



Residential Noise Assessment

Site Address: 3 Lily Street, Milnrow, Rochdale, OL16 3LH

Client Name: Michael Thomas

Project Reference No: NP-013396



Authorisation and Version Control

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

Contents

1.	INTRODUCTION	4
1.1	Standards, Legislation, Policy & Guidance	4
1.2	Proposal Brief	4
2.	ENVIRONMENTAL NOISE SURVEY	6
2.1	Measurement Methodology	6
2.2	Context & Subjective Impression.....	7
2.3	Environmental Noise Survey Results.....	7
3.	BS4142 NOISE IMPACT ASSESSMENT	9
4.	NOISE BREAK-IN ASSESSMENT AND SOUND INSULATION SCHEME.....	12
4.1	Internal Noise Level Criteria	12
4.2	Glazing and Background Ventilation Specification	13
5.	NOISE BREAKTHROUGH ASSESSMENT AND SOUND INSULATION SCHEME	14
5.1	Noise Breakthrough Criteria	14
5.2	Noise Breakthrough Assessment and Specification	15
6.	CONCLUSION AND ACTION PLAN	16
	APPENDIX A – ACOUSTIC TERMINOLOGY	17
	APPENDIX B – STANDARDS, LEGISLATION, POLICY, AND GUIDANCE	18
	B.1 – National Planning Policy Framework (2024)	18
	B.2 – Noise Policy Statement for England (2010).....	18
	B.3 – British Standard BS4142:2014+A1:2019 – Methods for rating and assessing industrial and commercial sound	19
	B.4 – BS8233:2014 ‘Guidance on Sound insulation and noise reduction for buildings’	22
	B.5 – ProPG: Planning and Noise (2017)	23
	B.6 – Approved Document F Volume 1: Dwellings (2021)	24
	B.7 - Acoustics Ventilation and Overheating – Residential Design Guide 2020	24
	APPENDIX C – LOCATION PLANS	28
	APPENDIX D – ENVIRONMENTAL SURVEY	29
	D.1 – Time History Noise Data	29
	D.2 – Surveying Equipment	29
	D.3 – Meteorological Conditions	30
	APPENDIX E – NOISE BREAK-IN CALCULATIONS	31

List of Figures

<i>Figure 1 – Proposed Development.....</i>	<i>5</i>
<i>Figure 2 – Measurement Locations and Site Surroundings.....</i>	<i>6</i>
<i>Figure 3 – MP1 Background Sound Level Analysis.....</i>	<i>9</i>
<i>Figure 4 – AVO Guide Level 1 Risk Category.....</i>	<i>25</i>
<i>Figure 5 – AVO Guide Level 2 Internal Ambient Noise Levels.....</i>	<i>27</i>
<i>Figure 6 – MP1 Noise Survey Time History.....</i>	<i>29</i>

List of Tables

<i>Table 1 – Measurement Methodology.....</i>	<i>6</i>
<i>Table 2 – Unattended Sound Level Results Summary.....</i>	<i>7</i>
<i>Table 3 – Attended Sound Level Results Summary.....</i>	<i>8</i>
<i>Table 4 – Measured Sound Levels of Existing Plant and Processes.....</i>	<i>9</i>
<i>Table 5 – BS4142 Noise Impact Assessment (Front Façade).....</i>	<i>10</i>
<i>Table 6 – BS4142 Noise Impact Assessment (Rear Façade).....</i>	<i>11</i>
<i>Table 7 – Acoustic Design Criteria (BS8233).....</i>	<i>12</i>
<i>Table 8 – Glazing & Background Ventilation Specification.....</i>	<i>13</i>
<i>Table 9 – Noise Breakthrough Calculation.....</i>	<i>15</i>
<i>Table 10 – BS8233:2014 Internal Ambient Noise Level Criteria.....</i>	<i>22</i>
<i>Table 11 – Hierarchy of Noise Management Measures.....</i>	<i>23</i>
<i>Table 12 – AVO Guide (2020) Level 1 Risk Assessment.....</i>	<i>26</i>
<i>Table 13 – Surveying Equipment.....</i>	<i>29</i>
<i>Table 14 – Weather Conditions.....</i>	<i>30</i>

1. Introduction

NOVA Acoustics Ltd has been commissioned to prepare a noise assessment for a residential development ('the proposed development') at 3 Lily Street, Milnrow, Rochdale, OL16 3LH ('the site'). The proposed development is for change of use of the first and second floor from offices to residential apartments.

The applicant has submitted planning application No. 25/20568/FUL ('the Application') to the Local Planning Authority ('LPA'), Rochdale Borough Council. This report has been prepared to accompany the application.

A noise survey has been undertaken to establish the prevailing sound levels outside the proposed development, although access within the development was not arranged. 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 (2024).
- Noise Policy Statement for England (2010).
- British Standard BS 4142:2014+A1:2019 – 'Methods for rating and assessing industrial and commercial sound'.
- British Standard BS8233:2014 – 'Guidance on sound insulation and noise reduction for buildings'.
- ProPG: 'Planning and Noise 2017' (including supplementary documents 1 & 2).
- Approved Document O: Overheating (2021).
- Acoustics Ventilation Overheating: Residential Design Guide 2020' (AVO Guide).

