	57	58	55	50	44
18/05/2021 13:45	104	75	53	69	63	57	57	66	71	68	57
18/05/2021 14:00	77	60	53	69	62	56	55	56	52	46	39
18/05/2021 14:15	75	60	53	68	61	56	55	56	54	47	38
18/05/2021 14:30	85	62	53	70	64	58	60	58	53	48	42
18/05/2021 14:45	74	61	54	70	64	58	57	57	54	48	44
18/05/2021 15:00	70	59	52	68	62	55	54	55	52	45	39
18/05/2021 15:15	88	64	52	70	63	59	61	60	55	52	47
18/05/2021 15:30	82	62	52	71	65	58	57	58	55	50	44
18/05/2021 15:45	74	62	53	71	66	58	57	58	54	48	44
18/05/2021 16:00	73	61	53	71	64	58	56	57	53	47	40
18/05/2021 16:15	71	60	53	68	63	57	55	57	53	47	41
18/05/2021 16:30	72	60	52	70	64	56	55	56	53	46	40
18/05/2021 16:45	75	60	53	68	62	56	55	57	53	46	40
18/05/2021 17:00	76	59	51	69	62	56	54	56	52	47	41
18/05/2021 17:15	84	63	53	72	69	60	58	59	55	48	43
18/05/2021 17:30	72	59	52	69	62	56	54	55	51	45	40
18/05/2021 17:45	84	62	52	66	64	61	58	58	55	46	40
18/05/2021 18:00	79	60	53	69	66	59	54	56	52	48	51
18/05/2021 18:15	77	60	52	69	66	59	56	56	52	46	42
18/05/2021 18:30	71	59	52	69	66	58	54	55	51	44	38
18/05/2021 18:45	86	63	53	69	69	68	58	57	53	44	40
18/05/2021 19:00	78	60	52	69	63	57	56	57	53	46	40
18/05/2021 19:15	81	62	53	68	64	57	58	58	54	49	42
18/05/2021 19:30	77	61	50	68	69	57	54	56	56	49	39
18/05/2021 19:45	84	61	52	68	65	57	57	56	53	46	43
18/05/2021 20:00	84	62	50	70	69	61	59	57	53	48	40
18/05/2021 20:15	75	59	51	69	61	55	54	56	53	45	38
18/05/2021 20:30	79	59	49	66	61	57	56	56	51	44	37
18/05/2021 20:45	76	59	49	67	60	54	54	55	51	44	46
18/05/2021 21:00	72	59	48	68	63	55	53	55	52	45	38
18/05/2021 21:15	94	72	50	68	65	63	74	62	59	57	51
18/05/2021 21:30	79	62	49	68	66	59	57	57	55	52	51

Start Date and Time	LA _{Fmax}	LA _{eq,T}	LA _{90,T}	Octave Band Sound Pressure Levels (L _{eq})							
				63	125	250	500	1 k	2 k	4 k	8 k
18/05/2021 21:45	92	65	48	67	71	63	62	60	57	49	42
18/05/2021 22:00	72	59	49	69	64	54	54	56	52	45	38
18/05/2021 22:15	74	58	49	66	58	53	55	55	50	43	35
18/05/2021 22:30	73	59	49	69	62	58	55	55	52	47	42
18/05/2021 22:45	75	57	46	65	58	53	52	54	50	44	45
18/05/2021 23:00	78	60	47	69	65	57	55	57	53	46	42
18/05/2021 23:15	77	55	43	65	56	50	49	52	48	42	35
18/05/2021 23:30	74	58	46	67	58	53	53	55	51	43	35
18/05/2021 23:45	72	57	43	65	58	52	51	54	49	42	36
19/05/2021 00:00	74	53	42	62	57	51	49	50	45	39	32
19/05/2021 00:15	73	55	43	60	56	50	49	52	48	42	34
19/05/2021 00:30	72	54	41	63	55	50	49	52	47	39	31
19/05/2021 00:45	69	54	40	64	58	52	49	51	47	38	31
19/05/2021 01:00	83	59	40	62	58	56	55	56	51	43	36
