Residential Noise Assessment

Site Address: Dixon Hall and Co. Ltd, Grafton Street, Batley, WF17 6AR

Client Name: EDG Architecture

Project Reference No: NP-012659

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

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1. Introduction

NOVA Acoustics Ltd has been commissioned to prepare a noise assessment for a residential development ('the proposed development') at Dixon Hall and Co. Ltd, Grafton Street, Batley, WF17 6AR ('the site'). The proposed development is for Change of Use from Office Building to Residential Apartments and Associated Alterations. The site is subject to noise from road traffic emissions and commercial activity.

The applicant has received conditional approval for planning application no. 2024/62/93177/E ('the Application') from Kirklees Council. This report has been prepared to discharge Condition 4 imposed by the Local Planning Authority ('LPA').

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

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

1.1 Standards, Legislation, Policy & Guidance

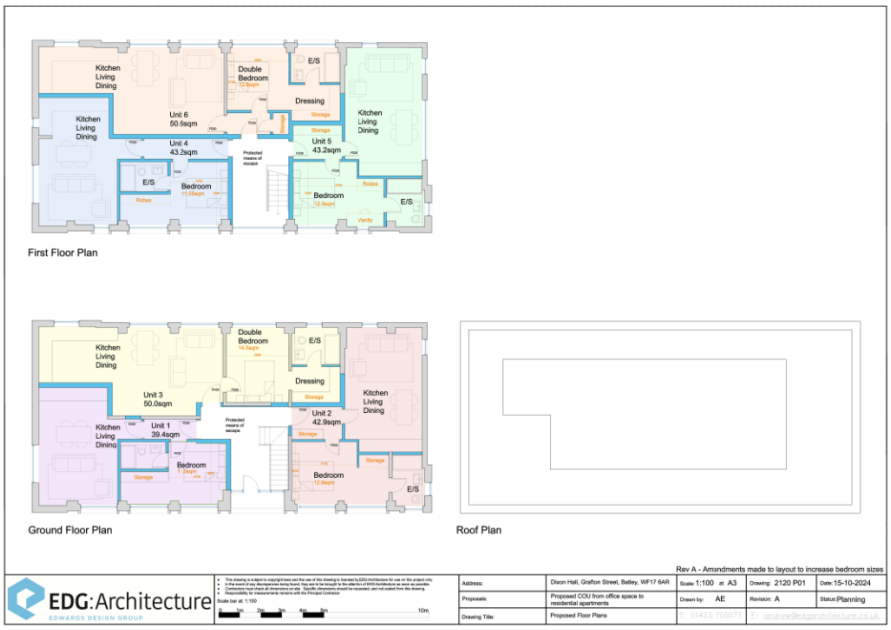
The following performance standards, legislation, policy, and guidance have been considered to ensure good acoustic design in the assessment:

- The Local Planning Authorities ('LPA') conditional approval; specifically, 'Condition 4'.
- 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).

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

1.2 Proposal Brief

The proposal is for the change of use of the existing building from offices to 6no. residential dwelling-flats. The figure below shows the proposed development.



Drawing Ref No. 2120 P01 A from 'EDG: Architecture'

Figure 1 – Proposed Development Floor Plans

1.3 Local Planning Authority & Background

The following condition of the approved planning application requires discharging:

- 2024/62/93177/E – Change of Use from Office Building to Residential Apartments and Associated Alterations:

Condition 4

Before construction work commences, a further/addendum report specifying the measures to be taken to protect the development from noise from all significant noise sources that are likely to affect the proposed development shall be submitted to and approved in writing by the Local Planning Authority. The report shall:

a) Determine the existing noise climate

b) Predict the noise climate in living rooms, bedrooms (night-time) and other habitable rooms of the development

c) Detail the proposed attenuation/design necessary to protect the amenity of the occupants of the new residences (including ventilation if required).

The development shall not be occupied until all works specified in the approved report have been carried out in full and such works shall be thereafter retained.

***Reason**: To protect the amenity of occupiers of the proposed development from noise or disturbance from nearby noise generating premises to accord with the aims of Policies LP24 and LP52 of the Kirklees Local Plan and Chapters 12 and 15 of the National Planning Policy Framework.*

