Azymuth Acoustics UK

Professional Acoustic Services

Noise Impact Assessment
Ref: Z56654

Residential Development
Dalton Avenue
Fallowfield,
Manchester

On behalf of

TADW Architects

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1.0 Introduction

Azymuth Acoustics UK (henceforth Azymuth) has been contracted by TADW Architects to perform a Noise Impact Assessment (NIA) in relation to 8no. new dwellings located on Dalton Avenue, Fallowfield. These dwellings consist of 8no. one-bedroom flats arranged in a two-storey cottage style.

The proposed site is located adjacent to Divine Mercy Primary School and is therefore susceptible to noise emitting from children playing in the playground throughout the week.

Figure 1 – Site plan of proposed development

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

- The results of a baseline noise survey undertaken in the vicinity of Dalton Avenue
- 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.

Daytime noise level measurements were undertaken between; 14:57hrs - 15:29hrs on Tuesday 21st February, 15:45hrs - 16:15hrs on Tuesday 4th April, 08:13hrs – 08:42hrs on Wednesday 5th April and between 15:13hrs – 16:40hrs on Wednesday 20th April 2023. The night-time measurements were undertaken between 00:42hrs and 01:12hrs on Tuesday 7th / Wednesday 8th March 2023.

The noise measurements were undertaken using the sound level meter at the position(s) shown in Figure 2 below:

- Position 1: Dalton Avenue (~1m from the roadside)

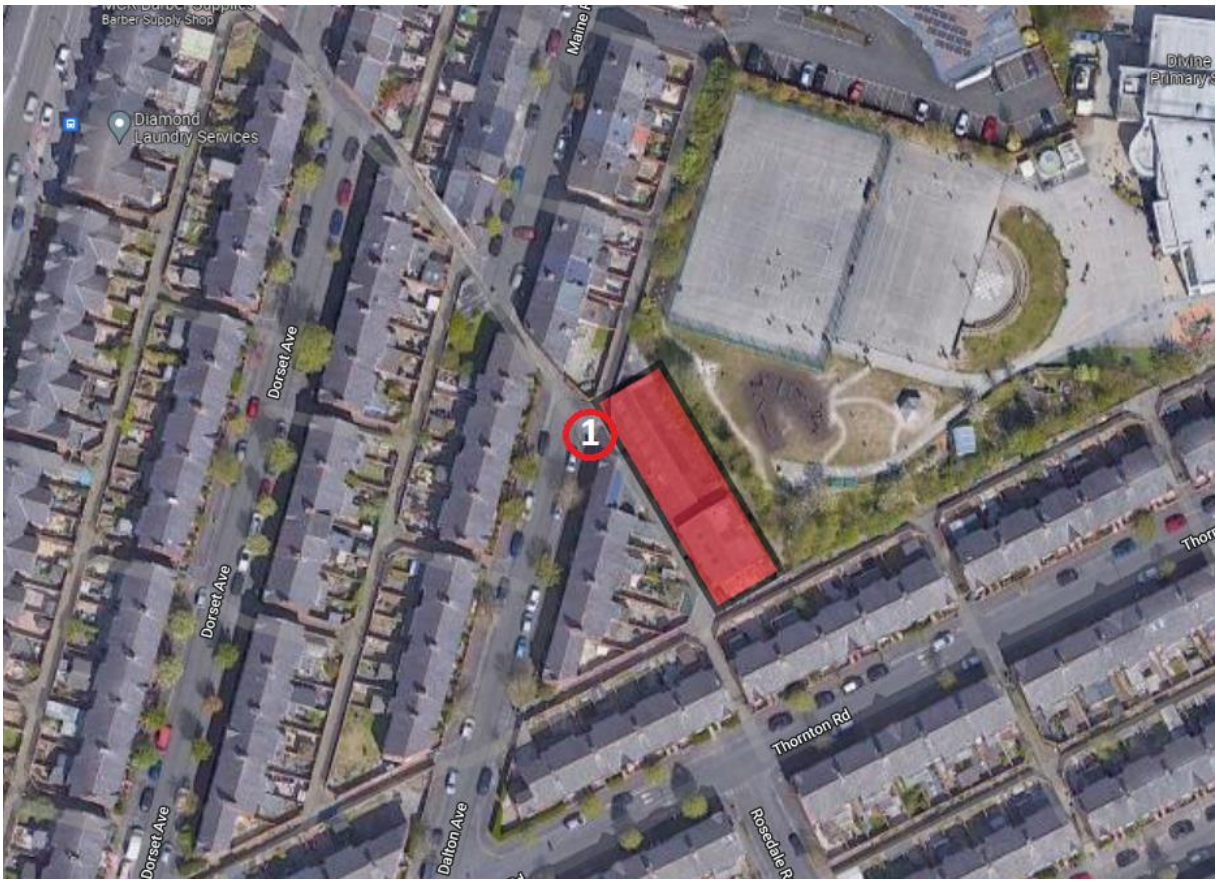

Figure 2 – Noise measurement positions

Azymuth was unable to gain access to Divine Mercy Primary School in order to take noise measurements during a typical school playtime.