19/05/2021 01:15	85	63	41	62	60	59	57	58	57	52	53
19/05/2021 01:30	76	55	40	62	58	51	50	52	47	41	33
19/05/2021 01:45	82	54	40	63	56	50	51	50	46	38	42
19/05/2021 02:00	72	52	39	58	54	48	48	49	45	37	33
19/05/2021 02:15	68	51	40	58	55	47	47	48	44	37	28
19/05/2021 02:30	69	51	38	54	52	45	44	48	44	35	25
19/05/2021 02:45	70	49	38	59	52	45	44	47	42	33	25
19/05/2021 03:00	71	48	39	55	52	45	44	45	39	31	22
19/05/2021 03:15	77	54	40	56	53	49	48	51	47	38	31
19/05/2021 03:30	65	48	40	55	52	46	42	44	41	35	26
19/05/2021 03:45	79	55	41	61	57	51	50	51	48	42	35
19/05/2021 04:00	95	67	41	63	58	52	53	62	60	61	56
19/05/2021 04:15	83	60	42	66	63	57	55	56	53	48	43
19/05/2021 04:30	72	55	42	59	54	48	48	52	48	40	30
19/05/2021 04:45	73	57	45	63	56	51	50	54	50	41	33
19/05/2021 05:00	78	56	45	70	63	54	50	52	49	43	39
19/05/2021 05:15	71	57	45	63	57	51	51	54	50	42	39
19/05/2021 05:30	82	64	48	74	65	60	59	59	56	55	52
19/05/2021 05:45	82	62	48	70	64	58	56	58	55	49	45
19/05/2021 06:00	77	60	50	69	63	56	54	57	54	48	40
19/05/2021 06:15	81	63	50	70	65	60	57	59	56	50	45
19/05/2021 06:30	75	63	51	71	64	59	57	59	55	50	43
19/05/2021 06:45	81	64	52	72	66	62	59	60	56	52	45
19/05/2021 07:00	83	63	53	71	67	61	60	59	56	50	45
19/05/2021 07:15	86	62	53	71	67	63	57	58	55	49	42
19/05/2021 07:30	79	63	53	72	69	61	57	59	56	51	45
19/05/2021 07:45	77	62	52	70	65	60	57	58	55	49	43
19/05/2021 08:00	74	60	51	70	61	56	54	56	53	47	41
19/05/2021 08:15	87	61	51	68	62	55	54	56	54	52	50

Start Date and Time	L _A F _{max}	L _A eq,T	L _A 90,T	Octave Band Sound Pressure Levels (L _{eq})							
				63	125	250	500	1 k	2 k	4 k	8 k
19/05/2021 08:30	83	64	53	71	65	60	56	58	60	49	43
19/05/2021 08:45	89	66	56	73	74	69	62	61	58	54	47
19/05/2021 09:00	82	66	54	74	72	65	62	60	61	53	51
19/05/2021 09:15	79	64	53	73	68	60	58	59	57	53	49
19/05/2021 09:30	92	66	54	71	67	59	59	63	60	55	52
19/05/2021 09:45	76	66	56	71	64	58	57	59	60	58	54
19/05/2021 10:00	76	64	54	70	64	59	56	58	58	56	52
19/05/2021 10:15	88	66	55	71	65	62	60	61	59	57	53
19/05/2021 10:30	77	64	54	70	64	59	57	59	58	57	52
19/05/2021 10:45	79	64	54	72	65	58	56	58	58	57	52
19/05/2021 11:00	79	66	55	71	64	58	58	60	60	58	54

Table B-2: Results from Measurement Location 2, Façade, dB

Start Date and Time	L _A F _{max}	L _A eq,T	L _A 90,T	Octave Band Sound Pressure Levels (L _{eq})							
				63	125	250	500	1 k	2 k	4 k	8 k
18/05/2021 12:00	81	61	52	71	70	60	56	55	52	49	43
