Noise impact assessment in support of a proposed residential development

30 West Street, Horsham, RH12 1PB

Client: Ganco Limited

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0. SUMMARY

0.1. A planning application is being prepared for a new residential development consisting of 8 apartments at 1st and 2nd floor levels above 30 West Street, Horsham. ACA Acoustics Limited has been commissioned on behalf of the applicant to carry out an assessment of existing and potential future noise sources on the development, and, where necessary, to make recommendations for a suitable mitigation scheme.

0.2. A sound level survey was carried out between the 24th May and 31st May 2023. Measured sound levels incident on the development are typically $L_{Aeq\ 16\text{-}hour}$ 58dB during the daytime and $L_{Aeq\ 8\text{-}hour}$ 55dB overnight. Short-term individual noise events overnight do not regularly exceed a level of LAfmax 72dB. Sound levels to the façade facing away from the street are noticeably lower than these values.

0.3. A Stage 1: Initial Site Noise Risk Assessment, in accordance with ProPG Planning & Noise, identifies the site as being in an area with a low noise risk during the daytime and a low to medium noise risk at night. An appropriate Acoustic Design Statement has been prepared, following the detailed acoustic design process set out in Stage 2 of ProPG, to ensure that the noise risks can be effectively mitigated, and a good standard of amenity will be achieved for future residents of the apartments. Details of the Acoustic Design Statement are included in this report.

0.4. ACA Acoustics' consultant witnessed a delivery occurring to the Poundland store via the loading bay at the rear of the site, overlooked by the proposed flats. An assessment of noise from the loading activity concludes that without further mitigation there is the potential for adverse impacts to future residents of the flats overlooking the loading bay. It is recommended these flats incorporate a mechanical ventilation system to ensure that occupants are able to achieve appropriate ventilation rates and mitigate overheating, without the need to open windows during loading events.

0.5. The first and part of the second-floor flats will have separating elements to commercial uses within the building. To protect the amenity of future occupants, it is recommended that separating elements between the proposed flats and any adjoining commercial use should achieve sound insulation performance of $D_{nT,w} + C'_{tr}$ 50dB. This is at least 7dB better than required under The Building Regulations Approved Document E and will ensure a good standard of amenity for future occupants, allowing for reasonable potential alterations of the commercial property within Use Class E.

0.6. In conclusion, ACA Acoustics recommend that the site is suitable for the proposed residential use, subject to implementation of noise control measures as set out in this report, and that planning consent may be granted for the proposed development.

1. INTRODUCTION

A planning application is being prepared seeking consent for to form a new residential development consisting of 8 apartments on the 1st and 2nd floors above 30 West Street, Horsham.

ACA Acoustics Limited has been commissioned by the applicant to carry out a noise impact assessment of existing and potential noise sources on the proposed development, and, where necessary, to make recommendations for a suitable mitigation scheme.

The objective of the assessment is to determine the impact that noise sources would have on the proposed properties in accordance with ProPG: Planning & Noise, national planning policies, and other relevant British Standards and guidance documents.

2. POLICY AND STANDARDS

2.1. National Planning Policy Framework (NPPF) and Noise Policy Statement for England (NPSE)

The National Planning Policy Framework (referred to as NPPF) sets out the Government's planning policies for England and provides guidance on how these are expected to be applied, providing a framework within which Local Authorities can produce their own distinctive local and neighbourhood plans, which reflect the needs and priorities of their communities.

Paragraph 187 of the NPPF states,

"*Planning policies and decisions should contribute to and enhance the natural and local environment by … 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*".

Paragraph 198 also talks specifically about noise and advises,

"*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:*

- *Mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and quality of life.*
- *Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.*"

The Government's long-term policy aims relating to noise are contained in the Noise Policy Statement for England (referred to as NPSE). Stated aims of the NPSE are,

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

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

Paragraphs 2.19 to 2.24 clarify the above aims, referring to established concepts from toxicology; NOEL (No Observed Effect Level) and LOAEL (Lowest Observed Adverse Effect Level). It also introduces a new concept relating to *"significant adverse*" of SOAEL (Significant Observed Adverse Effect Level), however noting,

"*It is not possible to have a single objective noise-based measure that describes SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times*".

The first aim of NPPF Paragraph 198 and the second underlying aim of the NPSE refers to the situation where the impact lies somewhere between LOAEL and SOAEL. It 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, as set out in the NPPF.

As neither the NPPF nor NPSE includes any numerical criteria, it is necessary to consider guidance provided in other documents to determine suitable limits that would define the LOAEL on an individual basis.

Finally, it is also of benefit to consider Paragraph 2.7, which advises that,

"*… the application of the NPSE should enable noise to be considered alongside other relevant issues and not to be considered in isolation. In the past, the wider benefits of a particular policy, development or other activity may not have been given adequate weight when assessing the noise implications*".

This provides clear guidance that noise must not be considered in isolation but as part of the overall scheme considering the overall sustainability and associated impacts of the proposed development; there is no benefit in reducing noise to an excessively low level if this creates or increases some other adverse impact. Similarly, it may be appropriate in some cases for noise to have an adverse impact if this is outweighed by the reduction or removal of some other adverse impact that is of greater significance to the development.

2.2. Planning Practice Guidance – Noise (PPG-N)

Related to the NPSE and the NPPF, The Department for Communities and Local Government has published additional guidance and clarifications within the Planning Practice Guidance – Noise (PPG-N), available at https://www.gov.uk/guidance/noise--2.

Paragraph 003 of the PPG advises that,

"Plan-making and decision making need to take account of the acoustic environment and in doing so consider:

- *Whether or not a significant adverse effect is occurring or likely to occur;*
- *Whether or not an adverse effect is occurring or likely to occur; and*
- *Whether or not a good standard of amenity can be achieved.*

In line with the Explanatory Note of the Noise Policy Statement for England, this would include identifying whether the overall effect of the noise exposure … is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation."

This guidance is like that set out in the NPPF and NPSE, however, Paragraph 005 of the PPG-N provides outline guidance of the definition of "*significant adverse*" and "*adverse*" effects. A copy of the table appended to Paragraph 005 is repeated below.

Response	Examples of outcomes	Increasing effect level	Action
No Observed Effect Level			
Not present	No Effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level			
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

Figure 1: Noise exposure hierarchy, taken from Planning Practice Guidance – Noise

Although this table provides descriptions of definitions for the NOEL, LOAEL and SOAEL, as with the NPPF and NPSE there are no numerical values provided.

Paragraph 011 of the PPG-N also provides examples where the noise impact may be offset, including using local amenity areas, noting,

"Noise impacts may be partially offset if residents have access to one or more of:

- *a relatively quiet facade (containing windows to habitable rooms) as part of their dwelling;*

- *a relatively quiet external amenity space for their sole use, (e.g., a garden or balcony). Although the existence of a garden or balcony is generally desirable, the intended benefits will be reduced if this area is exposed to noise levels that result in significant adverse effects;*
- *a relatively quiet, protected, nearby external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings, and/or;*
- *a relatively quiet, protected, external publicly accessible amenity space (e.g., a public park or a local green space designated because of its tranquillity) that is nearby (e.g., within a 5 minute walking distance).*"

The proposed development includes private balconies to each of the apartments along with a communal amenity space on the first-floor flat roof. This communal amenity space is screened from nearby noise sources, ensuring a reasonable standard of amenity which may offset any residual concerns of noise to future occupants. Furthermore, there is green space with off-road footpaths and walks available around the River Arun to the south and in Horsham Park to the north, both around a 5-minute walk from the site.