2.2 Summary of Measurements

2.2.1 Noise Survey

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) Dalton Avenue	Day	77.4	63.7	61.6	54.0	48.8
1) Dalton Avenue	Night	44.3	35.1	34.9	32.7	31.0

Table 1 – Summary of noise measurements

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

2.2.2 Assessment of Night-time L_{Amax} Data

Azymuth has carried out an assessment of the available night-time L_{Amax} noise level data for the Proposed Dalton Avenue site (referenced to ~1m from the roadside). The highest measured L_{Amax} value was 53.5dB and the duration of the night-time survey was exactly 25 mins hence it is estimated that the 10^{th} highest L_{Amax} value over the entire 8hr night-time period is likely to be around 66dB or slightly lower.

2.3 Description of Noise Climate

The noise climate surrounding the area is quiet with the only noise observed emanating from traffic noise on the distant A580 Princess Road (~500m) as well as noise from school related activities i.e parents and children commuting to school in the morning and after school.

The weather during the measurement periods was dry with wind speeds below 5mph.

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
- IOA Guide to Demonstrating Compliance with the Noise Requirements of Approved Document O', July 2022
- 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 IOA Guide to Compliance with Noise Requirements of Approved Document O

Approved Document O 'Overheating' was released in December 2021 and came into effect in England on 15th June 2022. It introduces requirements for various types of residential premises to limit unwanted solar gains in summer and provide an adequate means to remove heat from the indoor environment (Requirement O1 (1)). Requirement O1(2)(a) of the regulation requires that account must be taken of the safety of an occupant, and their reasonable enjoyment of the residence. There is also a requirement (O2(b)) that mechanical cooling may only be used where sufficient heat cannot be removed from the indoor environment without it.

The guide aims to set out a method to demonstrate compliance to the Building Control Body of the noise constraints in Approved Document O. This guide provides clarity for practitioners and regulators so that assessments can be carried out consistently, and the outcome is repeatable and reliable.

3.7 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.

3.8 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 new residential accommodation:

- 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
- Noise levels in gardens and patios to not exceed 55dB L_{Aeq}

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.'

4.0 Assessment of Results

4.1 Assessment of Noise Risk

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

Calculated values have been derived from the SoundPLAN 8.2 noise model.

Location	Time of Day	Measured/Calculated Noise Levels (dBA)	ProPG Risk of Adverse Effect	AVO Guide Risk (overheating) Category
West facing facades	Daytime $L_{Aeq,16hr}$	61 Measured	Low/Medium	Medium
	Night-time $L_{Aeq,8hr}$	35 Measured	Negligible	Negligible
East facing facades	Daytime $L_{Aeq,16hr}$	53 Calculated worst-case	Negligible/Low	Negligible
	Night-time $L_{Aeq,8hr}$	42 Calculated worst-case	Negligible/Low	Negligible

Table 3 – Noise risk assessment for Dalton Avenue

It should be noted that noise levels at the proposed development site shall be slightly lower than the values measured at Position 1, this is due to the screening from the road noise source that shall be provided by the existing houses on Dalton Avenue.

"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."

It should be noted that ProPG does not account for daytime L_{Amax} instances. These instances may cause annoyance during the day to the potential residents.

4.2 SoundPLAN Model

Azymuth has undertaken acoustic modelling with the SoundPLAN noise modelling software to predict and visualise the impact of noise on the development site.

Azymuth have modelled the playground noise using historic data that had been previously measured at a typical school playground.

4.2.1 Grid Noise Map (GNM)

Figure 3 – GNM Dalton Avenue

Based on the information contained in the GNM set out above it is clear that the (daytime) noise levels across the proposed site fall entirely in the range 45 to 50dB L_{Aeq} and as such require little or no further mitigation.

