



Azymuth Acoustics UK

Professional Acoustic Services

Noise Impact Assessment

Ref: AA0438

33 Thomas Street

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On behalf of

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Document Status – Draft

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1.0 Introduction

Azymuth Acoustics UK (AAUK) has been contracted by Hannah Kera to perform a Noise Impact Assessment (NIA) in relation to the proposed development of 2no. new dwellings and ground floor restaurant / café located at 33 Thomas Street, Manchester. The current building is in a state of disrepair with a full renovation planned.

It is understood that the restaurant / café is to be open from 10am to 10pm every day.

This NIA is intended to provide information relating to potential noise levels affecting the site in order to support the detailed planning application for the development. In particular, the report sets out the following details:

- The results of a baseline noise survey undertaken over a continuous period in the vicinity of the proposed development
- The appropriate assessment criteria and guidance relating to noise in the environment as associated with this kind of development
- Recommendations to meet the targets as set out by the assessment criteria

2.0 Baseline Noise Survey

2.1 Measurement Procedures

The instrumentation used for the NIA consisted of a SvanTek 977 type 1 precision sound level meter. The equipment was calibrated before and after measurements. The sound level meter measured A-weighted (fast response) noise levels as well as octave bands noise levels for all measurement record.

Measurements were taken over a continuous weekday period between 11:08hrs on Wednesday 21st September and 10:08hrs on Friday 23rd September 2022. Weekend measurements were taken over a continuous period between 17:11hrs on Friday 23rd September and 11:11hrs on Monday 26th September 2022.

The noise measurements were taken using a sound level meter placed at a fixed position of 1m outside a second-floor window as shown in figure 1:

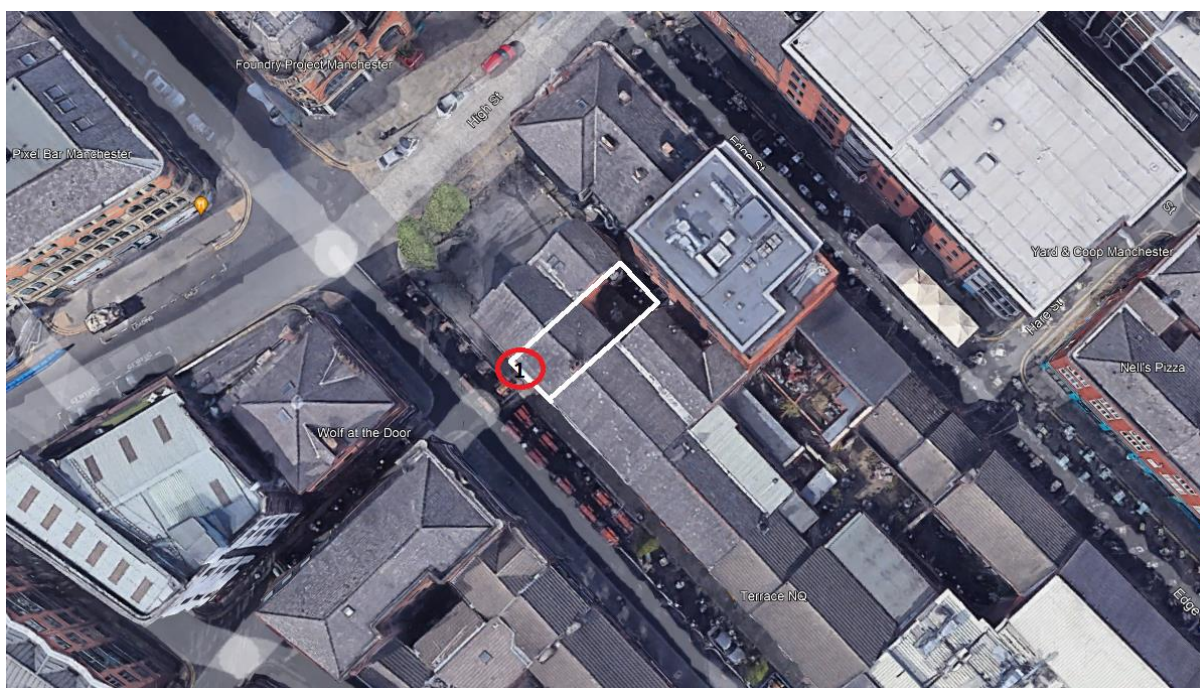


Figure 1 – Noise measurement position at 33 Thomas Street

Full results of the noise levels recorded during the course of the survey are included in Appendix B of this report.

The following table summarises the results of the noise measurements undertaken at the proposed site in terms of the average daytime and night-time noise levels.

Location	Period	L _{AFmax}	L _{Aeq}	L _{A10}	L _{A50}	L _{A90}
1) Weekday	Day	82.3	63.1	69.5	57.9	54.2
1) Weekday	Night	78.6	58.8	65.4	50.0	47.0
1) Weekend	Day	84.1	67.2	66.0	61.1	57.6
1) Weekend	Night	83.7	66.8	64.4	58.0	53.8

Table 1 – Summary of noise measurements

2.2 Description of Noise Climate

The site is located in Manchester's Northern Quarter which is home to many late-night restaurants and bars with outdoor seating and thus noise levels were expected to be high, especially during weekend periods.

The weather during the measurement periods was partly dry with intermittent showers and wind speeds of approximately 5-15mph.