2.3. ProPG: Planning & Noise

ProPG: Planning & Noise is a collaborative document prepared by the Institute of Acoustics, Association of Noise Consultants, and the Chartered Institute of Environmental Health.

The document brings together guidance and recommendations in assessing the noise impact on new residential developments from various documents including the NPPF, NPSE, PPG-N, BS 8233:2014 and the World Health Organisation guidance. The aim is to regularise the assessment process and to encourage good acoustic design for new noise-sensitive developments.

The assessment process is split into two sequential stages:

- Stage 1 – An initial noise risk assessment of the proposed development site; and
- Stage 2 – A systematic consideration of four key elements:
  - 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 Stage 1 risk assessment requires sound levels to be measured at the site over daytime and night-time periods and, if necessary, any anticipated significant changes to the climate to be predicted to determine a "'*typical worst case' 24-hour day either now or in the foreseeable future*".

The assessment should include all relevant sources of transport noise that affect the site (road, railway, aircraft). It may also include industrial and commercial noise, where this is present but not dominant. Paragraph 2.14 of ProPG defines this as being where,

"*The impact would be rated as lower than adverse (subject to context) if a BS 4142:2014 assessment was to be carried out*".

As discussed in Section 6, without mitigation commercial noise would be likely to result in adverse impact and therefore a further assessment in accordance with BS 4142:2014+A1:2019 is also appropriate.

Criteria in Element 2 of the Stage 2 assessment provides recommended internal sound levels to the residential dwellings. Criteria are taken from BS 8233:2014 with an additional criterion for individual short-term sound levels at night (LAfmax) and various clarifications and notes.

Paragraphs 2.33 to 2.36 discuss the impact of ventilation and opening windows. It is clearly stated that:

"*Most residents value the ability to open windows at will, for a variety of reasons, and LPAs should therefore normally request that designers principally aim, through the use of good acoustic design, to achieve the internal noise level guidelines in noise-sensitive rooms with windows open*".

However, Paragraph 2.33 confirms that an open window typically reduces the sound insulation performance of the façade to 10 to 15dBA. This means that any site with a noise risk assessment above "*Negligible*" would fail to achieve the internal sound level criteria with windows open. Paragraph 2.34 acknowledges this, confirming that internal sound levels for sites in urban areas and adjacent to transportation noise sources may only be practically achieved with windows closed.

"*In such circumstances, internal noise levels can be assessed with windows closed but with any façade openings used to provide "whole dwelling ventilation" in accordance with Building Regulations Approved Document F (e.g., trickle ventilators) in the open position. Furthermore, in this scenario the internal LAeq target noise levels should not generally be exceeded.*"

Copy of Figure 2 of ProPG is included in Figure 2 below.

ACTIVITY	LOCATION	07:00 – 23:00 HRS	23:00 – 07:00 HRS
Resting	Living room	35 dB $L_{Aeq,16\ hr}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16\ hr}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16\ hr}$	30 dB $L_{Aeq,8\ hr}$ **45 dB $L_{Amax,F}$** (Note 4)

NOTE 1 The Table provides recommended internal L_{Aeq} target levels for overall noise in the design of a building. These are the sum total of structure-borne and airborne noise sources. Ground-borne noise is assessed separately and is not included as part of these targets, as human response to ground-borne noise varies with many factors such as level, character, timing, occupant expectation and sensitivity.

NOTE 2 The internal L_{Aeq} target levels shown in the Table 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 internal L_{Aeq} target levels recommended in the Table.

NOTE 3 These internal L_{Aeq} target levels are based on annual average data and do not have to be achieved in all circumstances. For example, it is normal to exclude occasional events, such as fireworks night or New Year's Eve.

NOTE 4 Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$, depending on the character and number of events per night. Sporadic noise events could require separate values. 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 (see Appendix A).

NOTE 5 Designing the site layout and the dwellings so that the internal target levels can be achieved with open windows in as many properties as possible demonstrates good acoustic design. Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however any façade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the "open" position and, in this scenario, the internal L_{Aeq} target levels should not normally be exceeded, subject to the further advice in Note 7.

NOTE 6 Attention is drawn to the requirements of the Building Regulations.

NOTE 7 Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal L_{Aeq} target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved. The more often internal L_{Aeq} levels start to exceed the internal L_{Aeq} target levels by more than 5 dB, the more that most people are likely to regard them as "unreasonable". Where such exceedances are predicted, applicants should be required to show how the relevant number of rooms affected has been kept to a minimum. Once internal L_{Aeq} levels exceed the target levels by more than 10 dB, they are highly likely to be regarded as "unacceptable" by most people, particularly if such levels occur more than occasionally. Every effort should be made to avoid relevant rooms experiencing "unacceptable" noise levels at all and where such levels are likely to occur frequently, the development should be prevented in its proposed form **(see Section 3.D)**.

Figure 2: Internal sound level guidelines, taken from Figure 2 of ProPG: Planning & Noise

Sound levels in external amenity areas are considered in Element 3 of the Stage 2 assessment. This requires that, where practical, sound levels in amenity areas that are an intrinsic part of the overall design, should ideally not be above the range $LAeq_{,\ 16\text{-hour}}$ 50 to 55dB. It does however quote BS 8233:2014, that:

> "*These guideline values may not be achievable in all circumstances where development might be desirable. In such a situation, development should be designed to achieve the lowest practicable noise levels in these amenity spaces but should not be prohibited.*"

2.4. British Standard 8233:2014

The introduction to BS 8233:2014 *Guidance on sound insulation and noise reduction for buildings* advises that "*this guide suggests criteria, such as suitable sleeping/resting conditions, and proposes noise levels that normally satisfy these criteria*".

As such it is considered that guideline noise limits set out in BS 8233:2014 are suitable to protect future occupants of the dwelling from noise disturbance and compliance with these values would ensure sound levels within the new development are below the Lowest Observed Adverse Effect Level and comply with the principles of the NPPF, NPSE and PPG-N, along with corresponding to the recommended criteria provided by the Local Authority.

Guidance limits for internal sound levels within living rooms and bedrooms are provided in Table 4 of BS 8233:2014 and are identical to those shown in Figure 2 above.

2.5. Noise From Commercial Sources - British Standard 4142:2019+A1:2019

The scope of BS 4142:2014+A1:2019 advises that,

> "*This British Standard describes methods for rating and assessing sound of an industrial and/or commercial nature … to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident*".

BS 4142:2014+A1:2019 is commonly used to assess the potential for loss of amenity due to noise from commercial sources and is considered appropriate in this context for the assessment of delivery noise to the loading bay at the rear façade.

The assessment method of BS 4142:2014+A1:2019 corrects the specific sound level from the source under investigation to account for characteristics that could make the sound more obtrusive to obtain a rating level. This rating level is compared against the prevailing background noise outside the noise-sensitive property. Section 11 of the Standard provides a commentary of the assessment result and advises that:

a) Typically the greater this difference [between the rating level and background sound level], the greater the magnitude of the impact;
b) A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context;
c) A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context;
d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

It is important to consider however, that BS 4142:2014+A1:2019 specifically confirms that this commentary provides only an initial indicative conclusion and is dependent on the context of the assessment, which may materially alter the assessment result.

Section 11 discusses factors which should be taken into consideration when reviewing the context. These include:

> "*The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:*
> *i) Façade insulation treatment;*
> *ii) Ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and*
> *iii) Acoustic screening*".

This confirms that the façade sound insulation performance can be taken into account when considering the impact on the receptor. Using mechanical ventilation, for example, to ensure that occupants do not need to open windows during higher-noise events, would be an appropriate mitigation strategy.

