parkerjones acoustics

Bentley House

North Heath Lane Business Park, Horsham

Noise Impact Assessment

13th November 2025

Revision 1

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Revision History

Version	Comments	Author	Date
First Issue	First issued version of the report	**Chris Parker-Jones** Director and Acoustic Consultant BSc (Hons) MSc MIOA	12th December 2023
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Executive Summary and Conclusions

This document, a Noise Impact Assessment (NIA), has been written to assess the proposals for residential development at Bentley House, North Heath Lane Business Park, Horsham in terms of the noise impact that the residual environment would have on future occupants of the proposed development.

In summary, having followed a 'good acoustic design process' as referenced with the ProPG, PJA believes that the noise impact on future occupants at the proposed development can be controlled to an acceptable level, providing the recommendations herein are followed.

Internal ambient noise level (IANL) targets in accordance with BS 8233:2014 and ProPG: Planning & Noise (2017) can be achieved throughout the proposed dwellings, provided that the glazing and ventilation specifications outlined in Section 4.4.3 and Table 4.7 are implemented.

The external noise environment has been assessed through a multi-day unattended survey, capturing representative levels from both road traffic and surrounding commercial premises within North Heath Lane Business Park. Particular consideration has been given to the northern façade, which faces the adjoining industrial units and associated delivery area referenced in the Environmental Health Officer's consultation response on application DC/23/2323.

In addition to the residential design assessment under BS 8233 and ProPG, the review has also considered potential noise from nearby industrial and plant operations in accordance with BS 4142:2014 + A1:2019. While this analysis indicates that intermittent commercial activity could, at times, produce rating levels above the prevailing background sound level, such impacts are limited in duration and magnitude.

As these noise sources are outside of the applicant's control, the appropriate mitigation is through the façade and ventilation design, with enhanced acoustic glazing and acoustically rated trickle ventilators (or a mechanical ventilation system) specified to achieve the enhanced internal noise targets described in Section 4.3.1. These measures will ensure that suitable internal conditions are maintained when required.

Suitable options include acoustically rated trickle ventilators or, where overheating risk is identified, mechanical ventilation to remove any reliance on open windows for cooling. A mechanical ventilation or air-conditioning system may be appropriate to maintain comfortable internal conditions in warmer months, allowing occupants to keep windows closed during noisier periods without compromising comfort. This approach does not require the windows to be sealed shut; rather, it provides flexibility for occupants to open them at their discretion when noise levels are low, which, based on the survey results, represents the majority of the time. The intention is to ensure the dwellings perform acoustically when needed, while still allowing normal use and enjoyment of openable windows whenever conditions permit.

Overall, provided the recommendations within this report are adopted, the proposed development will achieve a good standard of internal acoustic comfort, ensuring that potential impacts from nearby commercial and industrial activity are controlled to an acceptable level in accordance with relevant national and local planning policy and guidance.

Contents

1.0 Introduction

ParkerJones Acoustics Limited (PJA) has been instructed to undertake an updated Noise Impact Assessment for the proposed residential development at Bentley House, North Heath Lane Business Park, Horsham, RH12 5QE.

The purpose of this report is to assess the site in terms of the noise impact that the residual acoustic environment — including both background sound and nearby commercial operations — may have on the future occupants of the proposed development, and to ensure that noise impacts are appropriately controlled. Where considered necessary, additional mitigation measures have been suggested to ensure that identified impacts are minimised.

This updated assessment has been prepared following Environmental Health Officer (EHO) comments received during the withdrawn application DC/23/2323 with Horsham District Council, which requested that the assessment also consider potential noise emissions from surrounding commercial and industrial sources in accordance with BS 4142:2014 + A1:2019 – Methods for rating and assessing industrial and commercial sound.

The report takes into account relevant national and local planning policy, including the National Planning Policy Framework (NPPF), the Noise Policy Statement for England (NPSE), and the Planning Practice Guidance on Noise (PPG-N) (summarised in Appendix B), as well as the Planning Noise Advice Document: Sussex (September 2021). These documents collectively aim to ensure that new development achieves good acoustic design and limits impacts to no greater than the Lowest Observed Adverse Effect Level (LOAEL).

The assessment has been undertaken with reference to the following guidance and standards:

- BS 4142:2014 + A1:2019 – Methods for rating and assessing industrial and commercial sound;
- Planning Noise Advice Document: Sussex (September 2021);
- Professional Practice Guidance on Planning and Noise (ProPG) (2017), which provides guidelines for good acoustic design and suitable internal ambient noise levels in residential dwellings;
- BS 8233:2014 – Guidance on sound insulation and noise reduction for buildings, which recommends internal and external noise limits for dwellings; and
- World Health Organisation (WHO) documents Guidelines for Community Noise (1999) and Night Noise Guidelines for Europe (2009), which suggest suitable internal noise levels for residential environments.

Whilst every attempt has been made to ensure that this report communicates effectively to readers who may not have specialist knowledge of acoustics, some sections are necessarily technical. A glossary of key acoustic terms and concepts is provided in Appendix A.

2.0 Site and Development Description

The proposed residential development is to be a refurbishment of Bentley House, at North Heath Drive, within North Heath Lane Business Park.

Figure 2.1 provides an overview of the site and the surrounding area and the existing site plan. The noise monitoring positions (P1, P2, P3 and P4) as referenced in the subsequent assessment chapters are also shown. The application site boundary is shown in Figure 2.2.

The site is a two-storey office building known as Bentley House located on the southern part of the business park. The site is surrounded by local roads including North Heath Lane to the east and Amundsen Road to the north. There is a significant distance to any major transportation sources, with the A24 further to the west and the A264 to the north. The main Horsham to Crawley railway line is also located to the east. As these sources are located at a considerable distance, environmental noise levels on site are low.

The existing site due to its formation as an enclosed business park creates screening to the surrounding local roads, which also contributes to low environmental noise levels.

It appears from the survey results that the existing commercial and business uses on site do not generate significant noise levels, being largely office-based in nature rather than light industrial with substantial plant, machinery, or vehicle activity. This is demonstrated by the results of the various noise monitoring positions.

However, following review of Environmental Health Officer (EHO) comments on the withdrawn application DC/23/2323 with Horsham District Council, it is noted that roller-shutter doors serving a delivery/dispatch area of an industrial building are located approximately 12 metres from the northern façade of Bentley House, with fixed external plant on the same elevation. While such activity was not observed during the original survey (or at least not clearly observed by the surveyor while on site), and noise levels recorded were low, the potential for intermittent noise from these operations has been considered within this updated assessment.

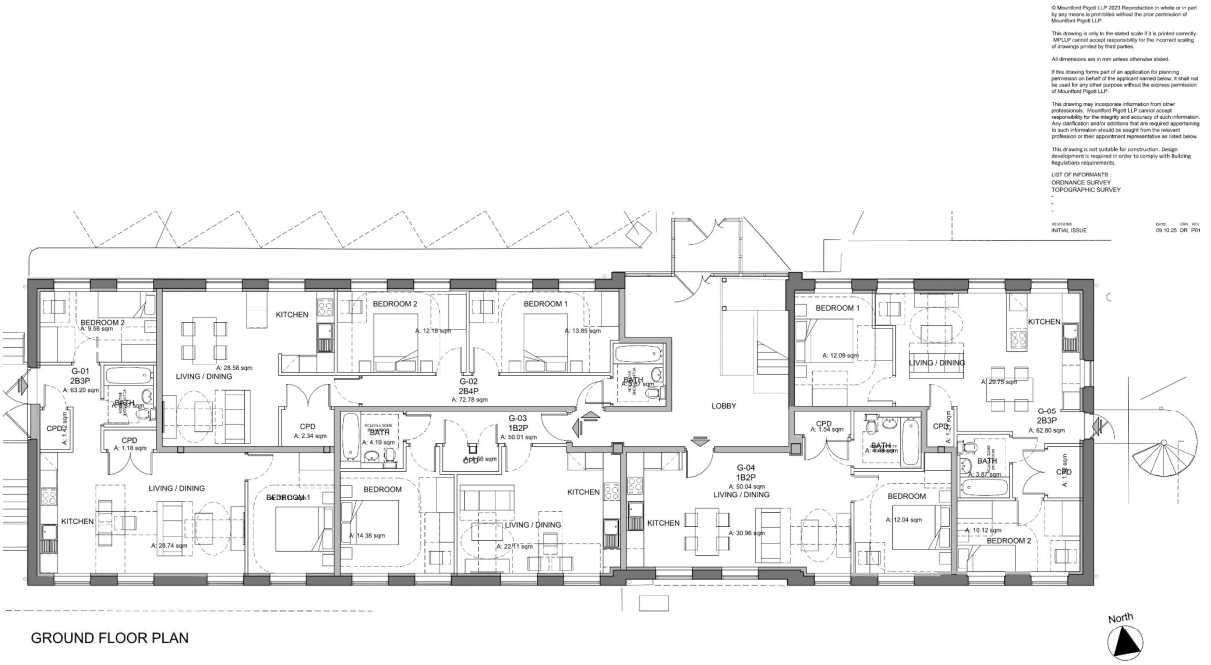
It is understood from the client that operational hours on the business park are restricted to 07:00 – 19:00, as enforced by the Local Planning Authority, which should limit the potential for significant evening or nighttime activity.

