



Residential Noise Assessment

Site Address: 65 Long Street, Middleton, M24 6UN

Client Name: Stacey Duncan

Project Reference No: NP-011968



Authorisation and Version Control

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Delivering sustainable development by promoting good health and well-being through effective management of noise.

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1. Introduction

NOVA Acoustics Ltd has been commissioned to prepare a noise assessment for a residential development ('the proposed development') at 65 Long Street, Middleton, M24 6UN ('the site').

The applicant has submitted an application for prior approval 24/00826/PRA56 – '*Prior approval for change of use from (Class E) to a 3-bedroom flat (Class C)*' ('the Application') to the Local Planning Authority ('LPA'), Rochdale Borough Council. The LPA have requested that a noise impact assessment is undertaken to accompany the application.

A noise survey has been undertaken to establish the prevailing sound levels at the proposed development. The findings have been subsequently used to assess the suitability of the site for residential use. Measures required to mitigate noise impacts for the proposed development have been assessed in accordance with the relevant performance standards, legislation, policy, and guidance.

This noise assessment is necessarily technical in nature; therefore, a glossary of terms is included in Appendix A to assist the reader.

1.1 Standards, Legislation, Policy & Guidance

The following performance standards, legislation, policy, and guidance have been considered to ensure good acoustic design in the assessment:

- National Planning Policy Framework (2023).
- Noise Policy Statement for England (2010).
- British Standard BS8233:2014 – 'Guidance on sound insulation and noise reduction for buildings'.
- Approved Document F: Volume 1 Dwellings (2021).
- Acoustics Ventilation Overheating: Residential Design Guide 2020' (AVO Guide).

Further information on the legislation can be found in Appendix B.

1.2 Proposal Brief

The proposal is for change of use of the first and second floors from commercial space to a single residential unit. The ground floor will remain under commercial use. The proposed dwelling will comprise of a kitchen, living room, bathroom, 1 No. bedroom on the first floor and 2 No. bedrooms on the second floor. There will not be habitable windows facing the rear of the building. The overleaf figure shows the proposed development.

2. Environmental Noise Survey

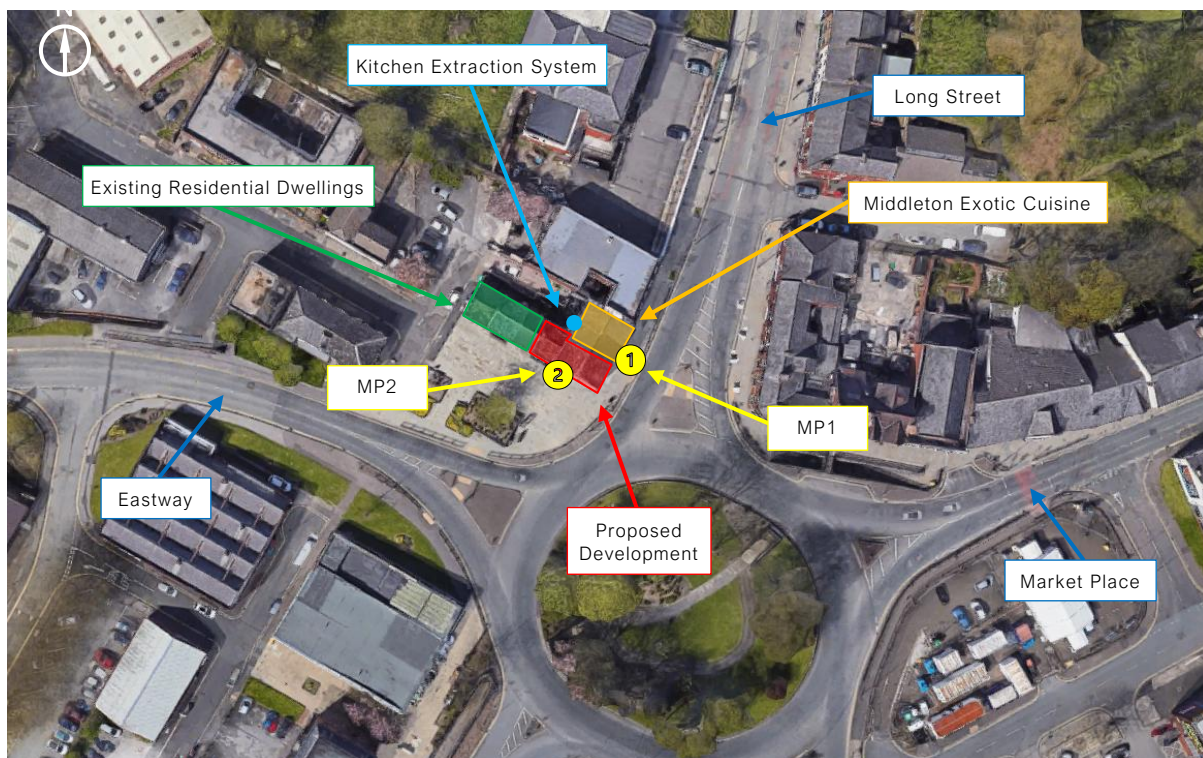
2.1 Measurement Methodology

The following table outlines the measurement dates and particulars. Weather conditions recorded during the environmental sound survey can be found in Appendix D. A 130mm diameter windshield was fitted to the microphone which is effective in windspeeds up to 8m/s. The equipment was field calibrated before and after the survey and negligible drift was noted.

Location	Survey Dates	Measurement Particulars
MP1	22-25/11/2024	Equipment mounted on a lamp post at 2.5m distance from the building façade at a height of 4.5m on Long Street.
MP2	22-25/11/2024	Equipment mounted protruding from a first-floor window at 1.3m distance from the building façade on Eastway. The microphone was located at the proposed 1F living room.

Table 1 – Measurement Methodology

The figure below outlines the site surroundings and measurement locations:



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Figure 2 – Measurement Locations and Site Surroundings

2.2 Context & Subjective Impression

The area surrounding the site is a mixture of commercial premises and residential dwellings. To the east and south run Long Street and Eastway, both joining other surrounding roads on the roundabout located to the southeast.

Adjacent to the north is 'Middleton Exotic Cuisine', an Indian takeaway that opens from 17:00 to 23:30 from Sunday to Thursday and from 16:30 to 00:00 on Fridays and Saturdays. The restaurant operates an extraction system kitchen to the rear; however, this was not operational during the site visits. Detailed analysis of the monitoring indicates that plant noise emissions do not influence either of the monitoring locations. This is to be expected considering the screening provided by the building and high levels of traffic along the surrounding road network. Additionally, the proposed development does not include habitable windows on that façade. Therefore, noise associated with Middleton Exotic Cuisine's extraction system is not anticipated to result in adverse noise impacts at the development site.

The site is also bounded by existing residential dwellings to the northwest. These properties are in a similar location than the proposed development and, as such, the proposed site is deemed suitable for residential purposes if an adequate mitigation scheme is adhered to.