2.6. Operational Noise from Ground Floor Commercial Unit - DEFRA NANR 163

The existing ground floor unit is currently in use as a retail shop. This will have relatively low operational noise levels and is unlikely to disturb adjoining residential occupants. However, permitted development regulations allow the change of use of this unit to other uses within Use Class E. The use of those permitted with highest typical internal sound levels would be a restaurant. ACA Acoustics have previously undertaken sound level surveys in many different restaurant brands and anticipate typical internal sound levels on a busy weekend evening of around LAeq 80dB, allowing for busy patron activity and background music.

There is no specific methodology within British Standards or other formal government guidance to assess noise emissions from premises with amplified music/speech potentially affecting nearby residential occupiers. However, a general requirement of most Local Authorities is that any noise breakout from such premises shall not cause a nuisance to any nearby residents.

The Department for Environment, Food, and Rural Affairs (DEFRA) commissioned a study into noise from pubs and clubs affecting nearby noise-sensitive properties. The final report of the study (NANR 163 authored by BRE and Capita Symonds) concluded that the metric that provided the best overall prediction of likelihood for adverse impacts was an absolute internal LAeq noise level value within a dwelling. A level of LAeq 27dB was considered to be 'clearly acceptable' while a level of LAeq 31dB had a semantic description of 'just acceptable'.

3. REVIEW OF SITE LOCATION & DEVELOPMENT PROPOSALS

The development site is located at 30 West Street, Horsham. The proposals are for the development of 8 apartments over the first and second floor levels above an existing Poundland store.

Aerial photograph of the proposed development site with the measurement locations is shown in Figure 3 below.

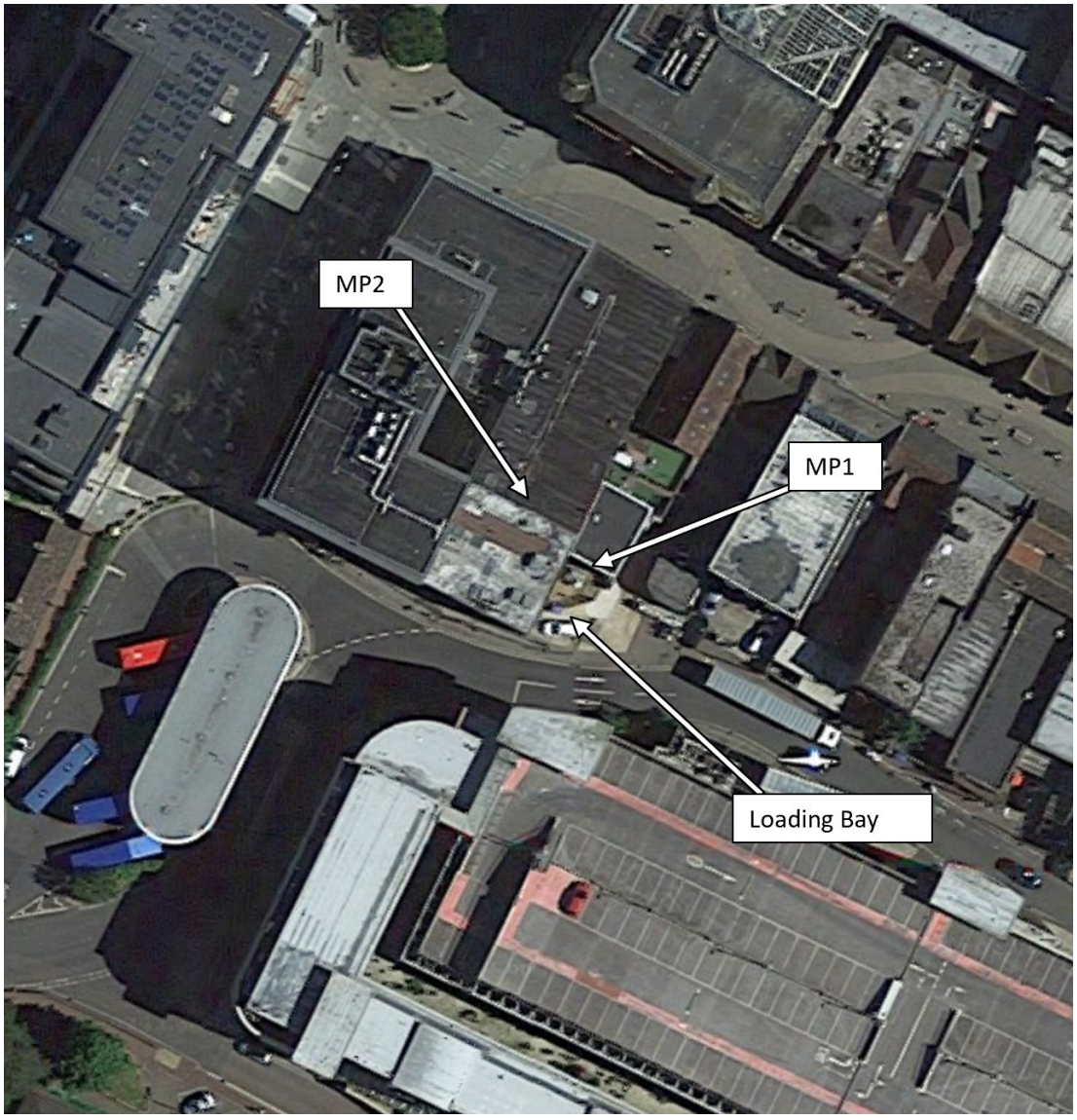


Figure 3: Photographs showing measurement locations and the proposed development

Figure 4 below shows an indicative floor plan of the development.