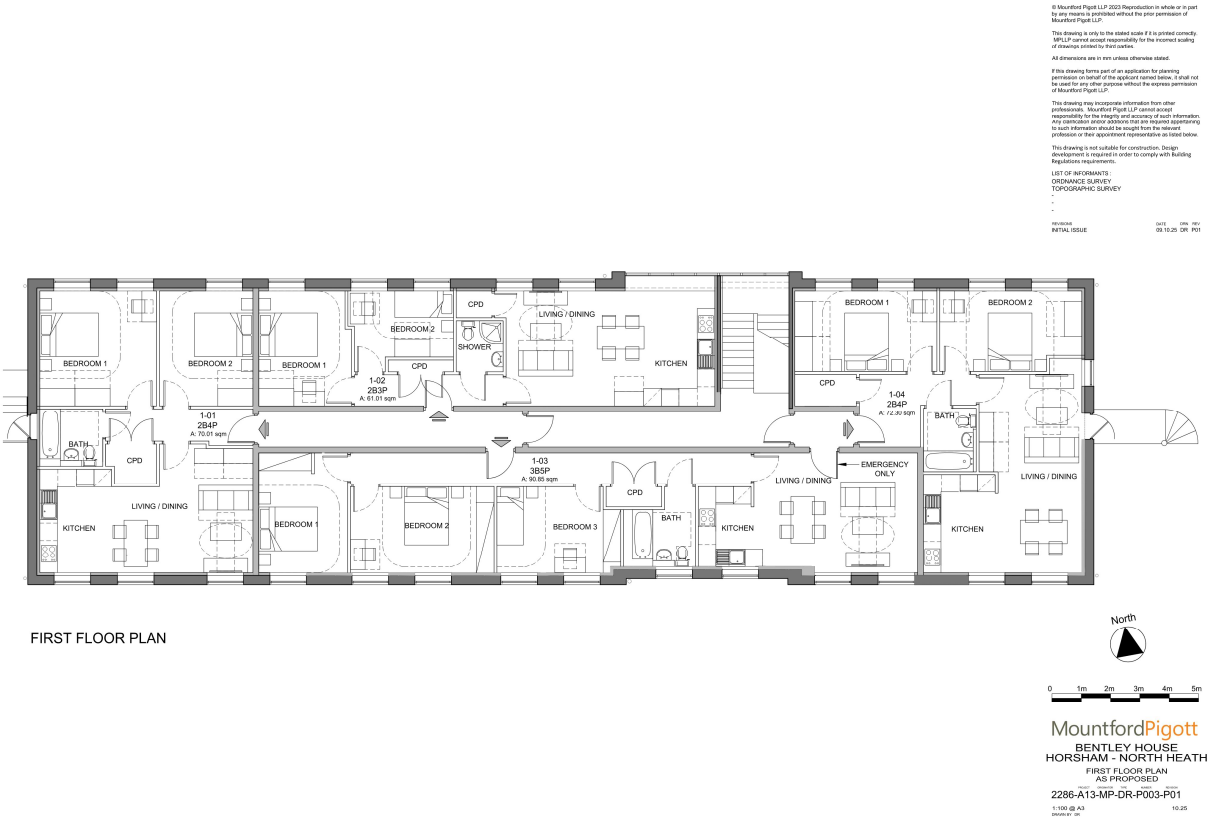
The proposals comprise the change of use and conversion of the existing office space under Class MA of the General Permitted Development Order (GPDO) into 10 private residential flats, comprising a mix of one-, two-, and three-bedroom units. Floor plans are shown in Figure 2.3.

Figure 2.1 – Aerial view of the site and surrounding area (top), site plan (bottom)

Figure 2.2 – Site location

Figure 2.3 – Proposed floor plans





3.0 Consultation and Relevant Guidelines

3.1 Local Authority Requirements

Following review of the withdrawn application DC/23/2323, Horsham District Council's Environmental Health Officer (EHO) raised specific concerns regarding potential noise impacts from nearby commercial operations. In their consultation response (dated 07 February 2024), Environmental Health noted that:

- Roller shutter doors serving a delivery/dispatch area of an adjacent industrial building are located approximately 12 metres from the northern façade of Bentley House, with fixed external plant also positioned on the same elevation.
- There were no known planning restrictions on the operational hours of that unit at the time, meaning that such activity could, in theory, occur at any time of day or night.
- Given these circumstances, the EHO stated that the noise assessment should be undertaken in accordance with BS 4142:2014 + A1:2019 – Methods for rating and assessing industrial and commercial sound, to more fully characterise the potential impact on future residential amenity.

The current (updated) assessment has therefore been expanded to address these points and to include a consideration of nearby commercial noise sources under BS 4142, in addition to the internal noise criteria already assessed under BS 8233:2014, ProPG: Planning & Noise (2017), and the WHO Guidelines.

In addition to the above, Horsham District Council's Supplementary Planning Document – Noise (2021) requires that new residential developments demonstrate that:

- Existing noise sources are appropriately assessed in line with recognised standards such as BS 4142, BS 8233, and ProPG.
- Internal and external noise levels within proposed dwellings are controlled to meet the guideline values of BS 8233 Table 4, and that maximum nighttime events are consistent with WHO criteria.
- Where potentially adverse noise from neighbouring commercial premises exists, mitigation should be incorporated through façade design and ventilation strategy, ensuring that occupants are not reliant on opening windows to achieve acceptable internal conditions.

The present assessment has been prepared in accordance with these local policy requirements and responds directly to the consultation comments issued by Horsham District Council's Environmental Health team.

3.2 The Professional Practice Guidance on Planning and Noise (ProPG)

The ProPG, published in 2017, extends on the guidance and numerical targets within BS 8233:2014 and WHO guidelines, providing new and extended recommendations where these standards (frequently used for assessing residential developments throughout the UK) are considered to fall short. Therefore, it is considered to be the most relevant and up to date design standard for assessing the noise impact on new residential developments. A full summary of the standard (including the 'good acoustic design' process) is given in Appendix B.4.

The ProPG recommends that an initial site noise risk assessment should be undertaken based on indicative external noise levels on the existing site, without accounting for the impact of any new or additional mitigation measures that may subsequently be included in development proposals. Figure 1 of the ProPG relates the increasing risk of adverse effects against indicative daytime noise levels ($L_{Aeq,16hr}$) and nighttime noise levels ($L_{Aeq,8hr}$) without noise mitigation. This is recreated in Table 3.1.

Table 3.1 – The ProPG initial site noise risk assessment guidelines

Indicative external daytime noise levels $L_{Aeq,16hr}$	Indicative external nighttime noise levels $L_{Aeq,8hr}$	Potential risk of adverse effect without noise mitigation
≤ 50 dB	≤ 40 dB	Negligible / No adverse effect [1]
> 50 dB and ≤ 60 dB	> 40 dB and ≤ 50 dB	Low
> 60 dB and ≤ 70 dB	> 50 dB and ≤ 60 dB	Medium
> 70 dB	> 60 dB	High

NOTES:

The noise level limits are an interpretation of Figure 1 in the ProPG, which is presented as a diagram rather than a table and does not explicitly state the limits at which each risk category exists.

[1] An indication that there may be more than 10 noise events at night with $L_{Amax,F}$ > 60 dB means the site should not be regarded as a negligible risk.

The ProPG provides internal ambient noise level targets based on BS 8233:2014 and WHO guidelines, as shown in the table below.

Table 3.2 – The ProPG internal ambient noise level (IANL) upper limits

Activity	Location	Daytime (07:00 – 23:00)	Nighttime (23:00 – 07:00)
Resting	Living Room	35 dB $L_{Aeq,16hr}$	-
Dining	Dining Room/Area	40 dB $L_{Aeq,16hr}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hr}$	30 dB $L_{Aeq,8hr}$ 45 dB $L_{Amax,F}$ [1]
[1] a threshold by which 'good acoustic design' is achieved by not exceeding this threshold more than 10 times a night			

The ProPG indicates that the guidance can be relaxed by up to 5 dB where development is considered necessary or desirable, despite high external noise levels.

Whilst it is desirable to achieve the recommended IANLs with windows open, an assessment can be made with closed windows and open ventilators (i.e., trickle vents) which provide *"whole dwelling ventilation"* (as defined by Building Regulations Approved Document F). Closed windows do not mean sealed shut/un-openable windows, as occupants would favour the ability to open the windows (especially during the hotter months of the year) even if the resultant internal acoustic conditions aren't as satisfactory.

3.3 BS 8233:2014

BS 8233:2014 '*Guidance on Sound Insulation and Noise Reduction for Buildings*' suggests appropriate criteria and limits for different situations. It is primarily intended to guide the design of new buildings, or refurbished buildings undergoing a change of use. It is seen that the criteria of BS 8233 are referenced within the typical planning condition.

Table 4 of BS 8233:2014 provides 'desirable' internal ambient noise level (IANL) limits for dwellings from *"steady external noise sources"*. BS 8233:2014 also notes that *"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."* These targets are summarised in Table 3.3 below.

Table 3.3 – BS 8233:2014 internal ambient noise level (IANL) upper limits

Activity	Location	Daytime (07:00 – 23:00)		Nighttime (23:00 – 07:00)	
		Desirable conditions	Reasonable conditions	Desirable conditions	Reasonable conditions
Resting	Living Room	35 dB $L_{Aeq,16hr}$	40 dB $L_{Aeq,16hr}$	-	-
Dining	Dining Room/Area	40 dB $L_{Aeq,16hr}$	45 dB $L_{Aeq,16hr}$	-	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hr}$	40 dB $L_{Aeq,16hr}$	30 dB $L_{Aeq,8hr}$	35 dB $L_{Aeq,8hr}$

Annex G.1 of BS 8233:2014 suggests that "*if partially open windows were relied upon for background ventilation, the insulation would be reduced to approximately 15 dB*".