The acoustic environment is deemed high in level and the noise profile is dominated by continuous road traffic noise emissions. During the site visits, it was found that noise emissions from the surrounding commercial premises were negligible.

2.3 Environmental Noise Survey Results

The following section outlines the measured sound levels during the survey. It is important to note that noise levels measured on Friday from the set up till 16:00 have been discarded as site works were being carried out. The time history results can be found in Appendix D.

Location	Measurement Period ('T')	Octave Frequency Band (Hz, $L_{eq,T}$, dB)							$L_{Aeq,T}$ (dB)	'Typical' $L_{AFmax,1min}$ (dB)
		63	125	250	500	1k	2k	4k		
MP1	$L_{eq,16hr}$ (Day)	71	67	66	66	69	69	67	74	--
	$L_{eq,8hr}$ (Night)	69	64	63	64	66	64	60	70	86
MP2	$L_{eq,16hr}$ (Day)	66	61	60	59	63	61	55	67	--
	$L_{eq,8hr}$ (Night)	63	57	56	55	59	55	47	62	78

Table 2 – Sound Level Results Summary

3. Noise Break-in Assessment and Sound Insulation Scheme

3.1 Internal Noise Level Criteria

The noise profile of the area is predominantly “anonymous” steady state noise sources e.g., transport. The following table outlines the internal acoustic design criteria used in the following assessment.

Activity	Location	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)
Resting	Living Room	35 dB $L_{Aeq,16hr}$	--
Dining	Dining Room/Area	40 dB $L_{Aeq,16hr}$	--
Sleeping (Daytime resting)	Bedroom	35 dB $L_{Aeq,16hr}$	30 dB $L_{Aeq,8hr}$ 45 dB L_{AFmax*}

**Note 1: The maximum criteria have been taken from the World Health Organisation (WHO) Guidelines for Community Noise.*

**Note 2: ProPG:2017 which is relevant to 'New Residential' states; "In most circumstances in noise sensitive rooms at night (e.g., bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45dB $L_{Amax, F}$ more than 10 times a night. However, where it is not reasonably practicable to achieve this guideline then the judgement of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number, distribution, predictability, and regularity of noise events".*

Note 3: BS8233:2014 states: "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".

Note 4: BS8233:2014 states: "The levels shown in Table 4 (criteria shown above) are based on the existing guidelines issued by the WHO and assume normal diurnal fluctuations in external noise. In cases where local conditions do not follow a typical diurnal pattern, for example on a road serving a port with high levels of traffic at certain times of the night, an appropriate alternative period, e.g., 1 hour, may be used, but the level should be selected to ensure consistency with the levels recommended in Table 4.

Note 5: BS8233:2014 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.

Table 3 – Internal Acoustic Design Criteria

The measured sound levels at the proposed development are assessed against the relevant criteria and a sound insulation scheme is provided to achieve a good internal acoustic environment.

3.2 Glazing and Background Ventilation Specification

The following section provides a glazing and background ventilation specification that achieves the relevant internal noise criteria. The calculations considering the following sound insulation scheme can be found in Appendix E. The façade allocation can be found in Appendix C.

Sound Insulation Scheme – Front Façade									
Location	Description	Octave Frequency Band (Hz, dB)							Overall (dB)
		63	125	250	500	1k	2k	4k	
1F & 2F Bedrooms	10mm Glass / 20mm Argon Cavity / 8.8mm Optiphon Glass	25	28	36	43	47	49	58	46 R_w (-6; C_{tr})
	Greenwoods MA3051 (Through Wall Ventilation)	30	46	45	50	55	65	67	55 $D_{ne,w}$ (-3; C_{tr})
Sound Insulation Scheme – Side Façade									
Living Room and Bedroom	6mm Glass / 16mm Air Cavity / 4mm Glass	20	21	20	26	38	37	39	32 R_w (-4; C_{tr})
	Greenwoods 2500EA.AC1 (Trickle Ventilation)	19	21	17	25	35	37	31	29 $D_{ne,w}$ (-4; C_{tr})

Table 4 – Glazing & Background Ventilation Specification

Any other window or ventilation specification capable of providing this attenuation will be suitable provided the glazing suppliers can provide an acoustic test report in accordance with BS EN ISO 10140-2:2010 or an evidence-based calculation.

4. Overheating Screening Assessment

In order to avoid excessively high temperatures and provide adequate levels of thermal comfort within dwellings, an overheating mitigation strategy should be developed. In low noise areas, this strategy can often rely upon opening windows as the primary source of ventilation, however, in areas with higher levels of noise, this would present a risk of adverse effects on health and quality of life.

4.1 Overheating Criteria

Considering that the development is a change of use and not new build, it is not a requirement to achieve the criteria defined in Approved Document O ('ADO'). However, to allow for a reasonable living environment, it is recommended that the less onerous criteria given in the 'Acoustics Ventilation and Overheating Design Guide' ('AVO') should be applied. Considering that a partially open window provides approximately 13dB of attenuation (as stated in 'AVO') the proposed internal and external noise criteria are summarised as follows:

Period	Proposed Criteria (dB)		External Level (dB)	
	Internal	External	Measured	Exceedance
Front Façade				
Daytime ($L_{Aeq,16hr}$)	50 [1]	63	74	+11
Night-time ($L_{Aeq,8hr}$)	42 [1]	55	70	+15
Night-time ($L_{AFmax,T}$) [2]	65 [1]	78	87	+9
Rear Façade				
Daytime ($L_{Aeq,16hr}$)	50 [1]	63	67	+4
Night-time ($L_{Aeq,8hr}$)	42 [1]	55	62	+7
Night-time ($L_{AFmax,T}$) [2]	65 [1]	78	78	0
Notes: [1] Criterion taken from the AVO guide. Above this level, it is stated: "Noise causes a material change in behaviour, e.g., having to keep windows closed most of the time." [2] L_{AFmax} exceeded fewer than 10 times per night.				

Table 5 – External Noise Level Limits for Overheating Criteria

4.2 Overheating Assessment

The noise levels measured on site significantly exceed the external noise criteria shown in the table above. This would indicate that relying on open windows to overcome potential overheating effects would likely result in unsuitable internal noise conditions.

Although not required, consideration of an alternative ventilation and cooling strategy may be beneficial to mitigate potential overheating effects. Any ventilation system should be compliant with the requirements of Approved Document F.

5. Noise Breakthrough Assessment and Sound Insulation Scheme

5.1 Noise Breakthrough Criteria

The proposed development structurally adjoins a commercial property via a separating wall and floor. BS8233:2014 states that the internal noise criteria include 'overall noise' which is the sum of structure borne and airborne noise sources. Noise breaking through from structurally adjoining commercial property will be considered to ensure the total noise from both structurally adjoining commercial properties and external noise ingress, does not exceed the proposed acoustic design criteria. Guidance on sound insulation between adjoining domestic and non-domestic dwellings is discussed in Approved Document E (ADE) of the Building Regulations, section 0.8 of Part E states.