18/05/2021 12:15	76	60	52	67	64	58	55	55	52	48	45
18/05/2021 12:30	78	60	52	70	68	60	56	55	51	47	42
18/05/2021 12:45	74	60	52	69	64	58	57	56	52	46	41
18/05/2021 13:00	101	74	51	67	63	58	58	72	68	63	54
18/05/2021 13:15	73	59	52	67	64	57	54	54	51	46	40
18/05/2021 13:30	77	60	52	69	68	59	55	55	52	47	42
18/05/2021 13:45	100	72	51	66	61	55	54	64	68	67	56
18/05/2021 14:00	76	58	51	66	61	55	53	54	50	45	38
18/05/2021 14:15	69	57	51	65	60	54	52	53	50	45	37
18/05/2021 14:30	84	60	51	66	62	57	59	55	50	46	41
18/05/2021 14:45	73	59	52	68	63	57	54	54	51	46	42
18/05/2021 15:00	69	57	51	65	60	54	53	53	49	44	38
18/05/2021 15:15	83	61	51	67	62	57	58	56	52	49	46
18/05/2021 15:30	80	59	51	68	63	57	55	55	52	49	43
18/05/2021 15:45	75	59	52	68	65	58	55	55	51	46	41
18/05/2021 16:00	73	58	52	67	62	57	54	54	50	45	39
18/05/2021 16:15	75	58	52	65	61	56	54	54	50	46	40
18/05/2021 16:30	74	57	51	67	62	55	53	53	49	44	39
18/05/2021 16:45	73	58	52	65	61	55	53	54	50	44	40
18/05/2021 17:00	75	57	50	65	60	54	52	53	49	44	39
18/05/2021 17:15	81	60	53	68	67	60	56	56	52	46	42
18/05/2021 17:30	69	57	51	65	62	57	52	52	48	43	39
18/05/2021 17:45	82	60	51	64	63	60	57	55	52	45	38
18/05/2021 18:00	77	58	52	68	67	60	53	53	49	46	48
18/05/2021 18:15	75	58	51	69	68	60	54	53	49	44	40
18/05/2021 18:30	68	58	51	68	68	59	53	52	48	43	37

Start Date and Time	L _{Afmax}	L _{Aeq,T}	L _{A90,T}	Octave Band Sound Pressure Levels (L _{eq})							
				63	125	250	500	1 k	2 k	4 k	8 k
18/05/2021 18:45	83	61	51	68	68	66	57	54	50	43	37
18/05/2021 19:00	74	58	50	66	60	55	53	54	50	44	38
18/05/2021 19:15	76	58	51	65	64	56	54	54	50	45	39
18/05/2021 19:30	74	59	50	67	68	57	52	52	53	48	37
18/05/2021 19:45	76	58	51	66	66	57	54	53	49	44	40
18/05/2021 20:00	82	59	50	67	68	59	57	54	50	46	39
18/05/2021 20:15	71	57	50	66	60	54	52	53	49	43	37
18/05/2021 20:30	76	57	49	63	60	56	53	53	48	43	37
18/05/2021 20:45	78	56	47	63	58	52	52	52	48	42	41
18/05/2021 21:00	73	56	47	64	60	54	51	52	49	43	37
18/05/2021 21:15	92	67	48	65	63	60	68	58	56	55	50
18/05/2021 21:30	76	59	47	64	64	57	54	54	51	49	49
18/05/2021 21:45	71	57	46	64	59	53	52	53	50	44	39
18/05/2021 22:00	89	62	47	65	68	61	59	56	54	46	39
18/05/2021 22:15	69	55	47	63	57	51	51	51	47	41	34
18/05/2021 22:30	71	56	47	64	60	55	53	52	48	44	39
18/05/2021 22:45	70	54	45	62	56	51	50	50	47	41	36
18/05/2021 23:00	82	58	45	66	63	56	52	54	50	44	47
18/05/2021 23:15	84	54	42	60	54	49	48	49	47	47	41
18/05/2021 23:30	71	55	44	63	56	51	50	51	48	41	34
