Residential Noise Assessment

Site Address: 3 Holbeach Road, Spalding, PE11 2HJ

Client Name: Masterplan Design Limited

Project Reference: NP-012186

Authorisation and Version Control		
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Amendment History		
Revision	Date	Summary of Amendments
05	16/04/2026	Updated site plans.

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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 3 Holbeach Road, Spalding, PE11 2HJ ('the site').

The applicant is preparing to submit a Class MA prior notification application to the Local Planning Authority ('LPA'), South Holland District Council. This report has been prepared to accompany a Class MA Prior notification application.

A noise survey has been undertaken to establish the prevailing sound levels at the proposed development. The findings have been used to assess the suitability of the site for residential use. Measures required to mitigate noise impacts have been assessed in accordance with the relevant performance standards, legislation, policy, and guidance. The 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 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)
- British Standard BS4142:2014+A1:2019 – 'Methods for rating and assessing industrial and commercial sound'

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

1.2 Local Planning Authority & Background

The client has received pre-application advice in relation to a residential scheme at the site. In terms of noise, it is understood that concerns have been raised regarding *'significant potential for noise disturbance impacting the potential occupants'*.

No specific criteria or assessment methodology have been provided. As such, the noise impact assessment is based on NOVA Acoustics' previous experience as well as the guidance and legislation documents presented in Section 1.1. In relation to any existing plant equipment that may affect the proposed residential scheme at the site, it is proposed that a criterion is set that would ensure the rating level from any equipment does not exceed the existing background sound level. In line with NPPF and NPSE, this would be an indication of 'Lowest Observed Adverse Effect Level' ('LOAEL') and this should be deemed acceptable.

2. Environmental Noise Survey

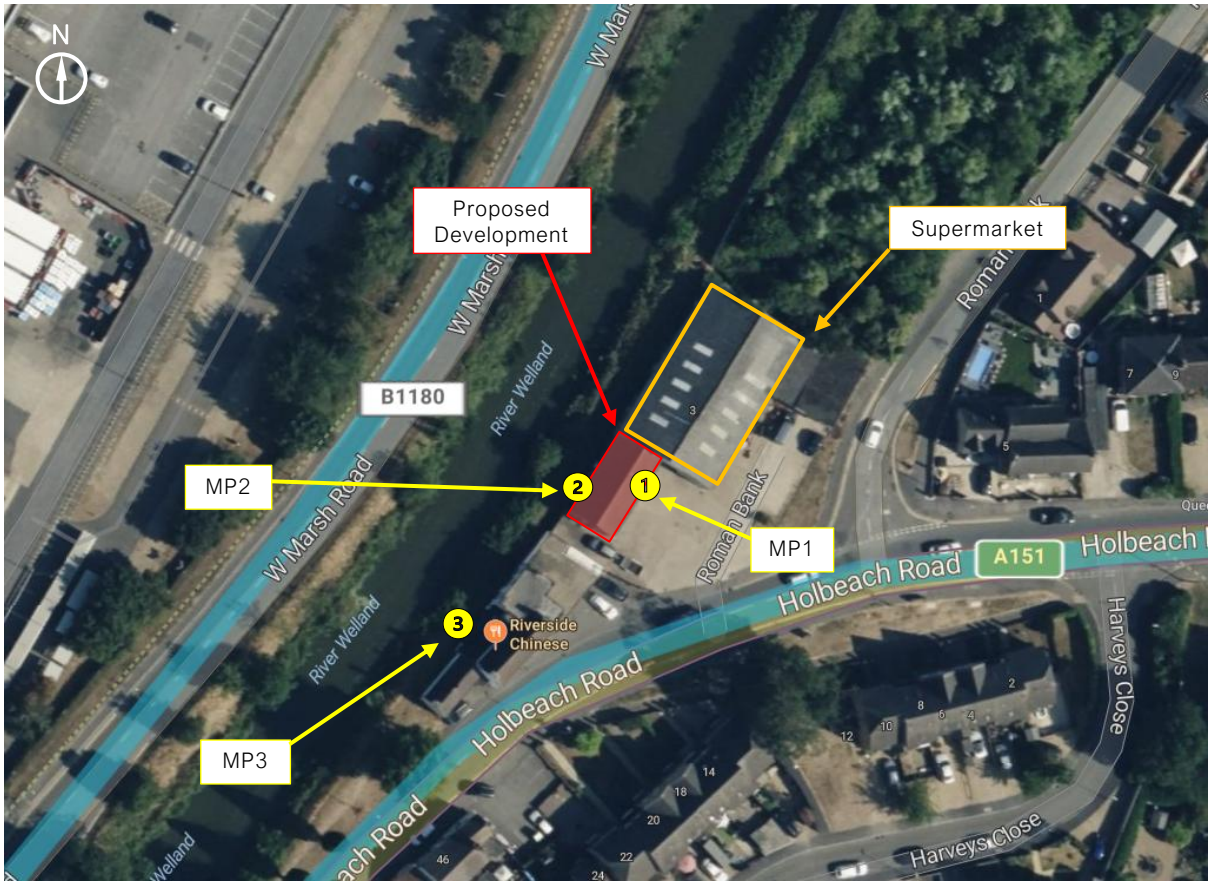
2.1 Measurement Methodology

A environmental noise survey was undertaken at the site to determine the existing noise climate affecting the facades of the proposed apartment. The following table outlines the measurement dates and particulars. Where measurements were undertaken under façade conditions, corrections have been applied to convert them to free-field levels. Weather conditions recorded during the survey and details of the equipment used can be found in Appendix C.

Location	Survey Dates	Measurement Particulars
MP1 (Unattended)	07/02/2025 – 10/02/2025	Equipment mounted protruding from a first-floor window at 1m distance from the south-eastern building façade.
MP2 (Unattended)		Equipment mounted protruding from a first-floor window at 1m distance from the north-western building façade.
MP3 (Attended)	07/02/2025	Equipment mounted on a tripod at 1.5m above ground, 2m from the plant associated with the Riverside Chinese restaurant. Measurements undertaken in free-field conditions.