2. Environmental Noise Survey

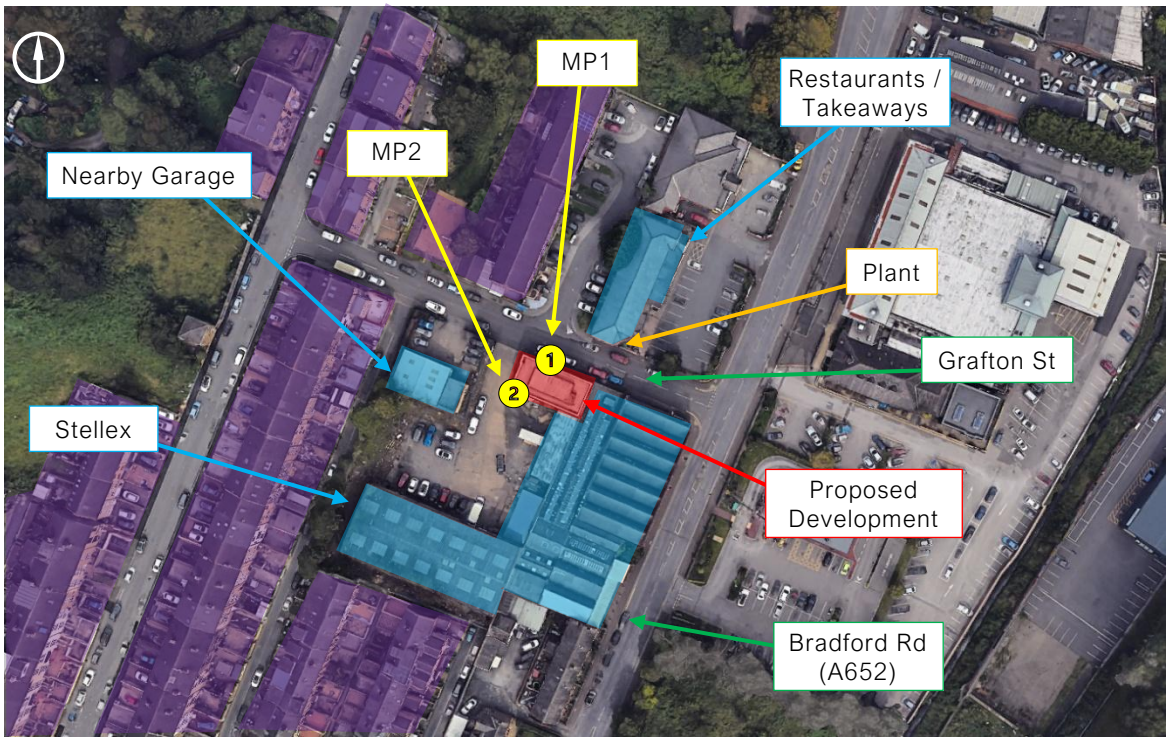
2.1 Measurement Methodology

The following table outlines the measurement dates and particulars. Details of the equipment used, and weather conditions recorded during the survey can be found in Appendix D.

Location	Survey Dates	Measurement Particulars
MP1	07/05/2025 – 09/05/2025	Equipment mounted on a lamp post at 1m distance from the building façade at a height of 3.5m on Grafton Street.
MP2	07/05/2025 – 09/05/2025	Equipment mounted protruding from a first-floor window at 1m distance from the building façade at the rear of the proposed development, overlooking the commercial yard.

Table 1 – Measurement Methodology

The figure below outlines the site surroundings and measurement locations:



Imagery ©2025 Google, Imagery ©2025 Airbus, Maxar Technologies, Map data ©2025

Figure 2 – Measurement Locations and Site Surroundings

2.2 Context & Subjective Impression

The proposed development site is situated off Grafton Street in Batley. The surrounding area exhibits a mixed-use character, comprising residential properties to the north, northeast, and west, while predominantly commercial establishments are located in close proximity in all directions.

The site was previously utilised as an office building and is currently under the ownership of Stellex, which also owns adjacent properties located to the rear of the site. Nearby commercial operations include

Grafton Street Autos, a vehicle repair facility; several takeaway/restaurant outlets situated opposite the site; and a mattress manufacturing workshop located immediately to the south.

The operational hours of the adjoining Stellex premises are publicly listed as 07:30 to 16:30, Monday to Friday. Grafton Street Autos operates from 09:00 to 18:00 on weekdays and from 09:00 to 15:00 on Saturdays. The takeaway and restaurant units, comprising KC Fast Food & Milkshakes, Golden Pizza, and Snowcold Creamery, operate as follows: KC Fast Food & Milkshakes and Golden Pizza are open from 15:00 to 01:00 Wednesday and Thursday, 16:00 to 03:00 Friday and Saturday, and 16:00 to 01:00 on Sunday. Snowcold Creamery operates daily from 12:00 to 23:30.

During site visits, noise levels within the building were not considered to be significantly influenced by surrounding commercial activities. Occasional operational activity, such as deliveries, was observed at rear of the site; however, the rear external area primarily serves as a parking facility. Aside from traffic noise originating from the adjacent road network, no notable noise emissions were detected at the front of the site. This includes noise from the vehicle repair garage and the takeaway outlets located opposite. Although extraction units associated with the takeaways were observed, these were not operational during the assessment period.

Further analysis of time-history graphs indicates that noise emissions from plant equipment are not dominant at the development site. Typically, plant noise presents as a consistent background level in L_{A90} measurements, forming a 'noise floor.' As demonstrated in the time-history graphs in Appendix D, this is not evident, suggesting that existing plant installations in the vicinity are not a matter of concern and do not warrant further investigation.

The overall acoustic environment is assessed as being of low to moderate intensity, primarily characterised by road traffic noise from the A652 and occasional vehicle pass-bys along Grafton Street. However, commercial activity at the rear of the site has also been noted as an occasional contributing factor. Therefore, further detailed acoustic assessment will be conducted in the subsequent sections.

2.3 Environmental Noise Survey Results

The following section outlines the measured sound levels during the 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)	'Typical' $L_{AFmax,1min}$ (dB)
		63	125	250	500	1k	2k	4k		
MP1	$L_{eq,16hr}$ (Day)	63	57	54	52	53	50	45	57	--
	$L_{eq,8hr}$ (Night)	56	51	48	45	45	43	39	50	75
MP2	$L_{eq,16hr}$ (Day)	54	49	47	45	45	44	41	50	--
	$L_{eq,8hr}$ (Night)	47	41	38	36	36	32	36	42	64
	Highest $L_{eq,1hr}$ (Operational Hours)	*56*	*53*	*51*	*51*	*52*	*50*	*44*	*56*	--

Table 2 – Sound Level Results Summary

3. The Agent of Change Principle

As noise from the existing commercial properties is likely to be audible and impactful at the proposed development, the agent of change principle must be considered.

Regarding this, the following is stated in paragraph 200 of the NPPF:

"Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed."

Given the above, it is thought that good acoustic design principles must be implemented at the site to protect the amenity of future residents and avoid placing undue restrictions on the adjacent establishments.

The 'ProPG Planning and Noise' (May 2017) guidance, 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 by promoting good health and wellbeing through the effective management of noise. It 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"; and
- Element 4 – consideration of "Other Relevant Issues".

The ProPG supplementary document 2 provides the following 'Good Acoustic Design' hierarchy of noise management measures which are considered to be relevant to this development:

1. Reduction of noise at the source.

It should first be investigated whether noise emissions can be reduced at the source. As the neighbouring businesses are owned by the client, it is advised that the client reviews the possibility of noise mitigation (such as closing doors to work areas and installation of upgraded glazing and doorset). However, it is understood that this may be difficult to achieve and will not account for noise in external areas. Where premises is not owned or operated by the client, suggestion of mitigation measures may be met with opposition from the neighbouring premises.

2. Reorientation of the development

Considering the nature of the development and the location of the existing windows, it is thought that it would not be feasible to locate the sensitive rooms away from the commercial noise sources.