The performance standards set out in Tables 1a and 1b are appropriate for walls, floors and stairs that separate spaces used for normal domestic purposes. A higher standard of sound insulation may be required between spaces used for normal domestic purposes and communal or non-domestic purposes. In these situations, the appropriate level of sound insulation will depend on the noise generated in the communal or non-domestic space. Specialist advice may be needed to establish if a higher standard of sound insulation is required and, if so, to determine the appropriate level.

The higher standard of sound insulation required is dependent on the level of noise generated within the commercial property. Noise from structurally adjoining commercial sources can lead to elevated impact and as such further consideration is given to the level of audibility, dominance, attention grabbing features, spectral distribution, regularity, change in level, duration, and time of day the sound is occurring. The commercial properties 'Use Classes' can assist in defining a suitable higher standard of sound insulation.

5.2 Noise Breakthrough Assessment and Specification

The following table outlines the expected level of risk associated with the 'Class Use' of the structurally adjoining commercial property and provides a required sound insulation standard including a discussion to justify the standard.

Planning Class	Level of Risk from Noise	Required Sound Insulation Standard (dB)
Separating Floor - Class E Commercial	Medium	$\geq 55 D_{nT,w} + C_{tr}$
Separating Wall – Middleton Exotic Cuisine Storage		

Discussion: *The use of the ground floor commercial property is not yet finalised; however, businesses defined as ‘Class E – Commercial Use’ generally include noise from patrons and background music. Any music in these types of premises would be normally of a low level to facilitate easy conversation and as such, music is not a primary concern. The noise from patrons can vary significantly and is highly dependent on the nature of the establishment. The required level of sound insulation should consider raised and elevated vocal efforts occurring regularly. Based on the previous commercial usage and the operational hours of the surrounding premises, it is assumed that the permitted opening hours will not extend into the night-time period (23:00 – 07:00).*

It is assumed that the adjacent 1F and 2F are used for storage for Middleton Exotic Cuisine. The noise from such a use is deemed not high and will most likely be dictated by patron noise using the storage.

It is recommended that this reassessed if the property will be used for a business that generates higher levels of noise.

Table 6 – Noise Breakthrough Assessment

Partition Floor

A preliminary sound insulation test was carried out during the site visit on 22/11/2024. The testing was carried out in accordance with the procedures and guidance specified within Annex B of the Building Regulations Approved Document E (ADE) 2003 edition which incorporates 2004, 2010, 2013 and 2015 amendments. The results are assessed in accordance with section 0: performance - table 1.0a and 1.0b of ADE in order to indicate compliance. The rooms referenced in this report were tested in the condition presented by the client and the results relate exclusively to the items tested.

The airborne sound insulation measurements are undertaken in accordance with BS EN ISO 140-4:1998. A summary of the test procedure is provided below:

1. A dodecahedral loudspeaker is used to generate pink noise at a steady and continuous level across the required frequency bands.
2. The sound levels are measured in 1/3 octave frequency bands from 100Hz to 3.15kHz in the source and receiver room using fixed or moving microphone positions to establish a representative average sound pressure level for each room.
3. The reverberation time is measured in the receiving room in accordance with BS EN ISO 3382 - 2:2008.
4. Background sound levels are measured in the receiving room.

5. The weighted standardised level difference ($D_{nT,w}$) in decibels and the spectrum adaptation term (C_{tr}) are calculated in accordance with BS EN ISO 717 - 1:1997.

The following table shows the airborne sound insulation ($D_{nT,w} + C_{tr}$) measured during the site visit.

Description	1/1 Octave Frequency Band (Hz, dB)						Overall $D_{nT,w} + C_{tr}$
	125	250	500	1k	2k	4k	
Measured Sound Insulation Performance between Ground Floor Retail Unit and First Floor Proposed Kitchen	26	40	46	50	53	54	40

Table 7 – Measured Airborne Sound Insulation of Separating Floor

As can be seen in the table above, the airborne sound insulation measured during the preliminary tests does not achieve the proposed criteria and, as such, further upgrade works are required.

During the site visits, it could be seen that the current partition floor is comprised of 180mm timber joists with standard floorboards on top and a layer of plasterboard attached straight to the base of the joists. This assumption has been further corroborated when modelling the partition floor in INSUL 9.0.

An indicative specification that can achieve the required sound insulation standard is outlined below.

- 18mm standard particle board (min. surface mass of 11.9 kg/m³)
- Existing floorboards made good with no holes and gaps
- Existing 180mm timber joists with 150mm Rockwool RW3 (60kg/m³) tightly and evenly fitted.
- MuteClip™ and Furring Channel System affixed to the underside of the joist. (In accordance with the manufacturers guidelines)
- 2 No. 15mm SoundBloc Plasterboards (with overlapping joints and sealed with flexible mastic at the perimeter)

This construction is predicted to provide a minimum sound reduction of 55dB $D_{nT,w} + C_{tr}$, and as such, is expected to achieve the criteria.

Partition Wall

The location on the wall under assessment can be found in Appendix C. The current partition is assumed to be a minimum of 200mm brickwork. An indicative specification that can achieve the required sound insulation standard is outlined below.

- Existing 200mm concrete blocks (min. density of 1880kg/m³)
- MuteClip™ and Furring Channel System affixed to the underside of the joist. (In accordance with the manufacturers guidelines)
- 2 No. 15mm SoundBloc Plasterboards (with overlapping joints and sealed with flexible mastic at the perimeter)

This construction is predicted to provide a minimum sound reduction of 55dB $D_{nT,w} + C_{tr}$, and as such, is expected to achieve the criteria.

It should be noted that this report provides an indicative specification that can achieve the required acoustic performance and considers that all flanking routes for sound have been appropriately

suppressed. As with any construction project, the ability to meet the specification will rely upon the quality of the built structure. As such the works should be carried out to a high standard of workmanship to ensure that any sound insulation measures are not breached, for example by installing a rigid connection across an isolated connection. The development cannot achieve compliance until sound insulation testing is carried out by a UKAS accredited sound insulation testing company upon completion and assessed against the required sound insulation standard.

6. Conclusion and Action Plan

The proposed development has been assessed against the acoustic design criteria and a sound insulation scheme has been provided to ensure the criteria has been achieved.

The following 'Action Plan' is outlined to ensure the design considerations and specifications from this report are duly implemented:

1. The proposed glazing and background ventilation system, or a suitable alternative, should be installed as shown in Section 3.2.
2. Although not required for planning or building regulations, provision of a secondary ventilation and/or cooling system should be considered to avoid using an 'open-window' strategy when overcome potential overheating effects.
3. The separating wall and floor between the structurally adjoining commercial property and the proposed development should be designed to achieve the required sound insulation. An indicative specification has been provided in Section 5. Further design assistance can be provided by NOVA Acoustics Ltd if required.