Table 1 – Measurement Methodology

The figure below outlines the site surroundings and measurement locations:



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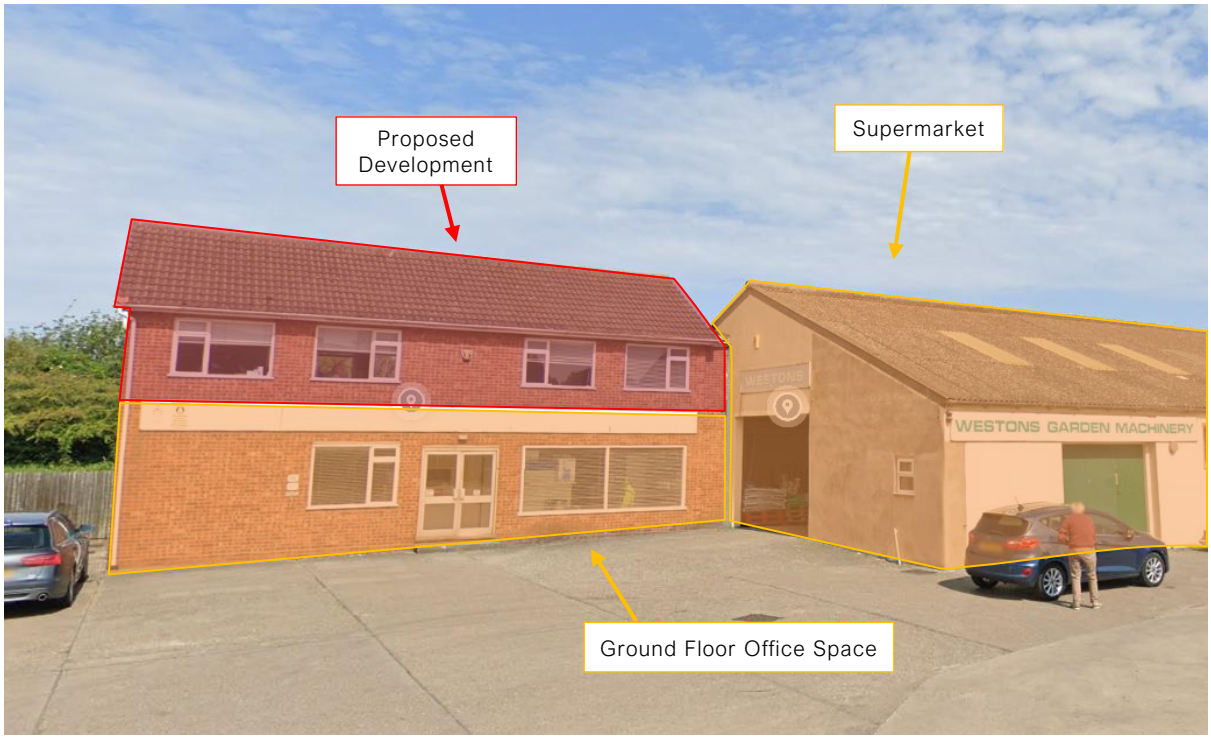
Figure 1 – Measurement Locations and Site Surroundings

2.2 Context & Subjective Impression

The proposed development site is located on the first floor of an existing commercial building off Roman Bank. The first floor was previously used an office and the ground floor and adjacent retail / shop are now functioning as a Green Holland Supermarket. These spaces are owned by the same client as the proposed development. Based on their locations, the proposed development site shares a separating wall to the north-east with the supermarket that will be retained. The supermarket only operates during daytime hours between 08:00 – 23:00 hours. A 3D site layout is shown below.

It is understood that there is no change to the planning class (Class E) of the ground floor and supermarket space. It is understood that they only operate during daytime hours. The applicant has informed NOVA Acoustics that the supermarket and office area only operates with at most, low level background music.

The roller shutter door to the supermarket has now been blocked up with the main entrance now located on the south-eastern elevation, facing away from the proposed apartment



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Figure 3 – 3D Site Layout

The site is bound by Holbeach Road to the to the south-east and the River Welland to the north-west, beyond which lies West March Road. On the other side of West March Road is a large industrial estate, the operator of which is unknown, as well as its operating hours.

To the south-west of the site is the Riverside Chinese restaurant. This operates between 17:00 and 23:00 hours, seven days a week. There is an extract fan located on its north-western façade.

The acoustic environment is deemed to be high in level and the noise profile is dominated by road traffic noise emissions from traffic on the surrounding roads.

2.3 Unattended Environmental Noise Survey Results

A summary of the noise levels measured during the survey is shown in the table below. The time history results can be found in Appendix C. The tenth highest maximum sound level measured over a 1-minute sampling period is also presented. Please note that all results have been corrected to free-field levels.

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)	63	57	58	57	61	57	48	64	--
	$L_{eq,8hr}$ (Night)	60	54	55	53	57	53	48	60	77
MP2	$L_{eq,16hr}$ (Day)	63	56	56	56	60	58	56	61	--
	$L_{eq,8hr}$ (Night)	60	53	54	51	54	49	40	57	72

Table 2 – Sound Level Results Summary

As identified above, the noise levels affecting the south-eastern façade at MP1 are slightly higher than those impacting the north-western façade at MP2.

2.4 Attended Environmental Noise Survey Results

Whilst on-site, a measurement of the plant to the rear of the Riverside Chinese restaurant was undertaken.

Measurements were carried out at 2m from the fan outlet. The determined specific sound level is shown below. These were conducted whilst the plant equipment was understood to be operating at its maximum permitted capacity.

Location	Description	Octave Band (Hz, L_{eq} dB)								Overall (dBA)
		63	125	250	500	1k	2k	4k	8k	
MP3	Specific Sound Level	68	64	66	61	61	55	47	42	64

Table 3 – Calculated Specific Sound Level at NSR

2.5 Background Sound Level Analysis

As there is existing plant associated with the Riverside Chinese, a review of the background sound levels measured at MP2 is presented below.

Based on online sources, the Riverside Chinese operates from 17:00 to 23:00 hours, seven days a week. However, on-site observations were that the plant equipment operates outside of these hours. Therefore, for robustness, a review of background sound levels measured during the night has been carried out. This is deemed to represent a worst-case scenario.