Through a site visit and using aerial photography from google earth it is assumed that there are no sources of potential activity noise to the direct rear (north) of the proposed development.

3.0 Assessment Criteria

In order to assess the extent of any measures required in order to comply with suitable conditions relating to potential noise sources, Azymuth Acoustics UK has reviewed various guidance documents and standards, these include:

- ProPG: Professional Practice Guidance on Planning and Noise (New residential development)
- National Planning Policy Framework (NPPF 2021)
- British Standard 8233:2014
- World Health Organisation Guidelines on Community Noise
- British Standard 4142:2014
- Acoustics Ventilation and Overheating Residential Design Guide 2020

3.1 ProPG: Planning and Noise - May 2017

This Professional Practice Guidance on Planning and Noise (ProPG) has been produced to provide practitioners with guidance on a recommended approach to the management of noise within the planning system in England. The National Planning Policy Framework (NPPF) encourages improved standards of design. The CIEH, IOA and the ANC have worked together to produce this guidance which encourages better acoustic design for new residential development and aims to protect people from the harmful effects of noise.

The Professional Practice Guidance on Planning and Noise States 'The recommended approach is intended to give the developer, noise practitioner, and decision maker an early indication of the likely initial suitability of the site for new residential development from a noise perspective and the extent of acoustic issues that would be faced'. It is important that acoustic design is reviewed at an early stage of the development process.

3.2 National Planning Policy Framework (NPPF) 2021

The NPPF provides guidance to local authorities taking into account noise in making planning decisions. Paragraph 185 of the National Planning Policy Framework (NPPF) states that planning policies and decisions should aim to:

- Avoid noise giving rise to significant adverse impacts on health and quality of life as a result of new development
- Mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions

The National Planning Policy Framework states that the planning system should 'prevent both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability'.

3.3 British Standard 8233: 2014

BS 8233 provides a code of practice for the sound insulation of a variety of building types affected by general environmental noise. It provides recommendations for control of noise in and around buildings and suggests appropriate internal ambient noise level criteria / limits for a variety of different situations including residential properties.

The following table summarises the noise limits suggested by BS 8233 applying to residential properties:

Activity	Room	Good Design Range $L_{Aeq, T}$ dB	
		07:00-23:00hrs	23:00-07:00hrs
Resting	Living Room	35	-
Dining	Dining Room / Area	40	-
Sleeping (daytime resting)	Bedroom (at night)	35	30

Table 2 – Noise Limits for Residential Properties Suggested in BS 8233

3.4 World Health Organisation Environmental Noise Guidelines (ENG) 2018

The main purpose of the 2018 WHO guidelines is to provide recommendations for protecting human health from exposure to environmental noise originating from the following sources: transportation (road traffic, railway and aircraft), wind turbines and leisure activities.

The guidelines set out to define recommended exposure levels for environmental noise in order to protect population health. Exposure limits are average levels defined over a period of one year, measured outdoors in free field at the most exposed façade. It should be noted that the document does not provide guideline limit values for multiple noise sources in combination.

The 2018 guidelines supersede the Community Noise Guidelines from 1999. Nevertheless, the document recommends that all CNG indoor guideline values and any values not covered by the current guidelines should remain valid. As such, the following guidance would remain appropriate:

For protection against sleep disturbance inside dwellings, night-time noise levels should not exceed 30dB L_{Aeq} for continuous noise and 45dB L_{Amax} for typical single sound events (which are exceeded 15 times or more per night – see ProPG Appendix A.12 for more details). To protect the majority of people from being seriously annoyed during the daytime, the outdoor sound level from steady, continuous noise (interpreted as noise from all sources combined) should not exceed 55dB L_{Aeq} on balconies, terraces and in outdoor living areas.

It should be noted that exposure levels defined in ENG and CNG are for guidance purposes as relates potential adverse health impacts and should not be interpreted as absolute limits or regulations.

3.5 British Standard 4142:2014

British Standard 4142: 2014 “Methods for assessing and rating industrial sound” describes methods for rating and assessing sound of an industrial and/or commercial nature. The methods described in this British Standard use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.



- Typically, the greater the difference between background sound and industrial/commercial noise, the greater the magnitude of the impact.
- The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.
- A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context.
- A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.

BS 4142 notes that: "Adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact."

3.6 Acoustics Ventilation and Overheating Residential Design Guide 2020

The Acoustics, Ventilation and Overheating Guide (AVO) is intended to be used by acoustic practitioners as well as all those involved in the planning, development, design and commissioning of new dwellings.

It recommends an approach to acoustic assessments for new residential developments that take due regard of the interdependence of provisions for acoustics, ventilation and overheating. Application of the AVO Guide is intended to demonstrate good acoustic design as described in the ProPG, when considering internal noise level guidelines.

3.7 Manchester City Council (MCC) Policy Document GD03

The GD03 guidance document provides developers with information related to Manchester City Council policy on discharging planning conditions imposed by the City Wide Environmental and Public Protection Team. The document has specific sections covering policy on noise from entertainment venues, fixed plant and equipment etc. The document states, 'A planning application for an entertainment venue should demonstrate that music noise from the proposal will not be audible inside residential properties nearby assuming that the residential properties in question have their windows open. The target noise criteria here should be 10dB (L_{Aeq}) below the existing L_{A90} in each octave band.'