18/05/2021 23:45	69	54	43	61	56	50	49	51	47	40	35
19/05/2021 00:00	71	50	42	59	55	49	47	46	42	37	30
19/05/2021 00:15	71	52	42	58	55	48	48	49	45	39	33
19/05/2021 00:30	70	52	42	59	54	48	48	48	44	37	30
19/05/2021 00:45	66	52	41	60	57	50	48	48	44	36	30
19/05/2021 01:00	79	56	41	59	56	54	53	52	47	41	35
19/05/2021 01:15	81	60	41	59	58	55	55	54	53	51	53
19/05/2021 01:30	71	52	41	59	56	49	48	48	44	38	31
19/05/2021 01:45	76	51	41	60	54	49	48	47	43	37	38
19/05/2021 02:00	69	50	41	57	53	48	46	47	43	36	33
19/05/2021 02:15	65	48	41	55	53	45	45	44	40	34	27
19/05/2021 02:30	70	49	40	53	51	45	45	46	42	34	27
19/05/2021 02:45	68	47	40	57	52	45	44	44	39	31	25
19/05/2021 03:00	69	46	41	54	51	45	44	43	37	30	22
19/05/2021 03:15	75	51	41	54	52	48	47	48	44	37	31
19/05/2021 03:30	63	46	41	54	52	46	43	41	38	33	26
19/05/2021 03:45	70	50	41	57	54	48	45	45	42	37	31
19/05/2021 04:00	94	64	42	62	57	52	52	58	56	59	56
19/05/2021 04:15	81	57	42	63	60	54	52	53	50	46	40
19/05/2021 04:30	70	52	42	57	53	47	47	49	45	38	30
19/05/2021 04:45	72	54	43	60	55	49	48	51	47	39	32
19/05/2021 05:00	73	53	44	66	60	52	48	48	45	41	38
19/05/2021 05:15	70	54	44	61	57	51	49	51	47	42	38

Start Date and Time	L _{Afmax}	L _{Aeq,T}	L _{A90,T}	Octave Band Sound Pressure Levels (L _{eq})							
				63	125	250	500	1 k	2 k	4 k	8 k
19/05/2021 05:30	80	61	46	68	63	57	56	55	53	52	51
19/05/2021 05:45	78	59	46	68	62	56	54	55	52	47	44
19/05/2021 06:00	75	58	47	68	62	55	52	54	51	48	43
19/05/2021 06:15	79	60	48	67	62	58	55	56	52	48	43
19/05/2021 06:30	73	60	49	68	63	57	55	56	52	48	44
19/05/2021 06:45	77	61	50	68	64	60	57	57	53	49	44
19/05/2021 07:00	82	61	51	69	65	60	58	56	53	48	45
19/05/2021 07:15	78	60	51	68	66	61	56	55	52	48	41
19/05/2021 07:30	74	61	51	70	67	59	55	56	53	49	44
19/05/2021 07:45	77	60	50	68	63	59	56	56	52	47	43
19/05/2021 08:00	70	57	49	67	61	55	52	53	50	45	41
19/05/2021 08:15	82	58	49	65	60	54	52	53	50	48	47
19/05/2021 08:30	78	60	51	68	63	58	55	55	54	46	42
19/05/2021 08:45	87	63	53	72	72	65	61	57	54	51	46
19/05/2021 09:00	78	63	52	70	70	62	59	56	55	51	50
19/05/2021 09:15	79	61	52	71	65	58	56	56	54	51	48
19/05/2021 09:30	82	63	52	67	64	58	57	58	55	54	51
19/05/2021 09:45	77	63	54	67	63	57	55	57	57	57	53
19/05/2021 10:00	75	61	53	68	61	56	54	55	55	55	52
19/05/2021 10:15	86	63	54	68	64	60	58	58	56	56	53
19/05/2021 10:30	75	62	52	67	63	57	55	56	55	55	51
19/05/2021 10:45	73	62	52	68	63	56	54	55	55	55	51
19/05/2021 11:00	75	63	54	67	62	57	55	57	57	57	54