The figure below shows a histogram graph of the background sound levels measured during the night.

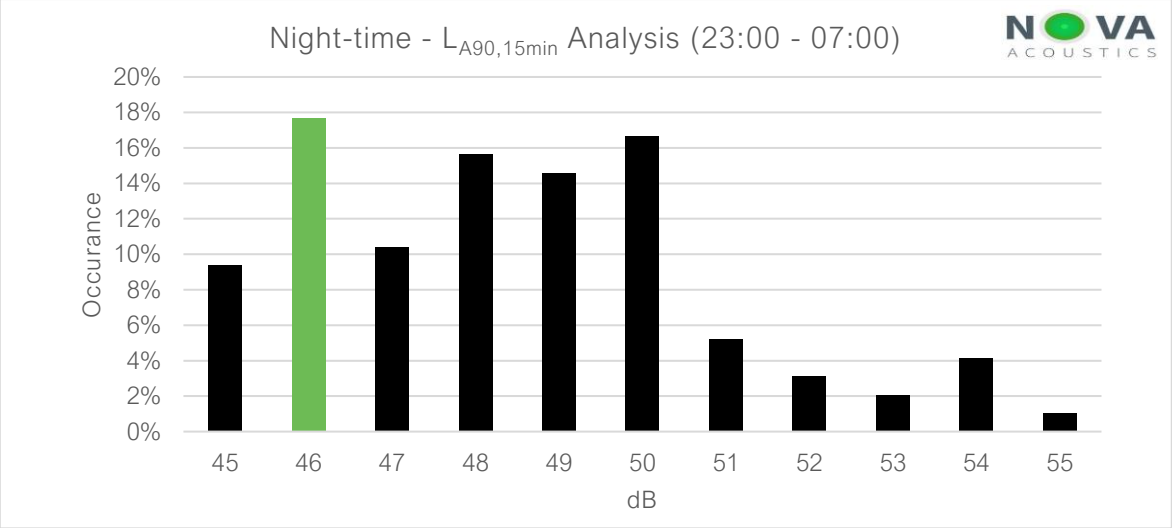


Figure 2 – MP2 Night-time Operational Hours Background Sound Level Analysis

As can be seen, the value of 46dB is considered to be the 'lowest typical' $L_{A90,15min}$. As such, this will be used as the baseline for the daytime BS4142 assessments. For context, the typical daytime background sound level is 50dB $L_{A90,15min}$.

3. Noise Break-in Assessment and Sound Insulation Scheme

3.1 Internal Noise Level Criteria

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 $L_{Aeq,16hr}$ / 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 4 – 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 Determined External Noise Levels from Supermarket Unit

The entrance to the convenience store is now located away from the site on the south-eastern façade with the current roller shutter door located on its western façade now being blocked up.

The area that has been blocked up is understood to be an insulated timber frame construction. This would achieve approximately 35dB R_w.

The remainder of the external envelope of the shop is comprised of masonry walls with a metal framed roof. It is understood that this is not lined. Calculations indicate that the roof would, therefore, be the weakest element of the external envelope and its performance would not be expected to exceed 25dB R_w.

As all elements within the external envelope are expected to provide a minimum of 10dB more sound insulation than the roof, noise breakout via these other elements has not been considered further as it will not impact the measurements.

Calculations have been undertaken in accordance with BS12354-4:2000, focusing on the breakout from the weakest element, the roof. The following parameters have been considered in the calculations:

- The internal noise level will not exceed 80dBA, based on the example internal noise levels stated in 'The Little Red Book of Acoustics' for a busy restaurant which is deemed to be a worst case sccenario.
- An approximate roof size of 225m^2 has been allowed for. It is assumed that this is approximately 5m away from the receptor.
- A C_d correction of -5 dB for the difference between internal reverberant conditions and external conditions.

The calculations and noise impact assessment during the more sensitive night-time period are provided in the table below.

Item / Description	1/1 Octave Frequency Band (Hz, dB)							Overall
	63	125	250	500	1k	2k	4k	
Internal Ambient Sound Level of Supermarket	60	70	75	75	75	75	70	80dBA
SRI of Roof	15	16	19	23	26	22	39	24 R_W
Cd Correction	-5							--
Distance Correction to NSR (5m)	-23							--
External Noise Level at NSR	41	50	52	48	45	49	27	52dBA

Table 5 – Supermarket Noise Breakout Assessment

As can be seen, the noise breakout from the supermarket is expected to be 12dB below the daytime ambient noise levels measured at MP1. As such, noise breakout will inherently be controlled, and further assessment is not required. As the ground floor is proposed to be admin offices for the supermarket, breakout from this area is also not considered further.

Given that the above is 12dB below the noise levels measured at MP1 from road traffic in the area, this does allow for some tolerance where internal noise levels within the supermarket may increase from the levels presented in Table 5 above. However, given that the client has confirmed the supermarket use, the above internal noise level of 80dBA is expected to be a worst case and deemed appropriate.

It is critical that all entrances to the supermarket are not left opened for sustained periods other than for brief entry and exit. Where this cannot be managed / maintained, a lobbied door system will need to be installed.

Summary

Considering the above, the external noise levels incident on the facades of the proposed first floor flat will be based on the noise levels measured in Table 2. Given there is similarity in the noise levels measured at MP1 and MP2, for robustness, only the higher noise levels measured at MP1 will be used to inform the

design of the external envelope. Whilst not audible on-site nor identified within the time histories, this will also account for any uncertainty in terms of noise breakout from the industrial units to the north-west.

3.3 Glazing and Background Ventilation Specification

Glazing and background ventilation specifications that achieve the relevant internal noise criteria are presented in the table below. Full calculations can be found in Appendix D.