In relation to proposed entertainment venues structurally connected to residential developments the document provides the following criteria:

'Noise levels in the 63Hz and 125Hz octave frequency bands should be controlled so as not to exceed (in habitable rooms) 47dB and 41dB respectively'.

3.8 Recommended Noise Assessment Criteria

Based on the guidance above it is recommended that the following criteria would be reasonable with the aim of minimising the impact of the environmental noise on the proposed dwellings:

- Daytime noise levels not to exceed 35dB $L_{Aeq, 16hr}$ in living rooms / bedrooms
- Daytime noise levels not to exceed 40dB $L_{Aeq, 16hr}$ in dining room / kitchen
- Night-time noise levels in bedrooms not to exceed 30dB $L_{Aeq, 8hr}$
- Night-time single sound events in bedrooms not to exceed 45dB L_{Amax} more than 15 times a night

Table 4, Note 5 of BS 8233:2014 states: 'If relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level. If applicable, any room should have adequate ventilation (e.g. trickle ventilators should be open) during assessment.'

The following criteria in relation to the restaurant / café unit should also be followed to minimise the impact of noise upon the first floor flat and surrounding environment:

- Break-out noise levels to not exceed the background sound level
- Noise levels in the 63Hz octave frequency band to not exceed 47dB in habitable rooms
- Noise levels in the 125Hz octave frequency band to not exceed 41dB in habitable rooms



4.0 Assessment of Results

4.1 Assessment of Noise Risk to Residential

The following noise risk assessment highlights the level of risk of an adverse noise effect based on the guidance from the ProPG document.

Location	Time of Day	Worst Case Measured Noise Levels (dBA)	ProPG Risk of Adverse Effect	AVO Guide Risk (overheating) Category
33 Thomas Street front elevation	Daytime L_{Aeq} , 16hr	67.2	Medium	High
	Night-time L_{Aeq} , 8hr	66.8	High	High

Table 3 – Noise risk assessment for 33 Thomas Street

4.2 Typical Noise Levels in Restaurants and Bars

The following noise levels would typically be expected within entertainment venues (based on Azymuth Acoustics historical survey data and Noise from Pubs and Clubs Phase 1 document):

- Café bars and restaurants during quiet period, approx. 65-70dB L_{Aeq}
- Café bars and restaurants during busy periods, no music (customer noise only), up to approx. 88dB L_{Aeq}
- Bars playing music (including customer noise), approx. 90-95dB L_{Aeq}
- Dance floor of large nightclub, up to approx. 105dB L_{Aeq}

4.2.1 Noise Break-through Calculations

The noise assessment presented in the following sections of this report is based on the absolute worst-case octave band noise levels for a typical café that have been previously measured by AAUK.

Parameter	Octave Band Centre Frequency (Hz)								Total dBA
	63	125	250	500	1k	2k	4k	8k	
Worst case source level $L_{Aeq,30sec}$	71	76	78	83	80	77	70	60	84.5

Table 4 – Noise levels inside a typical café

Using the data from Table 4, AAUK were able to calculate the required sound insulative performance of the ceiling required in order to mitigate the effect of noise from the café on the first floor flat above.

- Minimum D_{nTw} 64dB and $D_{nTw+Ctr}$ 58dB

A separating ceiling / floor with the above sound insulation performance would result in the following noise levels (Table 5) in the first floor flat.



Parameter	Octave Band Centre Frequency (Hz)							Total dBA
	63	125	250	500	1k	2k	4k	
Worst case receiver level $L_{Aeq,30sec}$	4	15	19	26	21	15	3	28

Table 5 – Calculated worst-case noise levels inside first floor flat

The resulting noise levels inside the first floor flat would satisfy the criteria provided by MCC in Section 3.7.

4.2.2 Noise Break-out

The worst-case noise level approx. 1 metre outside the café window is expected to be 44dBA which is below the daytime background sound level.

The worst-case noise level outside the first-floor flat window is expected to be 34dBA which is significantly below the daytime background sound level. The noise levels in the 63Hz and 125Hz frequency bands also satisfy the MCC council guidance in relation to entertainment venues that are structurally attached to residential developments.

Parameter	Octave Band Centre Frequency (Hz)							Total dBA
	63	125	250	500	1k	2k	4k	
Worst case noise level @1m outside $L_{Aeq,30sec}$	47	45	45	44	32	30	16	44
Worst case noise level @ flat window above cafe $L_{Aeq,30sec}$	37	35	35	34	25	22	20	34

Table 6 – Calculated worst-case break-out noise levels



5.0 Recommendations for Noise Mitigation

Based on survey data, AAUK have produced the following recommendations in order to mitigate the effects of noise within the proposed development. If these recommendations are followed, noise levels within the development shall satisfy the criteria as set out in Section 3.8.

5.1 Recommended Glazing Specification

The table below outlines the glazing specifications Azymuth would recommend in order to mitigate the effect of noise on the proposed dwellings.

It was mentioned that replacing the existing glazing may be unfeasible and thus a secondary glazing solution has also been recommended.