Whilst it is desirable to achieve the recommended IANLs with windows open, this is not stipulated as a mandatory requirement within the guidance of BS 8233:2014 which 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. If applicable, any room should have adequate ventilation (e.g., trickle ventilators should be open) during assessment."*

Therefore, a noise limit directly outside of the nearest residential windows could be set based upon the values above plus 15 dB, as per below:

- Desirable internal conditions – Façade noise levels <50 dB $L_{Aeq,16hr}$
- Reasonable internal conditions – Façade noise levels <55 dB $L_{Aeq,16hr}$

3.4 WHO Guidelines

The WHO document *Guidelines for Community Noise 1999* ('GCN') sets out guidance as to noise levels at which there will be an unacceptable impact on the occupants of residential developments.

For steady continuous noise, the GCN recommends an indoor guideline value for bedrooms of 30 dB $L_{Aeq,8hr}$ and 45 dB L_{AFmax} for a single sound event to prevent sleep disturbance. The document also states, 'For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dBA LAmax more than 10-15 times per night, (Vallet & Varnet 1991).'

3.5 BS 4142:2014

BS 4142:2014 *'Methods for rating and assessing industrial and commercial sound'* is intended to be used to assess the potential adverse impact of sound of an industrial and/or commercial nature, at nearby noise-sensitive receptor (NSR) locations (i.e., residential windows) within the context of the existing sound environment.

The method is based upon assessing the predicted noise emissions from plant/equipment against the existing background sound levels at NSRs, the latter of which is determined by a noise survey conducted at the site.

The predicted noise emissions are termed as a 'rating level', which is the 'specific sound level' from plant (the actual measurable noise level), plus 'penalties' which account for whether the noise has distinguishing characteristics such as tonality, intermittency, impulsivity, or is generally distinguishable from the ambient noise environment. Such features may attract attention and be considered annoying, hence sounds with these qualities should be penalised over sounds at the same specific noise level which is less intrusive.

The general aim is for the 'rating level' (plant noise emissions) to not exceed the existing background sound levels outside of residential windows. BS 4142:2014 states that *"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."*

4.0 Assessment

This section details the impact the existing noise environment would have on the proposed residential dwellings in the development, including the implications this has on the ventilation strategy and the construction types required within the façade to reduce external noise ingress to an acceptable level for the future occupants.

Firstly, the existing ambient noise environment at the site is assessed with the support of an environmental noise survey. Noise ingress into living spaces is then assessed against the IANL limits of the ProPG, to determine the sound reduction requirements of the building envelope and determine whether background ventilation can be provided by open windows, trickle ventilators, or mechanical ventilation (to meet IANL limits).

4.1 Noise Survey

4.1.1 Methodology

PJA has attended the site to conduct an environmental noise survey over the course of several days between Friday the 17th and Wednesday the 22nd of November 2023. The results of the survey have been used to quantify the typical residual noise levels that would be incident on the site and subsequently the proposed development on a day-to-day and night-by-night basis.

Four 'long term' measurement positions (P1, P2, P3 and P4) were installed at the locations denoted in Figure 2.1. Microphones at P1, P2 and P3 were positioned out of first floor windows. P4 is at ground level, at approximately 2m.

The sound level meters were set to log noise levels over continuous 5-minute averaging periods with a 1-second time history rate. The monitoring equipment was left unattended with the exception of the setup and collection of the equipment. The following noise indices were recorded:

- $L_{Aeq,T}$: The A-weighted equivalent continuous noise level over the measurement period T. This parameter is typically considered a good representation of the average ambient sound level;
- $L_{AFmax,T}$: The maximum A-weighted noise level during the measurement period T and the best representation of short high noise levels 'events' – i.e., emergency services sirens;
- $L_{A90,T}$: The A-weighted noise level that is exceeded for 90% of the measurement period T. This parameter is often considered as the 'average minimum level' and is therefore used in determining the representative background noise level – or noise levels from continuous noise sources such as plant; and
- $L_{A10,T}$: The A-weighted noise level that is exceeded for 10% of the measurement period T. This parameter is often considered as the 'average maximum level' and a good representation of traffic noise contributions.

Appendix C contains further information on the methodology of the survey; including the equipment used; photographs of the site and monitoring positions; and the weather conditions.

Subjectively, the noise climate is predominantly from vehicles in and out of the business park, and the road to the east. The surveyor did not note significant plant noise sources or light industrial use.

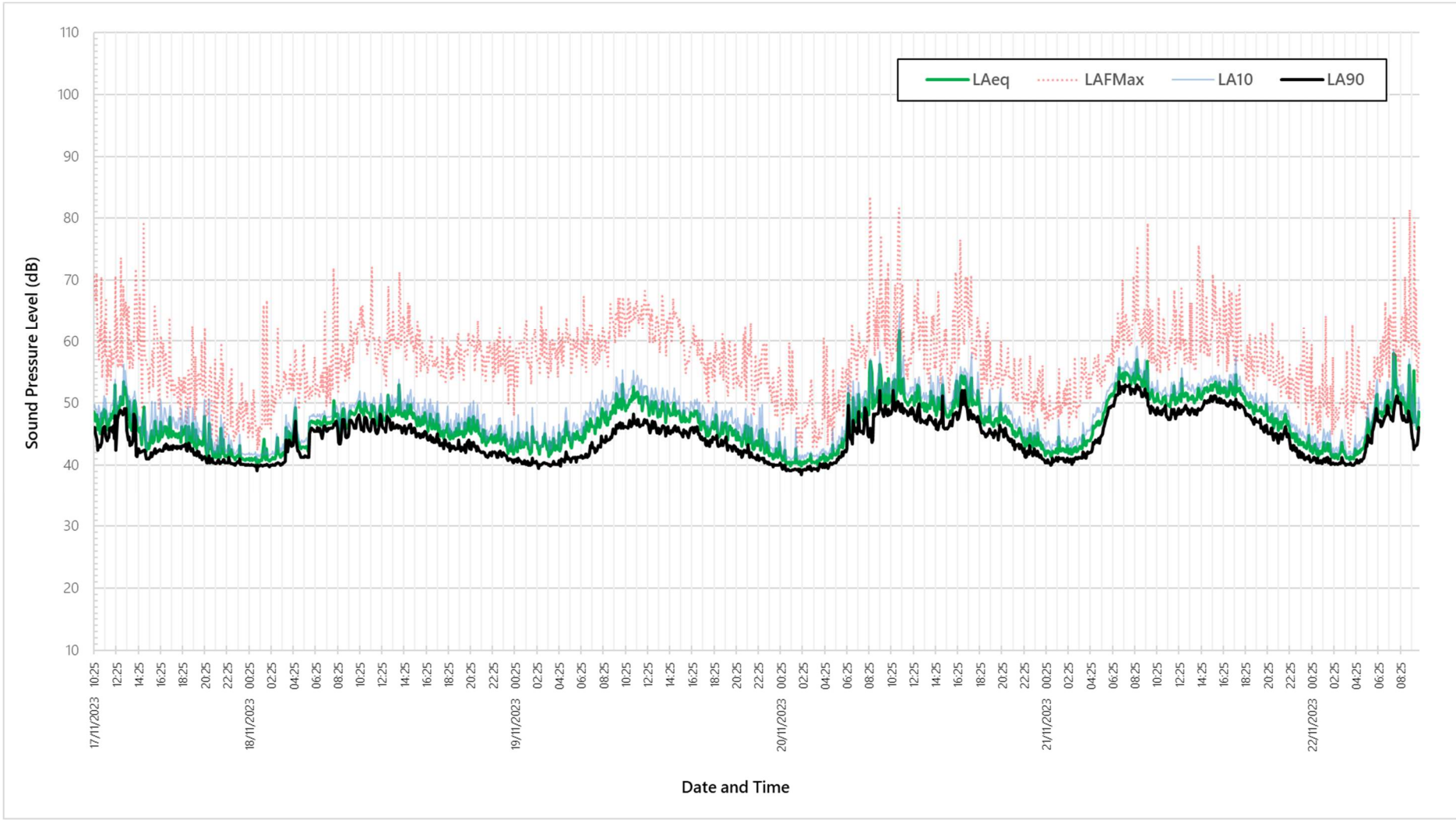
4.1.2 Results – P1

A graph of the measured noise levels across the entire monitoring period at P1 is given in Figure 4.1, with a summary provided in Table 4.1 below.