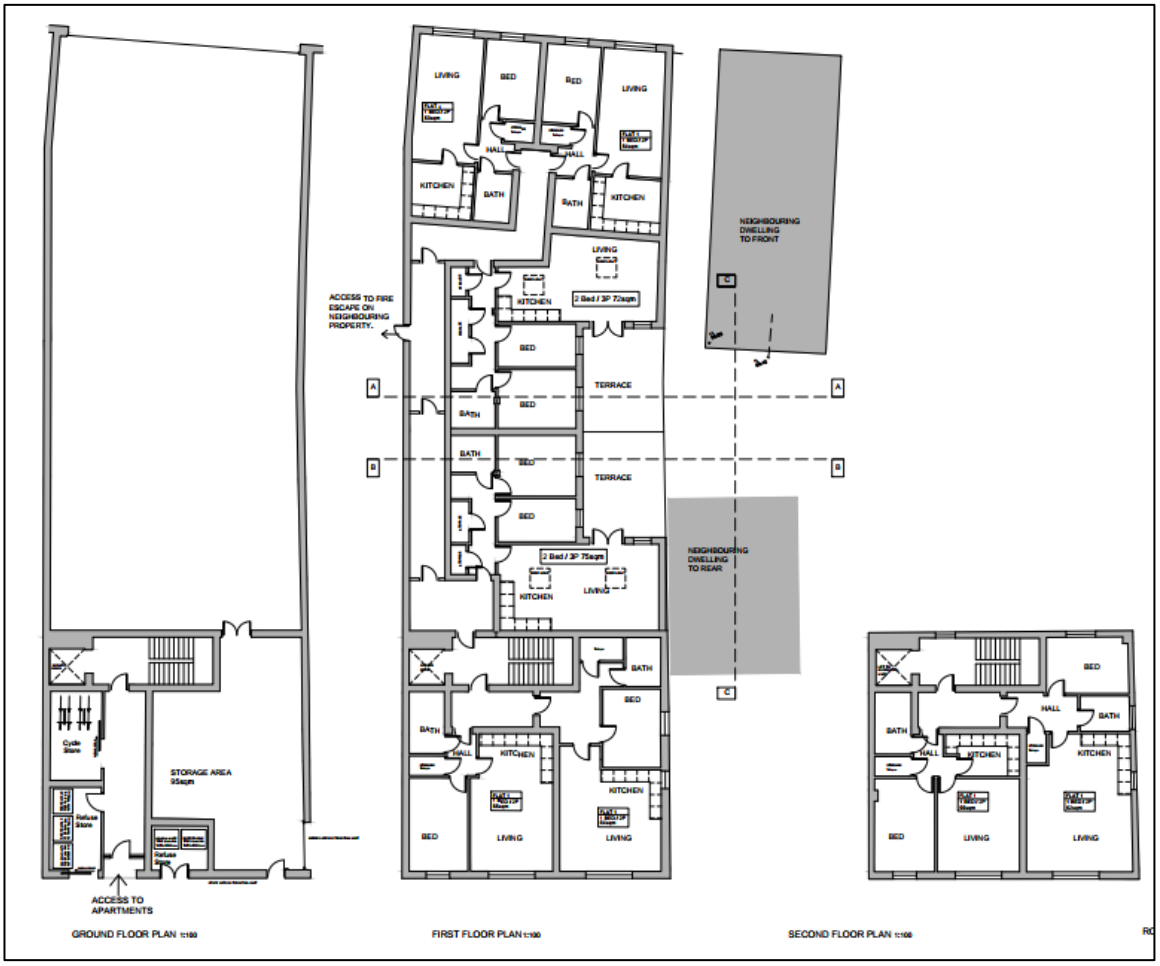


Figure 4: Indicative Floor Plan Layout

4. SOUND LEVEL SURVEY

To assess the impact of existing sound sources, a sound level survey was conducted at the rear of the development site. Details of the sound level survey carried out by Sam Message of ACA Acoustics are provided below.

Measurements were undertaken overlooking the loading bay to the rear façade between 24th and 25th May 2023. The sound level meter was then moved to position MP2, at the proposed communal amenity space on the first-floor flat roof for the remainder of the survey between 27th and 31st May.

Measurements were recorded in consecutive 15-minute samples of overall LAfmax, LAeq, and LA90 values along with other statistical indices and octave band spectra. The sound level meter was also set to log short-term levels simultaneously, to assist with assessment of individual noise events.

The following equipment was used during the survey at the monitoring position. An on-site calibration check was conducted on the sound level meters before the survey and repeated after with no deviation noted.

Equipment	Serial Number
Svantek Class 1 sound level meter type SVAN971 complete with MOLES weatherproof outdoor environmental kit	28263
Svantek calibrator type SV33B. Compliant to IEC 60942-1:2003	10436

Table 1: Equipment used for the sound level survey

Weather conditions at the time of setting up the survey were mild, with around 50% cloud cover 14km/h easterly breeze. Weather conditions have been reviewed at www.worldweatheronline.com, using the closest available commercial weather station. Due to the extended nature of the survey, there are periods with suitable weather conditions and meteorological conditions are not considered to have adversely impacted the outcome of the assessment.

While setting up the sound level survey the acoustic character included road traffic noise on nearby routes. ACA Acoustics' consultant remained on site for a period whilst setting up the survey and witnessed a delivery occurring over the first hour. This allows an assessment of noise from the delivery activity to be carried out.

Results of the survey are shown in Figure 4 and 5 below.