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.

Acoustic shielding is deemed unsuitable given the urbanised location of the proposed development site, and the fact residential units will span the upper floors.

4. Enhanced façade sound insulation treatment.

Finally, it is recommended that an enhanced façade sound insulation treatment is implemented in order to reduce internal noise levels as much as possible. This is proposed as follows:

- The level of façade sound insulation required should be calculated considering the measurements from the loudest operational periods at the southern and western elevations when commercial is dominant.
- In addition, a more stringent performance criterion will be applied when specifying the glazing system. The glazing and ventilation design shall be developed to achieve compliance with NR25 standards during daytime hours for all noise-sensitive rooms located at the rear of the proposed development site. This is approximately 5dB lower than the typical BS8233 daytime criteria and should also control spectral contributions from potential industrial/commercial activity.

The LPA will need to be satisfied that achieving the lowest practicable noise levels appropriately considers the ‘Agent of Change’ principle and will not affect the viability of existing businesses.

4. Noise Break-in Assessment and Sound Insulation Scheme

4.1 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."

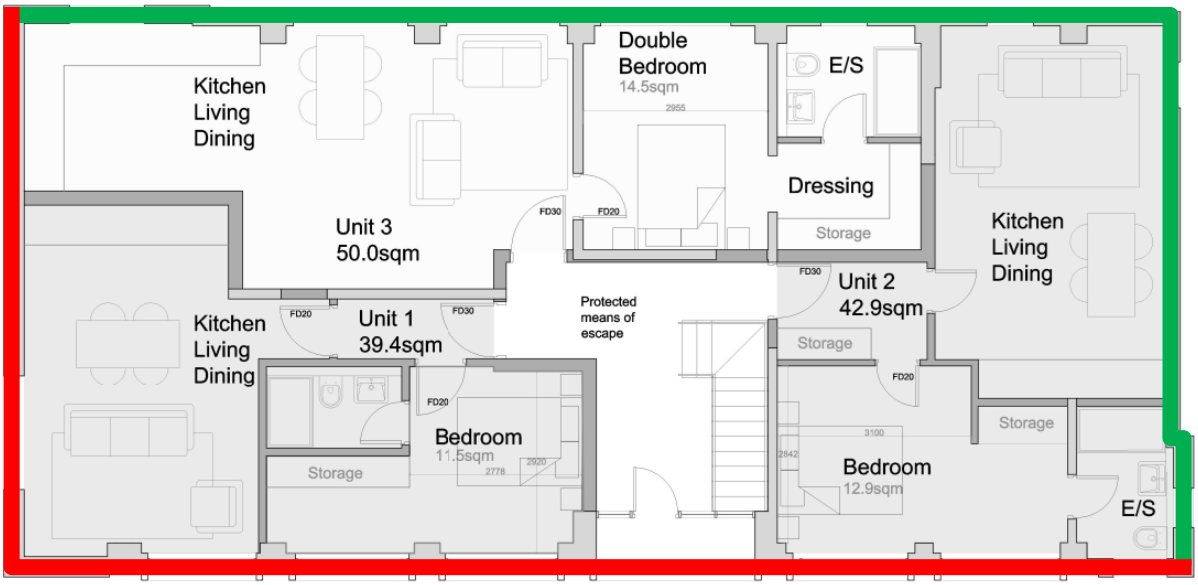
Note 5: BS8233:2014 states: "If relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level."

Table 3 – Internal Acoustic Design Criteria

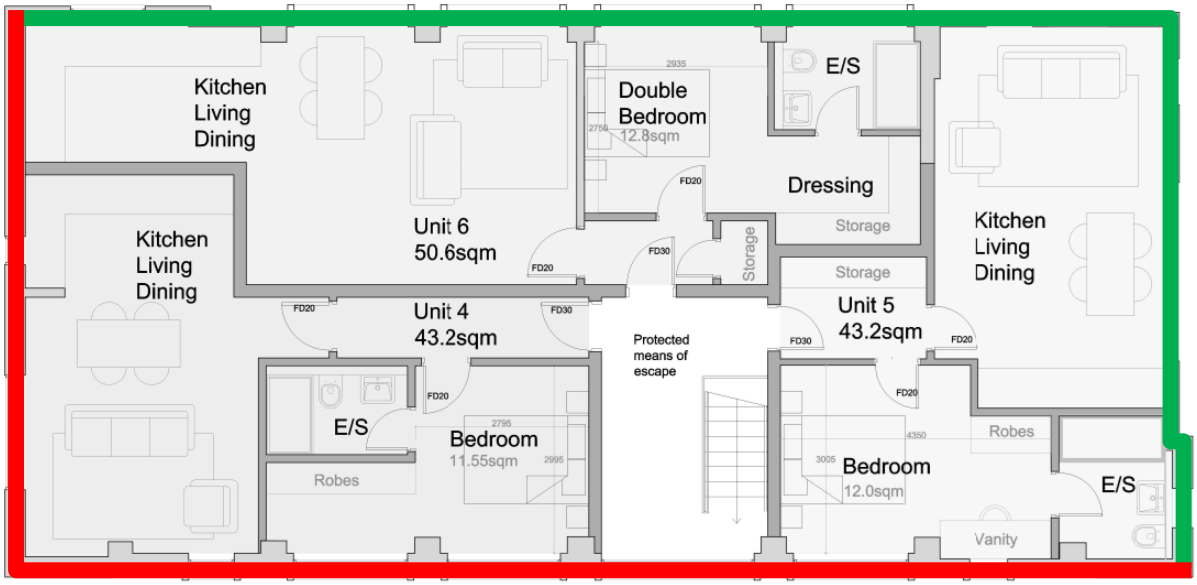
As previously stated, more stringent NR25 (L_{Aeq}) criteria are used for the assessment to the rear of the development. In addition, the loudest 1-hour period during operation of the commercial to the rear is used to inform the assessment, in line with Note 4 of the table above. This will provide a robust assessment to ensure adequate measures are incorporated within the design to protect the amenity of future residents.