Table 4.1 – Summary of measured noise levels – P1

Period	Logarithmic Average $L_{Aeq,T}$ (dB)	10th Highest $L_{AFmax,5min}$ (dB)	Median $L_{A90,5min}$ (dB)	Median $L_{A10,5min}$ (dB)
Daytime (07:00 – 23:00) **T = 16-hours**				
Friday 17th November; 10:25 - 23:00	47	67	42	47
Saturday 18th November; 07:00 - 23:00	47	66	45	49
Sunday 19th November; 07:00 - 23:00	48	66	45	49
Monday 20th November; 07:00 - 23:00	51	71	47	51
Tuesday 21st November; 07:00 - 23:00	52	70	49	53
Wednesday 22nd November; 07:00 - 10:10	51	64	48	51
Nighttime (23:00 – 07:00) **T = 8-hours**				
Friday 17th November / Saturday 18th November; 23:00 - 07:00	44	56	40	43
Saturday 18th November / Sunday 19th November; 23:00 - 07:00	44	62	41	45
Sunday 19th November / Monday 20th November; 23:00 - 07:00	42	56	40	42
Monday 20th November / Tuesday 21st November; 23:00 - 07:00	46	58	41	45
Tuesday 21st November / Wednesday 22nd November; 23:00 - 07:00	44	59	41	45

Figure 4.1 – Graph of measured noise levels – P1



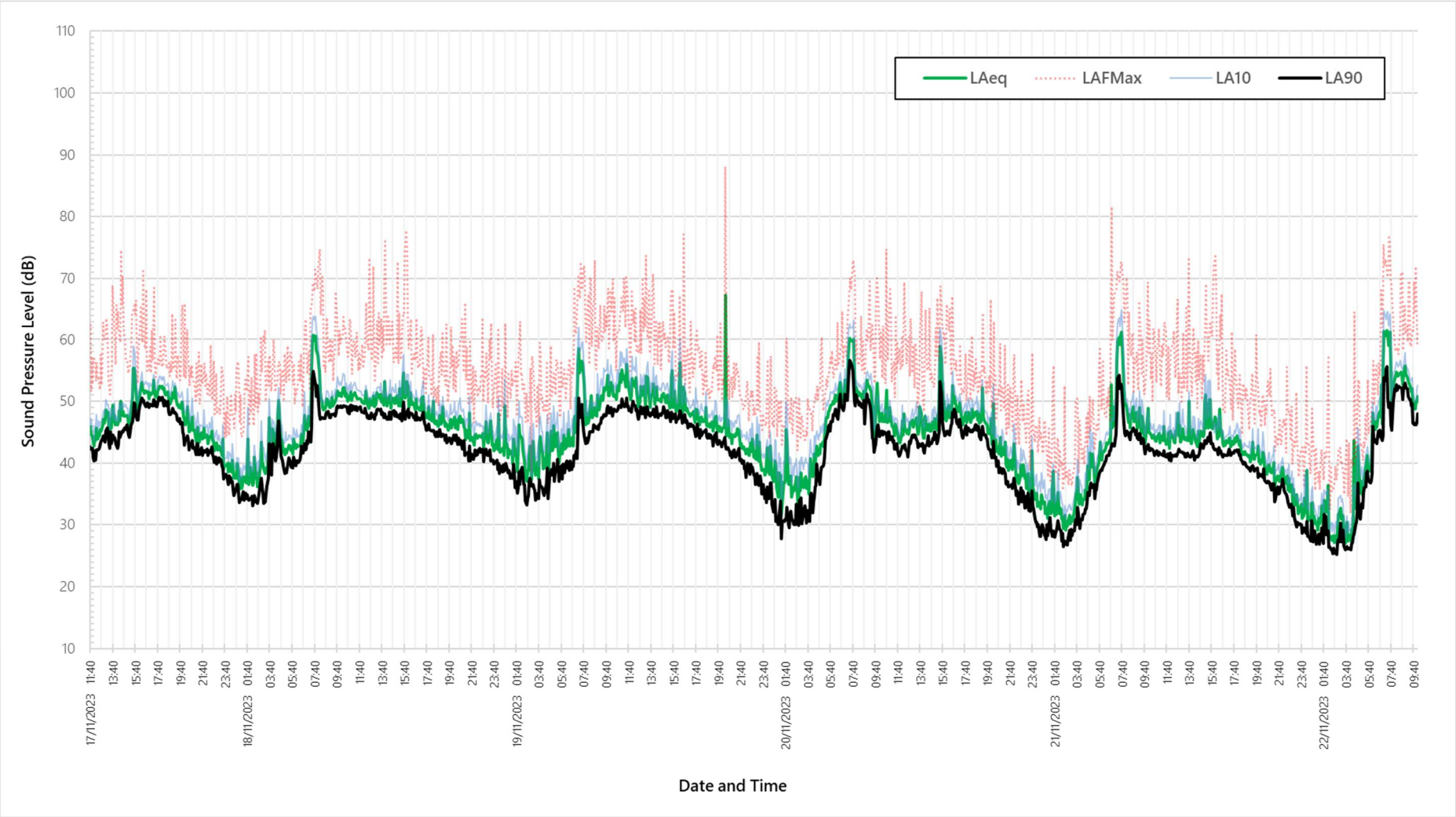
4.1.3 Results – P2

A graph of the measured noise levels across the entire monitoring period at P2 is given in Figure 4.2, with a summary provided in Table 4.2 below.

Table 4.2 – Summary of measured noise levels – P2

Period	Logarithmic Average $L_{Aeq,T}$ (dB)	10th Highest $L_{AFmax,5min}$ (dB)	Median $L_{A90,5min}$ (dB)	Median $L_{A10,5min}$ (dB)
Daytime (07:00 – 23:00) **T = 16-hours**				
Friday 17th November; 11:40 - 23:00	49	66	45	49
Saturday 18th November; 07:00 - 23:00	51	72	47	51
Sunday 19th November; 07:00 - 23:00	51	70	47	51
Monday 20th November; 07:00 - 23:00	50	69	44	48
Tuesday 21st November; 07:00 - 23:00	48	70	41	45
Wednesday 22nd November; 07:00 - 10:05	56	71	51	56
Nighttime (23:00 – 07:00) **T = 8-hours**				
Friday 17th November / Saturday 18th November; 23:00 - 07:00	42	58	38	43
Saturday 18th November / Sunday 19th November; 23:00 - 07:00	43	59	39	45
Sunday 19th November / Monday 20th November; 23:00 - 07:00	45	58	35	42
Monday 20th November / Tuesday 21st November; 23:00 - 07:00	39	52	31	37
Tuesday 21st November / Wednesday 22nd November; 23:00 - 07:00	40	55	29	34

Figure 4.2 – Graph of measured noise levels – P2



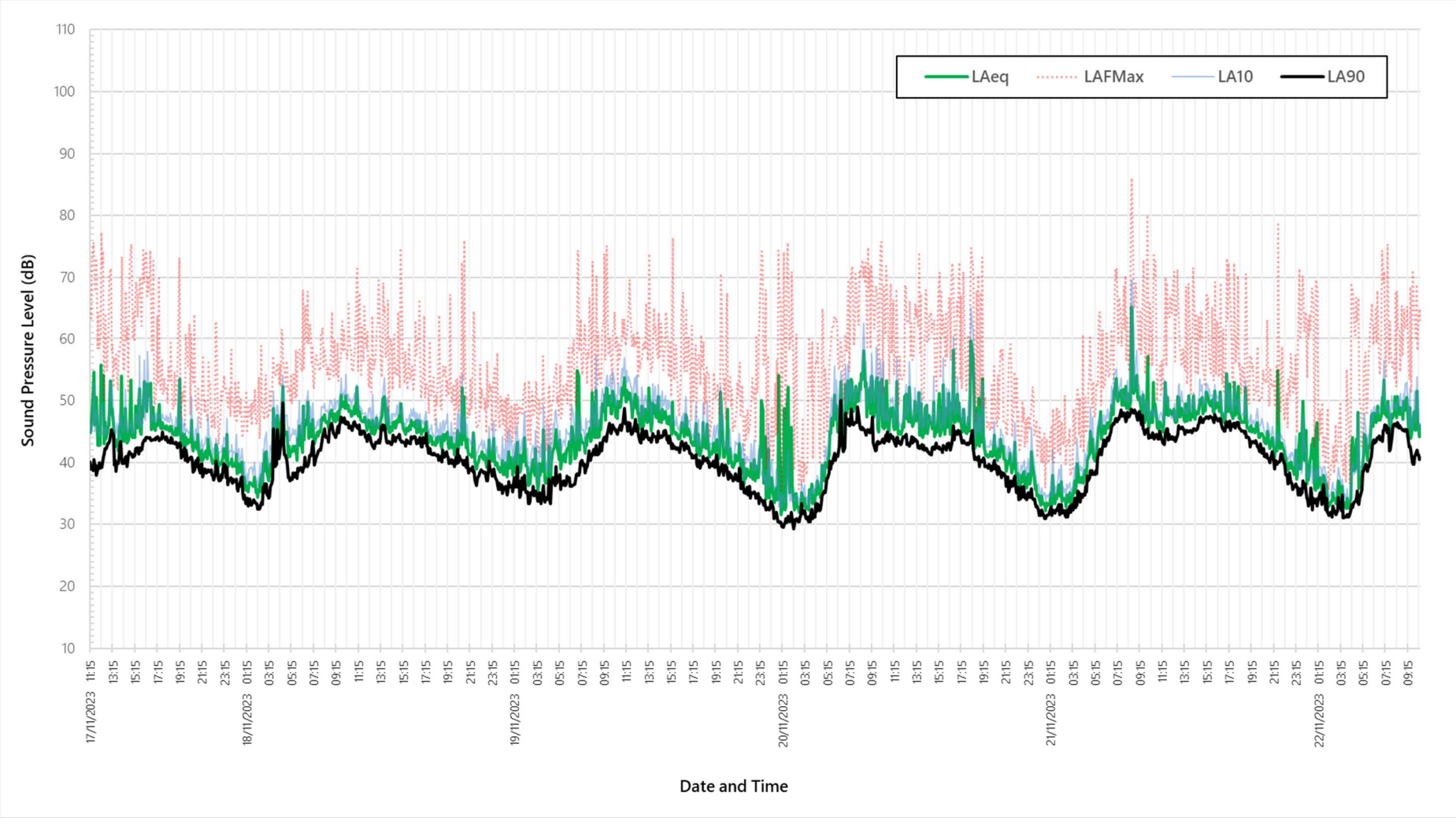
4.1.4 Results – P3

A graph of the measured noise levels across the entire monitoring period at P3 is given in Figure 4.3, with a summary provided in Table 4.3 below.