Description	Octave Frequency Band (Hz, dB)							Overall (dB)
	63	125	250	500	1k	2k	4k	
Daytime Rooms – Living Rooms, Kitchen, etc.								
6mm Glass / 16mm Air Cavity / 6mm Glass (SRI)*	20	20	18	28	38	34	38	31 R_w (-4 C_{tr})
Greenwoods 2500EA.AC1 (2 No. Trickle) ($D_{n,e}$)*	31	41	40	37	47	43	46	42 $D_{n,e,w}$ (-2 C_{tr})
Night-time Rooms – Bedrooms Only								
6mm Optiphon Glass / 16mm Argon Cavity / 6.8mm Optiphon Glass (SRI)*	21	21	28	37	48	48	54	40 R_w (-6 C_{tr})
Greenwoods 2500EA.AC1 (2 No. Trickle) ($D_{n,e}$)*	31	41	40	37	47	43	46	42 $D_{n,e,w}$ (-2 C_{tr})

Notes:
**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.*
**Please note all ventilator performance shown above are based on them in the 'open' position.*
**If desired, as the glazing requirements are higher to bedrooms, for ease, this specification could also be installed to daytime rooms and the requirements would still be met.*

Table 6 – Glazing & Background Ventilation Specification

4. Overheating Screening Assessment

To avoid excessively high temperatures and provide adequate levels of thermal comfort within dwellings, an overheating mitigation strategy must 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 13 dB 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 (South-eastern)				
Daytime ($L_{Aeq,16hr}$)	50 [1]	63	64	+1
Night-time ($L_{Aeq,8hr}$)	42 [1]	55	60	+5
Night-time ($L_{AFmax,T}$) [2]	65 [1]	78	77	-1
Rear (North-western) & Side (South-western) Façade				
Daytime ($L_{Aeq,16hr}$)	50 [1]	63	61	-2
Night-time ($L_{Aeq,8hr}$)	42 [1]	55	57	+2
Night-time ($L_{AFmax,T}$) [2]	65 [1]	78	72	-6

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 7 – External Noise Level Limits for Overheating Criteria

4.2 Assessment

The noise levels incident on all facades of the proposed development exceeds the external noise criteria during the night-time, as shown in the table above. There is an exceedance during the daytime on the front façade, however, this is only 1dB and would be deemed marginal and acceptable.

In response to the above, an overheating assessment was completed by UK Building Compliance (ref: 114317). This report stated '.. installing both a solar control product and mechanical ventilation throughout the dwelling achieves compliance and mitigates overheating risk'. This would indicate that the site is at risk of overheating.

Based on this TM59 report and the findings of the above acoustic overheating assessment, a form of mitigating overheating, as an alternative to openable windows, would be required only during the night-time on all facades. During the daytime, openable windows can be utilised.

Alternative forms of ventilation include passive systems (such as acoustic louvres) and mechanical systems (such as 'centralised mechanical extract ventilation' and 'mechanical ventilation with heat recovery'). The installation of passive systems is generally preferable; however, the precise requirements must be confirmed with a ventilation specialist. It must also be ensured that all ventilation strategies are compliant with the requirements of Approved Document F.

It should be noted that this assessment relates exclusively to overheating mitigation, and as such, open windows may be used for purge ventilation without acoustic constraint. Further advice can be provided by NOVA Acoustics if required.

5. Noise Breakthrough Assessment and Sound Insulation Scheme

5.1 Noise Breakthrough Criteria

As previously stated, the first floor will share a separating floor with the ground floor offices areas. It will also share a section of its north-eastern wall with the supermarket. 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 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. The following is stated in section 0.8 of Part E:

> *"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 supermarket and office and provides a required sound insulation limit. Whilst the below planning class refers to food and drink, it is also applicable to office use.

Planning Class	Level of Risk from Noise	Required Sound Insulation Standard (dB)
E Sale of food and drink for consumption (mostly) on the premises	High	$\geq 55\ D_{nT,w} + C_{tr}$
Discussion: *The noise emissions produced by small supermarkets and offices could at most include low background level music. It would not be expected to generate high noise levels to that of a restaurant.*		

Table 8 – Noise Breakthrough Assessment

5.3 Testing Results Summary & Assessment

Airborne sound insulation testing was conducted on site using a Svantek 977 Class 1 sound level meter (S/N: 97493) and a Svantek 103 Dodecahedral Speaker. The sound level meter was field calibrated before and after testing and was found to have negligible calibration drift noted. The testing was conducted following 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 to indicate compliance.

The results below are indicative of the sound insulation performance of the separating partition between sensitive spaces and adjoining areas.

Test Type	Source Room	Receiving Room	Measured Level (dB)
Airborne Floor Test	Ground Floor Retail Office	First Floor Area	29 $D_{nT,w} + C_{tr}$
Airborne Floor Test	Ground Floor Retail Office Lobby	First Floor Area	30 $D_{nT,w} + C_{tr}$
Airborne Wall Test	Ground Floor Commercial	First Floor Area	47 $D_{nT,w} + C_{tr}$

Table 9 – Sound Insulation Testing Results

Based on the above, significant upgrades are required to all partitions.

Separating Floors

It is assumed that all the floors are a timber construction. An indicative specification that can achieve the required sound insulation standard is outlined below. The airborne sound reduction provided by the proposed system has been modelled in INSUL 9.0.

- 12mm Overlay Plywood
- 4mm MuteBarrier mass-loaded vinyl (min. surface mass of 10kg/m^2)
- 18mm flooring chipboard
- 200mm timber joists with 150mm Rockwool RW3 insulation (min. density of 60kg/m^3) tightly and evenly fitted
- MuteClip™ and Furring Channel System affixed to the underside of the joists (in accordance with the manufacturers guidelines)
- 2no. 15mm SoundBloc plasterboards (with overlapping joints and sealed with flexible mastic at the perimeter)

Separating Wall

It is understood that the wall face of the supermarket is constructed from two layers of brick. The construction on the first-floor apartment wall face is unknown, however, this appears to be an additional layer of brick, finished with plasterboard. It is unknown if this layer of brick is independent of the supermarket wall.

It is advised that a lining is fixed to one side of the wall face. The preference for this would be to install this on the supermarket side, however, this is not critical.