The findings of this report will require written approval from the Local Authority prior to work commencing.

Appendix A – Acoustic Terminology

A-weighted sound pressure level, L_{pA}	Quantity of A-weighted sound pressure given by the following formula in decibels (dBA). $L_{pA} = 10 \log_{10} (pA/p_0)^2$. Where: pA is the A-weighted sound pressure in pascals (Pa) and p_0 is the reference sound pressure (20 μ Pa)
Background Sound	Underlying level of sound over a period, T , which might in part be an indication of relative quietness at a given location
Equivalent continuous A-weighted sound pressure level, $L_{Aeq,T}$	Value of the A-weighted sound pressure level in decibels (dB) of a continuous, steady sound that, within a specified time interval, T , has the same mean-squared sound pressure as the sound under consideration that varies with time
Facade level	Sound pressure level 1 m in front of the facade
Free-field level	Sound pressure level away from reflecting surfaces
Indoor ambient noise	Noise in a given situation at a given time, usually composed of noise from many sources, inside and outside the building, but excluding noise from activities of the occupants
Noise Criteria	Numerical indices used to define design goals in a given space
Noise Rating (NR)	Graphical method for rating a noise by comparing the noise spectrum with a family of noise rating curves
Octave Band	Band of frequencies in which the upper limit of the band is twice the frequency of the lower limit
Percentile Level, $L_{AN,T}$	A-weighted sound pressure level obtained using time-weighting “F”, which is exceeded for $N\%$ of a specified time interval
Rating Level, $L_{Ar,Tr}$	Equivalent continuous A-weighted sound pressure level of the noise, plus any adjustment for the characteristic features of the noise
Reverberation time, T	Time that would be required for the sound pressure level to decrease by 60 dB after the sound source has stopped
Sound Pressure, p	root-mean-square value of the variation in air pressure, measured in pascals (Pa) above and below atmospheric pressure, caused by the sound
Sound Pressure Level, L_p	Quantity of sound pressure, in decibels (dB), given by the formula: $L_p = 10 \log_{10} (p/p_0)^2$. Where: p is the root-mean-square sound pressure in pascals (Pa) and p_0 is the reference sound pressure (20 μ Pa)
Weighted sound reduction index, R_w	Single-number quantity which characterizes the airborne sound insulating properties of a material or building element over a range of frequencies

Appendix B – Standards, Legislation, Policy, and Guidance

This report is to be primarily based on the following standards, legislation, policy, and guidance.

B.1 – National Planning Policy Framework (2023)

Government policy on noise is set out in the National Planning Policy Framework (NPPF), published in 2023. This replaced all earlier guidance on noise and places an emphasis on sustainability. In section 15, Conserving and enhancing the natural and local environment, paragraph 180e, it states:

Preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans.

Paragraph 191 states:

Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

- a) Mitigate and reduce to a minimum potential adverse impact resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*
- b) Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and*
- c) Limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes, and nature conservation.*

B.2 – Noise Policy Statement for England (2010)

Paragraph 191 of the NPPF also refers to advice on adverse effects of noise given in the Noise Policy Statement for England (NPSE). This document sets out a policy vision to:

Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.

To achieve this vision the Statement identifies the following three aims:

Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- Avoid significant adverse impacts on health and quality of life:
- Mitigate and minimise adverse impacts on health and quality of life:
- Where possible, contribute to the improvement of health and quality of life.

In achieving these aims the document introduces significance criteria as follows:

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur. It is stated that “significant adverse effects on health and quality of life should be avoided while also considering the guiding principles of sustainable development”.

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected. It is stated that the second aim above lies somewhere between LOAEL and SOAEL and requires that: “all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also considering the guiding principles of sustainable development. This does not mean that such adverse effects cannot occur.”

NOEL – No Observed Effect Level

This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise. This can be related to the third aim above, which seeks: “where possible, positively to improve health and quality of life through the pro-active management of noise while also considering the guiding principles of sustainable development, recognising that there will be opportunities for such measures to be taken and that they will deliver potential benefits to society. The protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim.”

This is further expanded using the updated “Noise Exposure Hierarchy Table” which includes an additional level of impact referred to as the ‘No Observed Adverse Effect Level’ (‘NOAEL’). It is stated that at this level: *“noise can be heard, but does not cause any change in behaviour, attitude or other physiological response”*. In addition, noise at this level *“can slightly affect the acoustic character of the area but not such that there is a change in the quality of life”*.

The NPSE recognises that it is not possible to have a single objective noise-based measure that is mandatory and applicable to all sources of noise in all situations and provides no guidance as to how these criteria should be interpreted. It is clear, however, that there is no requirement to achieve noise levels where there are no observable adverse impacts but that reasonable and practicable steps to reduce adverse noise impacts should be taken in the context of sustainable development and ensure a balance between noise sensitive and the need for noise generating developments.

Any scheme of noise mitigation outlined in this report will, therefore, aim to abide by the above principles of the NPPF and NPSE whilst recognizing the constraints of the site.

B.3 – BS8233:2014 ‘Guidance on Sound insulation and noise reduction for buildings’

BS8233 provides guidance on noise levels from sources without specific character in the built environment, based on the recommendations of the World Health Organization; specifically, ‘WHO Guidelines on Community Noise, 1999’. The Guidelines on Community Noise (1999) document defines community noise to include noise from “industries” and “construction”. The desirable criteria levels of steady state, “anonymous” noise in unoccupied spaces within dwellings, from sources such as road traffic, mechanical services and other continuously running plant, are tabulated below.

Activity	Location	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)
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 $L_{Aeq,8hour}$ 45 dB L_{AFmax}^*

Table 8 – BS8233:2014 Internal Ambient Noise Level Criteria

**ProPG:2017 states that's good acoustic design can be used so that individual noise events do not normally exceed 45 dB L_{AFmax} more than 10 time a night within noise sensitive rooms such as bedrooms. However, where it is not reasonably practicable to achieve the guideline then the judgment of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number distribution, predictability, and regularity of noise events.*

It is noted, however, that where development is considered necessary or desirable, despite external noise level above WHO guidelines, the above target levels may be relaxed by up to 5 dB.

General recommendations for mitigation to enable these targets to be achieved are provided, including the use of bunds and barriers to reduce external noise and space planning and sound insulation for the control of internal noise levels.

For this assessment, the above criteria are considered to be the ‘LOAEL’ as defined in the NPSE in Appendix B.

B.4 – Approved Document F Volume 1: Dwellings (2021)

Approved Document F states the following in relation to noise:

- Mechanical ventilation systems, including both continuous and intermittent mechanical ventilation, should be designed and installed to minimise noise. This includes doing all of the following.
 - o Correctly sizing and jointing ducts.
 - o Ensuring that equipment is appropriately and securely fixed, such as using resilient mountings where noise carried by the structure of the building could be a problem.
 - o Selecting appropriate equipment, including following paragraph
- For mechanical ventilation systems, fan units should be appropriately sized so that fans operating in normal background ventilation mode are not overly noisy. This might require fans to be sized so that they do not operate near maximum capacity when in normal background ventilation mode.
- Account should be taken of outside noise when considering whether openable windows are appropriate for purge ventilation.
- If an exposed façade is close to an area of sustained and loud noise (e.g. a main road), then a noise attenuating background ventilator should be fitted.

