INFINITY ACOUSTICS

May 2023

Noise Assessment

50 Market Street,
Milnsbridge,
Huddersfield,
HD3 4HT

INFINITY ACOUSTICS

Quality and Version Control	
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Project Reference No.	A033AB

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1. Introduction

1.1 Infinity Acoustics Ltd has been appointed to undertake a noise assessment of the proposed development located at 50 Market Street, Milnsbridge, Huddersfield, HD3 4HT. It is proposed the retail unit be converted into residential dwellings.

1.2 As part of the development process, the client has submitted a Prior Approval application to Kirklees Council The application reference number and title are *2023/CLASS MA/90373 - Prior notification for change of use from ground floor commercial space into two apartments.*

1.3 The application has subsequently been approved by the local authority. The decision notice states the following condition in relation to protecting future residents from noise ingress due to the surrounding external environment:

6 Before the hereby approved dwellings are first brought into use a report specifying the measures to be taken to protect the development from noise from nearby commercial premises on Market Street and George Street shall be submitted to and approved in writing by the Local Planning Authority. The report shall: -

a) Determine the existing noise climate
b) Predict the noise climate in gardens (daytime), bedrooms (night-time) and other habitable rooms of the development
c) Detail the proposed attenuation/design necessary to protect the amenity of the occupants of the new residences (including ventilation if required).
d) Demonstrate that the airborne sound insulation performance of the floor/wall of the development is a minimum of 55dB Dntw + Ctr

1.4 The aim of the noise survey and assessment below is to provide the relative information to assist the client and the local planning authority in discharging the noise condition. The noise levels at the site will be measured and assessed according to the relative standards and local planning policy, a sound insulation scheme will be provided where necessary to ensure the amenity of any future residents can be protected from surrounding commercial noise and that relative criteria can be achieved.

1.5 The following noise assessment report will be undertaken in line with the following legislation policy and guidance.

- National Planning Policy Framework 2021
- Noise Policy Statement for England 2010
- BS8233:2014 – Guidance on Sound Insulation and Noise Reduction In Buildings

1.6 *BS8233:2014*

The general noise criteria used in the assessment will be obtained from BS8233: 2014 ‘Guidance on sound insulation and noise reduction for buildings’ The criteria in BS8233 are largely based on the World Health Organisation Guidelines on Community Noise. The BS8233 criteria are outlined below:

- Living Room/Bedroom - 35 dB $L_{Aeq,16hour}$ (Day)
- Dining Room – 40 dB $L_{Aeq,16hour}$ (Day)
- Bedroom – 30 dB $L_{Aeq,8hour}$ (Night)

1.7 L_{Afmax} levels will also be assessed based on the criteria defined by the World Health Organisation. The WHO state within the 'Guidelines on Community Noise' that in order to avoid sleep disturbance within bedrooms during the night, the internal sound pressure level should not exceed 45 dB $L_{Afmax.}$ The frequency of L_{Afmax} events should also be considered it is understood that for an L_{Afmax} noise event to adversely impact sleep the criteria would need to be exceeded less than ten times during a night time period.

1.8 It should be noted that the above criteria are desirable however BS8233 states the following: *'where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved.'* Given the site has prior approval planning permission it is assumed the development is desirable. Therefore, it is assumed that when considering an open window condition reasonable internal conditions can be achieved with a 5 dB relaxation in criteria.

2. Site & Surroundings

2.1 The development site is situated in the centre of Milnsbridge, the surrounding area could be described as urban with a mix of both commercial and residential units.

2.2 In direct proximity to the proposed development along the western façade is Market Street which facilitates moderate to high levels of traffic flow. To the south of the site runs George Street with low levels of rod traffic flow.

2.3 There are several commercial units in direct proximity to the site including Aldi which operates between 08:00 – 22:00, K V Convenience which operates between 07:00 – 23:00 and Flooring 365 which operates between 09:00 – 17:00. In general, during the site visits noise from these units was not audible and the dominant noise source was that of road traffic noise from Market Street. Given this, it is understood that if future residents can be protected from transport noise in the area they will also be protected from all other commercial noise sources.

2.4 Directly adjacent to the site is a takeaway called Pizza Delight which operates between 17:00 – 22:00. This takeaway shares an adjoining wall with the site. Upon inspection, the existing wall construction was found to be a minimum of two skins of masonry brick equating to 210mm in thickness.

2.5 To the rear of the site, there is also a small yard area in which the takeaways extraction system terminates. During the site visits the extraction system was not operating. However, a review of the noise data measured at the rear of the site generally does not indicate any significant increase in noise levels during the 17:00 – 22:00 period where the extraction system may operate thus indicating noise from the extraction system is low.

3. Survey

3.1 A noise survey of the site was undertaken between Friday the 5th of May 2023 to Tuesday 9th of May 2023.

3.2 The following table presents the equipment used to undertake the noise survey. All equipment used was field calibrated at 1kHz to 114 dB or 94dB with a tolerance of less than 0.5 dB drift before and after the measurement. Calibration certificates for the equipment can be provided upon request.

Equipment
SVAN 971A Class 1 Sound Level Meter – SN – 113352
SVAN SV33B Class 1 Calibrator – SN – 122241
Castle Mirus GA117 Class 1 Sound Level Meter – SN - 35779
Castle GA607 Class 1 Calibrator – SN - 044493

Table 1.0 – Noise Survey Equipment

3.3 The long-term noise meter and associated microphone at Measurement Location 1 (ML1) were located approximately 3.5m from the ground protruding from a window at the front façade of the site along Market Street. The long-term noise meter and associated microphone at Measurement Location 2 (ML2) were located within the rear yard approximately 3.5m from the floor attached to a drainpipe. Due to both meters being located in proximity to the façade of the building appropriate façade corrections have been applied to establish free field noise levels.