Table 4.3 – Summary of measured noise levels – P3

Period	Logarithmic Average $L_{Aeq,T}$ (dB)	10th Highest $L_{AFmax,5min}$ (dB)	Median $L_{A90,5min}$ (dB)	Median $L_{A10,5min}$ (dB)
Daytime (07:00 – 23:00) **T = 16-hours**				
Friday 17th November; 11:15 - 23:00	47	74	41	46
Saturday 18th November; 07:00 - 23:00	46	66	43	47
Sunday 19th November; 07:00 - 23:00	47	68	42	47
Monday 20th November; 07:00 - 23:00	49	73	43	48
Tuesday 21st November; 07:00 - 23:00	50	72	45	49
Wednesday 22nd November; 07:00 - 10:25	48	66	45	49
Nighttime (23:00 – 07:00) **T = 8-hours**				
Friday 17th November / Saturday 18th November; 23:00 - 07:00	43	59	37	43
Saturday 18th November / Sunday 19th November; 23:00 - 07:00	42	56	36	43
Sunday 19th November / Monday 20th November; 23:00 - 07:00	44	68	33	37
Monday 20th November / Tuesday 21st November; 23:00 - 07:00	41	57	34	39
Tuesday 21st November / Wednesday 22nd November; 23:00 - 07:00	42	67	34	39

Figure 4.3 – Graph of measured noise levels – P3



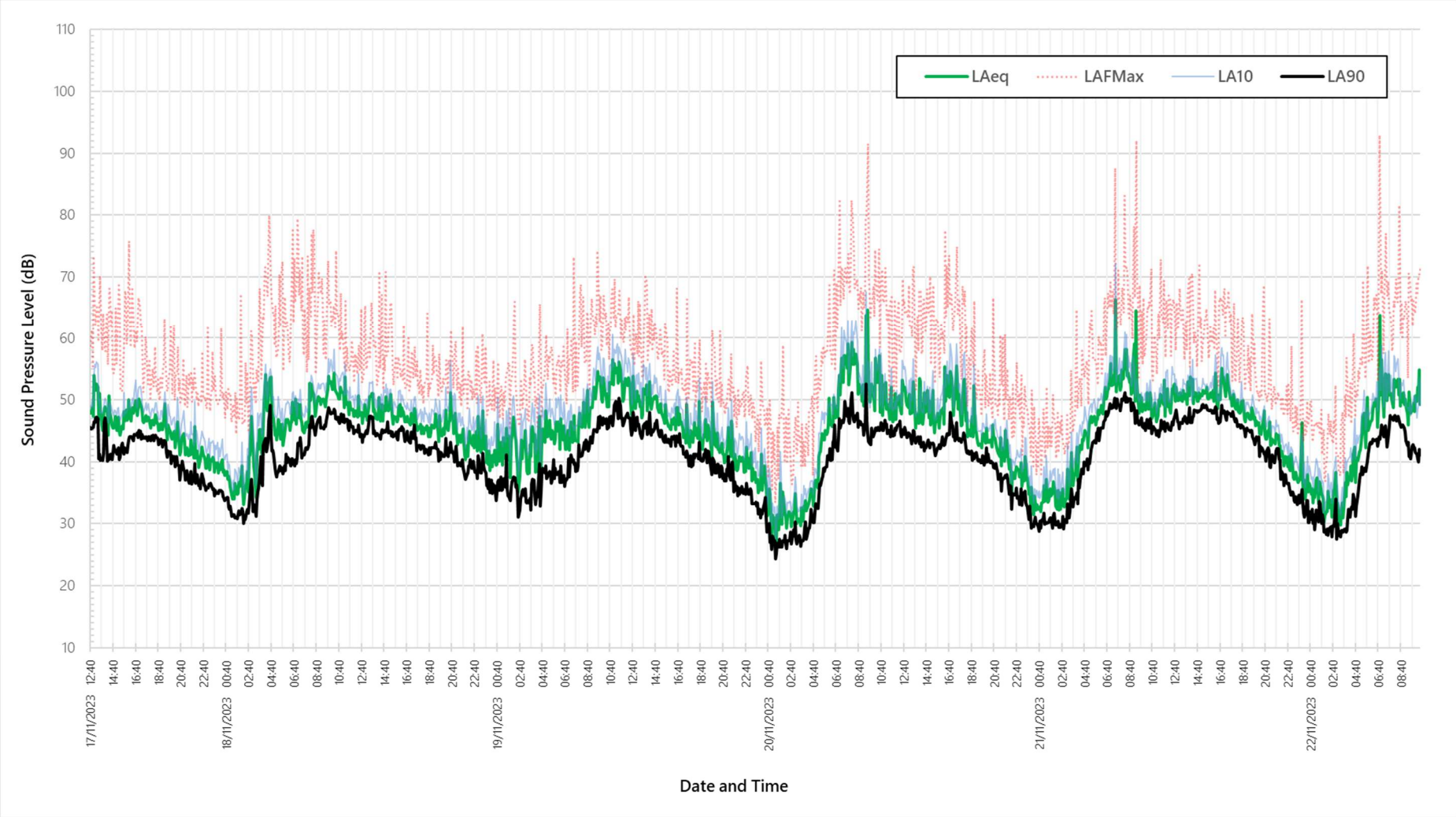
4.1.5 Results – P4

A graph of the measured noise levels across the entire monitoring period at P4 is given in Figure 4.4, with a summary provided in Table 4.4 below.

Table 4.4 – Summary of measured noise levels – P4

Period	Logarithmic Average $L_{Aeq,T}$ (dB)	10th Highest $L_{AFmax,5min}$ (dB)	Median $L_{A90,5min}$ (dB)	Median $L_{A10,5min}$ (dB)
Daytime (07:00 – 23:00) **T = 16-hours**				
Friday 17th November; 12:40 - 23:00	47	67	42	48
Saturday 18th November; 07:00 - 23:00	48	71	44	50
Sunday 19th November; 07:00 - 23:00	49	67	43	49
Monday 20th November; 07:00 - 23:00	52	74	44	50
Tuesday 21st November; 07:00 - 23:00	52	71	46	51
Wednesday 22nd November; 07:00 - 10:25	51	69	45	51
Nighttime (23:00 – 07:00) **T = 8-hours**				
Friday 17th November / Saturday 18th November; 23:00 - 07:00	45	70	36	44
Saturday 18th November / Sunday 19th November; 23:00 - 07:00	44	59	37	46
Sunday 19th November / Monday 20th November; 23:00 - 07:00	41	58	30	38
Monday 20th November / Tuesday 21st November; 23:00 - 07:00	44	61	33	40
Tuesday 21st November / Wednesday 22nd November; 23:00 - 07:00	46	65	33	40

Figure 4.4 – Graph of measured noise levels – P4



4.2 Stage 1 - Initial Site Noise Risk Assessment

As described in Section 3.2, the ProPG states that an initial assessment of the risk of adverse noise impact is made without accounting for the impact of any new or additional mitigation measures that may subsequently be included in development proposals. An overview of the noise risk criteria is provided in Table 3.1.

Based on the measured daytime $L_{Aeq,16hr}$ and nighttime $L_{Aeq,8hr}$ levels it is seen that the potential risk of adverse effect without noise mitigation when comparing the levels to those in Table 3.1 are as follows.

- Daytime – *Low* in all areas of the site.
- Nighttime – *Low* in all areas of the site.

4.3 Stage 2 – Internal Design Noise Levels

4.3.1 Internal Ambient Noise Limits

The criteria for internal ambient noise levels (IANLs) are based primarily upon guidance from the ProPG.

In summary, IANL contributions from external noise sources inside the residential dwellings should be greater than those in the table below. The criteria are considered to be in line with the Lowest Observed Adverse Effect Level (LOAEL) referenced in national planning policy (Appendix B).

Table 4.5 – Internal ambient noise level (IANL) upper limits

Location	General/Overall Noise		Intermittent Commercial Operation Noise	Fixed Plant Noise
	Daytime (07:00 – 23:00)	Nighttime (23:00 – 07:00)	Daytime (07:00 – 23:00)	Anytime
All areas	35 dB $L_{Aeq,16hr}$	30 dB $L_{Aeq,8hr}$ 45 dB $L_{Amax,F}$ [1]	25 dB $L_{Aeq,1hr}$	20 dB $L_{Aeq,15min}$
[1] a threshold by which 'good acoustic design' is achieved by not exceeding this threshold no more than 10 times per night				

Commercial and Plant Noise

In relation to the potential commercial and plant noise sources referenced within the Environmental Health Officer's consultation response on application DC/23/2323, the baseline noise survey results have been reviewed with particular focus on Position P1, located on the northern side of Bentley House and most exposed to the adjacent industrial units.

The measurement data exhibit a typical diurnal pattern, with higher noise levels during weekday daytime periods and notably quieter conditions overnight. While no clear or sustained tonal or impulsive features were evident from the time histories, there are periods where intermittent fluctuations occur — particularly on 20th and 21st November (Monday and Tuesday) — that could be indicative of occasional industrial or commercial activity within the nearby business units.

BS 4142 requires assessment of a worst-case one-hour daytime period. It is noted that operational hours on the business park are restricted to 07:00 – 19:00 under planning control. During this period, the highest $L_{Aeq,1hr}$ noise level recorded at Position P1 — and indeed at any point across the wider daytime period (07:00 – 23:00) — was 55 dB $L_{Aeq,1hr}$. It is not possible to definitively attribute these variations to a specific source; however, the timing and character of the peaks suggest that some may coincide with deliveries or other intermittent operations associated with the industrial premises to the north, in the absence of other notable local noise sources.