B.5 – Acoustics Ventilation and Overheating – Residential Design Guide 2020

It is suggested that the desirable internal noise criteria within BS8233:2014 should be achieved considering adequate ventilation as defined by Building Regulations 'Approved Document F' ('ADF') whole dwelling ventilation. However, for a whole dwelling ventilation system such as MVHR it is considered reasonable to allow higher levels of internal ambient noise from transport sources when higher rates of ventilation are required in relation to the overheating condition.

The 'Institute of Acoustics' ('IOA') and the 'Association of Noise Consultant's' ('ANC') have published 'The AVO Guide: 2020' document 2020. It provides guidance for those acousticians involved in the design of buildings to prevent noise ingress to and achieve reasonable internal levels. This provides valuable guidance on ventilation and overheating in support of the "Good Acoustic Design" principle advocated by ProPG. Along with guidance showing an acoustic assessment during the overheating condition, the AVO Guide (2020) provides a framework that has a two-level assessment procedure to estimate the potential impact on occupants:

Level 1 Risk Assessment

AVO 'Level 1' risk assessment criteria guide based on external free field ambient noise levels for dwellings relying on purge ventilation (e.g., opening windows) to prevent summertime overheating. AVO Guide Table 3-2 detailed in the figure below. To assess the possibility of overheating it is reasonable to relax the BS 8233:2014 internal ambient noise levels from opening a window by 5 decibels (5 dB). Also, it is assumed that a partially open window will provide a sound reduction of 13 dB. Therefore, to achieve internal noise levels in line with BS 8233:2014 the façade external noise levels should fall inside the levels shown in Table 3-2.

Risk category for Level 1 assessment ^[Note 5]	Potential Effect without Mitigation	Recommendation for Level 2 assessment
	Increasing risk of adverse effect	Recommended Optional
	Use of opening windows as primary means of mitigating overheating is not likely to result in adverse effect	Not required

Table 3-2 of AVO Guide (2020)

Figure 3 – AVO Guide Level 1 Risk Category

The AVO Guide (2020) seeks to determine the level of risk associated with overheating in a new residential development based on the existing noise climate. The AVO risk categories are detailed in the table below with clearer categorisation.

Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)	Risk Category	Mitigation
≥ 63 dB $L_{Aeq,16hr}$	≥ 55 dB $L_{Aeq,8hr}$	High Risk	Level 2 assessment recommended. Windows which are unopenable on grounds of noise will inevitably create issues for the overheating strategy.
57 – 62 dB $L_{Aeq,16hr}$	52 – 54 dB $L_{Aeq,8hr}$	Medium Risk	Level 2 assessment optional to give more confidence regarding the suitability of internal noise conditions.
54 – 56 dB $L_{Aeq,16hr}$	49 – 51 dB $L_{Aeq,8hr}$	Low Risk	
≤ 53 dB $L_{Aeq,16hr}$	≤ 48 dB $L_{Aeq,8hr}$	Negligible Risk	None required – openable windows suitable for ventilation

Table 9 – AVO Guide (2020) Level 1 Risk Assessment

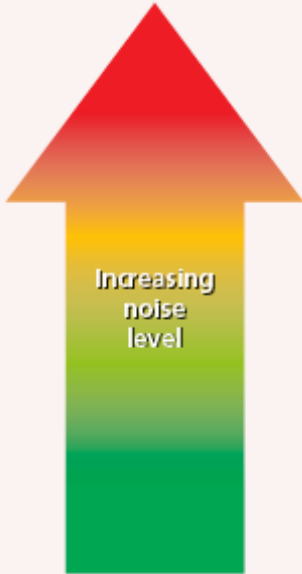
Level 2 Risk Assessment:

A ‘Level 2’ assessment of noise is recommended where a dwelling using purge ventilation (e.g., open windows) reaches Level 1 ‘High Risk’ or ‘Medium Risk’. The Level 2 assessment guidance comments that where internal ambient noise levels are >50 dB $L_{Aeq,16hr}$ (day) or >42 dB $L_{Aeq,8hr}$ (night) then the outcome might be that the noise causes a material change in behaviour, e.g., having to keep windows closed for the majority of the time, or there is the potential for sleep disturbance.

To conduct a Level 2 assessment, the following minimum information is required:

- Statement of the overheating criteria being applied.
- Description of the provisions for meeting the stated overheating criteria. This should include, where relevant, the area of façade opening.
- Details of the likely internal ambient noise levels whilst using provisions for mitigating overheating, and the method used to predict these.
- Estimation of how frequently and for what duration such provisions are required to mitigate overheating.
- Consideration of the effect of individual noise events.
- Assessment of the adverse effect on occupants.

The figure below outlines the AVO Guide (2020) guidance for a Level 2 assessment of noise from transport sources relating to the Overheating Condition.