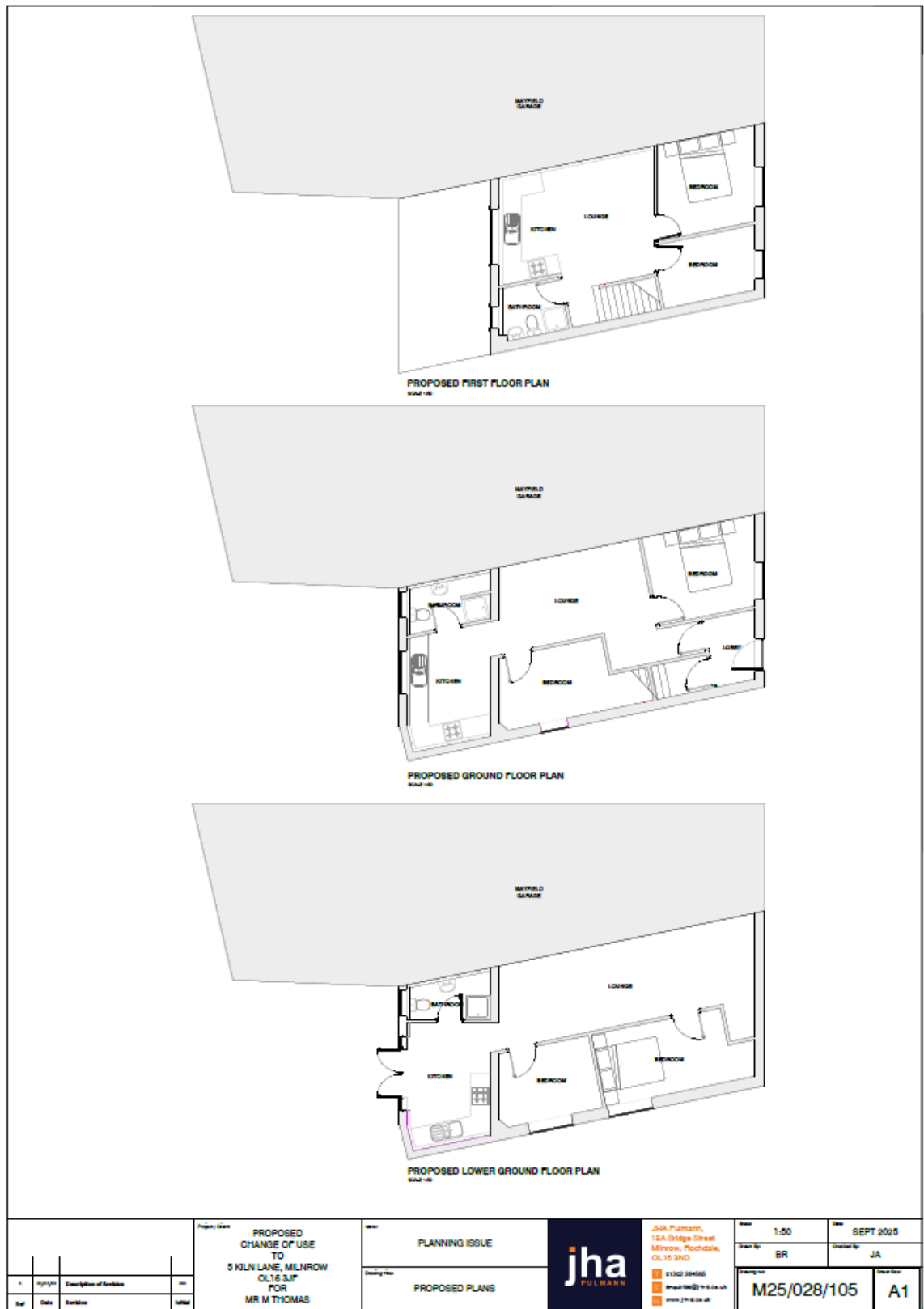
Further information on the legislation can be found in Appendix B.

1.2 Proposal Brief

The proposal is for the change of use of a 2-storey residential dwelling with a basement to form 3 No. 2-bedroom apartments. The building is structurally adjoined to an operational MOT garage.

Due to the layout of the building, the only shared partition between the existing MOT garage and residential is the party wall, which has been included within the assessment to ensure that noise breakthrough from within the structure does not result in unsuitable noise levels within the residential areas.

The figure overleaf shows the proposed development.



Drawing Ref No. M25/025/105 from JHA Pulmann

Figure 1 – Proposed Development

2. Environmental Noise Survey

2.1 Measurement Methodology

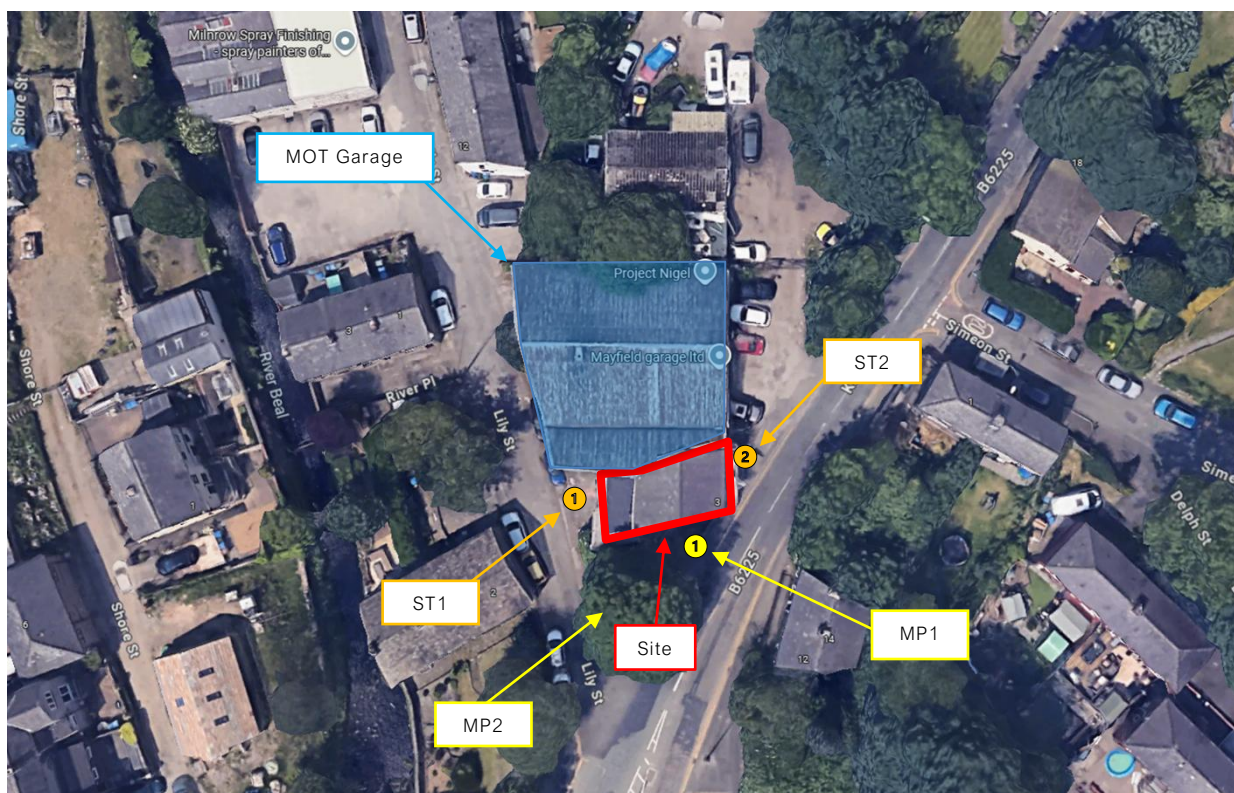
The following table outlines the measurement dates and particulars. In all instances a 130mm diameter windshield was fitted to the microphones along with a suitable outdoor environmental kit. Details of the equipment used, and the meteorological conditions are available in Appendix D.