The lining would need to be constructed from timber studwork that is entirely independent from the structural wall and is installed such that a minimum cavity of 25mm is formed. The lining should be finished with 2no. layers of 15mm Gyproc SoundBloc and the cavity filled with 25mm mineral wool insulation (min. density of 30kg/m^3). Where this lining is to be installed on the apartment wall face, this would need to be installed on all rooms on the north-eastern façade.

It should be noted that this report provides indicative specifications 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.

It should also be noted that the above may not be sufficient if an alternative use, such as a restaurant or gymnasium (as per Class Use E), were to take over the unit. In such an instance, further upgrades would be required, and NOVA Acoustics should be consulted.

6. Plant Noise Breakout – Riverside Chinese

6.1 BS4142 Noise Impact Assessment

Whilst there is no external amenity spaces associated with the site, for robustness, a BS4142 assessment of the plant associated with the Riverside Chinese restaurant is presented below. Full calculations are provided in Appendix E.

The calculations and BS4142 noise impact assessment at the nearest window of the proposed development is the table below. It has been assumed that the plant operates continuously throughout the daytime and night-time periods as a worst-case scenario.

As the nearest window of the proposed development does not directly overlook the plant, a nominal -5dB of screening attenuation has been allowed for.

Description	1/1 Octave Frequency Band (Hz, dB)								Overall (dBA)
	63	125	250	500	1k	2k	4k	8k	
1no. External Fan (L_W)	82	78	80	75	75	69	61	56	79
Propagation Loss to Proposed Development	-32 (15m – Q2)								--
Screening Attenuation	-5								
Specific Sound Level at Proposed Development ($L_{Aeq,Tr}$)	45	41	43	38	38	32	24	19	42
Acoustic Feature Correction	*Whilst the units are assumed to operate continuously, there is a possible uncertainty in relation to this. Therefore, a +3dB penalty has been applied for potentially perceptible intermittent noise emissions.*								+3
Rating Sound Level ($L_{Ar,Tr}$)	Specific sound level plus rating penalties.								45
Background Sound Level ($L_{90,T}$)	MP2 night-time $L_{A90,15min}$ – Figure 3.								46
Exceedance	$L_{Ar,Tr} - L_{A90,15min}$								-1
BS4142 Initial Outcome	'Low Impact, dependent on context'.								

Table 10 – Calculations & BS4142 Noise Impact Assessment

Based on the above, there would be 'low impact, dependent on context' as per BS4142.

As the site has no external amenity areas and the glazing strategy relies on closed windows and trickle vents, internal noise levels due to mechanical plant will be inaudible against the prevailing noise climate (greater than 10dB below).

Given these contextual arguments, in line with NPSE and NPPF, this would indicate 'Lowest Observed Adverse Effect Level' ('LOAEL'). Based on the above, this would meet the requirements and should be deemed acceptable.

7. 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 systems, or suitable alternatives, should be installed as shown in section 3.3.
2. An overheating assessment has been completed in Section 4. The noise levels incident on all facades of the proposed development exceeds the external noise criteria during the night-time. There is an exceedance during the daytime on the front façade, however, this is only 1dB and would be deemed marginal and acceptable. It is understood that a TM59 assessment has been completed and has indicated that the development could be at risk of overheating. As such, alternative forms of mitigating overheating to openable windows would be required during the night-time. It is understood that an MVHR system will be installed
3. The separating walls and floors between the structurally adjoining supermarket and office space and the proposed development should be designed to achieve the required sound insulation. Indicative specifications have been provided in section 5. Further design assistance can be provided by NOVA Acoustics Ltd if required.
4. A BS4142 assessment has been completed in relation to the existing external plant associated with the Riverside Chinese restaurant. This is detailed in Section 6. In summary, there is not expected to be adverse impact from plant noise emissions.

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 $p0$ is the reference sound pressure (20 µPa)
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: $L_p = 10\log_{10}(p/p_0)^{2.}$ Wherehere: p is the root-mean-square sound pressure in pascals (Pa) and $p0$ is the reference sound pressure (20 µPa)
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 – 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 11 – 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.
    - Correctly sizing and jointing ducts.
    - 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.
    - 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.