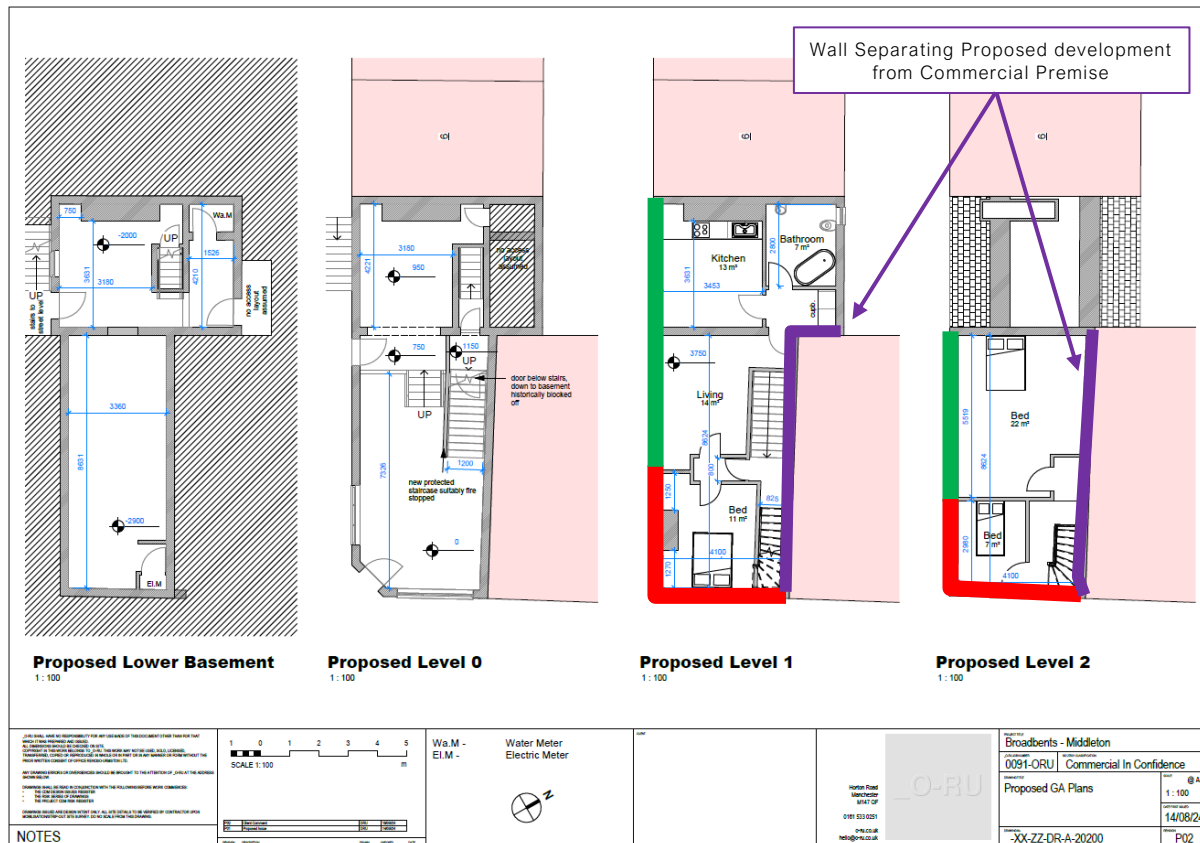
Internal ambient noise level ^[Note 2]			Examples of Outcomes ^[Note 5]	
$L_{Aeq,T}$ ^[Note 3] during 07:00 – 23:00 ^[Note 6]	$L_{Aeq,sh}$ during 23:00 – 07:00	Individual noise events during 23:00 – 07:00 ^[Note 4]		
> 50 dB	> 42 dB	Normally exceeds 65 dB $L_{A,Fmax}$	Noise causes a material change in 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 noise level			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 $L_{A,Fmax}$ 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.

Table 3-3 of AVO Guide (2020)