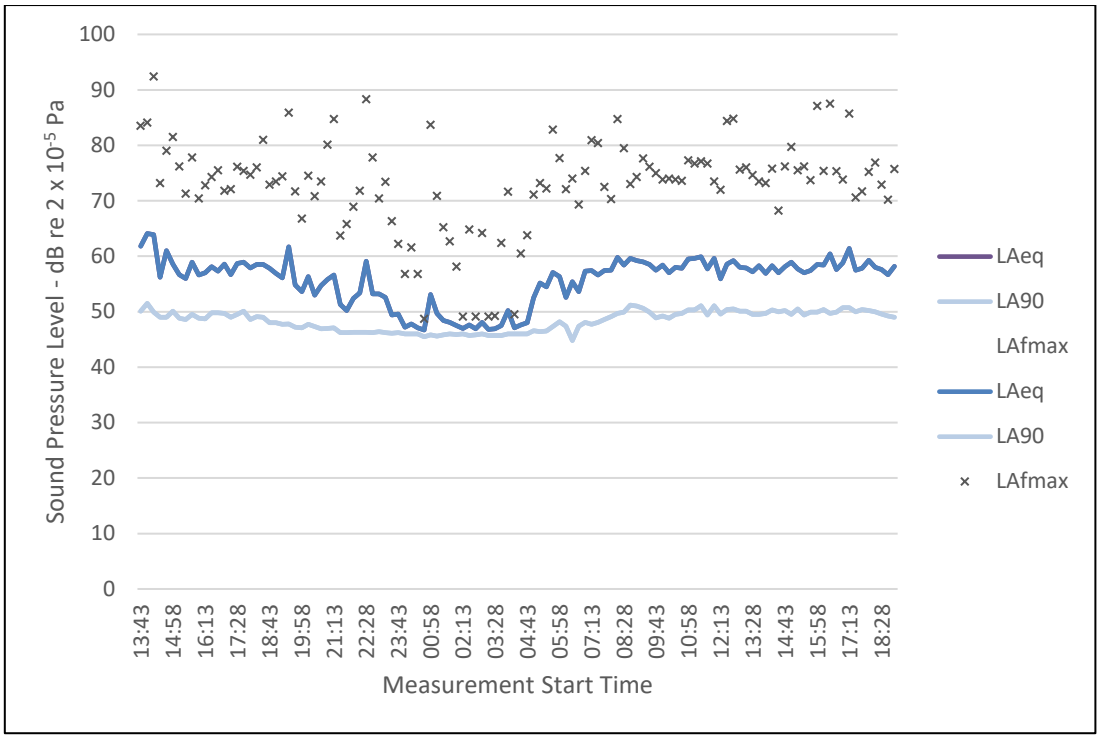


Figure 5: Sound level survey results at position MP1

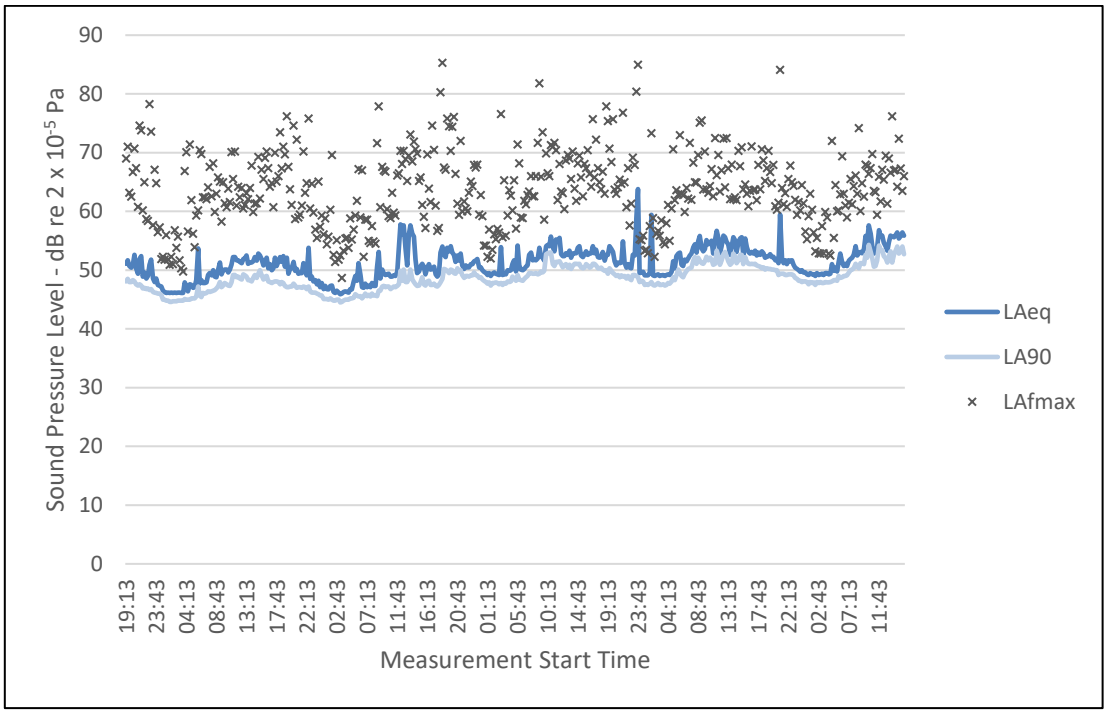


Figure 6: Sound level survey results at position MP2

Summary results are included in Table 2 below.

Date:	Position	Daytime LAeq	Night-time LAeq	Night-time 10th Highest LAfmax
Wed, 24 May 2023	MP1	58dB	52dB	72dB
Thu, 25 May 2023	MP1	58dB	55dB	72dB
Sat, 27 May 2023	MP2	51dB	47dB	59dB
Sun, 28 May 2023	MP2	52dB	51dB	63dB
Mon, 29 May 2023	MP2	53dB	54dB	63dB
Tue, 30 May 2023	MP2	54dB	50dB	61dB
Wed, 31 May 2023	MP2	54dB	-	-

Table 2: Summary sound level survey results

Sound levels to the rear façade, equivalent of MP1, were LAeq 58dB during the daytime and LAeq 55dB overnight, with typical LAfmax sound levels of 72dB. Sound levels to the façade and proposed communal amenity space, screened from the road and loading bay were noticeably lower, not exceeding LAeq 54dB over the daytime period.

The proposed development overlooks the loading bay and assessment of this has been carried out in accordance with the requirements of BS 4142:2014+A1:2019 below.

In accordance with BS 4142:2014+A1:2019, the prevailing background sound level is not necessarily taken to be the lowest recorded values, but rather the level that best represents the typical background sound level in the area over a defined period. A statistical analysis of the measured background sound levels has been carried out, generally following suggested guidance contained in Section 8 of the Standard. Distribution of the measured LA90 sound levels is shown below.

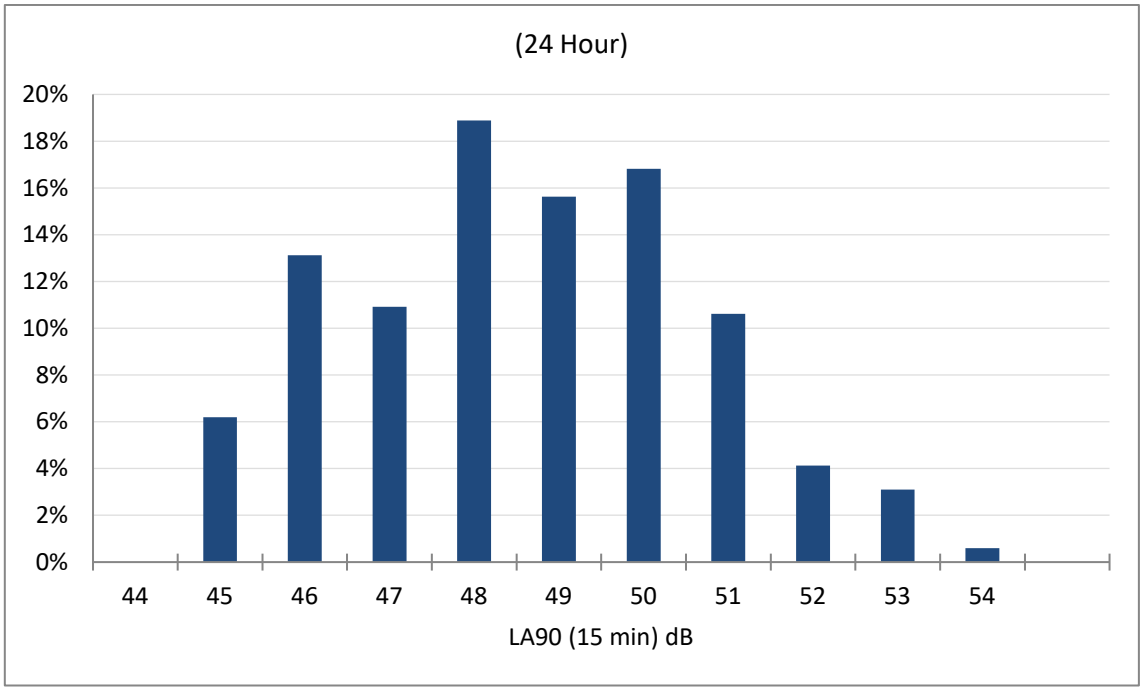


Figure 7: Statistical analysis of measured LA90 sound levels

Figure 6 confirms that the representative background sound levels are LA90 48dB.

Results of the sound level measurements at position MP1 during the first hour of the survey, when a delivery was witnessed as occuring, were measured at LAeq 62dB. The residual sound level over the following hour, after the delivery had been completed, was LAeq 59dB. Confirmation of these levels used in the BS 4142 assessment is included below.

Delivery Ambient Sound Level	**Residual Sound Level Following Delivery**	**Specific Sound Level**
LAeq 62dB	LAeq 59dB	LAeq 59dB

Table 3: Specific sound level during witnessed delivery

Measured sound levels have been assessed in accordance with the requirements of BS 4142:2014+A1:2019 within this report.

5. ProPG STAGE 1 INITIAL NOISE RISK ASSESSMENT

In accordance with the methodology described in ProPG, the measured sound levels should be adjusted to account for any anticipated significant changes to the climate to be predicted to determine a "'*typical worst case' 24-hour day either now or in the foreseeable future*".

Highest daytime and night-time sound levels measured to MP1 have been plotted on the image in Figure 1 to determine the relevant noise risk category.

Results of the initial risk assessment are included in Figure 7 below.