Note that a -3dB façade correction has been applied to all measured levels at MP1 to account for increased façade reflections.

Location	Survey Dates	Measurement Particulars
MP1	10/10/25 – 13/10/25	Equipment mounted to a lamppost at a height of approximately 4m to the southeast of the proposed development approximately 1.4m from the façade.
ST1	10/10/25 13:45 – 14:00 13/10/25 09:07 -09:37	Equipment mounted on a tripod at a height of 1.5m to the rear of the proposed development in front of the rear access roller shutter doors to the MOT garage.
ST2	10/10/25 14:01 – 14:31 13/10/25 09:37 -10:07	Equipment mounted on a tripod at a height of 1.5m to the front of the proposed development approximately 2m from the front façade.

Table 1 – Measurement Methodology

The figure below outlines the site surroundings and measurement locations:



Imagery ©2023 Google, Airbus Map data ©2025

Figure 2 – Measurement Locations and Site Surroundings

2.2 Context & Subjective Impression

The site is situated in a mixed-use area with residential properties to the east and west, with a collection of industrial buildings located to the north of the proposed site. The Mayfield MOT garage structurally adjoins the development to the north. The MOT garage features roller shutter entrances to the front and rear, both of which were open during the garage's operational hours.

The dominant noise source in the area was observed to be road traffic noise along Kiln Lane. The road was observed to have continuous traffic flow. Additionally, the road features a steeper incline, so it was observed that there was an increase in vehicle noise from the revving of engines from cars travelling in the up-slope direction.

Some noise breakout from the garage was also audible in the absence of road traffic (such as compressed air, drilling and impulsive noise from hammering). It was noted that the roller shutter door was left open to the front of the garage. However, road traffic was still deemed to be more dominant.

To the rear, it was witnessed that the roller shutter doors leading to the garage were only opened for access to the vehicle ramp. Once these roller shutter doors were closed again, noise breakout from the garage was significantly lower. Again, road traffic was more dominant once the roller shutter door was closed.

The operational hours for the adjoining garage are as presented below.

- Monday to Friday – 09:00 – 18:00 hours
- Saturday – 09:00 – 14:00 hours
- Sundays - Closed

2.3 Environmental Noise Survey Results

The following section outlines the measured sound levels during the unattended survey. 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)	$L_{AFmax,1min}$ (dB)*
		63	125	250	500	1k	2k	4k		
MP1	$L_{eq,16hr}$ (Day)	70	69	65	64	65	62	52	69	--
	$L_{eq,8hr}$ (Night)	63	61	59	58	60	54	46	62	82
*Exceeded 10 times or fewer per night.										

Table 2 – Unattended Sound Level Results Summary

The following table outlines the measured sound levels during the attended survey.

Location	Measurement Period ('T')	Octave Frequency Band (Hz, $L_{eq,T}$ dB)							$L_{Aeq,T}$ (dB)	$L_{AFmax,1min}$ (dB)
		63	125	250	500	1k	2k	4k		
ST1	10/10/2025 13:45 -14:00	64	58	57	58	56	49	41	60	74
	13/10/25 09:07 -09:37	66	59	56	54	55	52	49	60	84
ST2	10/10/25 14:01 – 14:31	76	73	70	69	71	66	58	74	88
	13/10/25 09:37 -10:07	73	72	70	69	72	67	59	74	89

Table 3 – Attended Sound Level Results Summary

3. BS4142 Noise Impact Assessment

Noise Sources & Subjective Impression

During the survey, it was not possible to undertake internal measurement within the Mayfield Garage. Therefore, previous measurements within an MOT garage and vehicle repair workshop re used to inform the assessment (report ref. NP-013347). This site is considered to operate in a similar manner and scale to that which adjoins the development site.

Note that due to the premises being operational and the continued use of the plant being required, residual measurements of the plant could not be obtained. Therefore, the levels reported in the table below have not been corrected for the residual level; instead, the measured ambient level has been used. This is a 'worst-case' approach, likely to overestimate the noise impact.

Location	Octave Band (Hz, L _{eq} dB)							Overall (dBA)
	63	125	250	500	1k	2k	4k	
Internal Ambient of MOT Bays (shorter duration)	65	61	64	65	64	64	62	70
Internal Ambient of Body Shop (1hr in duration)	67	70	67	66	63	64	67	73

Table 4 – Measured Sound Levels of Existing Plant and Processes

Background Sound Level Analysis

The following section outlines the measured background sound levels that have been used as the baseline for the subsequent BS4142 noise assessment. The figure below shows a histogram graph of the background sound levels measured during Sunday, when it is understood that the garage is not in operation.