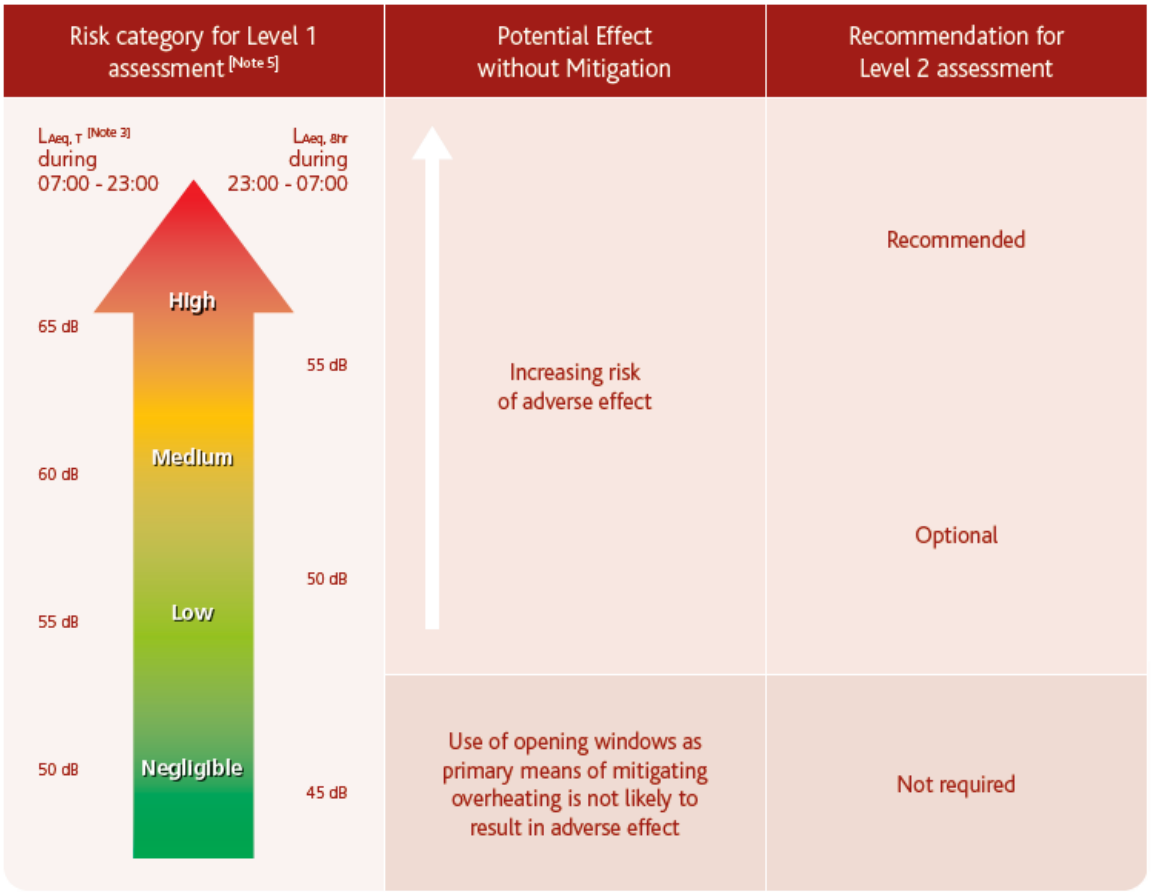


Table 3-2 of AVO Guide (2020)

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.

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.

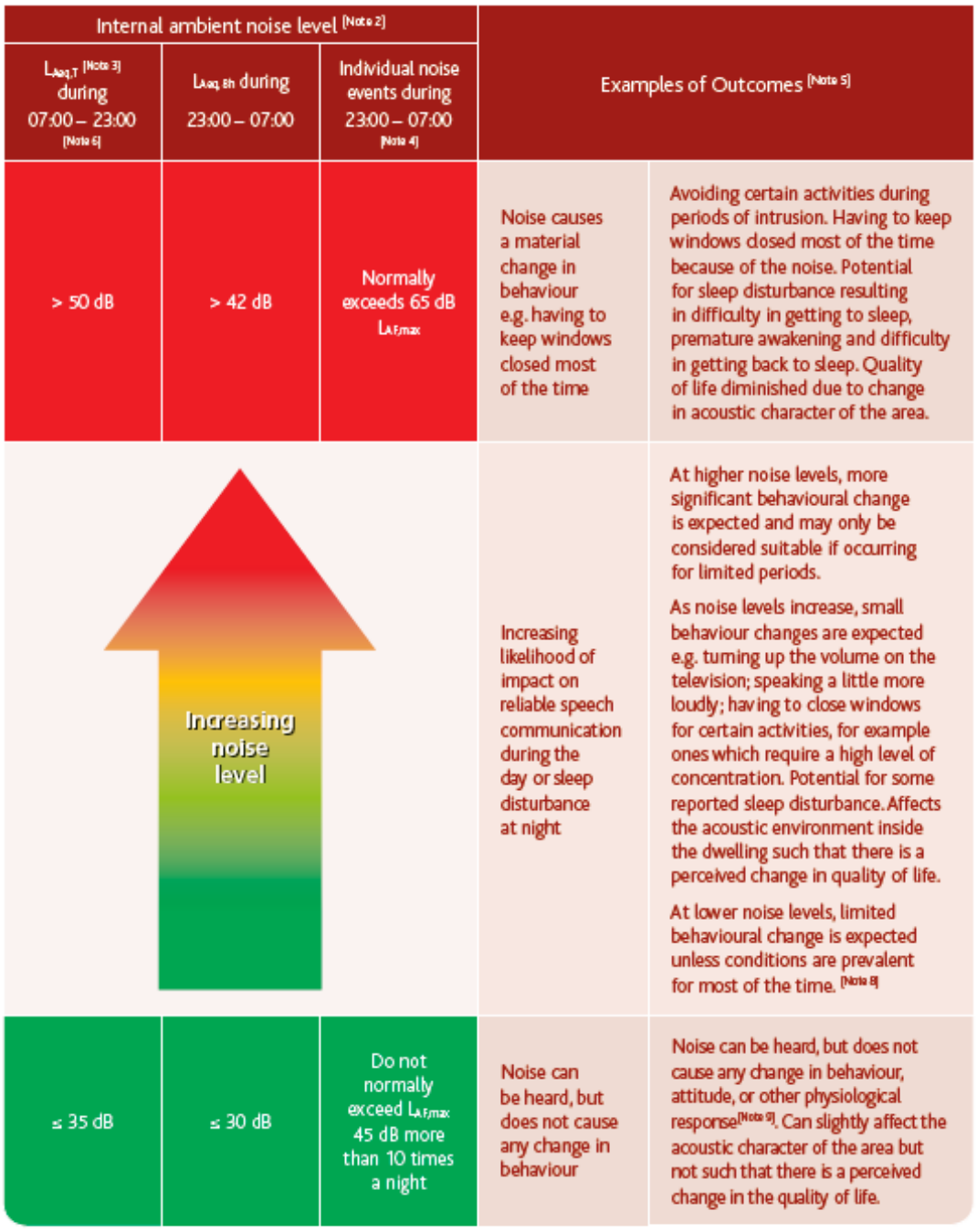


Table 3-3 of AVO Guide (2020)