3.4 The weather during the setup of the equipment is outlined below. The temperature was 9.6 degrees Celsius with wind speeds less than 1 m/s and no precipitation. During the collection of the equipment, the temperature was 14.9 degrees Celsius and wind speeds of 1.2 m/s. Generally, the weather across the majority of the survey complied with the requirements of BS 7445-2. A full weather summary for the duration of the survey is outlined in the table below. The weather data is taken from the nearest functioning weather stations and historical data.

Weather Data Reinwood – 05/05/23 – 09/05/23					
Date	**Temp (C)**	**Rain Fall (mm)**	**Wind Speed (m/s)**	**Prevailing Wind**	**Relative Humidity (%)**
05/05/23 – 00:00 – 23:59	7.9 – 18.4	0.0 – 1.3*	0.0 – 1.3	NNE	83.2
06/05/23 – 00:00 – 23:59	10.1 – 16.8	0.0 – 0.8**	0.0 – 0.5	E	84.3
07/05/23 – 00:00 – 23:59	10.9 – 20.7	0.0 – 0.8***	0.0 – 1.2	NNE	80.5
08/05/23 – 00:00 – 23:59	10.7 – 15.3	0.0	0.0 – 1.7	NNE	84.9
09/05/23 – 00:00 – 23:59	9.2 – 17.9	0.0	0. 5 – 1.5	NE	76.7

Table 2.0 – Weather Data

**Heavy rain occurred before the survey commenced*

*** Rain occurred between 21:00 – 22:00 removed from the assessment*

**** Rain occurred between 03:00 – 04:00 removed from the assessment*

3.5 The results of the ambient noise survey are presented in the tables below and will be used in the subsequent Noise Assessment. A full noise survey time history can be found in Appendix C. The time history Appendix C at ML2 generally indicates no clear increase in noise levels due to the operation of the extraction system between 17:00 – 22:00. However, due to the presence of the extraction system at the rear of the site, the loudest daytime octave band 1-hour will be presented for ML2. The use of the highest 1-hour period will fully protect future residents from any commercial noise associated with the extraction system.

16 & 8 Hour Results ML1		
Time Period	**$L_{Aeq\ (dB)}$**	**$L_{Afmax\ (dB)}$**
Day – 05/05/2023 – 16:00 – 23:00	68.0	100.0
Night – 05/05/2023 – 23:00 – 07:00	61.0	94.0
Day – 06/05/2023 – 07:00 – 23:00	67.0	100.0
Night – 06/05/2023 – 23:00 – 07:00	**61.0**	91.0
Day – 07/05/2023 – 07:00 – 23:00	**68.0**	103.0
Night – 07/05/2023 – 23:00 – 07:00	58.0	87.0
Day – 08/05/2023 – 07:00 – 23:00	67.0	100.0
Night – 08/05/2023 – 23:00 – 07:00	61.0	97.0
Day – 09/05/2023 – 07:00 – 08:00	68.0	85.0
ML1 L_{Afmax} Analysis		
Time Period	**$L_{Afmax,t}$**	**10th Highest $L_{Afmax,15min}$**
Night 1	94.0	81.0
Night 2	91.0	**84.0**
Night 3	87.0	78.0
Night 4	97.0	78.0

Table 3.0 – Noise Survey Global Data ML1

1/1 Octave Band L_{eq} – Measurement Location 1 (Hz) (dB)							
Description	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**
Highest $L_{Zeq,16hour}$	81.0	76.0	70.0	66.0	64.0	59.0	53.0
Highest $L_{Zeq,8hour}$	73.0	68.0	63.0	59.0	57.0	50.0	41.0

Table 4.0 – Noise Survey Octave Band Data ML1

16 & 8 Hour Results ML2		
Time Period	**$L_{Aeq\ (dB)}$**	**$L_{Afmax\ (dB)}$**
Day – 05/05/2023 – 16:00 – 23:00	47.0	76.0
Night – 05/05/2023 – 23:00 – 07:00	44.0	83.0
Day – 06/05/2023 – 07:00 – 23:00	48.0	83.0
Night – 06/05/2023 – 23:00 – 07:00	41.0	68.0
Day – 07/05/2023 – 07:00 – 23:00	48.0	86.0
Night – 07/05/2023 – 23:00 – 07:00	39.0	73.0
Day – 08/05/2023 – 07:00 – 23:00	47.0	83.0
Night – 08/05/2023 – 23:00 – 07:00	42.0	71.0
Day – 09/05/2023 – 07:00 – 08:00	48.0	72.0
ML2 L_{Afmax} Analysis		
Time Period	**$L_{Afmax,t}$**	**10th Highest $L_{Afmax,15min}$**
Night 1	83.0	**64.0**
Night 2	69.0	62.0
Night 3	73.0	59.0
Night 4	71.0	63.0

Table 5.0 – Noise Survey Global Data ML2

1/1 Octave Band L_{eq} – Measurement Location 2 (Hz) (dB)							
Description	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**
Highest $L_{Zeq,1hour}$	62.0	61.0	55.0	49.0	47.0	44.0	39.0
Highest $L_{Zeq,8hour}$	52.0	48.0	43.0	41.0	40.0	37.0	34.0

Table 6.0 – Noise Survey Octave Band Data ML2

4. Sound Insulation Scheme and Recommendations

4.1 The following section of the report details the sound insulation scheme required to ensure internal and external noise criteria can be achieved and that future residents are protected from noise ingress from the external environment. Prior approval of the sound insulation scheme should be sought from the local authority before any of the works outlined below are implemented.