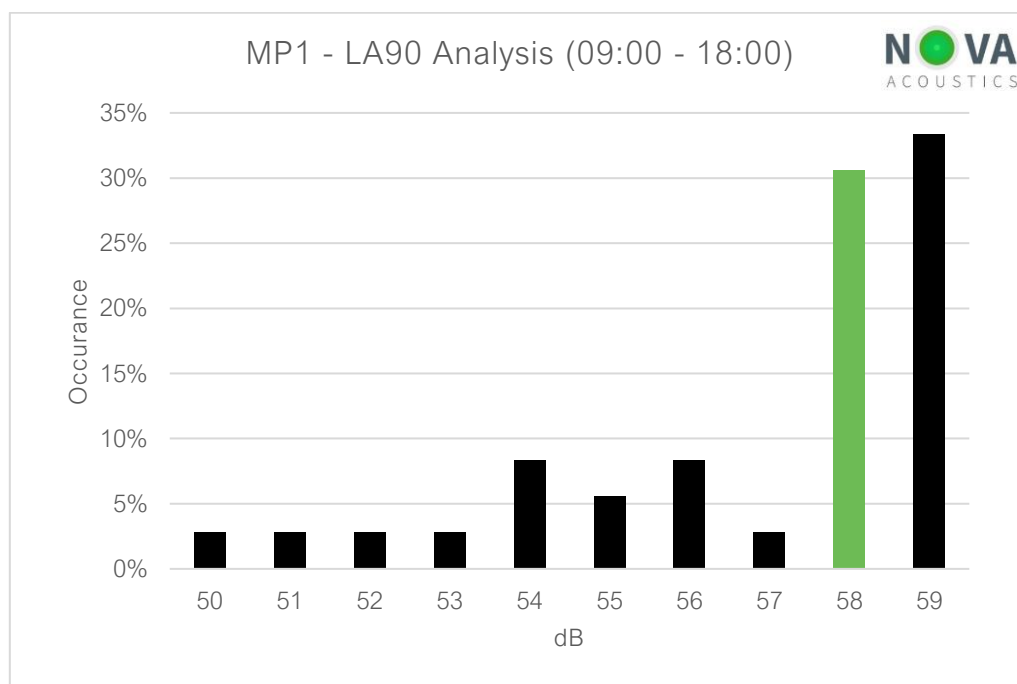


Figure 3 – MP1 Background Sound Level Analysis

Given the distribution of the measured $L_{A90,15min}$ values, 58dB is chosen as the background sound level that is representative during the operational hours of the Mayfield Garage.

Noise Breakout Emissions

The internal ambient noise level, measured throughout the entire body shop, has been incorporated into the breakout calculations. This approach reflects the longer duration of the measurements, providing a more accurate representation of typical tool usage and accounting for the actual percentage of operational time for various equipment.

The measurement captures activity involving multiple vehicles simultaneously, including the use of tools such as welders, slide hammers, hammers, pneumatic air lines, pneumatic sanders, hand sanders, and painting equipment. It is believed that using source noise from a body shop across both buildings will ensure a more thorough and reliable assessment.

In accordance with BS12354-4, the following has been assumed:

- The noise breakout emissions are continuous over the BS4142 reference daytime period of 1-hour.
- It is predicted that the roller shutter doors and garage access will remain open during operations, therefore no reduction has been applied for building elements.

BS4142 Noise Impact Assessment

The BS4142 noise impact assessment is presented in the table below.

Description	1/1 Octave Frequency Band (Hz, dB)								Overall (dBA)
	63	125	250	500	1k	2k	4k	8k	
Specific Sound Level at Most Exposed Window of Site (MP2)	46	49	46	45	42	43	46	46	52
On-time Correction	Front roller shutter door witnessed to be constantly open during operation of the garage.								0
Acoustic Feature Correction	A +6 dB penalty has been applied for a clearly perceptible impulsivity of noise breaking out from the garage								+6
Rating Sound Level (L _{Ar,Tr})									58
Background Sound Level	MP1 L _{A90,15min} in Figure 3.								58
Exceedance									+0
BS4142 Assessment Outcome	Low adverse impact, dependent on context.								
NPPF & NPSE Outcome	Below the LOAEL (Lowest Observed Adverse Effect Level).								
No further mitigation measures required.									

Table 5 – BS4142 Noise Impact Assessment (Front Façade)

Description	1/1 Octave Frequency Band (Hz, dB)								Overall (dBA)
	63	125	250	500	1k	2k	4k	8k	
Specific Sound Level at Most Exposed Window of Site (MP2)	55	58	55	54	51	52	55	55	61
On-time Correction	Rear roller shutter door noted to only be opened for access to the car ramp. This is assumed to be open for a maximum of 10 minutes every hour.								-8
Acoustic Feature Correction	A +6 dB penalty has been applied for a clearly perceptible impulsivity of noise breaking out from the garage								+6
Rating Sound Level (L _{Ar,Tr})									59
Background Sound Level	MP1 L _{A90,15min} in Figure 3.								58
Exceedance									+1
BS4142 Assessment Outcome	Low likelihood of adverse impact, dependent on context.								
NPPF & NPSE Outcome	Below the LOAEL (Lowest Observed Adverse Effect Level).								
No further mitigation measures required.									

Table 6 – BS4142 Noise Impact Assessment (Rear Façade)

Discussion

The assessment indicates that noise breakout from the garage is unlikely to result in adverse impacts at the development site, with a predicted rating level of up to 59dB $L_{A,r,Tr}$. This conclusion is, however, contingent upon appropriate management of the garage, particularly ensuring that the rear roller shutter remains predominantly closed, as was observed during the site visit.