4.2.2 Façade Noise Map (FNM)

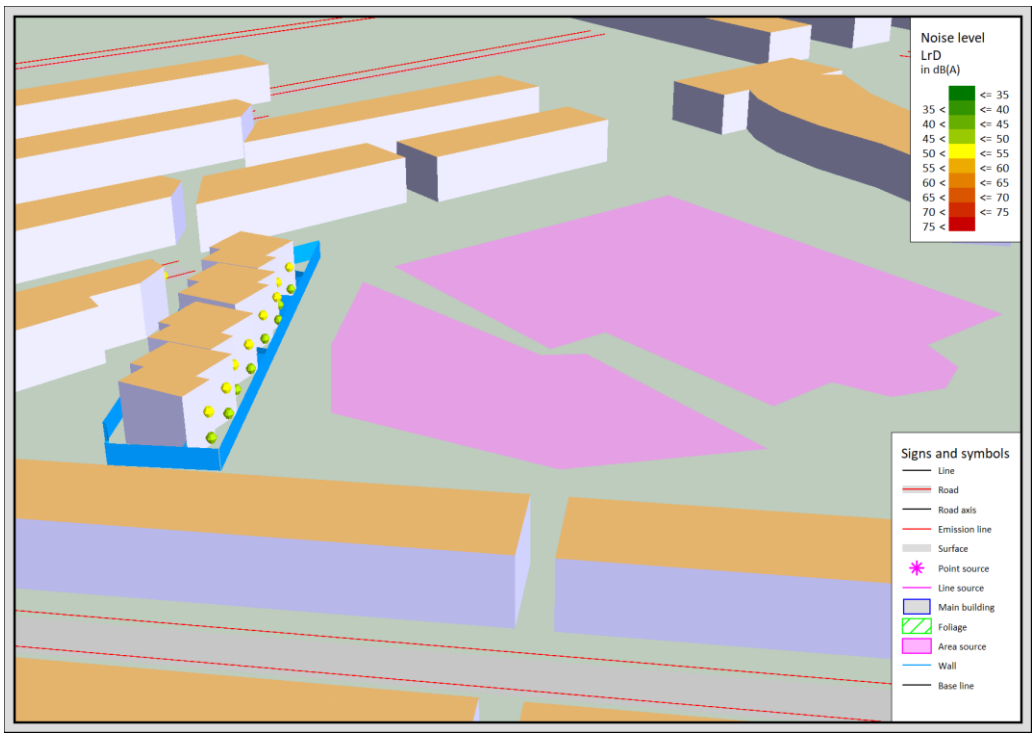

Figure 4 – FNM Dalton Avenue

5.0 Recommendations for Noise Mitigation

Based on survey data and the predicted noise levels derived from SoundPLAN, Azymuth 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 will 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 achieve the target noise criteria as set out in Section 3.8.

Location (Habitable Spaces)	Glazing Specification	Appropriate Glazing Types
All facades	Any building regulations approved min. 29dB R_W and 25dB R_W+C_{tr}	Any good quality double glazed units

Table 4 – Azymuth recommended glazing specification for Dalton Avenue

5.2 Recommended Ventilation Specification

Table 5 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 specifications to ensure sufficient air flow to dwellings whilst also achieving internal noise level targets.

Location (Habitable Spaces)	Ventilation Specification	Appropriate Ventilation Types
All dwellings	Any building regulations approved, min. D_{new} 32dB	Standard ventilation types e.g comprising standard trickle vents for background vent where necessary

Table 5 – Azymuth recommended ventilation specification for Dalton Avenue

5.3 Boundary Treatment / Protection of Communal Gardens

Azymuth has reviewed the proposed boundary treatment at the development site and estimate that noise levels within the gardens of the development shall be not exceed 55dB L_{Aeq} as per the assessment criteria contained in Section 3.8.

5.4 Other Elements of Building Envelope

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

- External Walls: minimum sound insulation 55dB R_W. 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 55dB R_W.
- Roof: minimum sound insulation 45dB R_W. 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 100m mineral wool insulation would be recommended over and above the rigid insulation required to provide the required levels of thermal insulation).

6.0 Summary

Azymuth has undertaken a noise impact assessment in relation to a proposed development located at Dalton Avenue, Manchester. This development shall consist of 8no. one-bedroom flats arranged in a two-storey cottage style.

The main source of noise that shall affect the site originates from the adjacent Divine Mercy Primary School where noise from children playing in the playground is expected throughout the school week.

Ambient noise levels surrounding the site were measured to be ~64dB $L_{Aeq,\ 16hr}$ during the daytime and ~35dB $L_{Aeq,8hr}$ during the night-time.

The development possesses a Negligible/Low to Medium risk of adverse noise effect and a negligible risk of overheating as per the ProPG and AVO guides.