4.2 Façade Allocation

In order to correctly specify the required sound reduction, the façades have been divided into colour groups. Appropriate models of glazing and ventilation for each façade colour are shown in Table 5.



Ground Floor Plan



First Floor Plan

Figure 3 – Façade Allocation – All Floors

4.3 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.

Description	Octave Frequency Band (Hz, dB)							Overall (dB)
	63	125	250	500	1k	2k	4k	
Red Façades – Bedrooms								
6mm Glass / 16mm Argon Cavity / 6.8mm Glass	21	21	28	37	48	48	54	40 R_w (-6 C_{tr})
Greenwoods 2500EA.AC1 (2 No. Trickle)	31	41	40	37	47	43	46	42 $D_{ne,w}$ (-2 C_{tr})
All Other Rooms								
6mm Glass / 16mm Air Cavity / 4mm Glass	20	21	20	26	38	37	39	32 R_w (-4 C_{tr})
Titon Standard Vent + C75 (2 No. Trickle)	--	38	36	35	42	39	42	35 $D_{ne,w}$ (-1 C_{tr})

Table 4 – Glazing & Background Ventilation Specification

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

As outlined in the preceding sections, the subjective impression during the site visit was that internal noise levels were low, and any potential noise intrusion from nearby commercial activity was not considered to be of significant concern. It is also noted that a delivery occurred during the setup phase, which was audible above the residual noise levels when windows were open. However, this was not subjectively perceived as a nuisance.

Given that the operational hours of the commercial units to the rear are restricted to daytime periods, and that audible commercial activity appears to be limited to occasional deliveries, the use of openable windows for natural ventilation is considered suitable for this development. This conclusion is further supported by the presence of existing residential properties in the immediate vicinity, suggesting that such commercial activity has not posed a barrier to residential use. Furthermore, it is reasonable to assume that prospective occupants of the proposed development will be aware of the local commercial context, further reducing the likelihood of adverse impacts on residential amenity.

5. Noise Breakthrough Assessment and Sound Insulation Scheme

5.1 Noise Breakthrough Criteria

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

Planning Class	Level of Risk from Noise	Required Sound Insulation Standard (dB)
E(g)(iii) Industrial processes	Medium	$\geq 55\ D_{nT,w} + C_{tr}$
Discussion: The noise emissions produced by the neighbouring premises includes both noise from employees and noise from manufacturing areas. The noise from employees can vary significantly and is highly dependent on the nature of the establishment. The required level of sound insulation should consider raised and elevated vocal efforts occurring regularly. The noise from the manufacturing areas included noise from machinery and hand tools. The permitted opening hours do not extend into the night-time period (23:00 – 07:00) and as such the sensitivity of the adjoining residential does not require additional consideration during this period.		

Table 5 – Noise Breakthrough Assessment

During the site visit it was noted that noise was clearly audible at ground floor level from the adjacent commercial unit. This was due to an interlinking shutter door located at lower ground level. The client has made assurances that the lower ground area will be completely blocked up and access will not be possible from the residential dwellings. To ensure the amenity of the residential dwellings are not affected by noise from commercial activity, it is recommended that the shutter door is removed and proposed infills should mimic the existing masonry structure. Further to this, the client has also proposed a wall liner. The client has proposed the following construction detail.

- Min. 100mm masonry wall (assumed min. density of 1600kg/m^3)
- Min. 50mm air cavity filled with 50mm RW45 mineral wool insulation
- Min. 100mm masonry wall (assumed min. density of 1600kg/m^3)
- Ikoustic MuteClips® and furring channels
- 1no. 12.5mm Gyproc WallBoard (min. surface mass 8kg/m^2)

This specification has been modelled in INSUL 9 prediction software and should achieve the required sound insulation standard outlined in the table above. As such, no further upgrades are deemed necessary

It should be noted that this report provides an indicative specification that can achieve the required acoustic performance and considers that all flanking routes for sound have been appropriately suppressed. As with any construction project, the ability to meet the specification will rely upon the quality of the built structure. As such the works should be carried out to a high standard of workmanship to ensure that any sound insulation measures are not breached, for example by installing a rigid connection across an isolated connection. The development cannot achieve compliance until sound insulation testing is carried out by a UKAS accredited sound insulation testing company upon completion and assessed against the required sound insulation standard.

6. Conclusion and Action Plan

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

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

1. The proposed glazing and background ventilation system, or a suitable alternative, should be installed as shown in Section 4.3. This includes acoustic double glazing for bedrooms along the front façade in addition to passive trickle ventilation. However, it is recommended that windows remain openable.
2. The separating wall between the structurally adjoining commercial property and the proposed development should be designed to achieve the required sound insulation. This will also require removal and infill of the existing roller shutter door between the development and adjoining commercial premises. The client's specification has been provided in Section 6.2, which is anticipated to achieve the adopted criteria. Further design assistance can be provided by NOVA Acoustics Ltd if required.

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

Appendix A – Acoustic Terminology

A-weighted sound pressure level, L_{pA}	Quantity of A-weighted sound pressure given by the following formula in decibels (dBA). $L_{pA} = 10 \log_{10} (pA/p_0)^2$. Where: pA is the A-weighted sound pressure in pascals (Pa) and $p0$ 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: $L_p = 10\log_{10}(p/p_0)^{2.}$ Where: 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 6 – 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.