Ambient sound measurements indicate that daytime road noise levels along the front of the development are approximately 69dB L_{Aeq} . Designing to this level will therefore provide additional protection against any potential noise associated with the garage. To provide a robust assessment, noise measurements measured at the front of the building are also used to inform the noise break-in assessment to the rear.

4. Noise Break-in Assessment and Sound Insulation Scheme

4.1 Internal Noise Level Criteria

The following table outlines the internal acoustic design criteria outlined within BS8233. This is typically adopted when the external environment is dominated by transportation noise, as is the case at the measurement location.

Activity	Location	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)
Resting	Living Room	35 dB $L_{Aeq,16hr}$ / NR30	--
Dining	Dining Room/Area	40 dB $L_{Aeq,16hr}$ / NR35	--
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hr}$ / NR30	30 dB $L_{Aeq,8hr}$ / NR25 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 7 – Acoustic Design Criteria (BS8233)

4.2 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.

Due to the elevated noise levels at the site, enhanced glazing is required in addition to acoustic ventilation units.

Description	Octave Frequency Band (Hz, dB)							Overall (dB)
	63	125	250	500	1k	2k	4k	
6mm Glass / 16mm Air Cavity / 6.8mm Optiphon Glass (SRI)	21	21	28	37	48	48	54	40 R_w (-6 C_{tr})
Greenwoods MA3051 (D_{ne})	30	46	45	50	55	65	67	55 $D_{ne,w}$ (-3 C_{tr})

Table 8 – 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.

It should be noted that the reduction from through-frame trickle ventilation is not likely suitable at the site. Therefore, the above specification is for a through-wall passive system. Alternatively, mechanical ventilation could be installed to provide background ventilation.

Given that the BS4142 assessment indicates a low likelihood of adverse impact, it is considered that noise associated with the garage is sufficiently masked along the front of the development. Therefore, low impact from the garage is expected should future occupants rely on windows to provide higher rates of ventilation.

To the rear, a low likelihood of impact is expected providing the roller shutter doors are only opened for short periods. Should the rear roller shutter door be left open for a significant period when noisy works are being undertaken, there is potential for adverse impacts at the residential development. Therefore, provision of a secondary ventilation/cooling system should be considered at the site.

5. Noise Breakthrough Assessment and Sound Insulation Scheme

5.1 Noise Breakthrough Criteria

The proposed development structurally adjoins an MOT Garage via a separating wall. BS8233:2014 states that the internal noise criteria includes '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 existing separating wall is expected to be a typical cavity wall construction. For the purpose of the breakthrough assessment this is assumed to be 2 butterfly-tied 70mm brick with a 90mm cavity filled with 60mm mineral wool.

Calculations have been undertaken using the internal ambient noise levels of a body shop presented in Table 4. The receiving room has been assumed as a furnished bedroom and a more stringent adopted criteria of NR25 has been used due to the potential impact from the breakout calculations.

The results of the calculations are presented in the table below.

Description	Octave Band (Hz, L _{eq} dB)								Overall (dBA)
	63	125	250	500	1k	2k	4k	8k	
Source Noise Level	67	70	67	66	63	64	67	67	73
SRI of cavity wall (R _w)	31	36	39	40	49	58	67	67	47
Calculated level inside Bedroom	35	32	26	24	12	4	-4	-4	24
NR25 Criteria	55	44	35	29	25	22	20	18	30
Exceedance	-20	-12	-9	-5	-13	-18	-24	-23	-6

Table 9 – Noise Breakthrough Calculation

As shown in the table above, the existing partition is capable of controlling noise breakthrough from the MOT garage without need for further mitigation or upgrades.

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.

A BS4142 noise impact assessment has indicated a low likelihood of adverse impact from the neighbouring Mayfield Garage. Additionally, noise from road traffic is deemed as the dominant source at the area, and as such, the sound insulation scheme focuses on external noise ingress from road noise.

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 4.2.
2. The separating wall between the structurally adjoining garage is capable of meeting the adopted criteria to control noise breakthrough from the garage into the residential flats.

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 (2024)

Government policy on noise is set out in the National Planning Policy Framework (NPPF), published in 2024. 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 187e, 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 198 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 198 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 – British Standard BS4142:2014+A1:2019 – Methods for rating and assessing industrial and commercial sound

Overview

BS4142:2014 sets out a method to assess the likely effect of sound from factories, industrial premises or fixed installations and sources of an industrial nature in commercial premises, on people who might be inside or outside a dwelling or premises used for residential purposes in the vicinity.

The procedure contained in BS4142:2014 for assessing the effect of sound on residential receptors is to compare the measured or predicted sound level from the source in question, the $L_{Aeq,T}$ 'specific sound level', immediately outside the dwelling with the $L_{A90,T}$ background sound level.

Where the sound contains a tonality, impulsivity, intermittency and other sound characteristics, then a correction depending on the grade of the aforementioned characteristics of the sound is added to the specific sound level to obtain the $L_{A,r}$ 'rating sound level'. A correction to include the consideration of a level of uncertainty in sound measurements, data and calculations can also be applied when necessary.

Rating Penalty

Section 9 of BS4142:2014 describes how the rating sound level should be derived from the specific sound level, by deriving a rating penalty.

BS4142:2014 states:

"Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. Where such features are present at the assessment location, add a character correction to the specific sound level to obtain the rating level. This can be approached in three ways:

- a) subjective method;*
- b) objective method for tonality;*
- c) reference method."*

Due to the nature of the development the subjective method has been adopted to derive the rating sound level from the specific sound level. This is discussed in Section 9.2 of BS4142:2014, which states:

"Where appropriate, establish a rating penalty for sound based on a subjective assessment of its characteristics. This would also be appropriate where a new source cannot be measured because it is only proposed at that time, but the characteristics of similar sources can subjectively be assessed. Correct the specific sound level if a tone, impulse or other characteristics occurs, or is expected to be present, for new or modified sound sources."