Around the times these elevated levels occurred, the concurrent $L_{A90,1hr}$ background noise levels were typically in the region of 45 – 50 dB. Accordingly, the specific noise level associated with intermittent commercial or industrial activity could be interpreted as being between 5 and 10 dB above the background. Before the application of any BS 4142 rating penalties, this would already indicate a marginal to clear adverse impact, depending on the precise context. Allowing for potential acoustic characteristics such as tonality (e.g. reversing alarms) or intermittency, it would be reasonable to assume that the rating level could be approximately 5 dB higher, giving an indicative rating level of around 60 dB at the northern façade.

It is noted that operational hours on the business park are restricted to 07:00 – 19:00, significantly limiting the potential for evening or nighttime industrial activity. Nevertheless, fixed plant serving the neighbouring commercial units may continue to operate beyond these hours.

The L_{A90} values at Position P1 show relatively consistent overnight readings around 39 – 40 dB, with minimal variation. This may indicate the presence of continuously operating plant noise — potentially from the fixed equipment referenced by the EHO — which remains faintly audible during otherwise quiet periods. By contrast, the other monitoring locations exhibit more variable nighttime L_{A90} levels, reflecting the absence of that steady residual noise component.

Therefore, in summary, the survey results indicate that the specific or rating levels from both intermittent commercial or industrial operations and fixed plant could exceed the prevailing background (L_{A90}) levels during times when those sources are active. In accordance with BS 4142:2014 + A1:2019, such exceedances can be interpreted as an indicator of an adverse impact, depending on the context.

Contextually, PJA notes that the BS 4142 standard applies to results measured outside of a window. Given that there are no external amenity areas within the proposed development, the internal noise environment is the more relevant consideration. The façade and ventilation design should therefore be guided by internal noise criteria rather than external rating levels.

Accordingly, PJA recommends that internal noise levels within habitable rooms that are solely attributable to commercial and/or plant noise (excluding all other environmental noise sources which are subject to standard ProPG / BS 8233 limits) should not exceed:

- 25 dB $L_{Aeq,1hr}$ during the daytime from general intermittent commercial or industrial operations.
- 20 dB $L_{Aeq,15min}$ at any time from continuously operating fixed-plant noise.

These criteria are set 10 dB more stringent than the standard BS 8233 and ProPG internal noise targets to provide an additional margin of protection against occasional commercial and plant noise that falls outside the control of the

applicant. The enhanced targets reflect the mixed-use context of the development and the potential for intermittent external activity — such as occasional deliveries or plant operation — to occur alongside otherwise typical traffic-dominated conditions. This modest additional allowance ensures that, even under those less-frequent higher-noise scenarios, internal noise levels will remain comfortably within the Lowest Observed Adverse Effect Level (LOAEL) defined in national planning policy, thereby maintaining a consistently high standard of acoustic comfort and residential amenity for future occupants.

4.3.2 'Good' Acoustic Design

A 'good' acoustic design process should first explore other methods of mitigating noise which doesn't wholly rely on using the building envelope. Table 4.6 analyses the feasibility of the suggested mitigation measures for this site.

Table 4.6 – Analysis of noise mitigation measures as part of a 'good' acoustic design process

Mitigation Method	Analysis
Reduction of the noise generated at source by redesign, relocation or containment.	The adjacent commercial and industrial sources are off-site and outside the applicant's control. No practical measures can be implemented to reduce emissions at source.
Maximise the distance between noise source and receptor, using existing topography / structures or purpose built barriers to screen the development from significant noise sources.	The development involves refurbishment of an existing building with fixed boundaries and surrounding built form. Additional screening or increased separation is not feasible.
Using the layout of the scheme or orientation of buildings to avoid location of noise sensitive rooms on adversely impacted facades.	Limited potential. The existing building layout largely dictates the position of habitable rooms. Bedrooms are inevitably located on multiple elevations
Using planning conditions / obligations to restrict activities allowed on site at certain times and / or specifying permissible noise levels.	The operational hours of the adjoining business park (07:00 – 19:00) are already controlled by existing planning conditions and are outside the applicant's control.
Using the building envelope to mitigate noise to acceptable levels.	The primary and most effective mitigation available. Enhanced glazing, acoustic ventilators, and appropriate façade design (see Section 4.4.3) will ensure compliance with the enhanced internal noise targets adopted for commercial and plant noise (25 dB $L_{Aeq,1hr}$ for intermittent operations and 20 dB $L_{Aeq,15min}$ for fixed plant). These measures will provide robust protection of internal acoustic comfort and residential amenity.

4.3.3 Building Envelope (External Noise Break-in)

The weakest elements of a building façade in terms of sound insulation are typically the windows and ventilators, particularly when these are in the open position. According to BS 8233:2014, a partially open window provides an approximate 15 dB reduction between outside and inside noise levels. Based on this 15 dB reduction, and the external levels in Table 4.5, it is evident that the internal noise limits would be exceeded on all elevations.

This is not unusual in a central urban location, or even in many rural locations. Whilst internal limits would be exceeded with windows open, it should not be assumed that windows have to be sealed shut, as many occupants will favour the ability to open their windows at will, particularly during the hotter months of the year.

The ProPG: Planning & Noise (2017) acknowledges this limitation, stating: *"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."*

Accordingly, the proposed dwellings should incorporate an alternative form of background ventilation, such as acoustically rated trickle ventilators or a mechanical ventilation system, enabling occupants to keep windows closed for acoustic protection while retaining the option to open them when desired.

Although trickle ventilators are acoustically weaker than the surrounding wall construction, acoustic-rated models can achieve much higher sound insulation, allowing internal ambient noise level (IANL) targets to be met while maintaining effective background ventilation. Closed windows can then be specified to achieve the remaining sound reduction needed for compliance, ensuring that IANL targets are achieved with windows closed but alternative ventilation operating.

The required sound reduction performance of the glazing and ventilators has been determined using a simplified worst-case method, assuming that the façade performance is governed by its weakest components. This approach effectively treats the façade as being fully glazed, producing slightly higher (and therefore more conservative) sound insulation requirements than a full composite calculation under BS 12354. In reality, the solid wall and roof elements will contribute substantially greater attenuation, meaning that the true façade performance will exceed the calculated minimum requirement.

Table 4.5 presents the minimum required sound reduction indices for glazing and ventilators to achieve compliance with the internal ambient noise level targets under closed-window conditions, with trickle ventilators open or mechanical systems operating.

Where overheating risk is identified, mechanical ventilation may be installed instead of acoustically rated trickle ventilators. This would remove any reliance on open windows for ventilation, providing greater acoustic protection and thermal comfort during warmer periods or when external noise levels are elevated.

A non-exhaustive list of example glazing constructions and ventilator products such as trickle vents and air bricks have been provided in Appendix D, which are capable of achieving the required $R_w + C_{tr}$ and $D_{n,e,w} + C_{tr}$ indices.

Table 4.7 – Minimum sound reduction requirements of the building envelope

Exposure Category	Room Type	External Noise Level outside of the window					Minimum reduction required to meet internal noise targets dB	Minimum sound reduction indices/construction examples	
		Daytime average (07:00 – 23:00) dB $L_{Aeq,16hr}$	Nighttime average (23:00 – 07:00) dB $L_{Aeq,8hr}$	Nighttime maximum [1] (23:00 – 07:00) dB $L_{AFmax,5min}$	Intermittent Commercial Operation Noise dB $L_{Aeq,1hr}$	Fixed Plant Noise Level dB $L_{Aeq,15mins}$		Glazing [2] See Appendix D.1	Ventilators [3] see Appendix D.2
All Elevations	All	≤52	≤46	≤70	≤55	≤40	30	30 dB $R_w + C_{tr}$ Thick standard glass double glazing, i.e. - 4mm standard float - 10mm air cavity - 10mm standard float	33 dB $D_{n,e,w} + C_{tr}$ i.e., Titon SF 3300 EA Vent
	Limit	≤35	≤30	≤45	≤25	≤20	-	-	-
South Elevation	All	≤51	≤45	≤60	≤50	≤30	25	25 dB $R_w + C_{tr}$ i.e. Any glazing including existing (if in good condition).	28 dB $D_{n,e,w} + C_{tr}$ i.e. Duco DucoTop 60 SR (over window frame) – Corto AK+
	Limit	≤35	≤30	≤45	≤25	≤20	-	-	-

1. Value exceeded 10 times per night.
2. A non-exhaustive list of suitable glazing products is given in **Appendix D.1**. Standard double glazing will usually achieve a minimum sound reduction of 26 dB $R_w + C_{tr}$.
3. A non-exhaustive list of suitable ventilator products is given in **Appendix D.2**. The acoustic performance should meet these values when the vent is open. They may not be required if the development uses mechanical ventilation. Low-performance trickle vents will usually achieve a minimum sound reduction of 25 dB $D_{n,e,w} + C_{tr}$.

4.4 Summary

In summary, the assessment has demonstrated that internal ambient noise level (IANL) targets in accordance with BS 8233:2014 and ProPG: Planning & Noise (2017) can be achieved throughout the proposed dwellings, provided that the glazing and ventilation specifications outlined in Section 4.4.3 and Table 4.7 are implemented.

The external noise environment has been assessed through a multi-day unattended survey, capturing representative levels from both road traffic and surrounding commercial premises within North Heath Lane Business Park. Particular consideration has been given to the northern façade, which faces the adjoining industrial units and associated delivery area referenced in the Environmental Health Officer's consultation response on application DC/23/2323.