Location (Habitable Spaces)	Glazing Specification	Appropriate Glazing Types
South facing facades	Any building regulations approved min. 37dB R_w and 32dB R_w+C_{tr}	Acoustic glazing e.g 6 / 16 / 10mm laminated double glazed units OR Secondary glazing e.g 6.8mm laminated glass in an acoustically sealed frame
North facing facades	Any building regulations approved min. 29dB R_w and 25dB R_w+C_{tr}	Any good quality double glazed units OR Secondary glazing

Table 7 – Azymuth recommended glazing specification for 33 Thomas Street

5.2 Recommended Ventilation Specification

Table 8 outlines the recommended ventilation that should be paired with the glazing specifications to ensure the appropriate sound insulation targets are met. With reference to the AVO and ProPG guidance, Azymuth recommends the following ventilation specification to ensure sufficient air flow to dwellings whilst also achieving internal noise level targets.

Location (Habitable Spaces)	Ventilation Specification	Appropriate Ventilation Types
33 Thomas Street	System 4 MVHR – windows may be opened but system has purge / boost setting	No trickle vents. Any air inlets / outlets for MVHR should be appropriately attenuated.

Table 8 – Azymuth recommended ventilation specification for 33 Thomas Street



5.3 Other Elements of Building Envelope

Other elements of the building envelope should have the following sound insulation performance:

- Restaurant / café separating ceiling min. D_{nTw} 64dB and $D_{nTw+Ctr}$ 58dB
- External Walls: minimum sound insulation R_w 55dB. This minimum is likely to be significantly exceeded by a normal brickwork façade. Where alternative external wall types (eg composite cladding panels / Metsec build-ups) are proposed on habitable areas it will be appropriate to check whether they comply with the target R_w 55dB.
- Roof: minimum sound insulation R_w 48dB. This minimum would likely be exceeded with a traditional slate or tile roof with mineral wool loft insulation above plasterboard ceilings or by a suitably insulated concrete roof or composite flat roof. (NB for composite flat roof build-ups a minimum 200mm roof void and 100mm mineral wool insulation would be recommended over and above the rigid insulation required to provide the required levels of thermal insulation).

5.4 Recommendations for Restaurant / Café

If the restaurant / café is planning to have some level of ambient music, it is recommended that no more than 6 loudspeakers totaling 120W of amplification are used.

6.0 Summary

AAUK has undertaken a noise impact assessment in relation to 2no. dwellings and a ground floor restaurant / café located at 33 Thomas Street, Manchester. The site is located in Manchester's bustling Northern Quarter where there are many late-night bars and restaurants that are open every day of the week, because of this noise levels affecting the site are expected to be high.

A noise monitoring system was left outside a partly open 2nd floor window in order to measure the surrounding noise climate over a continuous period. Measurements were taken over a continuous period that began on Wednesday 21st September and ended on Monday 26th September 2022.

The ambient noise level recorded during weekday periods was measured to be 63.1dB L_{Aeq} during the daytime and 58.8dB L_{Aeq} during the night-time measurement periods.

The ambient noise level recorded during the weekend periods was measured to be 67.2dB L_{Aeq} during the daytime and 66.8dB L_{Aeq} during the night- periods.

With reference to the ProPG and AVO guidance the development has been identified as having a medium to high risk of adverse noise effect as well a high risk of overheating.

As such, AAUK has recommended the following glazing and ventilation specification in order to mitigate the effects of noise on the development.

Apartment Glazing specification:

- North facing facade min. R_w 37dB and R_w+C_{tr} 32dB
- South facing facade min. R_w 29dB and R_w+C_{tr} 25dB

Apartment Ventilation specification:

- System 4 mechanical heat recovery system (MVHR) to provide supply and extract with windows closed. No trickle vents.

In order to mitigate the effect of noise on the first floor flat AAUK would recommend implementing an upgrade to the separating floor-ceiling to achieve a minimum sound insulation performance of D_{nTw} 64dB and $D_{nTw+C_{tr}}$ 58dB.

If the restaurant / café is planning to have some level of ambient music, it is recommended that no more than 6 bookshelf (wall mounted) loudspeakers totalling 120W of amplification are used. Recessed ceiling mounted loudspeakers should be avoided.



Appendix A – Glossary of Acoustic Terms

Decibel (dB)

This is the unit used to measure sound. The human ear has an approximately logarithmic response to acoustic pressure over a very large dynamic range (typically 20 micro Pascal to 100 Pascal).

dB (A)

This is a measure of the overall noise level of sound across the audible spectrum with a frequency weighting (i.e. A-weighting) to compensate for the sensitivity of the human ear to sound of different frequencies. The A-weighting curve is implemented in sound level meters using an electronic filter that approximately corresponds to the frequency response of the ear.

Octave Band Noise Level

The human ear is sensitive to sound over a range of frequencies between approximately 20Hz to 20kHz. The ear is also generally more sensitive to medium and high frequencies than to low frequencies. In order to define the frequency content of a noise, the spectrum can be divided into frequency bands. The most commonly used frequency bands are octave bands, in which the mid-frequency of each band is twice that of the band below it.

L_{Aeq}

This is the equivalent steady sound level in dB(A) containing the same acoustic energy as the actual fluctuating sound level over a given time period.

Reverberation Time (RT or sometimes T_{30} or T_{60})

This is the time taken for the reverberant sound energy in an enclosure to decay one millionth of its equilibrium value, i.e. by 60dB, after the source has been switched off. The reverberation time is frequency dependent and it is customary to measure its value in octave or one-third octave bands. Reverberation occurs when sound waves are repeatedly reflected from each surface of the room.