Azymuth has undertaken acoustic modelling using SoundPLAN 8.2 to predict and visualise the effect of noise on the proposed development. Playground noise was modelled using historic data Azymuth had previously measured at a school playground.

The following recommendations have been produced by Azymuth in order to mitigate the effects of noise on the proposed development:

Glazing:

- All facades: Minimum 29dB R_W and 25dB R_W+C_{tr}

Ventilation:

- All dwellings: Any building regulations approved, min. D_{new} 32dB.

If these recommendations are followed the noise levels within the development shall satisfy the criteria stated in Section 3.8.

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 = L1 - L2 + 10 log (S/A), where:
L1 = Noise level in the source room
L2 = 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}
21st February 2023							
14:57:00	1	00:05:00	75.2	62.7	65.7	60.5	54.6
15:02:00	1	00:05:00	77.3	63.2	65.9	60.9	53.9
15:07:00	1	00:05:00	79.5	66	69.5	62.5	57.6
15:12:00	1	00:05:00	80.2	66.3	69.4	62.8	55.8
15:17:00	1	00:05:00	82.4	65.5	68.5	62.4	57.1
15:22:00	1	00:05:00	82.3	67.9	71.2	63.4	56.9
15:45:00	1	00:05:00	81.9	57.2	48.5	41.2	38
4th April 2023							
15:45:00	1	00:05:00	81.9	57.2	48.5	41.2	38
15:50:00	1	00:05:00	83.9	59.4	51.8	38.7	36.1
15:55:00	1	00:05:00	52	39.6	41.6	38.7	36.1
16:00:00	1	00:05:00	70.5	47.4	48	37.9	35.5
16:05:00	1	00:05:00	67.2	47.8	48.7	44.9	36.7
16:10:00	1	00:05:00	66.8	45.9	47.8	38.3	35.5
5th April 2023							
08:13:00	1	00:05:00	61.2	48.5	50.8	47.6	45.1
08:18:00	1	00:05:00	76.8	57	57.1	48.1	45.8
08:23:00	1	00:05:00	74.8	55.9	56.1	48.1	46
08:28:00	1	00:05:00	61.3	48.9	51	47.6	45.7
08:33:00	1	00:05:00	64.4	52.6	54.5	51.4	50.2
08:38:00	1	00:05:00	75	53	52.9	51	50
19th April 2023							
15:13:00	1	00:05:00	80.1	64.8	75.6	68.4	58.7
15:18:00	1	00:05:00	82.7	66.1	76.6	69.8	60.4
15:23:00	1	00:05:00	81.9	65.7	75.4	69.4	60.6
15:28:00	1	00:05:00	82.1	65.1	75.5	68.7	59.5
15:33:00	1	00:05:00	83.7	64.5	76	67.3	56.8
15:38:00	1	00:05:00	79.3	59.6	71.3	60.9	53
15:43:00	1	00:05:00	84.1	67.4	78.3	70.8	60.5
15:48:00	1	00:05:00	82.2	65.7	76.1	69.4	60.6
15:53:00	1	00:05:00	86	66.6	77.6	69.5	57.3
15:58:00	1	00:05:00	79.7	66.2	76.4	70.1	61.3
16:03:00	1	00:05:00	86.7	65.6	75.8	68.9	59.9
16:08:00	1	00:05:00	80.4	63.8	76.3	66.8	56.2
16:13:00	1	00:05:00	84.2	66.2	77.8	69.5	59.2
16:18:00	1	00:05:00	88.2	65.2	76.5	67.6	57.7
16:25:00	1	00:05:00	67.5	53.9	61.4	56.4	52.2
16:30:00	1	00:05:00	73.2	55.1	63.3	57.8	52.2
16:35:00	1	00:05:00	84.7	63	75.5	61.2	53.4
16:40:00	1	00:05:00	88.2	68.8	83.3	67.6	58.5

Table B1 – Fully tabulated daytime noise measurement results

Start	Position	Time	L_{Amax}	L_{Aeq}	L_{A10}	L_{A50}	L_{A90}
8th March 2023							
00:42:00	1	00:05:00	68.3	38.5	33	31.1	29.8
00:47:00	1	00:05:00	42.4	32.8	34.7	32.2	30.5
00:52:00	1	00:05:00	38	32.9	34.2	32.7	31.2
00:57:00	1	00:05:00	38.6	33.6	35.2	33.3	31.4
9th March 2023							
01:02:00	1	00:05:00	49.2	34.9	36.7	33.4	31.7
01:07:00	1	00:05:00	53.5	34.6	35.6	33.3	31.2

Table B2 – Fully tabulated night-time noise measurement results