In addition to the residential design assessment under BS 8233 and ProPG, the review has also considered potential noise from nearby industrial and plant operations in accordance with BS 4142:2014 + A1:2019. While this analysis indicates that intermittent commercial activity could, at times, produce rating levels above the prevailing background sound level, such impacts are limited in duration and magnitude.

As these noise sources are outside of the applicant's control, the appropriate mitigation is through the façade and ventilation design, with enhanced acoustic glazing and acoustically rated trickle ventilators (or a mechanical ventilation system) specified to achieve the enhanced internal noise targets described in Section 4.3.1. These measures will ensure that suitable internal conditions are maintained when required.

Suitable options include acoustically rated trickle ventilators or, where overheating risk is identified, mechanical ventilation to remove any reliance on open windows for cooling. A mechanical ventilation or air-conditioning system may be appropriate to maintain comfortable internal conditions in warmer months, allowing occupants to keep windows closed during noisier periods without compromising comfort. This approach does not require the windows to be sealed shut; rather, it provides flexibility for occupants to open them at their discretion when noise levels are low, which, based on the survey results, represents the majority of the time. The intention is to ensure the dwellings perform acoustically when needed, while still allowing normal use and enjoyment of openable windows whenever conditions permit.

Overall, provided the recommendations within this report are adopted, the proposed development will achieve a good standard of internal acoustic comfort, ensuring that potential impacts from nearby commercial and industrial activity are controlled to an acceptable level in accordance with relevant national and local planning policy and guidance.

Appendix A – Acoustic Terminology and Concepts

A.1 – Glossary

Table A.1 – Glossary of acoustic terminology

Term	Description
dB (decibel)	The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio of the root-mean-square pressure of the sound and a reference pressure (2x10-5 Pa).
dB(A)	A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e., 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
C_{tr}	A weighting curve applied to level differences to account for low-frequency noise, typically associated with traffic noise. This is often applied as an addition to $D_{nT,w}$ and R_w ratings used to describe levels of sound insulation.
Frequency	Sound is generally assessed over the frequency range of 63 Hz to 4000 Hz (4 kHz), although humans can potentially hear between 20 Hz and 20 kHz. Frequency is often divided into ('first') octave bands for analysis, with the range above considered within 7-octave bands with centre frequencies at 63 Hz, 125 Hz, 250 Hz, 1 kHz, 2 kHz and 4 kHz. 'Third' octave bands split this further into smaller frequency bands.
$L_{Aeq,T}$	L_{Aeq} is defined as the notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the A-weighted fluctuating sound measured over that period. This parameter is typically considered as a good representation of the 'average' overall noise level. It is referred to technically as the A-weighted equivalent continuous sound level and is a dB(A) as defined above.
$L_{A90,T}$	The A-weighted noise level that is exceeded for 90% of the measurement period T. This parameter is often considered as the 'average minimum level'.
$L_{AFmax,T}$	The maximum A-weighted noise level during the measurement period T.
R_w	Weighted sound reduction index. A single number rating of the sound insulation performance of a specific building element. R_w is measured in a laboratory. R_w is commonly used by manufacturers to describe the sound insulation performance of building elements such as plasterboard and concrete.

A.2 – Subjective Changes in Sound Level

Table A.2 – Subjective loudness from an increase or decrease in sound pressure level

Change in sound pressure level	Relative change in sound power energy (multiplier)		Change in apparent subjective loudness (for mid-frequency range)
	Decrease	Increase	
3 dB	1/2	2	'Just perceptible'
5 dB	1/3	3	'Clearly noticeable'
10 dB	1/10	10	'Half or twice as loud'
20 dB	1/100	100	'Much quieter, or louder'

Appendix B – National Planning Policy

B.1 – National Planning Policy Framework (NPPF)

The National Planning Policy Framework (NPPF) sets out the Government's planning policies for England and how these are expected to be applied. The NPPF provides a framework within which local people and their council can produce their own distinctive local and neighbourhood plans. With explicit reference to noise, the NPPF states that *"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 … noise pollution"*.

B.2 - Noise Policy Statement for England (NPSE)

The NPPF refers to the Noise Policy Statement for England (NPSE), which applies to most forms of noise including environmental noise. The NPSE sets out the long-term vision of Government policy which is 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."*. It aims that *"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; and*
- *where possible, contribute to the improvement of health and quality of life."*

The use of the terms *"significant adverse"* and *"adverse"* are key phrases within the NPSE. The guidance establishes the concept of how the level of adverse effect on health and quality of life can be referenced including:

- 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.
- LOAEL – Lowest Observed Adverse Effect Level - This is the level above which *adverse* effects on health and quality of life can be detected.
- SOAEL – Significant Observed Adverse Effect Level - This is the level above which *significant adverse* effects on health and quality of life occur.

Under the first aim of the NPSE ("avoid significant adverse impacts on health and quality of life"), an impact in line with SOAEL should be avoided. Under the second aim ("mitigate and minimise adverse impacts on health and quality of life"), where the impact lies somewhere between LOAEL and SOAEL, requiring that all reasonable steps are taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development, but does not mean that such adverse effects cannot occur.

B.3 - Planning Practice Guidance on Noise (PPG-N)

The Planning Practice Guidance on Noise (PPG-N) is part of a suite of web-based guidance which is intended to support the implementation of the policies in the NPPF and the NPSE.

It aids in expanding on the definitions form the NPSE of NOEL, LOAEL and SOAEL, by linking these terms to 'examples of outcomes', i.e., changes in behaviour and/or attitude to noise. The table below summarises the guidance from PPG-N in this regard.

Table B.1 – Noise exposure hierarchy based on the likely average response – adapted from PPG-N

Perception	Examples of outcomes	Increasing effect level	Action
NOEL - No Observed Effect Level [1]			
Not noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
LOAEL - Lowest Observed Adverse Effect Level			
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g., turning up the 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 perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
SOAEL - Significant Observed Adverse Effect Level			
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, 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 a change in the acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate the effect of noise leading to psychological stress or physiological effects, e.g., regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g., auditory and non-auditory	Unacceptable Adverse Effect	Prevent

[1] This line is an assumption of the adverse effect level and is not explicitly referenced by PPG-N, though this appears to be a safe assumption.

B.4 – The Professional Practice Guidance on Planning and Noise (ProPG)

The ProPG, published in 2017, is a design guide for new residential development that are exposed predominantly to airborne noise from transport sources. It was produced *"to provide practitioners with guidance on the management of noise within the planning system in England"*, though it is not an official code of practice or official interpretation of the law or government policy.

However, the ProPG extends on the guidance and numerical targets within BS 8233:2014 and WHO guidelines, as well as national planning policy, providing new and extended recommendations where these standards are considered to fall short. Therefore, it is considered to be the most relevant and up to date design standard for assessing the noise impact on new residential developments.

The ProPG *"advocates a systematic, proportionate, risk based, 2-stage, approach. The approach encourages early consideration of noise issues, facilitates straightforward accelerated decision making for lower risk sites, and assists proper consideration of noise issues where the acoustic environment is challenging…*

…The two sequential stages of the overall approach are:

- *Stage 1 – an initial noise risk assessment of the proposed development site; and*
- *Stage 2 – a systematic consideration of four key elements….*

The approach is underpinned by the preparation and delivery of an "Acoustic Design Statement" (ADS). An ADS for a site assessed as high risk should be more detailed than for a site assessed as low risk. An ADS should not be necessary for a site assessed as negligible risk."

B.4.1 - Stage 1: Initial Site Noise Risk Assessment

The ProPG recommends that an initial site noise risk assessment should be undertaken based on indicative external noise levels on the existing site, without accounting for the impact of any new or additional mitigation measures that may subsequently be included in development proposals. Figure 1 of the ProPG relates the increasing risk of adverse effect against indicative daytime noise levels ($L_{Aeq,16hr}$) and nighttime noise levels ($L_{Aeq,8hr}$) without noise mitigation. This is recreated in the table below.

Table B.2 – The ProPG initial site noise risk assessment guidelines

Indicative external daytime noise levels $L_{Aeq,16hr}$	Indicative external nighttime noise levels $L_{Aeq,8hr}$	Potential risk of adverse effect without noise mitigation
≤ 50 dB	≤ 40 dB	Negligible / No adverse effect [1]
> 50 dB and ≤ 60 dB	> 40 dB and ≤ 50 dB	Low
> 60 dB and ≤ 70 dB	> 50 dB and ≤ 60 dB	Medium
> 70 dB	> 60 dB	High

NOTES:

The noise level limits are an interpretation of Figure 1 in the ProPG, which is presented as a diagram rather than a table and does not explicitly state the limits at which each risk category exists.

[1] An indication that there may be more than 10 noise events at night with $L_{Amax,F}$ > 60 dB means the site should not be regarded as a negligible risk.

B.4.2 – Stage 2: Good Acoustic Design Process

The ProPG talks about a *"good acoustic design process"*, that will be suitable in the majority of situations likely to be encountered in practice, with the aim of a more consistent approach from designers through the use of the document. In short, "good acoustic design" means that the acoustic design should:

- be considered early in the development control process;
- take an integrated approach to achieve 'optimal' acoustic conditions both internally and externally, which does not just focus on compliance with noise exposure standards, but aims to avoid compromises for other sustainable design objectives that may adversely affect living conditions and quality of life;
- avoid "unreasonable" and prevent "unacceptable" acoustic conditions, without overdesigning or 'gold plating' the new development; and
- consider the viability of alternative solutions rather than solely rely on the building envelope to provide sufficient sound insulation, which may adversely affect living conditions.

B.4.3 – Stage 2: Noise Management Measures

The ProPG recommends that the design of sealed shut/un-openable windows should be avoided where possible, as occupants would favour the ability to open the windows even if the resultant internal acoustic conditions are unsatisfactory.