Figure 4 – AVO Guide Level 2 Internal Ambient Noise Levels

Appendix C – Location Plans



Appendix D – Environmental Survey

D.1 – Time History Noise Data

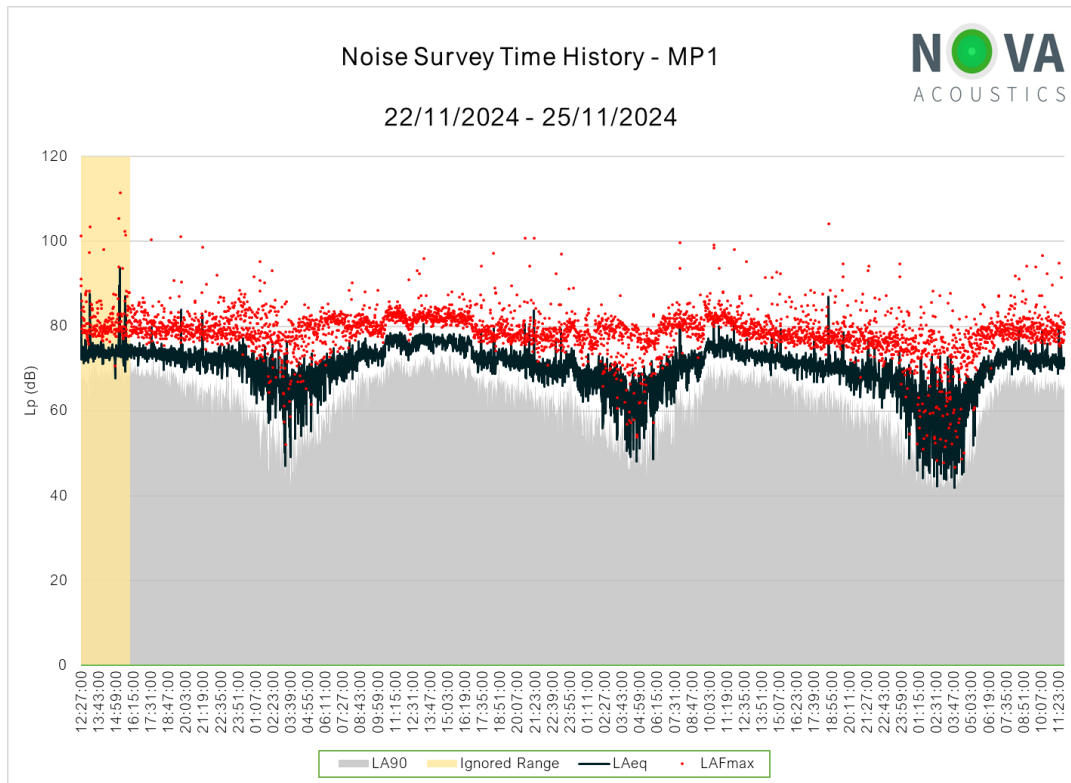


Figure 5 – MP1 Noise Survey Time History

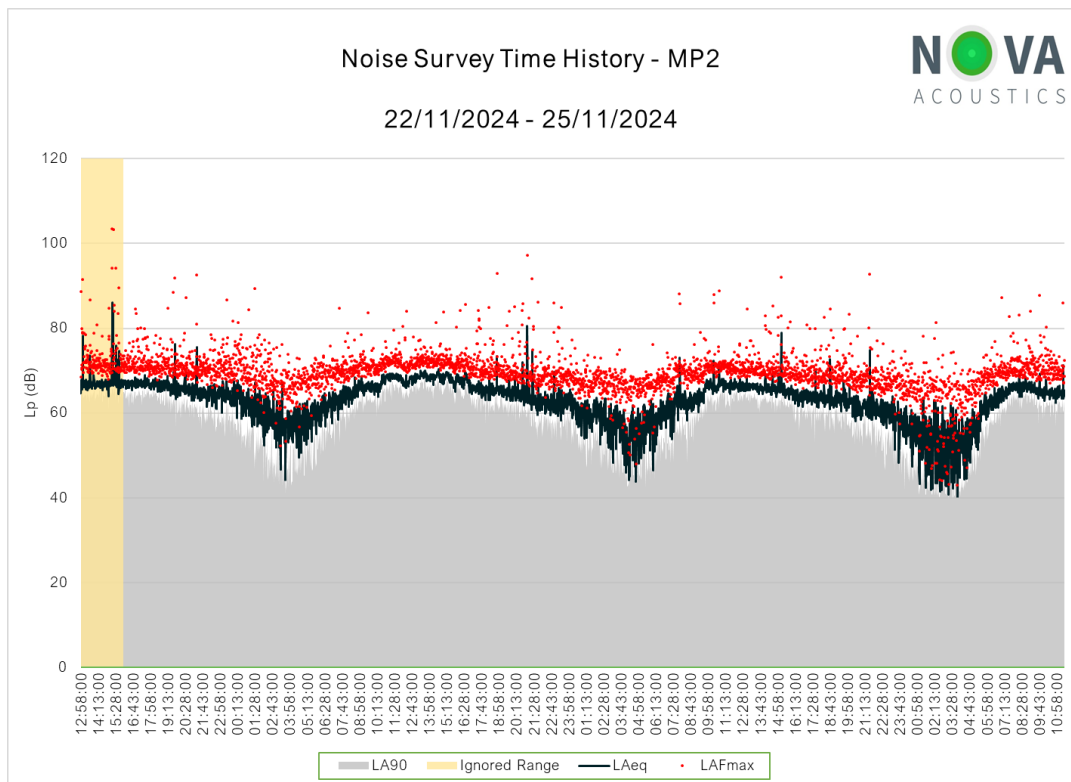


Figure 6 – MP2 Noise Survey Time History

D.2 – Surveying Equipment

Piece of Equipment	Serial No.	Calibration Deviation
Svantek SV971A Class 1 Sound Level Meter	141359	≤0.9
Svantek SV971A Class 1 Sound Level Meter	141425	≤0.2
Svantek SV971 Class 1 Sound Level Meter	97494	≤0.0
Svantek SV33B Class 1 Calibrator	125695	--

Table 10 – Surveying Equipment

All equipment used during the survey was field calibrated at the start and end of the measurement period with a negligible deviation of ≤0.9 dB. All sound level meters are calibrated every 24 months and all calibrators are calibrated every 12 months, by a third-party calibration laboratory. All microphones were fitted with a protective windshield for the entire measurements period. Calibration certificates can be provided upon request.

D.3 – Meteorological Conditions

As the environmental noise survey was carried out over a long un-manned period no localised records of weather conditions were taken. However, all measurements have been compared with met office weather data of the area, specifically the closest weather station, and the data from the weather station is outlined in the table below. When reviewing the time history of the noise measurements, any scenarios that were considered potentially to be affected by the local weather conditions have been omitted. The analysis of the noise data includes statistical and percentile analysis and review of minimum and maximum values, which aids in the preclusion of any periods of undesirable weather conditions. The weather conditions were deemed suitable for the measurement of environmental noise in accordance with BS7445 Description and Measurement of Environmental Noise. The table below presents the average temperature, wind speed and rainfall range for each 24-hour period during the entire measurement.

Weather Conditions – Chadderton (Approx. 3.3km SEE of Site)				
Time Period	Air Temp (°C)	Rainfall (mm/h) ^[1]	Prevailing Wind Direction	Wind Speed (m/s) ^[2]
22/11/24 – 00:00 – 23:59	0.4 – 4.1	0.0 – 1.2	SW	0.0 – 2.6
23/11/24 – 00:00 – 23:59	1.4 – 14.2	0.0 – 4.0	S	0.0 – 5.6
24/11/24 – 00:00 – 23:59	9.3 – 14.5	0.0 – 6.4	WNW	0.4 – 5.6
25/11/24 – 00:00 – 23:59	4.8 – 9.7	0.0 – 0.2	WSW	0.0 – 5.2

Notes:

[1] Any rainfall that occurred at during the environmental noise survey was not deemed to influence the measured noise levels.

[2] Wind speeds of less than 5 m/s were recorded on-site during the attended surveying and in all measurement locations (short & long-term) a windshield 130mm in diameter was fitted and is efficient up to 8 m/s (according to manufacturer's data sheets).

Table 11 – Weather Conditions

Appendix E – Noise Break-in Calculations

The façade sound reduction and predicted internal noise levels are calculated assuming the following:

- The calculation method for façade sound reduction is in accordance with BS8233 and BS EN 12354-3.
- The reverberation time is typically 0.5 and 0.3 seconds across the relevant frequency range for a furnished living room and bedrooms in the UK, respectively.
- Windows areas and room volumes have been taken from the technical drawings provided to NOVA Acoustics. Detailed details can be provided upon request.
- The acoustic performance of the façade elements is taken from the relevant manufacturers technical information or the sound reduction has been predicted using INSUL 9.0.
- For background trickle ventilation a total Equivalent Area of 5000mm² per bedroom and living room has been used in the calculations, which equates to 2 No. trickle vents (2500mm² each).

Front Façade (Red)

Bedroom (Red Façade - 1F)

Description	Height (m)	Width (m)	Length (m)	Volume (m3)	Area (m2)
Room	2.5	3.1	3.5	27.1	54.7
Single Aspect Façade	--	--	--	--	7.8
Glazing	1.5	--	1.2	--	1.8
Wall Element	--	--	--	--	6.0
Area of Roof / Ceiling	--	--	--	--	0.0
No. of Ventilators	2				
Room in Roof?	No				

Bedroom (Red Façade - 1F) Day Time Leq

Item / Description	dB(A)	63	125	250	500	1k	2k	4k	8k
Measured Leq,T	74	71	67	66	66	69	69	67	62
Glazing Noise Ingress	25	40	33	29	18	18	12	3	-2
Ventilation Noise Ingress	24	45	25	25	21	18	8	4	-1
Wall Noise Ingress	20	29	27	23	15	13	7	6	1
Roof Noise Ingress									
Room Absorption Correction		-2	-2	-2	-3	-3	-3	-4	-6
Total Noise Ingress	29	48	35	32	24	22	14	8	2
NR30	35	59	48	39	33	30	26	24	22
Exceedance of Criteria	-6	-11	-13	-7	-9	-8	-12	-16	-20

Bedroom (Red Façade - 1F) Night Time Leq

Item / Description	dB(A)	63	125	250	500	1k	2k	4k	8k
Measured Leq,T	70	69	64	63	64	66	64	60	55
Glazing Noise Ingress	22	38	30	26	15	15	7	-4	-9
Ventilation Noise Ingress	22	43	23	22	18	15	3	-3	-8
Wall Noise Ingress	16	27	24	20	13	10	3	-1	-6
Roof Noise Ingress									
Room Absorption Correction		-2	-2	-2	-3	-3	-3	-4	-6
Total Noise Ingress	26	46	33	29	21	19	9	1	-5
NR25	30	55	43	35	28	25	21	19	17
Exceedance of Criteria	-4	-9	-10	-6	-7	-6	-12	-18	-22

Bedroom (Red Façade - 1F) Night Time Max

Item / Description	dB(A)	63	125	250	500	1k	2k	4k	8k
Measured Lmax	86	86	83	82	82	81	79	77	73
Glazing Noise Ingress	40	55	49	45	34	29	23	13	8
Ventilation Noise Ingress	39	61	41	41	36	30	18	14	10
Wall Noise Ingress	34	44	43	39	31	24	18	16	11
Roof Noise Ingress									
Room Absorption Correction		-2	-2	-2	-3	-3	-3	-4	-6
Total Noise Ingress	44	63	51	48	39	33	25	18	12
NR40	45	67	56	49	43	40	37	34	33
Exceedance of Criteria	-1	-4	-5	-1	-4	-7	-12	-16	-21