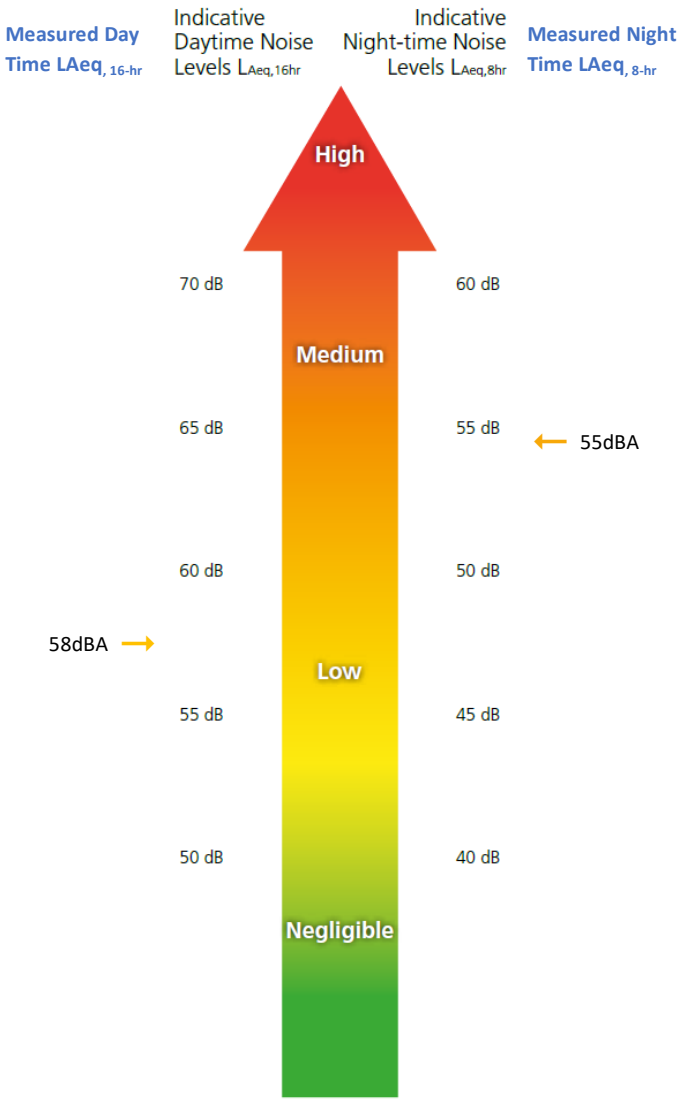


Figure 8: ProPG initial noise risk assessment (MP1)

The initial site risk assessment indicates that the site is in an area where there is a low noise risk during the daytime and a low to medium noise risk at night. An acoustic design is detailed within

Section 7 to ensure levels within the residential properties and amenity areas are acceptable from a noise perspective.

6. ASSESSMENT OF COMMERCIAL NOISE

6.1. Assessment of Noise from Deliveries

Assessment of the calculated specific sound level at the worst-case windows to determine the rating level in accordance with BS 4142:2014+A1:2019 is provided in Table 4 below.

Description	Closest Window to Habitable Room	Relevant Clause	Commentary
Calculated specific sound level of plant to receptor	LAeq 59dB	7.3	Calculated within Table 3 above
Background sound level	LA90 48dB	8	Measured representative background sound level
Acoustic feature correction	+3dB	9.2	Noise from deliveries contains distinct, identifiable bumps and bangs. Therefore, a +3dB penalty has been applied for intermittent noise.
Rating level	LAr 62dB	9.2	
Excess of rating level over background sound level	+14dB	11	Assessment indicates potential for significant adverse impact, depending on the context

Table 4: BS 4142:2014+A1:2019 Assessment

The primary context of this assessment is the development of new residential properties to an area of existing commercial use. In the author's experience the likelihood of adverse impact is reduced in this context compared to the reverse situation of bringing a new noise-generating use to an existing residential dwelling; in situations where a new noise source is introduced, residents notice a change in the acoustic climate, potentially causing a reduction of amenity. However, in this instance residents moving into the new residential flats would not be conditioned to any pre-existing lower levels.

However, the excess of the rating level above the background sound level is such that, without mitigation, there remains a likelihood of adverse or significant adverse impact.

It is generally accepted that achieving a good acoustic design initially considers reducing sound levels at source, mitigating the transmission from source to receiver, and finally through use of façade sound insulation.

It is not practical to reduce sound levels from the sources in this instance as the commercial units would be operated by a third-party and any barrier would be impractical to screen windows directly overlooking the loading bay.

As discussed in Section 2 designing the sound insulation performance of façade elements to achieve appropriate internal sound levels mitigates the adverse impact, particularly where the scheme includes mechanical ventilation such that residents can achieve both background and rapid ventilation rates without needing to open windows.

An appropriate scheme of façade sound insulation has been developed to ensure external noise intrusion to dwellings is low and levels do not exceed guideline criteria contained in the ProPG.

Allowing for the benefit of mechanical ventilation system to provide both background ventilation and to mitigate overheating, this alters the context of the assessment and ensures that there would be no acoustic adverse impacts on future residents.

6.2. Assessment of Sound Transmission Through Separating Partitions

As discussed in Section 2.6, the current use of the site is as a retail store and there is a low likelihood of adverse impact due to operational noise transmission through the separating partitions from this use to the proposed apartments. However, if the commercial unit was changed to a restaurant, still within Use Class E and not requiring planning consent, then this could have a higher likelihood of adverse impact.

Allowing for a typical internal sound level in a restaurant on a busy weekend evening of around LAeq 80dB, then separating walls and floors between the commercial unit and the new residential flats would need to achieve a sound insulation performance of nominally **DnT,w + C'tr 50dB** to ensure the recommended criteria in Section 2.6 is achieved.

This is at least 7dB better than the minimum performance standards of The Building Regulations Approved Document E and should ensure a good standard of amenity for future residents of the apartments.

It is recommended that this performance standard is controlled through a planning condition and can be verified through tests conducted on the completed structure on site, prior to occupation.

7. ProPG STAGE 2 ACOUSTIC DESIGN STATEMENT

As discussed in Section 2.3, Stage 2 of ProPG is separated into four elements: an overview ensuring a good acoustic design process, assessment of internal sound levels, consideration of sound levels in external amenity areas, and finally an assessment of any other relevant issues.

The four elements are considered in more detail within this Section.

7.1. Element 1 – Good Acoustic Design Process

The pre-planning application advice contained in ProPG confirms:

> "*As noise levels increase, the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless a good acoustic design process is followed and is demonstrated in an ADS* [Acoustic Design Statement] *which confirms how the adverse impacts of noise will be mitigated and minimised, and which clearly demonstrates that a significant adverse noise impact will be avoided in the finished development.*"

ProPG and the supplementary documents provide guidance on the typical matters that should be considered in an Acoustic Design Statement. These matters are discussed in Table 5.

Principle/Topic	**Discussion**
Identify significant existing and potential noise sources and measure or estimate sound levels	Nearby road traffic and other general sources have been identified as the dominant noise for much of the time. When deliveries are occurring then these become dominant. Results and discussion of the sound level survey are included in Section 4.
Consider the feasibility of reducing sound levels or relocating noise sources	It is not practical to relocate existing sources as part of this application.
Consider the potential to mitigate sound through planning of the site and orientation of the buildings	The proposed dwellings consist of single aspect apartments. Bedrooms have been located furthest away from the loading bay to mitigate the potential impact of this noise source.
Mitigating the sound through use of barriers or screens	Screening would be impractical to this upper-level development.
Select construction types and methods to achieve the internal sound level criteria	An appropriate acoustic specification for façade elements has been proposed. Refer Section 7.2.
Consider the acoustic impact of the proposed ventilation strategy	This is discussed in more detail in Section 7.3.

Principle/Topic	Discussion
Assess sound levels to external amenity areas	This is discussed in more detail in Section 7.5.
Assess the viability of alternative solutions	Where appropriate, alternative solutions have been considered during the design phase and the most appropriate scheme has been put forward.
Examine the effects of noise control measures on ventilation, fire regulation, H&S, costs, CDM, or other unintended consequence	Under the Construction (Design and Management) Regulations 2015, ACA Acoustics are acting as a Designer. This Acoustic Design Statement and the supporting evidence has considered best practice to reduce or control foreseeable risks. It is recommended that other relevant parties, including the Principal Designer, consider all non-acoustic aspects of the design.

Table 5: Acoustic Design Statement details

7.2. Element 2 – Internal Noise Level Guidelines

A scheme for sound insulation is necessary to ensure sound levels inside rooms of the new residential dwellings are reasonable and comply with the requirements of ProPG and BS 8233:2014.