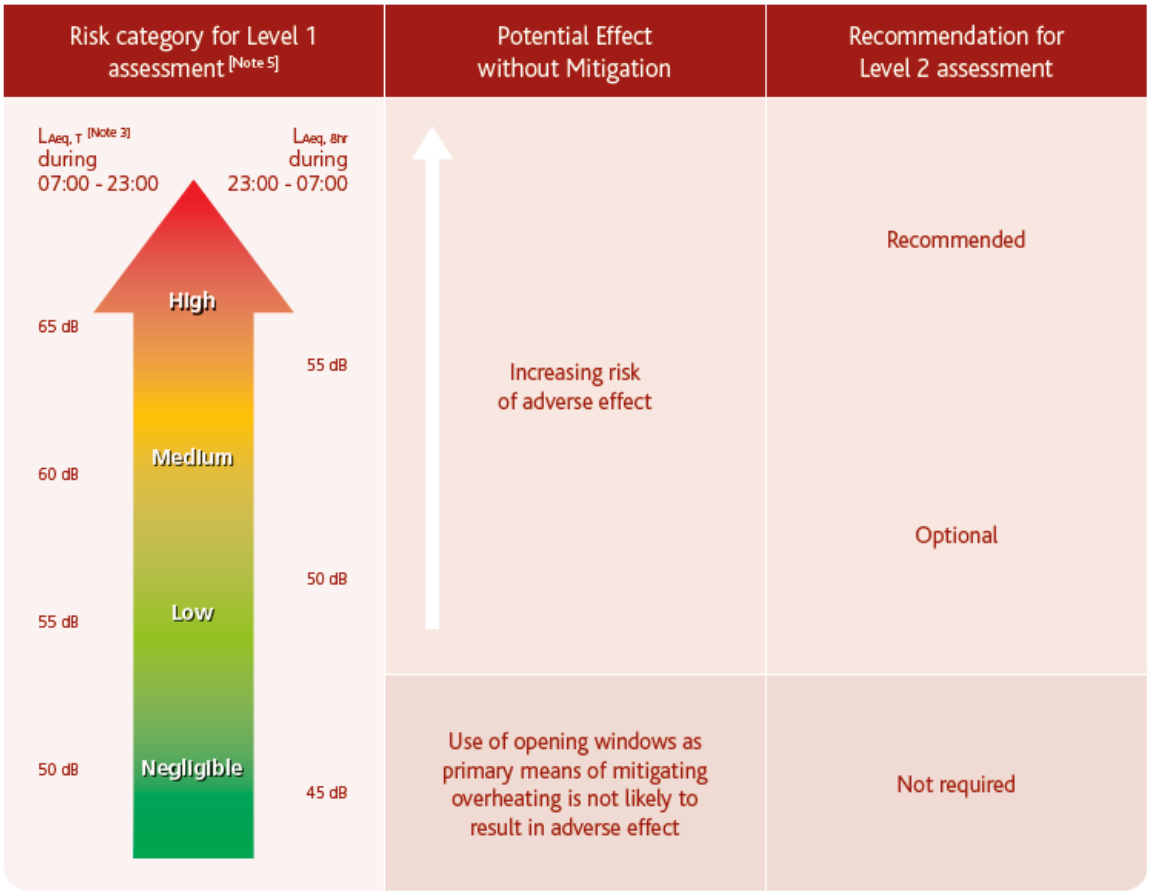


Table 3-2 of AVO Guide (2020)

Figure 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 7 – 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.

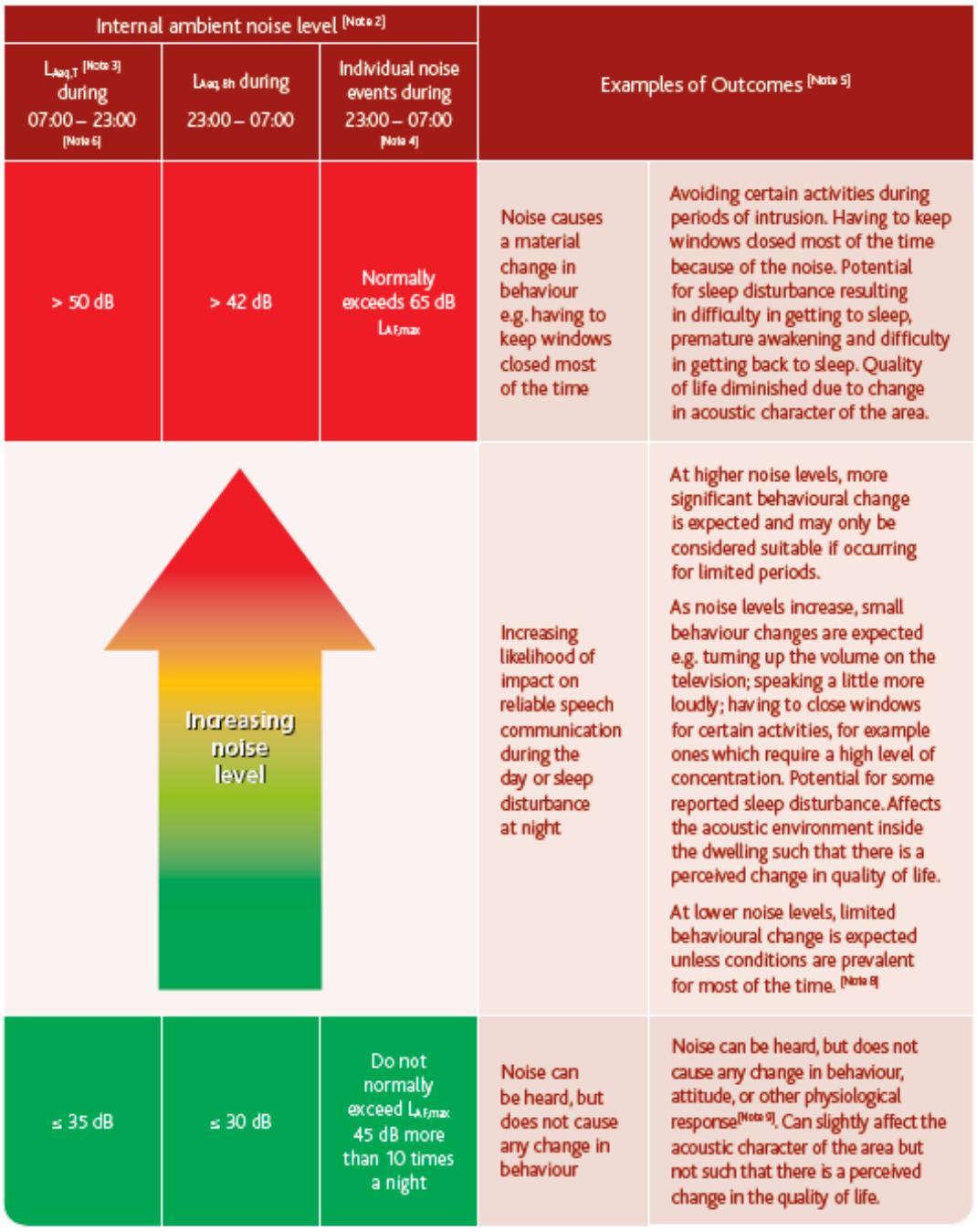


Table 3-3 of AVO Guide (2020)