Figure 4 – AVO Guide Level 2 Internal Ambient Noise Levels

Appendix C – Environmental Survey

C.1 – Time History Noise Data

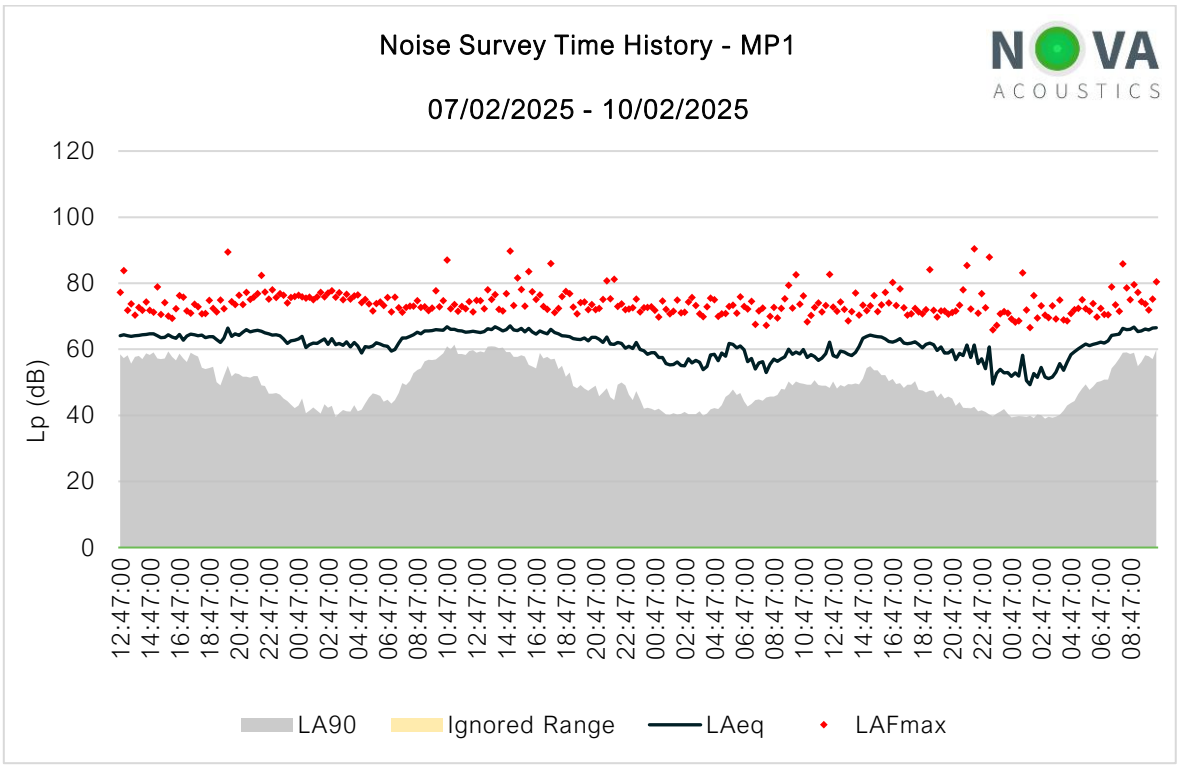


Figure 5 – MP1 Noise Survey Time History

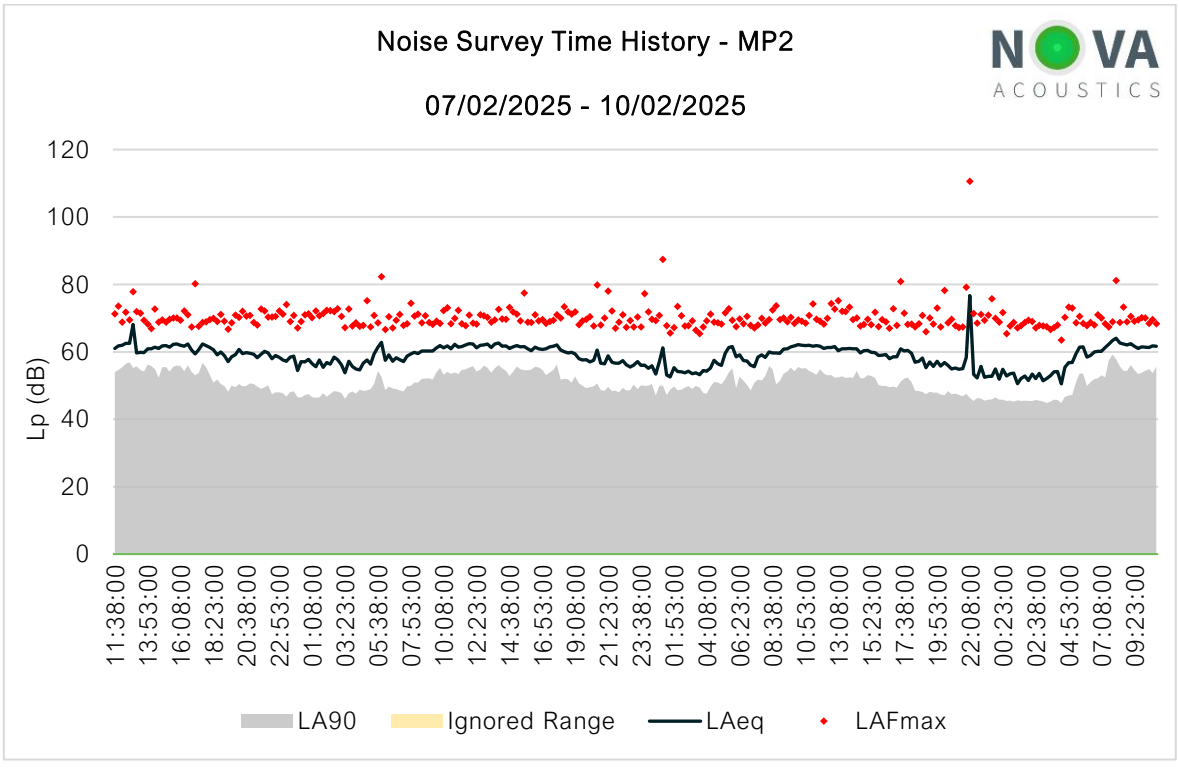


Figure 6 – MP2 Noise Survey Time History

C.2 – Surveying Equipment

Piece of Equipment	Serial No.	Calibration Deviation
Svantek SV971 Class 1 Sound Level Meter	77796	≤0.4
Svantek SV977 Class 1 Sound Level Meter	34826	≤0.1
Svantek SV971A Class 1 Sound Level Meter	113255	≤0.1
Svantek SV33B Class 1 Calibrator	116639	--

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 ≤0.4dB. 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.