4.2 Facades

The façade build-up obtained during the site visit is assumed to be a minimum of 210mm masonry brick. This is a heavyweight construction and as such is deemed to provide sufficient sound reduction. When modelled in INSUL 9.0 typical cavity wall constructions such as this are found to provide a minimum of 50 dB R_w.

4.3 Glazing & Ventilation

To ensure the amenity of the future residents can be protected the minimum sound reduction defined in the section below should be achieved by all glazing. The following glazing units are sufficient to achieve said performance and could be installed along each facade zone for both bedrooms and living rooms. To allow ease of assessment the development has been divided into two discrete façade zones front and rear as indicated in the figure below.

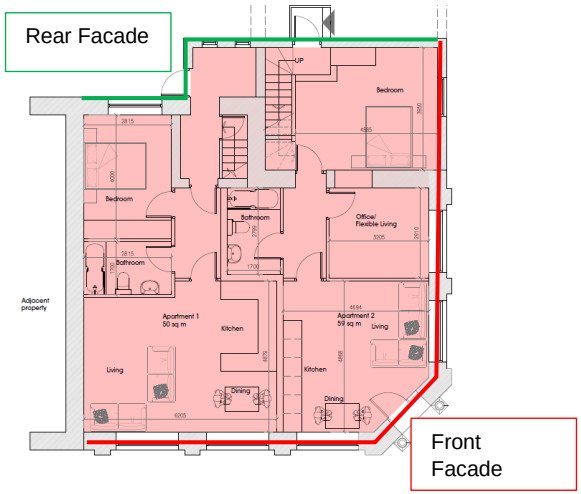

Figure 1.0 – Development Façade Zones

Glazing Sound Reduction Front Facade							
10mm Glass / 16mm Argon Cavity – 8.8mm Optiphon Glass (R_w 44 dB / R_{w+ctr} 38)							
Description	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**
1/1 Sound Reduction	25.0	28.0	31.0	42.0	45.0	50.0	58.0
Glazing Sound Reduction Rear Facade							
6mm Glass / 6-16mm Air Cavity /4mm Glass (R_w 32 dB / R_{w+ctr} 28)							
Description	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**
1/1 Sound Reduction	19.0	21.0	20.0	26.0	38.0	37.0	39.0

Table 7.0 – Proposed Glazing Sound Reduction

The glazing in the table above has been taken from the Pilkington database however any other glazing capable of achieving the minimum required sound reduction is outlined in the table above would be sufficient and thus could be installed.

An open window Assessment has been undertaken and it has been found that the windows along the rear of the site can be used for ventilation whilst still achieving appropriate internal noise levels. However, assuming open windows along the front façade of the site appropriate criteria cannot be achieved. It is also assumed that the site will need a degree of ventilation to comply with building regulations.

Given this, an alternative ventilation system should be employed across the site and this will be outlined for each façade zone, the ventilation system will be specified to ensure noise ingress can be reduced whilst vents are open and operating and the internal noise criteria achieved.

The AVO Guide is typically used to assess the risk of overheating in new build dwellings due to elevated noise. The AVO Guide can also be used to specify an appropriate ventilation system. Based on the noise levels incident on each façade zone and Table B-3 of the AVO Guide, System 3 outlined in the Building Regulations Approved Document F should be sufficient for the development. System 3 outlines the use of trickle or through-wall ventilation and continuous mechanical extract, as indicated in the figure below. It is assumed however that the residents can still use open windows for purge ventilation and rapid dispersion of moisture and odour.

Figure 2.0 – Proposed Ventilation System

Internal mechanical ventilation such as extract systems produce self-generated noise which needs to be fully considered. The following criteria should be archived by any mechanical ventilation systems employed at the site. The criteria below have been defined by the ANC in consultation on the Future Home Standards 2019 and the AVO Guide 2020.

Whole-dwelling ventilation system noise should not exceed:

- 26 dB $L_{Aeq,t}$ in Bedrooms
- 30 dB $L_{Aeq,t}$ in Living rooms

This would apply to Mechanical Extract Ventilation (MEV) and Mechanical Ventilation with Heat Recovery (MVHR) systems.

Extract ventilation system noise should not exceed:

- 26 dB $L_{Aeq,t}$ in Bedrooms
- 35 dB $L_{Aeq,t}$ in Living rooms
- 45 dB $L_{Aeq,t}$ in Kitchens and Bathrooms

This would apply to intermittent fans used with natural ventilation as well as MEV and MVHR.

The table below outlines trickle and through-wall ventilation models that are suitable for ventilation on all facades and locations both bedrooms and living rooms.

Ventilation Sound Reduction Rear Facade							
Greenwoods Through Wall MA3051 (55 Dn,e,w)							
Description	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**
1/1 Sound Reduction	41.0	46.0	45.0	50.0	56.0	65.0	67.0
Ventilation Sound Reduction Rear Facade							
Titon SF Xtra Standard Vent Standard Canopy (32 Dn,e,w)							
Description	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**
1/1 Sound Reduction	33.0	38.0	36.0	35.0	42.0	39.0	42.0

Table 8.0 – Ventilation Sound Reduction

4.4 Separating Wall Construction

The existing separating wall is assumed to be a double skin of masonry brick. When modelled in INSUL this provides 42 dB $D_{nt,w+ctr.}$ This is below the criteria outlined in planning Condition 6. The following upgrades could be installed in order to achieve the required 55 dB $D_{nt,w+ctr}$ criteria outlined by the local authority.