A computer model has been set up using the measured sound levels on site along with anticipated façade elements. The computer model is based on the calculation procedures outlined in BS EN ISO 12354-3:2000 and BS 8233:2014. Confirmation of the acoustic performance of the building envelope elements used in the calculation model is provided in Table 6 below.

Description	Rw (dB)	Rw + C'tr (dB)	Typical Construction
External façade walls	52	48	Traditional masonry construction such as brick-cavity-block or similar.
Windows & glazed doors	29	25	Typical thermal double glazing such as 4-16-4 or equivalent

Table 6: Acoustic performance specification for facade elements

Note that the constructions provided are typical and variations on the specification would be acceptable, so long as the installed construction achieved the specified sound insulation performance. The specification for glazed elements is for the window/door as a complete unit, including frames and seals and is based on data provided by Guardian Glass. It is recommended the glazing supplier submit test data confirming their unit will comply with the specified performance.

7.3. Ventilation Strategy

Section 2.3 confirms that any site with a noise risk assessment above '*Negligible*' would fail to achieve internal sound level criteria with windows open and in this instance ProPG and the supplementary guidance requires that internal sound level criteria are achieved whilst providing the '*whole dwelling ventilation*' rate as set out in The Building Regulations Approved Document F through the use of above-window or through-wall trickle ventilators.

To ensure noise from external sources is not detrimental to the amenity of future occupants, it will be necessary to incorporate an acoustic ventilation scheme into the design such that residents can achieve adequate ventilation without necessarily needing to open windows.

In accordance with Approved Document O of The Building Regulations, where sound levels to inside bedrooms exceed $L_{Aeq,\ 8\text{-hour}}$ 40dB or LAfmax 55dB more than 10 times per night, then it may not be appropriate to rely on open windows to mitigate overheating. In this instance dynamic thermal modelling may be necessary to determine an appropriate overheating mitigation strategy.

Based on measured levels to the facades of the site of LAeq 55dB and LAfmax 72dB to the rear façade and LAeq 54dB and LAfmax 63dB to the façade overlooking the flat roof area, and allowing a reduction through open windows of 9dBA as recommended within the IOA/ANC guidance, internal sound levels within bedrooms of the development will be nominally LAeq 46dB/LAfmax 63dB and LAeq 45dB/LAfmax 54dB to the different facades respectively with windows open. These sound levels exceed the requirements of Approved Document O and it may be appropriate to consider the overheating mitigation strategy further.

As discussed in Section 6, it is recommended that mechanical ventilation is included to the flats overlooking the loading bay at the rear façade. This will also mitigate potential overheating, ensuring compliance with the requirements of Approved Document O. Although not required to control commercial noise intrusion, the client may also consider including mechanical ventilation to the flats overlooking the flat roof, albeit determination of this is beyond the scope of this assessment for planning purposes.

Mechanical ventilation systems such as MVHR or MEV should be designed such that any self-noise (i.e., noise from the fans) and external noise intrusion through the ducted system must not cause internal sound levels to exceed the design requirements. To achieve these limits, it is recommended that the overall noise from any mechanical ventilation system will need to be no higher than LAeq 26dB to allow for accumulation of noise sources. Suitable MVHR systems must also incorporate summer bypass mode to minimise the potential for overheating during summer months.

7.4. Calculated Internal Sound Levels

Copy of acoustic calculations for daytime and night-time noise intrusion into a sample worst-case bedroom overlooking the rear façade is provided in Appendix A. Summary results are confirmed Table 7 below and demonstrate that intrusive sound levels within rooms of the proposed residential units will comply with guidance limits in ProPG and BS 8233:2014.

Plot / Room	Description	Calculated Internal Sound Level	Criteria
First Floor Bedroom	Daytime LAeq	30dB	≤ 35dB
	Night-time LAeq	27dB	≤ 30dB
	Night-time LAfmax	44dB	≤ 45dB

Table 7: Summary internal sound levels within sample habitable room

7.5. Element 3 – External Amenity Area Noise Assessment

Sound levels to the private balconies overlooking the rear façade will slightly exceed the guideline limit of BS 8233:2014. However, residents will also have access to the communal amenity area on the first-floor flat roof. Measured sound levels at this position were $LAeq_{,16\text{-hour}}$ 54dB. This complies with the criteria to ensure a reasonable standard of amenity, recommended in BS 8233:2014. Furthermore, the development is within a short walking distance of nearby public amenity spaces.

7.6. Element 4 – Assessment of Other Relevant Issues

Other relevant acoustic issues, including noise from deliveries and sound transmission through internal separating partitions, is included in Section 6 of this report.

8. CONCLUSION

A planning application is to be submitted seeking consent for new residential units to be developed at 30 West Street, Horsham.

ACA Acoustics have undertaken a sound level survey at the site. A ProPG Stage 1 initial noise risk assessment has indicated the site is in a low to medium risk area. Through a good acoustic design process ACA Acoustics have developed an appropriate Acoustic Design Statement, included in this report.

It is the author's opinion that the assessment has demonstrated that potential adverse impacts can be adequately mitigated to ensure noise is not detrimental to the amenity of future occupants.

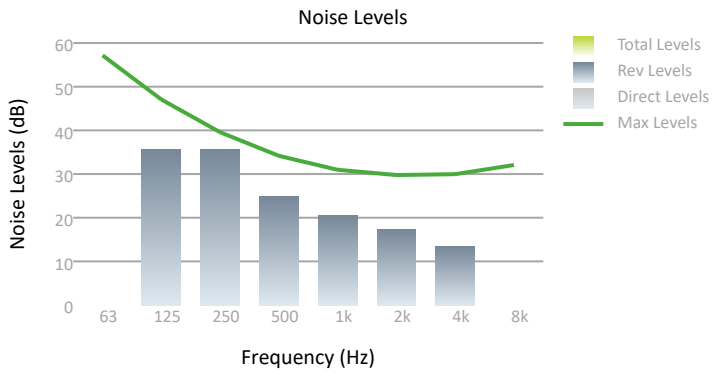
In accordance with guidance in ProPG, it is recommended that planning consent may be granted for the proposed development, subject to appropriate noise conditions.

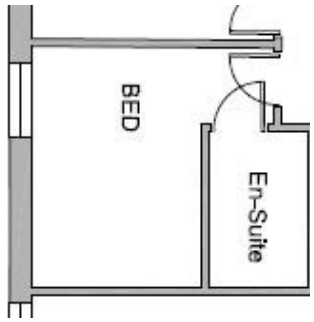
Appendix A

Acoustic Calculations

30 West Street, Horsham

Reference	1st Floor Bedroom
Description	Bedroom
Target Sound Level	35dB(A)
Max Sound Level	40dB(A)
Calculated Sound Level	30dB(A)
Calculated Tmf T60 (s)	0.47
Volume (m^3)	28.4





Calculated Internal Sound Levels

Reference	Quantity	Noise Levels (dB)							
		63	125	250	500	1k	2k	4k	8k
Leq, ff (Day)	1	-	36	36	25	21	17	13	-