Therefore, every effort should be made in the first instance to mitigate noise through alternative solutions before simply using the building envelope to mitigate noise. Supplementary Document 2 of the ProPG therefore advises that the following hierarchy of noise management measures (in descending order of preference) should be followed:

- Maximising the spatial separation of noise source(s) and receptor(s).
- Investigating the necessity and feasibility of reducing existing noise levels and relocating existing sources.
- 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.
- Incorporating noise barriers as part of the scheme to screen the proposed development site from significant sources of noise.
- Using the layout of the scheme to reduce noise propagation across the site.
- Using the orientation of buildings to reduce the noise exposure of noise sensitive rooms.
- (and finally) Using the building envelope to mitigate noise to acceptable levels.

Any reliance on the use of the building envelope alone to mitigate noise levels should be justified. In many cases there is "justification that the internal target noise levels can only be practically achieved with windows closed, which may be the case in urban areas and at sites adjacent to transportation noise sources".

B.4.4 – Stage 2: Internal Ambient Noise Levels

Whole Dwelling Ventilation

The ProPG provides internal ambient noise level targets based upon Table 4 of BS 8233:2014, with a few additions in guidance. These are summarised in the table below.

The ProPG suggests that the development layout should be designed such that internal noise level targets can be achieved with open windows in as many areas as possible, on the basis that residents will value the ability to open windows at will. It is generally stated within guideline documents (including the ProPG) that an open window will typically provide up to a 15 dB(A) reduction in noise from outside to inside.

However, an assessment can be made with closed windows and open ventilators (i.e., trickle vents) which provide *"whole dwelling ventilation"* (as defined by Building Regulations Approved Document F).

Table B.3 – The ProPG internal ambient noise level guidelines

Activity	Location	Daytime (07:00 – 23:00)	Nighttime (23:00 – 07:00)
Resting	Living Room	35 dB $L_{Aeq,16hr}$	-
Dining	Dining Room/Area	40 dB $L_{Aeq,16hr}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hr}$	30 dB $L_{Aeq,8hr}$ 45 dB $L_{Amax,F}$ [1]
[1] a threshold by which 'good acoustic design' is achieved by not exceeding this threshold more than 10 times a night			

The following summarises the ProPG guidance which relates to the table above.

- Internal L_{Aeq} targets:
  - assume normal daytime fluctuations in external noise;
  - are based on average annual data and do not have to be achieved in all circumstances. For example, it is normal to exclude occasional events such as bonfire night or New Year's Eve; and
  - can be relaxed by up to 5 dB where development is considered necessary or desirable, despite high external noise levels. However, most people will regard exceeding the targets by more than 5 dB on a regular basis as 'unreasonable' and exceeding by more than 10 dB as 'unacceptable'.
- Internal $L_{Amax,F}$ targets:
  - are set on the basis that regular individual noise events (such as aircraft and passing trains) can cause sleep disturbance; and
  - are not an absolute limit but a threshold by which 'good acoustic design' is achieved by not exceeding this threshold more than 10 times a night. However, where it is not practical to achieve this guideline, the judgement of acceptability will depend on the noise level, source, number, distribution, predictability and regularity of noise events.

Purge Ventilation

The guidelines above are generally not applicable under *"purge ventilation"* conditions (as defined by ADF), as this should only occur occasionally.

Mechanical Services

The ProPG indicates that *"where mechanical services are used as part of the ventilation or thermal comfort strategy for the scheme, the impact of noise generated by these systems on occupants should also be assessed."* It does not, however, give an explicit set of noise level targets for any form of mechanical ventilation (continuous, extract or purge).

Appendix C – Survey Methodology

C.1 – Survey Equipment

The monitoring equipment used for the baseline noise and vibration surveys is detailed in the table below. The sound level meter was calibrated before and after the survey, with no significant drifts of greater than 0.5 dB observed. The sound level meter has been calibrated to a traceable standard within the 24 months preceding the survey, and the calibrators have been calibrated to a traceable standard within the 12 months preceding the survey. The equipment complies with the standards of as BS EN 60942:2003 Class 1 device.

Table C.1 – Equipment used for the noise survey

Name	Serial Number	Last Calibrated	Calibration Due
SVAN 949 Class 1 Sound Level Meter	9720	Nov-21	Nov-23
SVAN 949 Class 1 Sound Level Meter	9719	Nov-21	Nov-23
Cirrus CR:800B Class 1 Sound Level Meter	C16642FF	May-23	May-25
Pulsar Quantifier 95 Class 1 Sound Level Meter	B21270	May-23	May-25
Cirrus CRL511E Class 1 Acoustic Calibrator	035235	May-23	May-24

C.2 – Meteorological Conditions

During the survey, weather conditions were for the most part dry with wind speeds of less than 6 ms^{-1} (the microphone was fitted with a weather protection kit/windshield). These weather conditions are suitable for the measurement of environmental noise in accordance with BS 7445 '*Description and Measurement of Environmental Noise*'. The weather data below has been sourced from https://www.timeanddate.com/weather/uk/horsham/historic

Figure C.1 – Meteorological conditions during the survey

C.3 – Photos

Figure C.2 – Photographs of the noise monitoring positions (P1 far left, P2 centre left, P3 centre right, and P4 far right)

Appendix D – Example Façade Constructions

D.1 - Glazing

Table D.1 – Example glazing constructions and associated sound reduction indices

Single / Double / Triple	Configuration	Manufacturer	$R_w + C_{tr}$ (dB)
Double	4 (12) 4	Saint Gobain	**27**
Double	4 (12) 6	Saint Gobain	**29**
Double	5 (12) 4	Saint Gobain	**29**
Double	4 (16) 8	Saint Gobain	**30**
Double	4 (12) 6.8P	Pilkington	**30**
Double	4 (10) 10	Saint Gobain	**31**
Double	6 (25) 4	Saint Gobain	**31**
Double	8 (18) 6	Saint Gobain	**32**
Double	8.8L (12) 8.8P	Pilkington	**32**
Double	4 (6) 10	Saint Gobain	**33**
Triple	4 (12) 4 (12) 8.4S	Saint Gobain	**33**
Double	4 (16) 8.8P	Pilkington	**33**
Double	10 (15) 6	Saint Gobain	**34**
Double	8 (6) 8.8S	Saint Gobain	**34**
Double	6 (16) 8.8P	Pilkington	**34**
Double	10 (6) 8.8S	Saint Gobain	**35**
Double	6 (24) 10	Saint Gobain	**35**
Double	6 (12) 9.5A	Saint Gobain	**35**
Triple	8 (12) 4 (12) 8.8P	Pilkington	**35**
Double	8 (12) 8.8A	Saint Gobain	**36**
Double	10 (12) 8.8A	Saint Gobain	**37**
Double	8.4A (16) 10.4A	Saint Gobain	**38**
Double	8.8P (16) 12.8P	Pilkington	**39**
Double	10 (16) 12.4A	Saint Gobain	**40**
Double	12.8A (15) 12.8A	Saint Gobain	**41**
Double	9.1P (20) 13.1P	Pilkington	**42**
Double	9.1P (20) 17.1P	Pilkington	**43**
Double	16.8A (15) 16.8A	Saint Gobain	**44**
Double	9.1P (20Arg) 17.1P	Pilkington	**44**
NOTATION A = Stadip Silence S = Stadip P = Optiphon L = Optilam Arg = Argon Cavity			
Further data at https://techhub.uk.saint-gobain-building-glass.com/acousticcalculator			

D.2 - Ventilators

For each additional ventilator, the required $D_{n,e,w} + C_{tr}$ should be increased by 10log(n), where 'n' is the number of ventilators. The $D_{n,e,w} + C_{tr}$ must be assessed in the open position.

Table D.2 – Example ventilator products and associated sound reduction indices

Product	$D_{n,e,w} + C_{tr}$ (dB)
Duco DucoTop 60 SR (over window frame) – Corto STD	**25**
Duco DucoTop 60 SR (over window frame) – Corto AK	**26**
Duco DucoTop 60 SR (over window frame) – Grando STD	**27**
Duco DucoTop 60 SR (over window frame) – Corto AK+	**28**
Duco DucoTop 60 SR (over window frame) – Alto AK	**30**
Duco DucoTop 60 SR (over window frame) – Basso AK+	**30**
Titon Invent	**30**
Duco DucoTop 60 SR (over window frame) – Grando AK	**31**
Titon Hit & Miss HM5050	**31**
Duco DucoTop 60 SR (over window frame) – Medio AK+	**32**
Duco DucoStrip Slimline	**32**
Duco GlasMax – Air slot 20mm	**32**
Rytons R2700 Window trickle ventilator (412mm wide)	**33**
Titon SF 3300 EA Vent	**33**
Greenwood Slotvent 3000S	**33**
Duco GlasMax – Air slot 10mm	**34**
Greenwood 2000D	**35**
Duco DucoTop 60 SR (over window frame) – Largo AK+	**35**
Duco DucoMax Corto 15	**36**
Duco DucoTop 60 SR (over window frame) – Grando AK+	**37**
Duco DucoMax Medio 25	**37**
Duco DucoMax Alto 25	**38**
Titon SF Xtra Sound Attenuator	**39**
Willan Fresh 100dB	**40**
Greenwood Airvac Acoustic Air Brick AAB-4000	**40**
Duco DucoMax Corto 10	**41**
Duco DucoMax Medio 15	**42**
Greenwood EHA574	**42**
Duco DucoMax Alto 15	**43**
Duco DucoMax Alto 10	**45**

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