- Existing masonry brick wall (Assumed 210mm).
- 25mm air cavity
- 70mm indipendend steel C stsud
- Minimum 50mm insulation situated within the stud (minimum density 22kg/m^3
- No.1 Layer of 15mm standard plasterboard (Min surface mass 9.8kg/m^2)

Expected Performance 56 dB $D_{nt,w+ctr}$

5. Noise Break-In Assessment

5.1 The following section of the report presents the calculated internal noise levels within the development considering the sound insulation scheme above has been implemented.

5.2 In order to calculate the internal noise levels within the development complex noise break-in calculations have been undertaken using the Apex Method which is based on the complex methodology in BS8233 and BS12354 - 3. Full break in calculations can be seen in Appendix D.

5.3 The table below indicates the internal noise levels within the bedrooms and living rooms on each façade considering the sound insulation scheme outlined in Section 4.0 has been implemented.

Noise Break-In Assessment Results – Front Facade				
Location	**Description**	**Calculated Internal Noise Level (dBA)**	**Internal Criteria (dBA)**	**Criteria Achieved**
Front Façade	Living Room Day Time	35.0	35 dB $L_{Aeq,16hour}$	Yes
Front Façade	Bedroom Day Time	32.0	35 dB $L_{Aeq,16hour}$	Yes
Front Façade	Bedroom Night	24.0	30 dB $L_{Aeq,8hour}$	Yes
Front Façade	Bedroom Night	37.0	45 dB $L_{Afmax,t}$	Yes

Table 9.0 – Noise Break-In Assessment Results – Front Façade

Noise Break-In Assessment Results – Rear Facade				
Location	**Description**	**Calculated Internal Noise Level (dBA)**	**Internal Criteria (dBA)**	**Criteria Achieved**
Rear Façade	Bedroom Day Time	29.0	35 dB $L_{Aeq,1hour}$	Yes
Rear Façade	Bedroom Night	18.0	30 dB $L_{Aeq,1hour}$	Yes
Rear Façade	Bedroom Night	39.0	45 dB $L_{Afmax,t}$	Yes

Table 10.0 – Noise Break-In Assessment Results – Rear Façade

5.4 As can be seen above the internal nosie level at the rear of the site are significantly below the criteria by 5-6 dB when considering the highest 1 hour period. This will fully prtect the aminety of future residents from all commercial nosie incident on the rear of the site.

6. Noise Breakthrough Assessment

6.1 The following section of the report compares the expected sound reduction of the proposed upgraded wall adjoining the neighbouring takeaway with the criteria outlined in Condition 6 of the planning notice. The assessment has been undertaken assigning the wall upgrades in Section 4.0 of the report have been implemented.

Noise Breakthrough Assessment			
Separating Element	**Expected Performance (dB, Dnt,w+ctr)**	**Criteria (dB, Dnt,w+ctr)**	**Criteria Achieved**
Wall	56.0	55.0	Yes

Table 11.0 – Noise Breakthrough Assessment

7. Conclusion

7.1 In conclusion, a noise survey has been undertaken at 50 Market Street, Milnsbridge, Huddersfield, HD3 4HT. The noise levels obtained during the survey have allowed a noise assessment to be undertaken in order to calculate the requirements for a sound insulation scheme to ensure the amenity of future residents can be protected.

7.2 The results of the noise survey indicate that the dominant noise source to the front of the site was that of road noise and as such should future residents be fully protected from these they will also be fully protected from any other surrounding commercial noise sources. The noise levels to the rear of the site were low. The time history in Appendix C indicates typical diurnal noise patterns generally with no significant or notable increase in noise levels due to the operation of the adjacent takeaway and or extraction system. In order to fully protect future residents from noise generated by the takeaway in the daytime period between 17:00 – 22:00 the loudest 1-hour period has been used in the assessment.

7.3 As a result of the noise assessment, a sound insulation scheme and further mitigation measures have been defined in Section 4.0 to ensure all the criteria outlined in BS8233:2014 can be achieved. The effectiveness of the sound insulation scheme has been assessed in Sections 5.0 and 6.0. Provided the sound insulation scheme and recommendations are installed and retained thereafter the amenity of future residents can be fully protected and all criteria should be achieved. Prior to the commencement of any works or implementation of the sound insulation works the above assessment should be fully approved by the local authority.

APPENDIX A – List of Terms and Glossary

The following section of the report outlines a glossary of terms used in the assessment to assist the reader in understanding the assessment above which is by necessity technical in nature.

Decibel DB - The decibel often denoted as dB is the logarithmic unit used to describe the magnitude of sound or noise levels. The typical range of sound pressure levels is from 0 dB, defined as the threshold of hearing to 120dB defined as the threshold of pain.

Frequency Hz – As well as the decibel sound and noise is also measured and defined in frequency. Frequency or Hertz (Hz) is an expression of the number of cycles a sound wave will complete per second. Lager frequencies may be expressed in Kilo Hertz (kHz). The typical range of human hearing is from 20 Hz to 20,000Hz however with age the audible frequency range decreases in most humans.

A - Weighting – The A-weighting is the most commonly used weighting curve taken IEC 61672:2003 and is applied to sound pressure level measurements. The A-weighting is applied to measured sound levels to account for the loudness perceived by the human ear, as the ear is less sensitive to low audio frequencies.

LAeq - The A-weighted 'equivalent continuous noise level' which is an average of the total sound energy measured over any given time period. L_{Aeq} is the level of a continuous noise that has the same total (A-weighted) energy as the real fluctuating noise, measured over the same time period. The A-weighting represents a curve that is applied to the measured noise levels to represent the way the human auditory system perceives sound.