Sound Reduction Index (SRI)

Difference measured between the amount of energy flowing towards the wall in the source room and the total amount of energy entering the receiving room (usual range 100 - 3150Hz for one third octave band values). The SRI varies with frequency and is measured in a laboratory in either octave or one-third octave bands.

$SRI = L_1 - L_2 + 10 \log (S/A)$, where:

L_1 = Noise level in the source room

L_2 = Noise levels in the receiving room

S = Surface area of test specimen

A = Equivalent acoustic absorption area in the receiving room

Weighted Sound Reduction Index (R_w)

This is a weighted single figure descriptor of the sound insulation performance of a partition measured under laboratory conditions. The procedure used to quantify the R_w is to compare the sound reduction index (SRI) in each of the one-third octave bands from 100Hz to 3150Hz against a set of standard reference curves.



Appendix B – Noise Survey Data

Start	Position	Time	L _{Amax}	L _{Aeq}	L _{A10}	L _{A50}	L _{A90}
21 st September 2022							
11:08:00	Window	00:30:00	92.1	62	70.7	58	54.1
11:38:00	Window	00:30:00	93.7	67.2	78.5	57.8	53.6
12:08:00	Window	00:30:00	92	64.5	75.9	57.7	52.5
12:38:00	Window	00:30:00	78.7	58.3	66.9	55.8	52.9
13:08:00	Window	00:30:00	81.3	58.8	66.5	55.8	52.5
13:38:00	Window	00:30:00	73.4	62.5	67.1	63.2	53.5
14:08:00	Window	00:30:00	77.8	57.5	65.6	55.7	52.7
14:38:00	Window	00:30:00	77.9	59.5	68.5	56.1	52.8
15:08:00	Window	00:30:00	85.5	63	70.6	60.7	55.8
15:38:00	Window	00:30:00	81.8	62.1	70	59.2	54.7
16:08:00	Window	00:30:00	76.7	60.4	67.6	58.6	54.8
16:38:00	Window	00:30:00	77.3	60	67.3	58.2	54.8
17:08:00	Window	00:30:00	88.2	59.8	67.1	57.3	54.1
17:38:00	Window	00:30:00	73.5	58.9	66.6	57.1	54.2
18:08:00	Window	00:30:00	77	60.2	67.3	58.4	55.1
18:38:00	Window	00:30:00	79.5	61.7	68.8	59.9	56.5
19:08:00	Window	00:30:00	84	62.8	70.5	60.4	57
19:38:00	Window	00:30:00	103	73.9	78.9	61.8	57.6
20:08:00	Window	00:30:00	81.9	66.2	73.6	64.7	58.7
20:38:00	Window	00:30:00	78.8	62.8	70.9	60.6	57.1
21:08:00	Window	00:30:00	89.8	63	70.3	60.3	57.1
21:38:00	Window	00:30:00	87.4	65.6	77.5	59.4	56.2
22:08:00	Window	00:30:00	78.9	62.3	71.7	59.3	55
22:38:00	Window	00:30:00	88.6	61.4	72	57	53.5
23:08:00	Window	00:30:00	94.2	66.4	75.4	56.7	52.8
23:38:00	Window	00:30:00	86	65.2	78.9	56.6	52.8
22 nd September 2022							
00:08:00	Window	00:30:00	93	58.4	64.4	52.3	48.7
00:38:00	Window	00:30:00	81.1	54.8	62.7	51.5	47.9
01:08:00	Window	00:30:00	77.6	55.5	65.7	51.1	47.3
01:38:00	Window	00:30:00	86	54.7	59.3	48.6	46
02:08:00	Window	00:30:00	74.1	53.1	62	50.3	46
02:38:00	Window	00:30:00	83.6	62.5	77.6	48.4	45
03:08:00	Window	00:30:00	84.4	54.1	64.1	47.5	44.5
03:38:00	Window	00:30:00	73.6	53.8	66.9	45.9	44
04:08:00	Window	00:30:00	70.6	48.8	58.6	44.9	43.5
04:38:00	Window	00:30:00	75	48.4	57.5	45.2	43.8
05:08:00	Window	00:30:00	76	51.1	60.9	45.7	44.2
05:38:00	Window	00:30:00	77.3	53.2	63.7	48	45
06:08:00	Window	00:30:00	87.4	56.1	62.5	48.4	45.6
06:38:00	Window	00:30:00	69.4	53.1	63	49.8	47.2
07:08:00	Window	00:30:00	77.8	57.7	67.5	53.6	49.1
07:38:00	Window	00:30:00	82.4	55.8	65.3	51.7	49
08:08:00	Window	00:30:00	93.4	67.9	79.9	54.8	50.3
08:38:00	Window	00:30:00	76.6	59.8	67.3	57.7	54