Bedroom (Red Façade - 2F)

Description	Height (m)	Width (m)	Length (m)	Volume (m3)	Area (m2)
Room	2.5	2.3	3.0	17.1	40.1
Single Aspect Façade	--	--	--	--	5.8
Glazing	1.5	--	1.2	--	1.8
Wall Element	--	--	--	--	4.0
Area of Roof / Ceiling	--	--	--	--	0.0
No. of Ventilators	2				
Room in Roof?	No				

Bedroom (Red Façade - 2F) Day Time Leq

Item / Description	dB(A)	63	125	250	500	1k	2k	4k	8k
Measured Leq,T	74	71	67	66	66	69	69	67	62
Glazing Noise Ingress	24	41	34	25	18	17	15	4	-1
Ventilation Noise Ingress	26	47	26	27	22	19	9	5	1
Wall Noise Ingress	19	29	26	23	15	12	7	5	1
Roof Noise Ingress									
Room Absorption Correction		-1	-1	-2	-2	-2	-2	-4	-5
Total Noise Ingress	30	50	37	31	25	23	17	9	3
NR30	35	59	48	39	33	30	26	24	22
Exceedance of Criteria	-5	-9	-11	-8	-8	-7	-9	-15	-19

Bedroom (Red Façade - 2F) Night Time Leq

Item / Description	dB(A)	63	125	250	500	1k	2k	4k	8k
Measured Leq,T	70	69	64	63	64	66	64	60	55
Glazing Noise Ingress	21	39	31	22	16	14	10	-3	-8
Ventilation Noise Ingress	23	44	24	24	19	16	4	-2	-7
Wall Noise Ingress	16	26	24	20	12	9	2	-2	-7
Roof Noise Ingress									
Room Absorption Correction		-1	-1	-2	-2	-2	-2	-4	-5
Total Noise Ingress	27	48	35	28	22	20	12	2	-4
NR25	30	55	43	35	28	25	21	19	17
Exceedance of Criteria	-3	-7	-8	-7	-6	-5	-9	-17	-21

Bedroom (Red Façade - 2F) Night Time Max

Item / Description	dB(A)	63	125	250	500	1k	2k	4k	8k
Measured Lmax	86	86	83	82	82	81	79	77	73
Glazing Noise Ingress	39	56	50	41	34	29	25	14	10
Ventilation Noise Ingress	40	62	43	43	38	31	20	16	11
Wall Noise Ingress	34	44	42	39	30	24	17	16	11
Roof Noise Ingress									
Room Absorption Correction		-1	-1	-2	-2	-2	-2	-4	-5
Total Noise Ingress	45	65	53	47	41	34	27	20	13
NR40	45	67	56	49	43	40	37	34	33
Exceedance of Criteria	0	-2	-3	-2	-2	-6	-10	-14	-20

Side Façade (Green)

Living Room (Green Façade)

Description	Height (m)	Width (m)	Length (m)	Volume (m3)	Area (m2)
Room	2.5	3.6	3.5	31.5	60.7
Single Aspect Façade	--	--	--	--	9.0
Glazing	1.5	--	1.4	--	2.1
Wall Element	--	--	--	--	6.9
Area of Roof / Ceiling	--	--	--	--	0.0
No. of Ventilators	2				
Room in Roof?	No				

Bedroom (Green Façade)

Description	Height (m)	Width (m)	Length (m)	Volume (m3)	Area (m2)
Room	2.5	5.5	4.4	60.5	97.9
Single Aspect Façade	--	--	--	--	13.8
Glazing	1.5	--	1.3	--	2.0
Wall Element	--	--	--	--	11.8
Area of Roof / Ceiling	--	--	--	--	0.0
No. of Ventilators	2				
Room in Roof?	No				

Living Room (Green Façade) Day Time Leq

Item / Description	dB(A)	63	125	250	500	1k	2k	4k	8k
Measured Leq,T	67	66	61	60	59	63	61	55	50
Glazing Noise Ingress	29	39	34	34	27	19	18	10	5
Ventilation Noise Ingress	27	38	24	24	26	20	21	13	7
Wall Noise Ingress	8	22	13	10	-1	2	0	-6	-11
Roof Noise Ingress									
Room Absorption Correction		1	0	0	0	0	-1	-2	-4
Total Noise Ingress	34	45	38	37	32	25	25	16	9
NR30	35	59	48	39	33	30	26	24	22
Exceednce of Criteria	-1	-14	-10	-2	-1	-5	-1	-8	-13

Bedroom (Green Façade) Day Time Leq

Item / Description	dB(A)	63	125	250	500	1k	2k	4k	8k
Measured Leq,T	67	66	61	60	59	63	61	55	50
Glazing Noise Ingress	27	37	32	32	25	17	15	8	2
Ventilation Noise Ingress	25	36	22	22	24	18	20	11	5
Wall Noise Ingress	8	23	14	11	0	2	0	-5	-11
Roof Noise Ingress									
Room Absorption Correction		-3	-3	-3	-4	-4	-4	-5	-7
Total Noise Ingress	29	40	32	32	27	20	20	11	4
NR30	35	59	48	39	33	30	26	24	22
Exceednce of Criteria	-6	-19	-16	-7	-6	-10	-6	-13	-18

Bedroom (Green Façade) Night Time Leq

Item / Description	dB(A)	63	125	250	500	1k	2k	4k	8k
Measured Leq,T	62	63	57	56	55	59	55	47	41
Glazing Noise Ingress	23	34	28	27	21	12	9	0	-6
Ventilation Noise Ingress	21	33	18	17	20	13	14	3	-3
Wall Noise Ingress	3	20	9	6	-4	-2	-6	-13	-19
Roof Noise Ingress									
Room Absorption Correction		-3	-3	-3	-4	-4	-4	-5	-7
Total Noise Ingress	24	37	28	27	23	15	14	2	-5
NR25	30	55	43	35	28	25	21	19	17
Exceednce of Criteria	-6	-18	-15	-8	-5	-10	-7	-17	-22

Bedroom (Green Façade) Night Time Max

Item / Description	dB(A)	63	125	250	500	1k	2k	4k	8k
Measured Lmax	78	80	75	73	74	73	71	67	60
Glazing Noise Ingress	40	51	45	45	39	26	25	20	13
Ventilation Noise Ingress	38	51	36	35	38	27	30	23	16
Wall Noise Ingress	20	37	27	23	14	12	10	7	0
Roof Noise Ingress									
Room Absorption Correction		-3	-3	-3	-4	-4	-4	-5	-7
Total Noise Ingress	42	55	46	45	41	29	30	22	14
NR40	45	67	56	49	43	40	37	34	33
Exceednce of Criteria	-3	-12	-10	-4	-2	-11	-7	-12	-19



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