LAfmax - The maximum A-weighted noise level that was recorded during the monitoring period using a fast time weighting. This acoustic parameter represents more transient sound levels within the acoustic environment which may only occur for a few seconds or minutes.

LA10 - This is the A-weighted noise level exceeded for 10% of a given time period. This parameter is typically used to measure and predict road traffic noise.

LA90 - This is the A-weighted noise level exceeded for 90% of any given time period. Generally, this acoustic parameter represents the underlying background sound level in a given area and doesn't generally include transient or short-term noise events that may occur within the surroundings.

Sound Pressure – Sound pressure is the difference between the instantaneous pressure at a point in the presence of a sound wave and the static pressure of the medium. Sound pressure fluctuates due to refractions and compressions of air molecules.

Sound Reduction Index – The sound reduction index denoted by the parameter 'R' is the laboratory-measured sound reduction given material or construction. R is measured in 1/3 octave band frequencies. The R_w sound insulation parameter stands for the weighted standardised sound reduction index and is a single-figure global rating of the sound insulation of a given material or construction.

APPENDIX B – Site Plans, Surroundings and Location

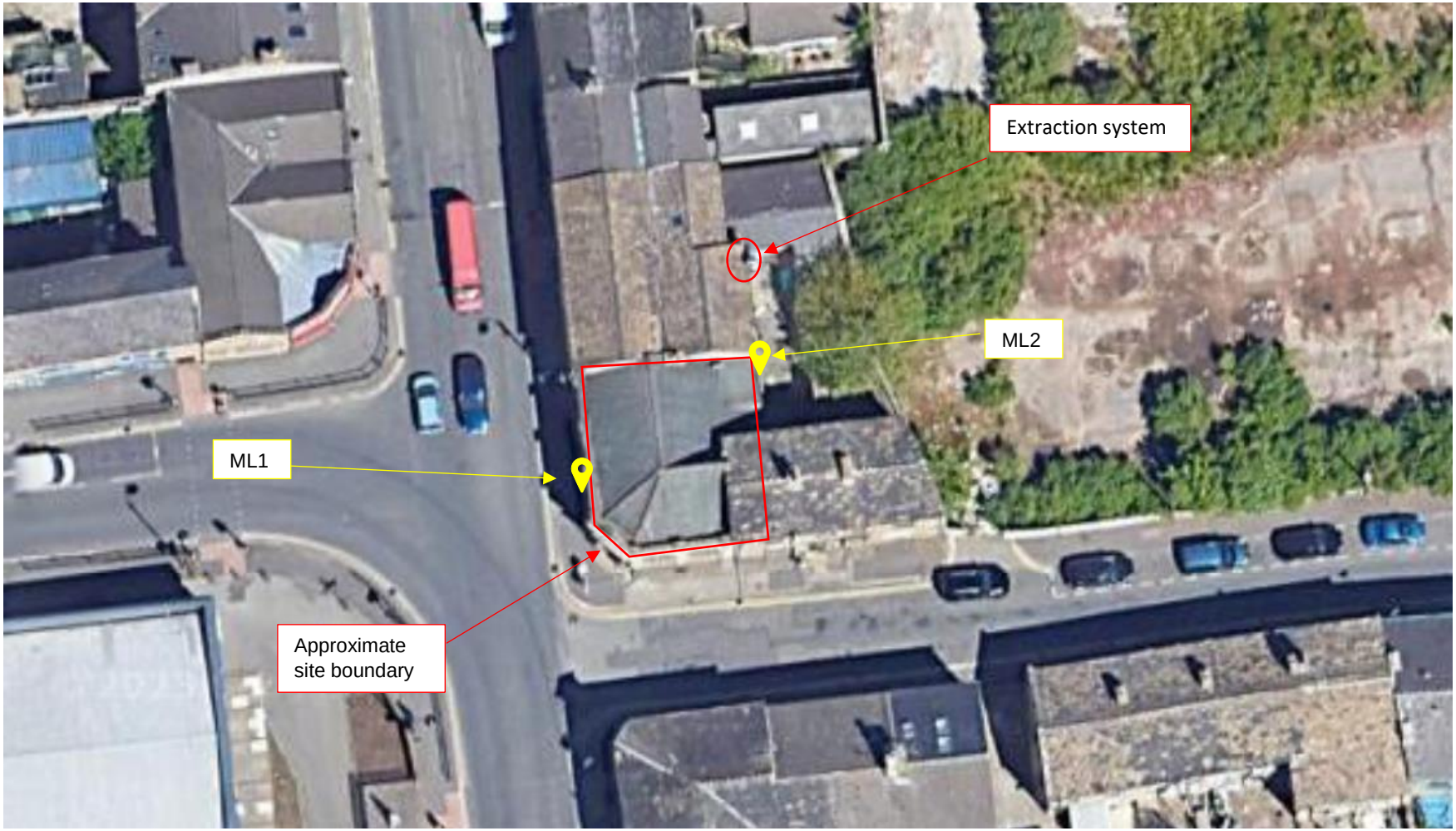

Figure 3.0 – Site and Measurement Location

Figure 4.0 – Site Plan

APPENDIX C – Noise Survey Time History

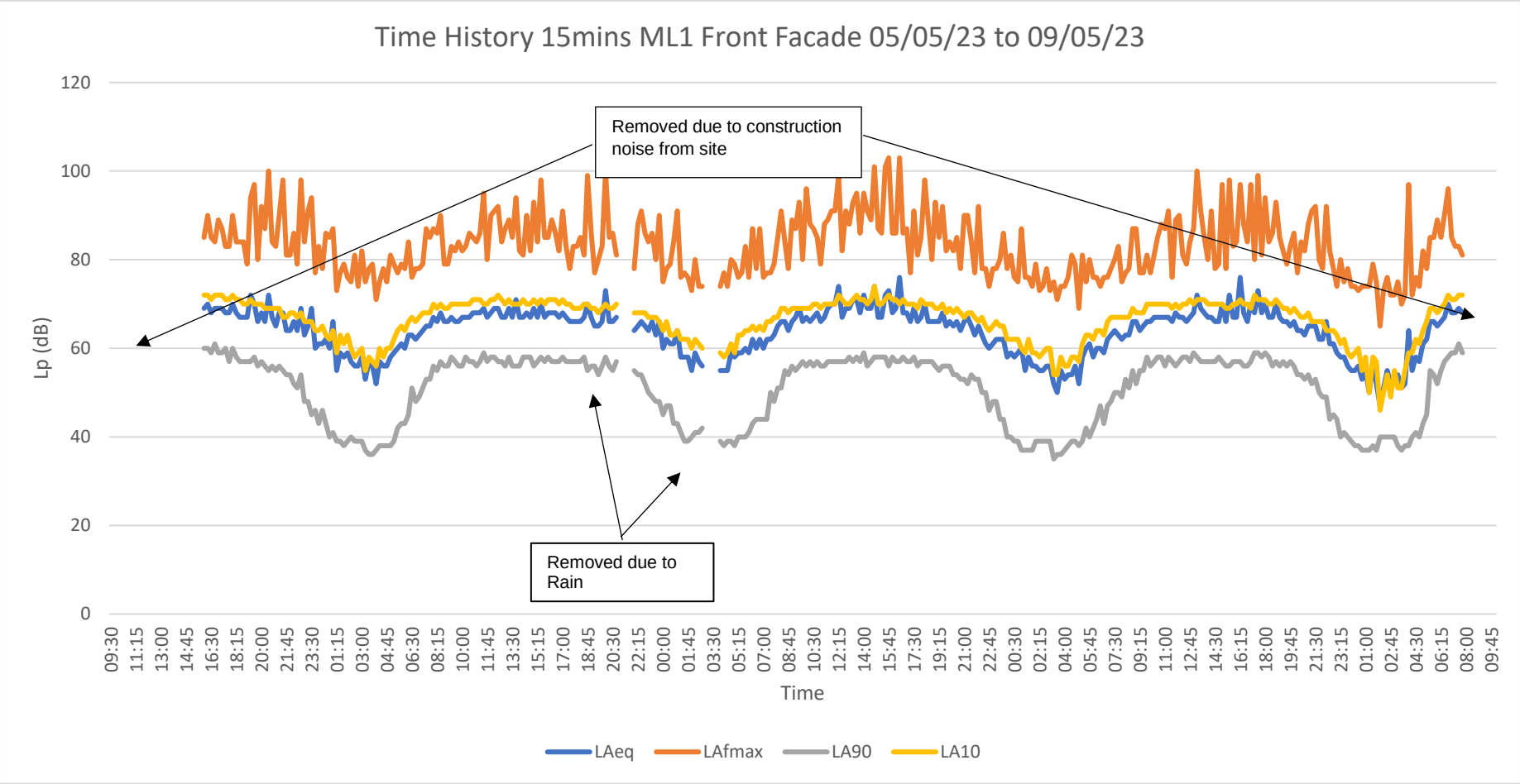

Figure 5.0 – Noise Survey Time History – ML1

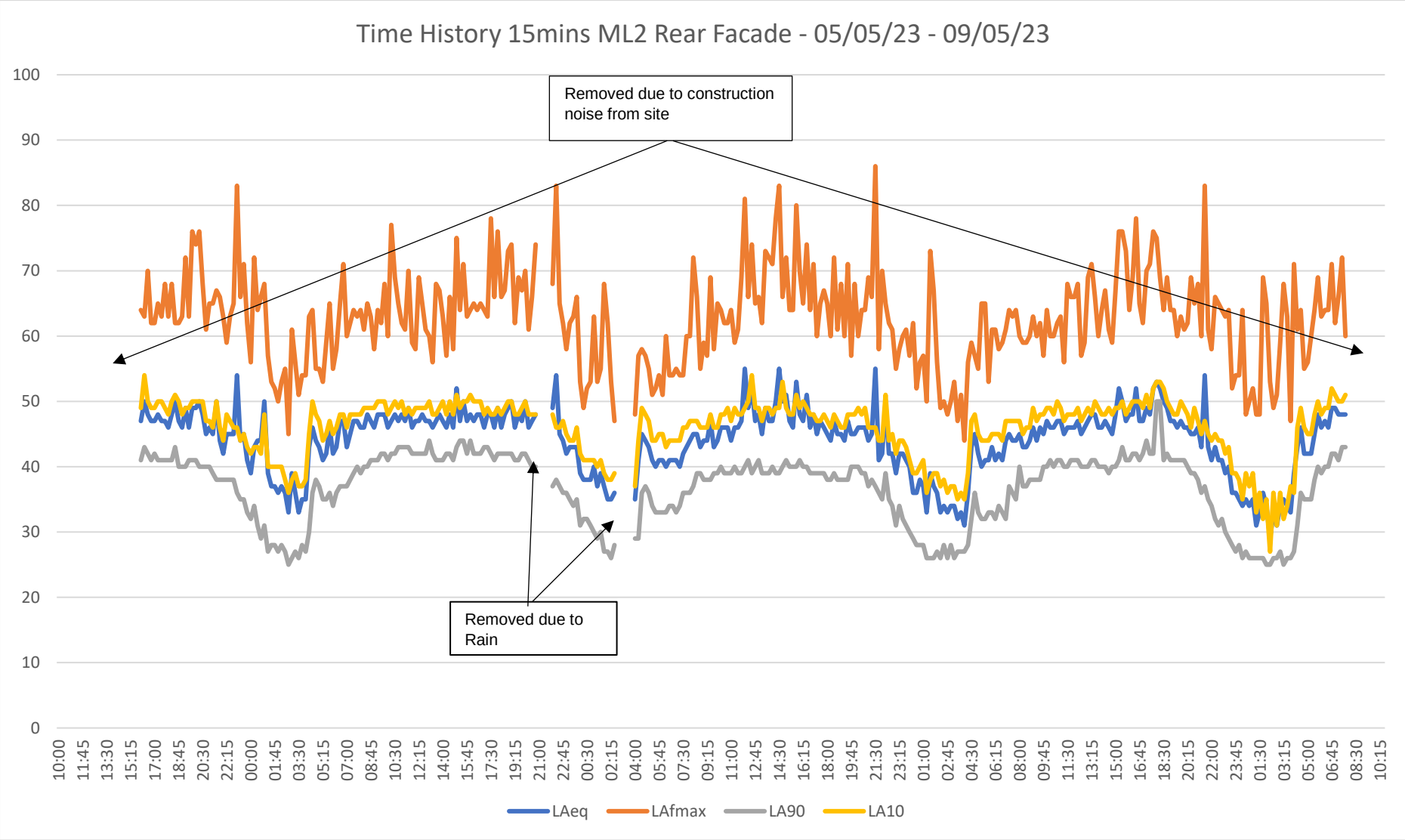

Figure 6.0 – Noise Survey Time History – ML2

APPENDIX D –Calculations

D.1 – BS8233 Noise Break-In Assessment

The tables below calculate the expected internal noise levels at each of the defined facade zones and compare this to the criteria outlined in BS8233:2014 in order to assess compliance.

Complex Noise Break In Calculations Front Façade

Calculation Specifics	
Room Name	Bedroom
Room Volume (m3)	49
Window Area (m2)	2.4
Reverb Time (Secs)	0.5
Number of Vents	2

LAeq,16hours (dB) Day Time	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
External Free Field Noise L1,ff (dBA)	81.0	76.0	70.0	66.0	64.0	59.0	53.0
R Glazing 10mm/ 16mm Argon / 8.8mm	25.0	28.0	31.0	42.0	45.0	50.0	58.0
Noise Through Glazing L2	50.9	42.9	33.9	18.9	13.9	3.9	-10.1
Dn,e of Vent Greenwoods MA3051	41.0	46.0	45.0	50.0	56.0	65.0	67.0
Noise Through Vent L2	44.1	34.1	29.1	20.1	12.1	-1.9	-9.9
Total Noise Break in (dB5)	52.0	43.0	35.0	23.0	16.0	5.0	-7.0