Start	Position	Time	L _{Amax}	L _{Aeq}	L _{A10}	L _{A50}	L _{A90}
09:08:00	Window	00:30:00	81.1	59.9	67.7	57.5	53.5
09:38:00	Window	00:30:00	74.8	59.5	67.9	56.2	52.8
10:08:00	Window	00:30:00	78.8	60.4	69	57.4	53.7
10:38:00	Window	00:30:00	90.5	63.4	70.6	56.6	52.3
11:08:00	Window	00:30:00	97.4	65	73.1	55.6	51.3
11:38:00	Window	00:30:00	87	61.5	72.1	55.4	52.3
12:08:00	Window	00:30:00	72.8	57.3	65.5	55.2	52.1
12:38:00	Window	00:30:00	74.4	58.2	65.8	56.5	53.3
13:08:00	Window	00:30:00	77.4	57.8	65.3	55.7	52.4
13:38:00	Window	00:30:00	77.7	58	65.9	55.7	52.6
14:08:00	Window	00:30:00	76.7	59	65.7	57.7	54.3
14:38:00	Window	00:30:00	81.3	59.4	67.2	57.3	54.2
15:08:00	Window	00:30:00	82.4	59.8	68.4	57.5	53.6
15:38:00	Window	00:30:00	77.7	59	67.5	56.5	53.3
16:08:00	Window	00:30:00	79.8	59.8	67.3	57.7	54.2
16:38:00	Window	00:30:00	79.8	59.6	66.9	57.5	54.1
17:08:00	Window	00:30:00	86.5	59.7	66.7	57	54
17:38:00	Window	00:30:00	79.9	61.1	68.9	58.9	55.7
18:08:00	Window	00:30:00	80.9	60.5	67.6	58.8	55.9
18:38:00	Window	00:30:00	76.4	60.7	67.9	59.2	56.2
19:08:00	Window	00:30:00	80.4	61.1	68.7	59.4	56.4
19:38:00	Window	00:30:00	77.3	60.3	68.3	58.5	55.6
20:08:00	Window	00:30:00	78.8	61	68.5	59.3	56.2
20:38:00	Window	00:30:00	76.5	60.2	67.6	58.5	56
21:08:00	Window	00:30:00	78.8	61.4	68.7	59.8	56.3
21:38:00	Window	00:30:00	83.7	62	70.4	59.9	56.4
22:08:00	Window	00:30:00	91.7	64.2	72.7	59.9	56.8
22:38:00	Window	00:30:00	80.9	62.4	70.4	60.6	57.3
23:08:00	Window	00:30:00	83.5	63.1	70.9	61	57.9
23:38:00	Window	00:30:00	77.9	62.7	71.8	59.6	55.7
23 rd September 2022							
00:08:00	Window	00:30:00	81.7	61.2	71.9	57.2	54
00:38:00	Window	00:30:00	79.2	56.4	64.8	54.1	51.3
01:08:00	Window	00:30:00	83.7	64.6	79.1	53.8	49.4
01:38:00	Window	00:30:00	84.8	56.4	65.6	52.1	48.4
02:08:00	Window	00:30:00	76.9	57.5	68	53.4	48.6
02:38:00	Window	00:30:00	71.1	53.3	64.4	48.1	44.2
03:08:00	Window	00:30:00	64.5	48.6	57.4	45	43.3
03:38:00	Window	00:30:00	65.1	49.1	57.1	45.6	43.4
04:08:00	Window	00:30:00	71.8	50.7	61.8	45.2	43.2
04:38:00	Window	00:30:00	79.8	50	57.8	45.4	43.4
05:08:00	Window	00:30:00	74.8	53.3	64.2	46.9	43.7
05:38:00	Window	00:30:00	80	54.2	65.1	46	43.8
06:08:00	Window	00:30:00	71.8	52.1	63.5	46.7	44.2
06:38:00	Window	00:30:00	80.1	56	66.5	49.6	46.2
07:08:00	Window	00:30:00	79.7	57	67.1	52.2	47.6
07:38:00	Window	00:30:00	79.5	59.1	67.9	55.2	50.2
08:08:00	Window	00:30:00	80	61	69.7	57.6	53.8
08:38:00	Window	00:30:00	80.3	65.6	72.3	62	55.9



Start	Position	Time	L _{Amax}	L _{Aeq}	L _{A10}	L _{A50}	L _{A90}
09:08:00	Window	00:30:00	94.8	64.7	71.8	59.9	55.1
09:38:00	Window	00:30:00	101.3	70.3	82.7	60.2	55.2
10:08:00	Window	00:30:00	76.6	58.6	67.3	56.6	53.1