BS4142:2014 defines four characteristics that should be considered when deriving a rating penalty, namely; tonality; impulsivity; intermittency; and other sound characteristics, which are defined as:

a) Tonality

A rating penalty of +2 dB is applicable for a tone which is "just perceptible", +4 dB where a tone is "clearly perceptible", and +6 dB where a tone is "highly perceptible".

b) Impulsivity

A rating penalty of +3 dB is applicable for impulsivity which is "just perceptible", +6 dB where it is "clearly perceptible", and +9 dB where it is "highly perceptible".

c) Other Sound Characteristics

BS4142:2014 states that where "the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distance against the residual acoustic environment, a penalty of +3 dB can be applied."

d) *Intermittency*

BS4142:2014 states that when the “specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time ... if the intermittency is readily distinctive against the residual acoustic environment, a penalty of +3 dB can be applied.”

Background Sound Level

The background sound level is the underlying level of sound over a period, T, and is indicative of the relative quietness at a given location. It does not reflect the occurrence of transient and/or higher sound level events and is generally governed by continuous or semi-continuous sounds.

To ensure the background sound level values used within the assessment are reliable and suitably represent both the particular circumstance and periods of interest, efforts have been made to quantify a ‘typical’ background sound level for a given period. The purpose has not been to simply select the lowest measured value. Diurnal patterns have also been considered as they can have a major influence on background sound levels, for example, the middle of the night can be distinctly different (and potentially of lesser importance) compared to the start or end of the night time period for sleep purposes.

Since the intention is to determine a background sound level in the absence of the specific sound that is under consideration, it is necessary to understand that the background sound level can in some circumstances legitimately include industrial and/or commercial sounds that are present as separate to the specific sound.

Assessment of Impact

BS4142:2014 states: “The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs”. An estimation of the impact of the specific sound can be obtained by the difference of the rating sound level and the background sound level and considering the following:

- “Typically, the greater this difference, the greater the magnitude of the impact.”
- “A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.”
- “A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context.”
- “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 negligible impact, depending on the context.”

Interpreting the guidance given in BS4142:2014, with consideration of the guidance given in the NPSE and NPPG Noise, an estimation of the impact of the rating sound is summarised in the following text:

- A rating sound level that is +10 dB above the background sound level is likely to be an indication of a Significant Observed Adverse Effect Level;

- A rating sound level that is +5 dB above the background sound level is likely to be an indication of a Lowest Observed Adverse Effect Level;
- The lower the rating sound 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 sound level does not exceed the background sound level, this is an indication of the specific sound source having a negligible impact and would therefore be classified as a No Observed Adverse Effect Level.

During the daytime, the assessment is carried out over a reference time period of 1-hour. The periods associated with day or night, for the purposes of the Standard, are 07.00 to 23.00 and 23.00 to 07.00, respectively.

B.4 – 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.

BS8233:2014 Internal Ambient Noise Level Criteria			
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 10 – 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 times 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.5 – ProPG: Planning and Noise (2017)

ProPG Planning and Noise published May 2017 by the Association of Noise Consultants (ANC) was produced to provide practitioners with guidance on a recommended approach to the management of noise within the planning system in England. ProPG aims to encourage better acoustic design of new residential developments promoting good health and wellbeing through the effective management of noise. It therefore outlines four key elements which should be considered in the assessment of noise:

- Element 1 – demonstrating a “Good Acoustic Design Process”.
- Element 2 – observing internal “Noise Level Guidelines”.
- Element 3 – undertaking an “External Amenity Area Noise Assessment”.
- Element 4 – consideration of “Other Relevant Issues”.

The ProPG supplementary document 2 provides the following ‘Good Acoustic Design’ hierarchy of noise management measures which LPAs should encourage. These are shown below, In descending order of preference:

Order of Preference	Noise Management Measure
1	Reduction of the noise generated at source by redesign, relocation or containment. *
2	Maximising the spatial separation of noise source(s) and receptor(s).
3	Using existing topography and existing structures (that are likely to last the expected life of the noise-sensitive scheme) to screen the proposed development site from significant sources of noise.
4	Investigating the necessity and feasibility of reducing existing noise levels and relocating existing noise sources.
5	Incorporating noise barriers as part of the scheme to screen the proposed development site from significant sources of noise.
6	Using the layout of the scheme to reduce noise propagation across the site.
7	Using the orientation of buildings to reduce the noise exposure of noise sensitive rooms.
8	Using the building envelope to mitigate noise to acceptable levels.

Table 11 – Hierarchy of Noise Management Measures

*Not from ProPG

B.6 – 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.7 - 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
$L_{Aeq, T}$ ^[Note 3] during 07:00 - 23:00 $L_{Aeq, 8hr}$ during 23:00 - 07:00 High 65 dB 55 dB Medium 60 dB 50 dB Low 55 dB 50 dB Negligible 50 dB 45 dB	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 4 – 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.

AVO Guide (2020) Level 1 Risk Assessment			
Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)	Risk Category	Mitigation
≥ 63 dB $L_{Aeq,16hour}$	≥ 55 dB $L_{Aeq,8hour}$	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 $L_{Aeq,16hour}$	52 – 54 dB $L_{Aeq,8hour}$	Medium Risk	Level 2 assessment optional to give more confidence regarding the suitability of internal noise conditions.
54 – 56 dB $L_{Aeq,16hour}$	49 – 51 dB $L_{Aeq,8hour}$	Low Risk	
≤ 53 dB $L_{Aeq,16hour}$	≤ 48 dB $L_{Aeq,8hour}$	Negligible Risk	None required – openable windows suitable for ventilation

Table 12 – AVO Guide (2020) Level 1 Risk Assessment

Level 2 Risk Assessment:

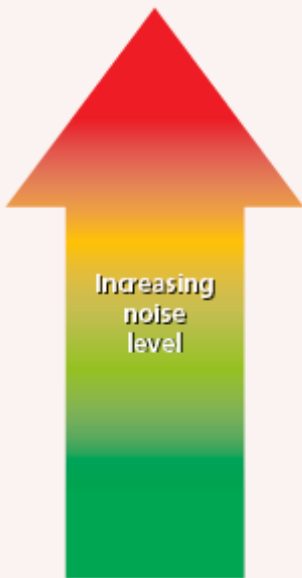
A 'Level 2' assessment of noise is recommended where a dwelling using purge ventilation (e.g., open windows) reaches Level 1 'High Risk' or 'Medium Risk'. The Level 2 assessment guidance comments that where internal ambient noise levels are >50 dB $L_{Aeq,16hr}$ (day) or >42 dB $L_{Aeq,8hr}$ (night) 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.