A Weighting Curve	-26.2	-16.2	-8.7	-3.2	0.0	1.2	1.0
Total Noise Break in (dBA)	25.8	26.8	26.3	19.8	16.0	6.2	-6.0
Total Global Noise Break in (dBA)	31.5						
Complies with 35 dB Criteria?	Yes						

LAeq,8hours (dB) Night Time	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
External Free Field Noise L1,ff (dBA)	73.0	68.0	63.0	59.0	57.0	50.0	41.0
R Glazing 10mm/ 16mm Argon / 8.8mm	25.0	28.0	31.0	42.0	45.0	50.0	58.0
Noise Through Glazing L2	42.9	34.9	26.9	11.9	6.9	-5.1	-22.1
Dn,e of Vent Greenwoods MA3051	41.0	46.0	45.0	50.0	56.0	65.0	67.0
Noise Through Vent L2	36.1	26.1	22.1	13.1	5.1	-10.9	-21.9
Total Noise Break in (dB5)	44.0	35.0	28.0	16.0	9.0	-4.0	-19.0
A Weighting Curve	-26.2	-16.2	-8.7	-3.2	0.0	1.2	1.0
Total Noise Break in (dBA)	17.8	18.8	19.3	12.8	9.0	-2.8	-18.0
Total Global Noise Break in (dBA)	24.0						
Complies with 30 dB Criteria?	Yes						

LAfmax,t (dB) Night Time	(dBA)
External Free Field LAfmax L1,ff (dBA)	84.0
R,w Glazing 10mm/ 16mm Argon / 8.8m	44
Noise Through Glazing L2	34.9
Dn,e,w of Vent MA3051	55.0
Noise Through Vent L2	33.0
Total Noise Break in (dBA)	37.0
Complies with 45 dB Criteria?	Yes

Complex Noise Break In Calculations Front Façade

Calculation Specifics	
Room Name	Living Room
Room Volume (m3)	62
Window Area (m2)	8
Reverb Time (Secs)	0.5
Number of Vents	2