Figure 5 – AVO Guide Level 2 Internal Ambient Noise Levels

Appendix C – Location Plans

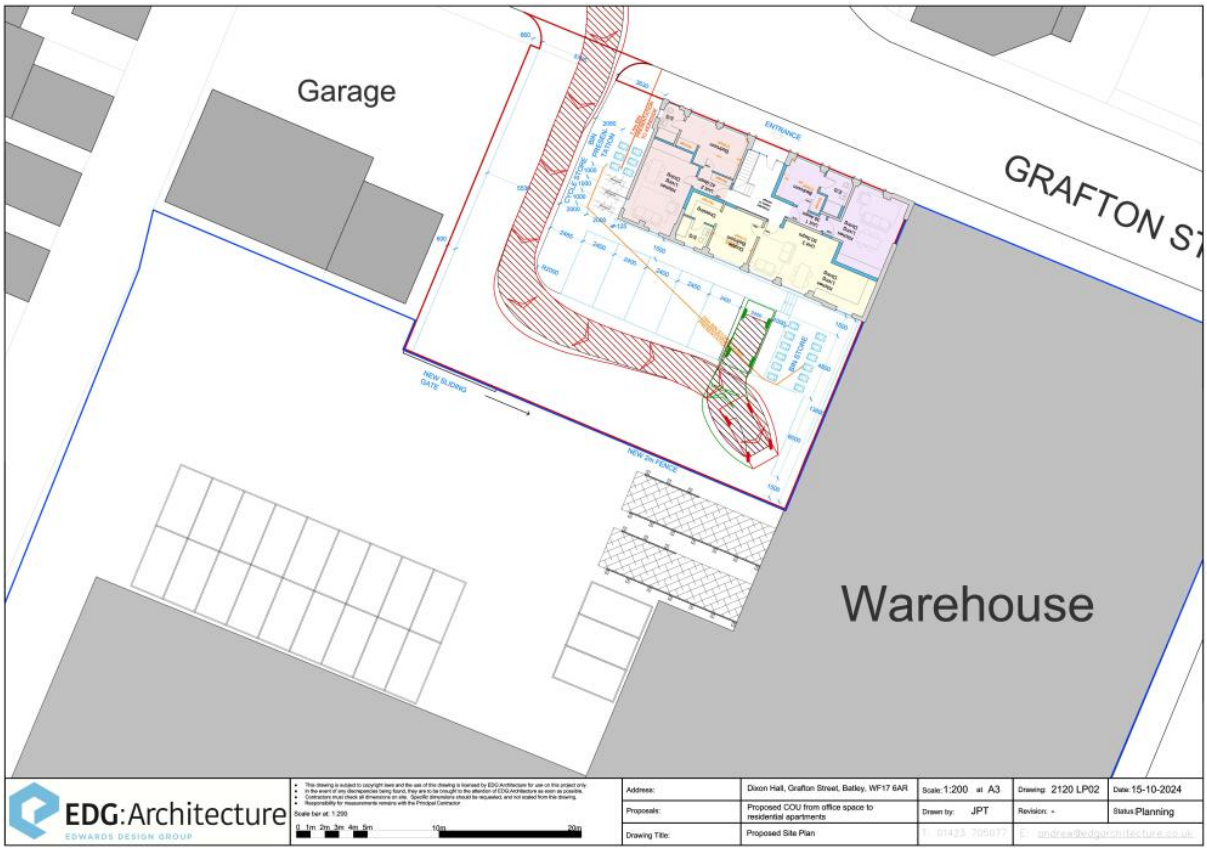


Figure 6 – Location Plans

Appendix D – Environmental Survey

D.1 – Time History Noise Data

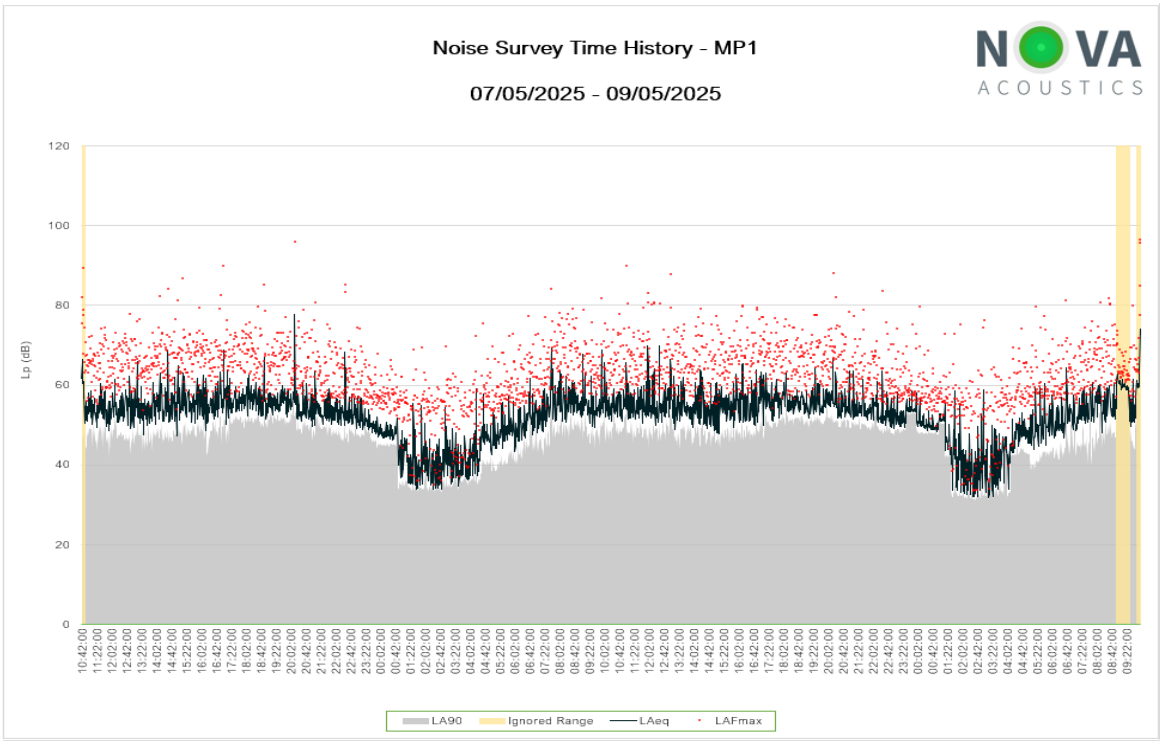


Figure 7 – MP1 Noise Survey Time History

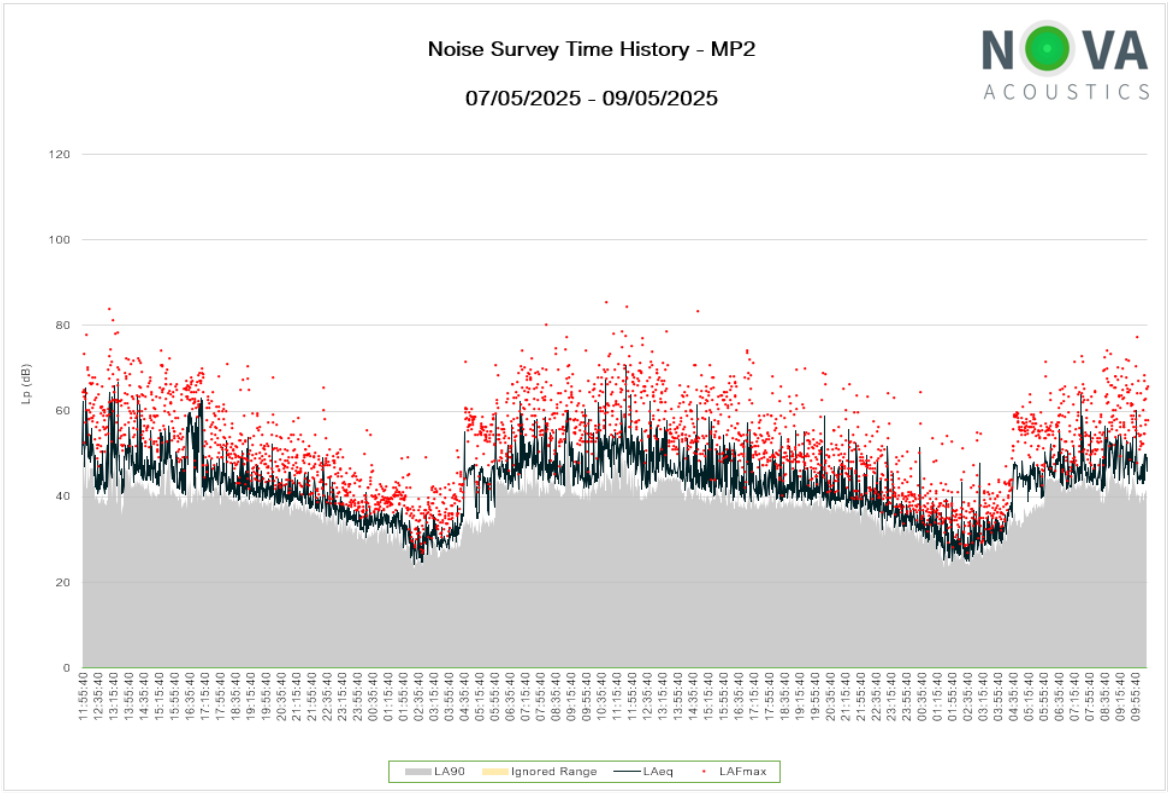


Figure 8 – MP2 Noise Survey Time History

D.2 – Surveying Equipment

Piece of Equipment	Serial No.	Calibration Deviation
Svantek SV971A Class 1 Sound Level Meter	141425	≤0.3
Svantek SV33B Class 1 Calibrator	163803	
Svantek SV971A Class 1 Sound Level Meter	141427	≤0.2
Svantek SV33B Class 1 Calibrator	163803	

Table 8 – 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 ≤0.3 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 – batleyweather.co.uk (Approx. 582m E of Site)				
Time Period	Air Temp (°C)	Rainfall (mm/h)	Prevailing Wind Direction[1]	Wind Speed (m/s)[1]
07/05/25 – 00:00 – 23:59	5.4 – 16.3	0.0	ESE	0.0 – 2.0
08/05/25 – 00:00 – 23:59	8.4 – 15.2	0.0	E	0.0 – 1.6
09/05/25 – 00:00 – 23:59	3.2 – 21.3	0.0	ESE	0.0 – 1.5

Notes:

[1] Data unavailable so taken from closest neighbouring weather station, 'Mel WOW' in Liversedge, approximately 6.6km WNW of site.