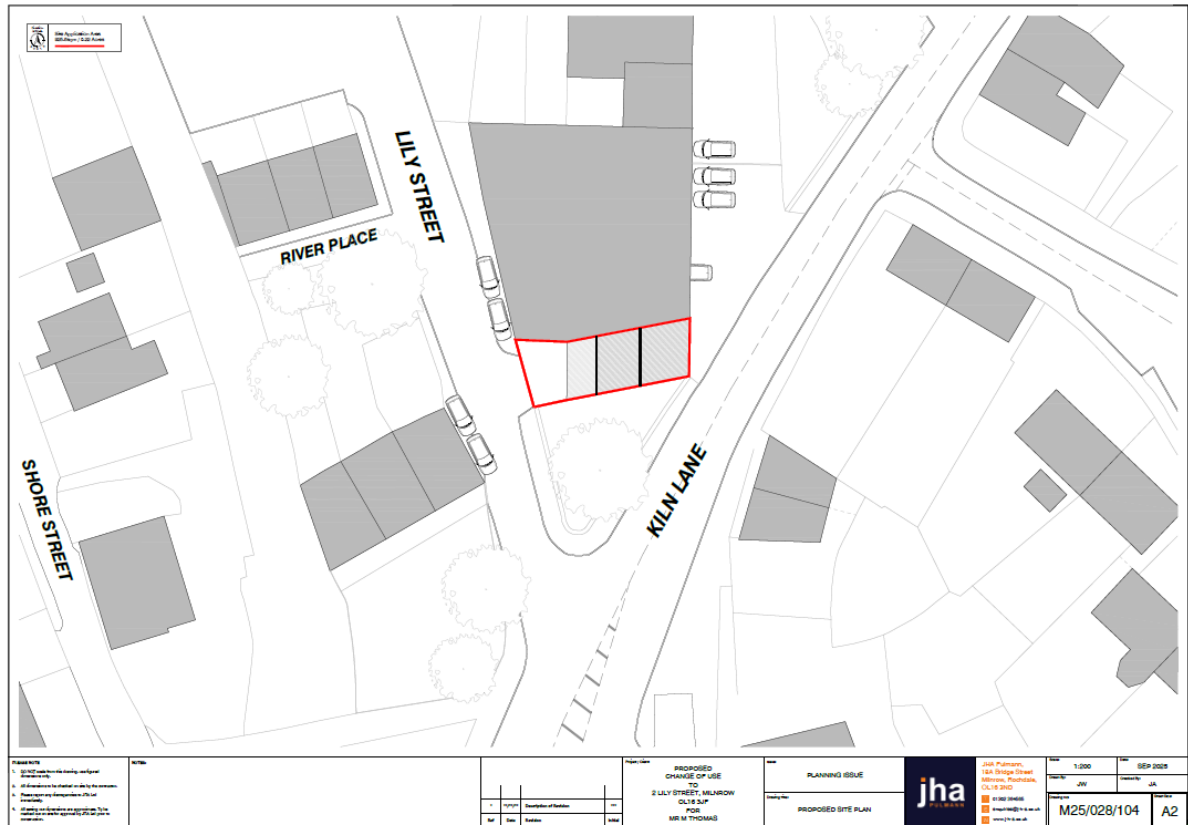
Internal ambient noise level ^[Note 2]			Examples of Outcomes ^[Note 5]	
$L_{Aeq,T}$ ^[Note 3] during 07:00 – 23:00 ^[Note 6]	$L_{Aeq,8h}$ during 23:00 – 07:00	Individual noise events during 23:00 – 07:00 ^[Note 4]		
> 50 dB	> 42 dB	Normally exceeds 65 dB $L_{A,Fmax}$	Noise causes a material change in 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 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 5]
≤ 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 5] . 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 5 – AVO Guide Level 2 Internal Ambient Noise Levels