LAeq,16hours (dB) Day Time	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
External Free Field Noise L1,ff (dBA)	81.0	76.0	70.0	66.0	64.0	59.0	53.0
R Glazing 10mm/ 16mm Argon / 8.8mm	25.0	28.0	31.0	42.0	45.0	50.0	58.0
Noise Through Glazing L2	55.1	47.1	38.1	23.1	18.1	8.1	-5.9
Dn,e of Vent Greenwoods MA3051	41.0	46.0	45.0	50.0	56.0	65.0	67.0
Noise Through Vent L2	43.1	33.1	28.1	19.1	11.1	-2.9	-10.9
Total Noise Break in (dB5)	55.0	47.0	39.0	25.0	19.0	8.0	-5.0
A Weighting Curve	-26.2	-16.2	-8.7	-3.2	0.0	1.2	1.0
Total Noise Break in (dBA)	28.8	30.8	30.3	21.8	19.0	9.2	-4.0
Total Global Noise Break in (dBA)	35.0						
Complies with 35 dB Criteria?	Yes						

Complex Noise Break In Calculations Rear Façade

Calculation Specifics	
Room Name	Bedroom
Room Volume (m3)	30.2
Window Area (m2)	3.5
Reverb Time (Secs)	0.5
Number of Trickle Vents	2

LAeq,1hours (dB) Day Time	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
External Free Field Noise L1,ff (dBA)	62.0	61.0	55.0	49.0	47.0	44.0	39.0
R Glazing 6mm / 6-16mm / 4mm	19.0	21.0	20.0	26.0	38.0	37.0	39.0
Noise Through Glazing L2	41.6	38.6	33.6	21.6	7.6	5.6	-1.4
Dn,e of Vent Titon SF Xtra Standard	33.0	38.0	36.0	35.0	42.0	39.0	42.0
Noise Through Vent L2	35.2	29.2	25.2	20.2	11.2	11.2	3.2
Total Noise Break in (dBZ)	43.0	39.0	34.0	24.0	13.0	12.0	5.0
A Weighting Curve	-26.2	-16.2	-8.7	-3.2	0.0	1.2	1.0
Total Noise Break in (dBA)	16.8	22.8	25.3	20.8	13.0	13.2	6.0
Total Global Noise Break in (dBA)	28.7						
Complies with 35 dB Criteria?	Yes						

LAeq,8hours (dB) Night Time	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
External Free Field Noise L1,ff (dBA)	52.0	48.0	43.0	41.0	40.0	37.0	34.0
R Glazing 6mm / 16mm / 4mm	19.0	21.0	20.0	26.0	38.0	37.0	39.0
Noise Through Glazing L2	31.6	25.6	21.6	13.6	0.6	-1.4	-6.4
Dn,e of Vent Titon SF Xtra Standard	33.0	38.0	36.0	35.0	42.0	39.0	42.0
Noise Through Vent L2	25.2	16.2	13.2	12.2	4.2	4.2	-1.8
Total Noise Break in (dBZ)	33.0	26.0	22.0	16.0	6.0	5.0	0.0
A Weighting Curve	-26.2	-16.2	-8.7	-3.2	0.0	1.2	1.0
Total Noise Break in (dBA)	6.8	9.8	13.3	12.8	6.0	6.2	1.0
Total Global Noise Break in (dBA)	18.1						
Complies with 30 dB Criteria?	Yes						

LAfmax,t (dB) Night Time	(dBA)
External Free Field LAfmax L1,ff (dBA)	64.0
R,w Glazing 6mm / 16mm / 4mm	32
Noise Through Glazing L2	30.6
Dn,e,w of Vent Titon SF Xtra Standrad	32.0
Noise Through Vent L2	38.2
Total Noise Break in (dBA)	39.0
Complies with 45 dB Criteria?	Yes

D.2 – BS8233 Open Window Assessment

The assessment below has been undertaken assuming a 15 dB attenuation from an open window to establish the internal noise levels. BS8233 states that where development is desirable noise criteria can be relaxed by 5 dB. The AVO Guide indicates at levels approximately 5 dB above the criteria there would be a low risk of overheating. Document O of the Building Regulations also stipulates internal levels of 40 dB $L_{Aeq,8hours}$ or below and L_{Amax} levels not regularly exceeding 55 dB are sufficient when using open windows for ventilation and prevention of overheating. Given this, it is reasonable to expect a 5 dB relaxation in the BS8233 criteria and still achieve acceptable internal noise levels. To provide a robust and conservative assessment of noise levels at the rear of the site the loudest 1 hour period during the day time will be used in this location to account for the nearby extraction system operating between 17:00 – 22:00.

BS8233 Open Window Assessment					
Location / Time Period	**Façade Zone**	**External Level (dBA)**	**Internal Noise Level (dBA)**	**BS8233 Criteria (dBA)**	**Exceedance (dBA)**
Bedroom / Living Room Day	Front Red Facade	68.0	53.0	40 dB $L_{Aeq,16hour}$	+13.0
Bedroom Night		61.0	46.0	35 dB $L_{Aeq,8hour}$	+11.0
Bedroom Night		84.0	69.0	50 dB $L_{Afmax,8hour}$	+19.0
Bedroom / Living Room Day	Green Rear Façade	52.0*	37.0*	40 dB $L_{Aeq,16hour}$	-3.0
Bedroom Night		44.0	29.0	35 dB $L_{Aeq,8hour}$	-6.0
Bedroom Night		64.0	49.0	50 dB $L_{Afmax,8hour}$	-1.0

Table 12.0 – Open Window Assessment

**Loudest 1-hour period.*

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Infinity Acoustics Ltd has undertaken the above assessment and provided the above interpretations based on the information available at the time of the assessment, and provided by the client, it has been undertaken given our 'best endeavours'. Infinity Acoustics Ltd cannot be held liable for any loss or damage incurred as a result of the interpretations or conclusions presented within this document or any interpretations or conclusions drawn from the document by a third party due to the inherent uncertainty pertaining to acoustic assessments. All works have been undertaken in accordance with Infinity Acoustics Ltd's Terms and Conditions.