Table B1 – Fully tabulated weekday noise measurement results

Start	Position	Time	L _{Amax}	L _{Aeq}	L _{A10}	L _{A50}	L _{A90}
23 rd September 2022							
17:11:00	Window	00:30:00	81.1	64.1	66.4	62.2	59.2
17:41:00	Window	00:30:00	93	66.9	68.6	64.2	60.9
18:11:00	Window	00:30:00	81.8	66.1	68.7	64.3	61
18:41:00	Window	00:30:00	85.8	67	69.5	65.7	62.5
19:11:00	Window	00:30:00	82.2	67.5	70.1	66.3	62.7
19:41:00	Window	00:30:00	83	68.3	70.9	66.9	63.4
20:11:00	Window	00:30:00	85.4	69.1	71.7	67.6	64.4
20:41:00	Window	00:30:00	84.4	70.6	73.2	69.4	66.1
21:11:00	Window	00:30:00	87.8	70.4	73.3	68.5	64.7
21:41:00	Window	00:30:00	86.5	67.6	69.9	66.3	63.6
22:11:00	Window	00:30:00	89.6	68.7	71.1	66.7	63.5
22:41:00	Window	00:30:00	86.7	70.1	72.8	68.2	64.6
23:11:00	Window	00:30:00	94.7	72.5	74.4	68.7	64.5
23:41:00	Window	00:30:00	89.4	68.7	70.5	65.1	61.5
24 th September 2022							
00:11:00	Window	00:30:00	84.7	68.2	70.6	66.2	62.9
00:41:00	Window	00:30:00	88.4	68.5	70.5	66.6	63.4
01:11:00	Window	00:30:00	88.8	70.5	73	68.5	65.1
01:41:00	Window	00:30:00	89.3	68.2	70.4	65.6	62.4
02:11:00	Window	00:30:00	87.5	65.8	68.4	63.6	60.1
02:41:00	Window	00:30:00	87	68.4	69.2	60.8	57.1
03:11:00	Window	00:30:00	83.5	66.2	69.6	61.4	54.7
03:41:00	Window	00:30:00	77.6	56.3	58.5	52.3	48
04:11:00	Window	00:30:00	85.3	58.2	57	51.1	47.2
04:41:00	Window	00:30:00	74.7	55.4	57	53.3	51.1
05:11:00	Window	00:30:00	82	54.7	55.3	47.9	44.6
05:41:00	Window	00:30:00	75.9	53.6	56.3	49.8	45
06:11:00	Window	00:30:00	73.2	53.2	56.5	49.4	43.7
06:41:00	Window	00:30:00	82.3	57.5	59.5	52.9	47
07:11:00	Window	00:30:00	77.8	57.1	61.1	52.4	47
07:41:00	Window	00:30:00	73.9	56.8	60	53.7	47
08:11:00	Window	00:30:00	82.1	62	63.9	57.8	50.4
08:41:00	Window	00:30:00	80.9	57.5	60	55.1	50.5
09:11:00	Window	00:30:00	83.7	61.6	65.2	58.2	53
09:41:00	Window	00:30:00	79.9	59.4	62	56.1	51.6
10:11:00	Window	00:30:00	79.7	59.3	62	56.3	52.9
10:41:00	Window	00:30:00	75.8	58.7	60.7	57.4	54.1
11:11:00	Window	00:30:00	88.3	65.5	66.5	60.1	56.1
11:41:00	Window	00:30:00	93.8	66.8	68.5	62.8	59.2
12:11:00	Window	00:30:00	89.4	64.6	66.5	60	56.5



Start	Position	Time	L _{Amax}	L _{Aeq}	L _{A10}	L _{A50}	L _{A90}
12:41:00	Window	00:30:00	89.8	66.7	67.1	61.6	57.9
13:11:00	Window	00:30:00	86.1	64.1	66.7	62	58.5
13:41:00	Window	00:30:00	82.7	63.9	65.9	61.8	58.6
14:11:00	Window	00:30:00	81.8	64.9	67.4	63.6	60.2
14:41:00	Window	00:30:00	85.2	68.6	70.9	66	62.8
15:11:00	Window	00:30:00	84.7	69.8	72.4	68.3	64.8
15:41:00	Window	00:30:00	95.2	71.2	72.8	69.4	66.5
16:11:00	Window	00:30:00	90.6	71.3	73.3	69.4	66.4
16:41:00	Window	00:30:00	89.5	74.2	76.9	72.8	69.2
17:11:00	Window	00:30:00	89.5	72.8	75.6	71.2	67.6
17:41:00	Window	00:30:00	86.3	72.9	75.5	71.6	68.4
18:11:00	Window	00:30:00	86.8	73.7	76.1	72.5	69.4
18:41:00	Window	00:30:00	85.5	72.1	74.7	70.7	67.6
19:11:00	Window	00:30:00	89.2	71.4	73.7	70.3	67.5
19:41:00	Window	00:30:00	86.8	71.1	73.3	69.7	67
20:11:00	Window	00:30:00	86.4	70	72.5	68.8	66
20:41:00	Window	00:30:00	85.3	69.6	71.9	68.5	65.6
21:11:00	Window	00:30:00	93.4	71.7	73.6	70.5	68
21:41:00	Window	00:30:00	83.9	70.8	72.9	70	67.4
22:11:00	Window	00:30:00	87.6	70.8	73	69.7	67.1
22:41:00	Window	00:30:00	92	71.9	74	70.3	67.3
23:11:00	Window	00:30:00	94	72.9	74.9	70.6	67.4
23:41:00	Window	00:30:00	95.8	70.5	72	67.2	63.7
25 th September 2022							
00:11:00	Window	00:30:00	88.4	69	71.3	67.5	64.4
00:41:00	Window	00:30:00	88	71.5	73.7	69.8	66.6
01:11:00	Window	00:30:00	87.5	71.5	74	69.6	66.4
01:41:00	Window	00:30:00	84	69.4	72.1	67.7	64
02:11:00	Window	00:30:00	83.8	66	68.9	63.9	59.5
02:41:00	Window	00:30:00	93	65.3	64.6	59.9	56.2
03:11:00	Window	00:30:00	86.6	67.2	70.7	62.4	56.7
03:41:00	Window	00:30:00	84	65.5	67.1	56.5	51.2
04:11:00	Window	00:30:00	83.4	64.5	65.3	55.2	49.5
04:41:00	Window	00:30:00	78.4	54.7	56.6	50.1	46.1
05:11:00	Window	00:30:00	77.9	56.5	59.5	50.6	45.1
05:41:00	Window	00:30:00	81.9	61	56	46.9	43.4
06:11:00	Window	00:30:00	80.9	52.3	53.4	46.5	43.4
06:41:00	Window	00:30:00	76.6	52.6	54.8	47.6	44.2
07:11:00	Window	00:30:00	79.8	53.9	56.4	49	44.7
07:41:00	Window	00:30:00	77.6	56.2	59.2	51.8	45.4
08:11:00	Window	00:30:00	78.7	54.2	54.3	48.4	44.5
08:41:00	Window	00:30:00	71.7	55.8	58.6	54.6	47.2
09:11:00	Window	00:30:00	86.5	63.8	63.1	58.4	54.8
09:41:00	Window	00:30:00	78	60.6	62.1	56.8	53.1
10:11:00	Window	00:30:00	81.6	60.5	64.1	55.6	52.2
10:41:00	Window	00:30:00	84.6	59.7	61.7	55.5	52.6
11:11:00	Window	00:30:00	82.9	60.7	63	56.7	53.6
11:41:00	Window	00:30:00	83.5	60.5	62.9	56.9	53.8
12:11:00	Window	00:30:00	81.1	59.6	61.8	57.3	54.2