C.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 – Baffensway (Approx. 5km NNW of Site)				
Time Period	Air Temp (^{0}C)	Rainfall (mm/h)	Prevailing Wind Direction	Wind Speed (m/s)
07/02/25 – 00:00 – 23:59	1.4 – 4.1	0.0 – 1.8	NNE	0.0 – 3.0
08/02/25 – 00:00 – 23:59	2.1 – 4.8	0.0 – 1.8	NNE	0.0 – 2.1
09/02/25 – 00:00 – 23:59	4.4 – 7.2	0.0	NNW	0.0 – 5.0
10/02/25 – 00:00 – 16:00	3.0 – 4.4	0.0	ENE	0.0 – 2.6

Notes:
As identified in the measurements, the rainfall identified above did not impact the results.

Table 14 – Weather Conditions

Appendix D – Noise Break-in Calculations

D.1 – Façades with Background Ventilation

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.
- The reverberation time is typically 0.5 seconds across the relevant frequency range for a furnished living room in the UK. This value is used for both living rooms and bedrooms.
- Technical drawings have not been provided to NOVA Acoustics at this stage. Therefore, glazed percentage areas of 50% and 40% have been used for living areas and bedrooms, respectively. Where the final designs show areas larger than this, these calculations may need to be reviewed and NOVA Acoustics should be consulted.
- The acoustic performance of the façade elements is taken from the relevant manufacturer's technical information, or the sound reduction has been predicted using INSUL 9.0.
- For background trickle ventilation a total Equivalent Area of 5000mm^2 per habitable room has been used in the calculations, which equates to 2 No. trickle vents (2500mm^2 each).

Living Room Day Time Leq

Item / Description	dB(A)	63	125	250	500	1k	2k	4k	8k
Measured Leq,T	64	63	57	58	57	61	57	48	48
Glazing Noise Ingress	31	40	34	37	26	20	20	7	7
Ventilation Noise Ingress	24	35	19	21	23	17	17	5	5
Wall Noise Ingress	9	19	15	13	4	3	-6	-15	-15
Roof Noise Ingress									
Room Absorption Correction		0	0	-1	-1	-1	-2	-3	-4
Total Noise Ingress	**34**	**44**	**37**	**39**	**30**	**24**	**23**	**9**	**8**
NR30	35	59	48	39	33	30	26	24	22
Exceedance of Criteria	-1	-15	-11	0	-3	-6	-3	-15	-14

Bedroom Day Time Leq

Item / Description	dB(A)	63	125	250	500	1k	2k	4k	8k
Measured Leq,T	64	63	57	58	57	61	57	48	48
Glazing Noise Ingress	21	38	32	26	16	9	5	-10	-10
Ventilation Noise Ingress	24	35	19	21	23	17	17	5	5
Wall Noise Ingress	9	20	16	14	5	4	-5	-14	-14
Roof Noise Ingress									
Room Absorption Correction		0	0	-1	-1	-1	-2	-3	-4
Total Noise Ingress	**28**	**43**	**35**	**30**	**26**	**20**	**19**	**6**	**5**
NR30	35	59	48	39	33	30	26	24	22
Exceedance of Criteria	-7	-16	-13	-9	-7	-10	-7	-18	-17

Bedroom Night Time Leq

Item / Description	dB(A)	63	125	250	500	1k	2k	4k	8k
Measured Leq,T	60	60	54	55	53	57	53	48	48
Glazing Noise Ingress	18	35	29	23	12	5	1	-10	-10
Ventilation Noise Ingress	21	32	16	18	19	13	13	5	5
Wall Noise Ingress	6	17	13	11	1	0	-9	-14	-14
Roof Noise Ingress									
Room Absorption Correction		0	0	-1	-1	-1	-2	-3	-4
Total Noise Ingress	**25**	**40**	**32**	**27**	**22**	**16**	**15**	**6**	**5**
NR25	30	55	43	35	28	25	21	19	17
Exceedance of Criteria	-5	-15	-11	-8	-6	-9	-6	-13	-12

Bedroom Night Time Max

Item / Description	dB(A)	63	125	250	500	1k	2k	4k	8k
Measured Lmax	77	81	73	74	73	73	70	67	62
Glazing Noise Ingress	38	56	48	42	32	21	18	9	4
Ventilation Noise Ingress	39	53	36	38	39	29	30	24	20
Wall Noise Ingress	25	38	32	30	21	15	8	4	0
Roof Noise Ingress									
Room Absorption Correction		0	0	-1	-1	-1	-2	-3	-4
Total Noise Ingress	**44**	**61**	**51**	**46**	**42**	**32**	**32**	**25**	**19**
NR40	45	67	56	49	43	40	37	34	33
Exceedance of Criteria	-1	-6	-5	-3	-1	-8	-5	-9	-14

Appendix E – Plant Calculations

Description	Item	Source Term	Parameter	dBA	1/1 Octave Frequency Band (Hz, dB) 63	125	250	500	1k	2k	4k	8k
Model / Unit	Riverside Chinese Plant	Octave-Band Lp	Lp at 2m, Q factor (Q=2)	65	68	64	66	61	61	55	47	42
No. of	1											
Data Type	Manufacturers Data		Total Lw	79	82	78	80	75	75	69	61	56
Source Mitigation	No											
Description	e.g. Caice Enclosure											
Time Corrected Lw of Fixed Plant	On-Time (min)	Time Period	Correction (dB)									
	60	Day	0	79	82	78	80	75	75	69	61	56
Propagation Loss to NSR1 (Point Source)	Distance (m)	Q Factor	Loss (dB)						Shielding (dB)			Yes
	15	2	-32		-5	-5	-5	-5	-5	-5	-5	-5
Specific Sound Level at NSR1				42	45	41	43	38	38	32	24	19

Item / Description	Source/Notes	dB(A)	63	125	250	500	1k	2k	4k	8k
Cumulative Specific Sound Level		42	45	41	43	39	39	33	25	20
Acoustic Feature Corrections	Tonality (dB) None 0	Justification								
	Intermittency (dB) Yes 3	Justification								
	Impulsivity (dB) None 0	Justification								
	Other (dB) None 0	Justification								
Rating Sound Level at NSR1		45								
Background Sound Level (L90)		46								
Exceedance		-1	Assessment indicates 'Low Impact, depenedent on context' in accordance with BS4142							


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