Table 9 – 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.
- 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.
- Based on the technical drawings provided to NOVA Acoustics, window areas of 4-6m^2 and room volumes of 28-33m^3 are used in the calculations for bedrooms as a worst-case scenario. For living rooms, the calculations are based on a window area of 4-8m^2 and room volume of 50-73m^3 as a worst-case scenario.
- 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 (Red Façades) Day Time Leq

Item / Description	dB(A)	63	125	250	500	1k	2k	4k	8k
Measured Leq,T	57	63	57	54	52	53	50	45	39
Glazing Noise Ingress	24	38	31	29	21	10	8	1	-5
Ventilation Noise Ingress	20		21	20	19	13	13	5	-1
Wall Noise Ingress	0	19	8	3	-8	-9	-12	-17	-22
Roof Noise Ingress									
Room Absorption Correction		0	0	-1	-1	-1	-2	-3	-4
Total Noise Ingress	**28**	**41**	**34**	**32**	**25**	**17**	**15**	**7**	**0**
NR30	35	59	48	39	33	30	26	24	22
Exceedance of Criteria	-7	-18	-14	-7	-8	-13	-11	-17	-22

Bedroom (Red Façades) Day Time Leq

Item / Description	dB(A)	63	125	250	500	1k	2k	4k	8k
Measured Leq,T	57	63	57	54	52	53	50	45	39
Glazing Noise Ingress	23	41	35	25	15	4	1	-10	-15
Ventilation Noise Ingress	20	37	20	19	20	11	11	4	-2
Wall Noise Ingress	-7	13	1	-3	-15	-15	-19	-23	-29
Roof Noise Ingress									
Room Absorption Correction		0	0	-1	-1	-1	-2	-3	-4
Total Noise Ingress	**27**	**46**	**38**	**29**	**23**	**13**	**13**	**4**	**-3**
NR30	35	59	48	39	33	30	26	24	22
Exceedance of Criteria	-8	-13	-10	-10	-10	-17	-13	-20	-25

Bedroom (Red Façades) Night Time Leq

Item / Description	dB(A)	63	125	250	500	1k	2k	4k	8k
Measured Leq,T	50	56	51	48	45	45	43	39	37
Glazing Noise Ingress	16	35	29	19	7	-4	-6	-16	-18
Ventilation Noise Ingress	13	30	14	12	12	3	4	-3	-4
Wall Noise Ingress	-14	6	-5	-10	-23	-23	-26	-30	-31
Roof Noise Ingress									
Room Absorption Correction		0	0	-1	-1	-1	-2	-3	-4
Total Noise Ingress	**20**	**39**	**32**	**22**	**15**	**5**	**6**	**-2**	**-5**
NR25	30	55	43	35	28	25	21	19	17
Exceedance of Criteria	-10	-16	-11	-13	-13	-20	-15	-21	-22

Bedroom (Red Façades) Night Time Max

Item / Description	dB(A)	63	125	250	500	1k	2k	4k	8k
Measured Lmax	75	75	66	72	69	71	69	66	60
Glazing Noise Ingress	37	54	44	43	32	22	20	11	5
Ventilation Noise Ingress	37	49	30	36	37	28	30	25	18
Wall Noise Ingress	10	25	11	14	2	2	0	-2	-9
Roof Noise Ingress									
Room Absorption Correction		0	0	-1	-1	-1	-2	-3	-4
Total Noise Ingress	**42**	**58**	**47**	**46**	**40**	**31**	**32**	**25**	**17**
NR40	45	67	56	49	43	40	37	34	33
Exceedance of Criteria	-3	-9	-9	-3	-3	-9	-5	-9	-16

Living Room (Green Façades) Day Time Leq

Item / Description	dB(A)	63	125	250	500	1k	2k	4k	8k
Measured Leq,T	56	56	53	51	51	52	50	44	39
Glazing Noise Ingress	23	33	29	27	22	10	9	2	-4
Ventilation Noise Ingress	18		16	15	17	10	11	3	-3
Wall Noise Ingress	-4	12	4	-1	-10	-10	-13	-18	-24
Roof Noise Ingress									
Room Absorption Correction		0	0	-1	-1	-1	-2	-3	-4
Total Noise Ingress	**26**	**36**	**31**	**30**	**25**	**15**	**15**	**6**	**-1**
NR25	30	55	43	35	28	25	21	19	17
Exceedance of Criteria	-4	-19	-12	-5	-3	-10	-6	-13	-18

Bedroom (Green Façades) Day Time Leq

Item / Description	dB(A)	63	125	250	500	1k	2k	4k	8k
Measured Leq,T	56	56	53	51	51	52	50	44	39
Glazing Noise Ingress	23	33	29	28	22	11	10	2	-3
Ventilation Noise Ingress	21		19	19	20	14	15	6	1
Wall Noise Ingress	-4	12	3	-1	-11	-11	-13	-19	-24
Roof Noise Ingress									
Room Absorption Correction		0	0	-1	-1	-1	-2	-3	-4
Total Noise Ingress	**27**	**36**	**32**	**31**	**26**	**18**	**17**	**8**	**1**
NR25	30	55	43	35	28	25	21	19	17
Exceedance of Criteria	-3	-19	-11	-4	-2	-7	-4	-11	-16

Bedroom (Green Façades) Night Time Leq

Item / Description	dB(A)	63	125	250	500	1k	2k	4k	8k
Measured Leq,T	42	47	41	38	36	36	32	36	35
Glazing Noise Ingress	10	23	17	15	7	-6	-9	-6	-8
Ventilation Noise Ingress	6		6	6	5	-3	-4	-2	-4
Wall Noise Ingress	-17	2	-9	-14	-26	-27	-31	-27	-28
Roof Noise Ingress									
Room Absorption Correction		0	0	-1	-1	-1	-2	-3	-4
Total Noise Ingress	**13**	**26**	**20**	**18**	**11**	**1**	**-1**	**0**	**-3**
NR25	30	55	43	35	28	25	21	19	17
Exceedance of Criteria	-17	-29	-23	-17	-17	-24	-22	-19	-20

Bedroom (Green Façades) Night Time Max

Item / Description	dB(A)	63	125	250	500	1k	2k	4k	8k
Measured Lmax	64	68	65	59	63	59	55	51	43
Glazing Noise Ingress	33	45	41	36	34	18	15	9	0
Ventilation Noise Ingress	30		31	27	32	21	20	13	4
Wall Noise Ingress	5	24	15	7	1	-3	-8	-12	-20
Roof Noise Ingress									
Room Absorption Correction		0	0	-1	-1	-1	-2	-3	-4
Total Noise Ingress	**37**	**48**	**44**	**39**	**38**	**25**	**23**	**15**	**5**
NR40	45	67	56	49	43	40	37	34	33
Exceedance of Criteria	-8	-19	-12	-10	-5	-15	-14	-19	-28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