Start	Position	Time	L _{Amax}	L _{Aeq}	L _{A10}	L _{A50}	L _{A90}
12:41:00	Window	00:30:00	84	60.7	63.4	57.8	54.2
13:11:00	Window	00:30:00	75.8	58.8	60.9	57.3	54.2
13:41:00	Window	00:30:00	80.7	59.9	61.7	57.2	54.2
14:11:00	Window	00:30:00	77.6	59.1	61	56.8	54.2
14:41:00	Window	00:30:00	80.8	58.4	60	55.7	53
15:11:00	Window	00:30:00	73.7	58.3	60.8	56.5	53.5
15:41:00	Window	00:30:00	84.8	61.1	62.1	57.1	54.1
16:11:00	Window	00:30:00	89.6	62.2	62.4	56.4	53.2
16:41:00	Window	00:30:00	77.9	58.4	60.6	56.5	53.6
17:11:00	Window	00:30:00	89.3	63.9	64	58.1	54.8
17:41:00	Window	00:30:00	85.6	61.7	62.9	58.4	55.4
18:11:00	Window	00:30:00	79	59.1	61.9	56.7	53.5
18:41:00	Window	00:30:00	85.1	59.8	62.1	56.5	53
19:11:00	Window	00:30:00	90.9	62.9	64.8	57.6	53.7
19:41:00	Window	00:30:00	86.5	60.9	62.8	56.2	52.3
20:11:00	Window	00:30:00	89.9	62.3	60.6	54.8	51.8
20:41:00	Window	00:30:00	81.4	57	59.3	53.4	50.4
21:11:00	Window	00:30:00	82	58.5	60.4	54.5	51.2
21:41:00	Window	00:30:00	73	55.6	58	53.1	50.3
22:11:00	Window	00:30:00	83	56.9	58	52.7	50
22:41:00	Window	00:30:00	86.9	58.6	60.9	54.5	50.4
23:11:00	Window	00:30:00	99.6	71.2	65	55	50.3
23:41:00	Window	00:30:00	77.5	54.7	56.9	50.7	47.5
26 th September 2022							
00:11:00	Window	00:30:00	76.7	56.3	58.5	50.8	47.6
00:41:00	Window	00:30:00	69.5	55.1	58.3	53.5	48
01:11:00	Window	00:30:00	78.2	56.9	59	53	49.4
01:41:00	Window	00:30:00	77.3	55	58	51.1	47.4
02:11:00	Window	00:30:00	76.7	60.6	64.3	51.6	46.5
02:41:00	Window	00:30:00	85.7	66.6	66.2	59.5	50.9
03:11:00	Window	00:30:00	64.9	51.1	54.1	48.9	45.8
03:41:00	Window	00:30:00	75.3	49.5	50.1	44.7	42.8
04:11:00	Window	00:30:00	68	47.1	47.6	43.5	42.1
04:41:00	Window	00:30:00	77.8	50.6	52.3	44.1	42.3
05:11:00	Window	00:30:00	77	54.1	56.7	47.5	43.3
05:41:00	Window	00:30:00	74.8	54.9	57.3	46.9	43.5
06:11:00	Window	00:30:00	79	57.6	59.1	49.7	45.1
06:41:00	Window	00:30:00	71.8	56.1	59.2	50.6	46
07:11:00	Window	00:30:00	77.2	58	61.3	53.6	48
07:41:00	Window	00:30:00	84	59.9	62.2	55.3	50.2
08:11:00	Window	00:30:00	84.2	59.3	61.2	55.7	49.9
08:41:00	Window	00:30:00	77.1	57.8	60.8	55.4	50.9
09:11:00	Window	00:30:00	82.7	59.6	62.3	55.6	51.2
09:41:00	Window	00:30:00	84.4	60.1	62.5	56.3	52.2
10:11:00	Window	00:30:00	81	58.9	61.4	55.8	51.9
10:41:00	Window	00:30:00	91	60	62.3	55.8	51.8
11:11:00	Window	00:30:00	94.4	65	63.3	56.2	52.5

Table B2 – Fully tabulated weekend noise measurement results