Appendix C – Location Plans



Appendix D – Environmental Survey

D.1 – Time History Noise Data

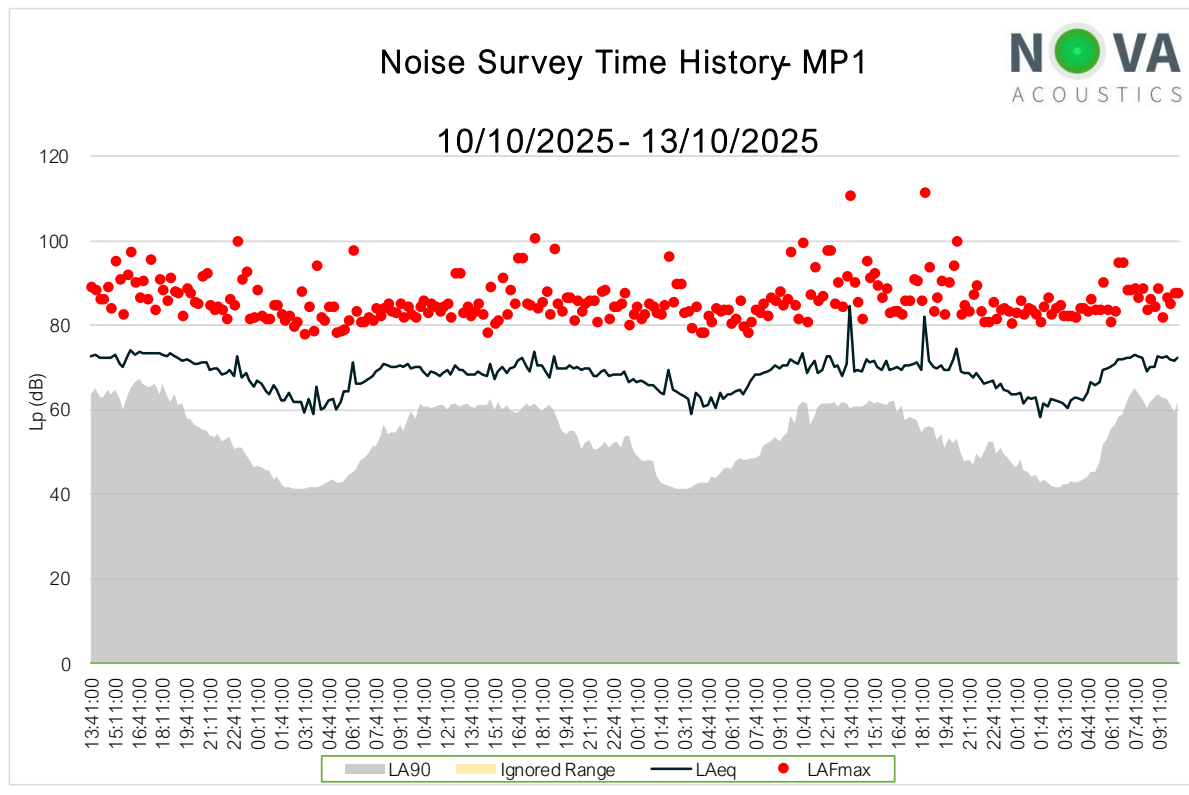


Figure 6 – MP1 Noise Survey Time History

D.2 – Surveying Equipment

Piece of Equipment	Serial No.	Calibration Deviation
Svantek SV971A Class 1 Sound Level Meter	154353	≤ 0.2
Svantek SV36 Class 1 Calibrator	106876	
Svantek SV971A Class 1 Sound Level Meter	162046	≤ 0.2
Svantek SV36 Class 1 Calibrator	106876	

Table 13 – 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 ≤ 0.2 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 – OL12 Weather, Rochdale (Approx. 3.3km NNW of Site)				
Time Period	Air Temp (°C)	Rainfall (mm/h)	Prevailing Wind Direction	Wind Speed (m/s)
10/10/25 – 00:00 – 23:59	11.3 – 13.8	0.0	SSW	0.0 – 3.4
11/10/25 – 00:00 – 23:59	5.7 – 15.8	0.0 – 0.6	WSW	0.0 – 2.7
12/10/25 – 00:00 – 23:59	4.2 – 14.4	0.0 – 0.6	SSE	0.0 – 2.8
13/10/25 – 00:00 – 23:59	8.2 – 14.4	0.0	SE	0.0 – 2.0

Table 14 – 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 BS8233:2014 and BS EN 12354-3.
- Based on previous experience and measurements of reverberation within furnished rooms, reverberation times of 0.5 seconds and 0.3 seconds are assumed for living rooms and bedrooms, respectively.
- Based on the technical drawings provided to NOVA Acoustics, window areas of 2.3m² and room volumes of 22.5m³ are used in the calculations for bedrooms as a worst-case scenario. Its noted that no living rooms have a window so the assessment has been restricted to bedrooms
- The acoustic performance of the façade elements are 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 habitable room has been used in the calculations, which equates to 2 No. trickle vents (2500mm² each).

Bedrooms Day Time Leq

Item / Description	dB(A)	63	125	250	500	1k	2k	4k	8k
Measured Leq,T	69	70	69	65	64	65	62	52	47
Glazing Noise Ingress	29	44	43	32	22	12	8	-7	-12
Ventilation Noise Ingress	23	45	27	25	18	14	1	-11	-16
Wall Noise Ingress	11	27	20	15	3	4	0	-9	-15
Roof Noise Ingress									
Room Absorption Correction		-1	-1	-2	-2	-2	-2	-4	-5
Total Noise Ingress	32	50	45	34	24	18	10	-5	-11
NR30	35	59	48	39	33	30	26	24	22
Exceedance of Criteria	-3	-9	-3	-5	-9	-12	-16	-29	-33

Bedrooms Night Time Leq

Item / Description	dB(A)	63	125	250	500	1k	2k	4k	8k
Measured Leq,T	63	63	61	59	58	60	54	46	41
Glazing Noise Ingress	22	36	35	26	16	7	1	-13	-18
Ventilation Noise Ingress	16	37	19	18	13	9	-7	-17	-21
Wall Noise Ingress	4	19	12	8	-2	-2	-7	-15	-20
Roof Noise Ingress									
Room Absorption Correction		-1	-1	-2	-2	-2	-2	-4	-5
Total Noise Ingress	25	42	37	28	19	12	3	-11	-17
NR25	30	55	43	35	28	25	21	19	17
Exceedance of Criteria	-5	-13	-6	-7	-9	-13	-18	-30	-34

Bedrooms Night Time Max

Item / Description	dB(A)	63	125	250	500	1k	2k	4k	8k
Measured Lmax	82	82	81	78	79	79	74	69	67
Glazing Noise Ingress	42	56	55	45	37	25	21	9	8
Ventilation Noise Ingress	36	56	39	38	33	28	14	6	5
Wall Noise Ingress	24	38	32	28	19	17	13	7	6
Roof Noise Ingress									
Room Absorption Correction		-1	-1	-2	-2	-2	-2	-4	-5
Total Noise Ingress	44	61	57	47	40	31	23	12	9
NR40	45	67	56	49	43	40	37	34	33
Exceedance of Criteria	-1	-6	1	-2	-3	-9	-14	-22	-24



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