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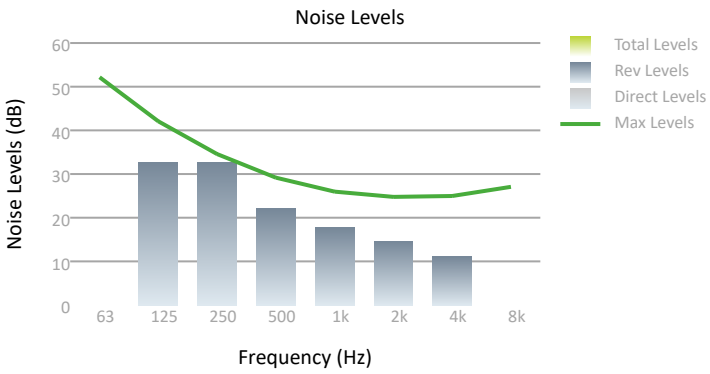
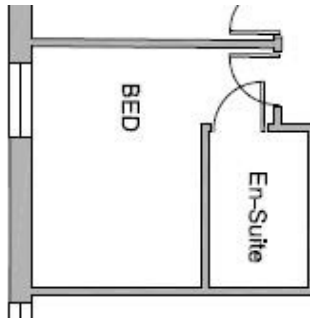
30 West Street, Horsham

Reference	1st Floor Bedroom - Night
Description	Bedroom
Target Sound Level	30dB(A)
Max Sound Level	35dB(A)
Calculated Sound Level	27dB(A)
Calculated Tmf T60 (s)	0.47
Volume (m^3)	28.4





Calculated Internal Sound Levels

Reference	Quantity	Noise Levels (dB)							
		63	125	250	500	1k	2k	4k	8k
Leq, ff (Night)	1	-	33	33	22	18	15	11	-

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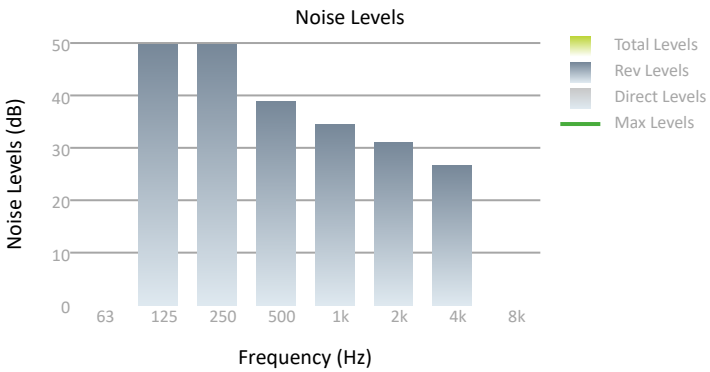
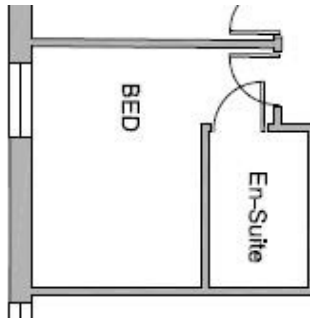
30 West Street, Horsham

Reference	1st Floor Bedroom - Night Lfmax
Description	Bedroom
Target Sound Level	45dB(A)
Max Sound Level	-
Calculated Sound Level	44dB(A)
Calculated Tmf T60 (s)	0.47
Volume (m^3)	28.4





Calculated Internal Sound Levels

Reference	Quantity	Noise Levels (dB)							
		63	125	250	500	1k	2k	4k	8k
Lmax, ff (Night)	1	-	50	50	39	34	31	27	-

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Calculation Sheet

Bedroom - Daytime Leq

		Octave Band Centre Frequency (Hz)								
		63	125	250	500	1k	2k	4k	8k	
Sound Level at Facade (Daytime Leq)										
Source dBA	**58.0**									
Octave Band Frequencies										
Leq,ff		**62.0**	**60.0**	**56.0**	**54.0**	**54.0**	**50.0**	**45.0**	**39.0**	**Row A**
Facade Wall Element										
		-38.7	*-41.7*	*-45.7*	*-45.7*	*-54.7*	*-58.7*	*-60.7*	*-65.7*	
Facade Glazed Element										
		-	*-33.3*	*-24.3*	*-34.3*	*-47.3*	*-55.3*	*-47.3*	*-*	
Ventilators										
		-31.1	*-30.1*	*-33.1*	*-38.1*	*-37.1*	*-36.1*	*-35.1*	*-36.1*	
Cumulative Lp										
Result		**-**	**31.8**	**32.3**	**21.5**	**17.6**	**14.3**	**11.0**	**-**	
ISO 12354-3 Lfs Correction										
		-	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*-*	
Room Corrections										
		-	*3.9*	*3.4*	*3.4*	*3.0*	*3.0*	*2.5*	*-*	
Internal Receiver Noise										
Internal Receiver Noise - 1st Floor Bedroom **Reverberant Field, LPrev:**		**-**	**35.7**	**35.7**	**25.0**	**20.5**	**17.3**	**13.4**	**-**	

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Calculation Sheet

Bedroom - Night-time Leq

		Octave Band Centre Frequency (Hz)								
		63	125	250	500	1k	2k	4k	8k	
Sound Level at Facade (Nighttime Leq)										
Source dBA	**55.0**									
Octave Band Frequencies										
Leq,ff		**59.0**	**57.0**	**53.0**	**51.0**	**51.0**	**47.0**	**42.0**	**36.0**	**Row A**
Facade Wall Element										
		-38.7	*-41.7*	*-45.7*	*-45.7*	*-54.7*	*-58.7*	*-60.7*	*-65.7*	
Facade Glazed Element										
		-	*-33.3*	*-24.3*	*-34.3*	*-47.3*	*-55.3*	*-47.3*	*-*	
Ventilators										
		-31.1	*-30.1*	*-33.1*	*-38.1*	*-37.1*	*-36.1*	*-35.1*	*-36.1*	
Cumulative Lp										
Result		**-**	**28.8**	**29.3**	**18.6**	**14.7**	**11.7**	**8.6**	**-**	
ISO 12354-3 Lfs Correction										
		-	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*-*	
Room Corrections										
		-	*3.9*	*3.4*	*3.4*	*3.0*	*3.0*	*2.5*	*-*	
Internal Receiver Noise										
Internal Receiver Noise - 1st Floor Bedroom - Night **Reverberant Field, LPrev:**		**-**	**32.7**	**32.7**	**22.0**	**17.7**	**14.6**	**11.1**	**-**	

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Calculation Sheet

Bedroom - Night-time Lmax

		Octave Band Centre Frequency (Hz)								
		63	125	250	500	1k	2k	4k	8k	
Sound Level at Facade (Nighttime Lmax)										
Source dBA	**72.0**									
Octave Band Frequencies										
Leq,ff		**76.0**	**74.0**	**70.0**	**68.0**	**68.0**	**64.0**	**59.0**	**53.0**	**Row A**
Facade Wall Element										
		-38.7	*-41.7*	*-45.7*	*-45.7*	*-54.7*	*-58.7*	*-60.7*	*-65.7*	
Facade Glazed Element										
		-	*-33.3*	*-24.3*	*-34.3*	*-47.3*	*-55.3*	*-47.3*	*-*	
Ventilators										
		-31.1	*-30.1*	*-33.1*	*-38.1*	*-37.1*	*-36.1*	*-35.1*	*-36.1*	
Cumulative Lp										
Result		**-**	**45.8**	**46.3**	**35.4**	**31.4**	**28.0**	**24.2**	**-**	
ISO 12354-3 Lfs Correction										
		-	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*-*	
Room Corrections										
		-	*3.9*	*3.4*	*3.4*	*3.0*	*3.0*	*2.5*	*-*	
Internal Receiver Noise										
Internal Receiver Noise - 1st Floor Bedroom - Night Lfmax **Reverberant Field, LPrev:**		**-**	**49.7**	**49.7**	**38.9**	**34.4**	**31.0**	**26.7**	**-**	

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