NRG CONSULTING

Hayes Park West

Noise Assessment

November 2025

CONTENTS

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1 Executive Summary

NRG Consulting was commissioned to prepare an acoustic report to support a planning application for the proposed residential development at **Hayes Park West, Hayes Park, Uxbridge, UB4 8FE.**

The proposed description of development is:

"Partial demolition and redevelopment of the existing multi storey car park to provide new homes (Use Class C3), landscaping, car and cycle parking, and other associated works."

To support this application, a noise impact assessment has been carried out and provides guidance on appropriate façade elements to ensure that desirable internal noise levels are capable of being achieved. The report also presents a noise assessment of the proposed external amenity areas.

The findings of the assessment are reported herein.

- Section 2: Describes the existing site and the proposed development.
- Section 3: Contains the legislation and criteria used for the assessment.
- Section 4: Presents the results noise survey.
- Section 5: Details the noise assessment.
- Section 6: Provides a scheme of noise mitigation.
- Section 7: Summarises the conclusions of the report.
- Appendix 1 and 2: Contains figures & tables
- Appendix 3: Includes a description of useful acoustic terms

2 Site Description and Proposed Development

2.1 Site Description

Hayes Park West ('the site') is located within the Charville Ward of the London Borough of Hillingdon ('the Council'), who will be the relevant Local Planning Authority for the application. The site sits within a wider former business park known as 'Hayes Park'.

The Hayes Park estate comprises a historically significant office campus in West London, situated in Hayes, and bounded by a structured, pastoral landscape. The estate is framed by the buildings known as Hayes Park North ('HPN'), Hayes Park Central ('HPC'), and Hayes Park South ('HPS'), both positioned within a broader landscape setting originally envisaged by architect Gordon Bunshaft as a modernist business park set in parkland. HPC and HPS are Grade II* listed due to their architectural and historic interest.

A new residential development, known as 'Hayes Park North' is currently being constructed immediately to the east of the development site.

Existing office buildings are located to the south.

The location of site is shown in Figure 1.1 of Appendix 1.

2.2 Proposed Development

The proposed development comprises the *"Partial demolition and redevelopment of the existing multi storey car park to provide new homes (Use Class C3), landscaping, car and cycle parking, and other associated works."*

A plan showing the location of the proposed development is presented in Figure 1.2 of Appendix 1.

The proposed site floor plans and elevation drawings are displayed in Figures 1.3 to 1.10 of Appendix 1.

Subjective Observations

The ambient sound environment at the site was primarily influenced by distant road traffic and bird song.

During the site visits, occasional noise from the adjacent construction site was also noted.

RAF Station Northolt and Heathrow Airport are located approximately 2 km to the north and 6 km to the south of the proposed development site, respectively.

No aircraft noise was observed during the visits. Analysis of the published noise contours for both RAF Station Northolt and Heathrow Airport confirms that the proposed development site lies outside the lowest contour areas. It is therefore considered unlikely that aircraft activity will have a significant influence on site noise levels, consistent with the onsite observations.

3 Policy Framework

3.1 Noise Policy Statement for England (NPSE) & National Planning Policy Framework (NPPF)

Noise Policy Statement for England

The Noise Policy Statement for England (March 2010)[i], sets out the long-term vision of Government noise policy.

The vision of the NPSE is to 'Promote good health and a good quality of life through the effective management and control of noise within the context of Government policy on sustainable development.' This vision is supported by three key aims:

- avoid significant adverse impacts on health and quality of life;
- mitigate and reduce to a minimum other adverse impacts on health and quality of life; and
- where possible, contribute to the improvement of health and quality of life.

The NPSE should apply to all forms of noise including environmental noise, neighbour noise and neighbourhood noise but does not apply to noise in the workplace (occupational noise).

The NPSE had adopted the following concepts, to help consider whether noise is likely to have 'significant adverse' or 'adverse' effects on health and quality of life:

<u>NOEL – No Observed Effect Level</u>
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 noise.

<u>LOAEL – Lowest Observed Adverse Effect Level</u>
This is the level above which adverse effects on health and quality of life can be detected.

<u>SOAEL – Significant Observed Adverse Effect Level</u>
This is the level above which significant adverse effects on health and quality of life occur.

However the NPSE goes on to state that:

'it is not possible to have a single objective noise-based measure that defines 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. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise. However, not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available.'

National Planning Policy Framework

In March 2012 the Department for Communities and Local Government published the National Planning Policy Framework (NPPF); an updated version was published in December 2024[ii]. The document sets out the Planning Policies for England and how these are to be applied.

The NPPF replaces many of the existing Planning Policy documents including Planning Policy Guidance 24: Planning and Noise (PPG24). PPG24 gave guidance on the control of noise to sensitive developments and has been used as the basis of assessment in all Local Authorities in England. The Framework allows local people and their council to produce their own distinctive local and neighbourhood plans, which reflect the needs and priorities of their communities.

It is stated 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, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability.

- With regards to noise the Framework states that Planning Policies and decisions should also ensure that new development is appropriate for its location, taking into account the likely effects of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or wider area:

- 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 the 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.

* NPPF refers to The Noise Policy Statement for England, published by DEFRA in March 2010.

3.2 BS 8233: 2014 Sound Insulation and Noise Reduction for Buildings – Code of Practice

The scope of BS 8233: 2014[iii] includes the provision of recommendations for the control of noise in and around buildings. It suggests appropriate design guide noise limits for different situations, which are primarily intended to guide the design of new or refurbished buildings.

For steady external noise source, it is desirable that the internal ambient noise levels do not exceed the guideline values in Table 2 of BS 8233: 2014. This information has been reproduced below in Table 1 for ease of reference.

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq, 16hour}$	--
Dining	Dining room /area	40 dB $L_{Aeq, 16hour}$	--
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq, 16hour}$	30 dB $L_{Aeq, 8hour}$

Table 1: BS 8233: 2014 Internal Noise Targets for Domestic Uses

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.

In external amenity spaces, such as private gardens and patios, BS 8233 indicates that it is desirable that the external noise level in these areas does not exceed 50 dB $L_{Aeq,T}$ with an upper guideline value of 55 dB $L_{Aeq,T}$ in noisier environments.

3.3 ProPG: Planning & Noise

ProPG (Professional Practice Guidance: Planning and Noise)[iv] was jointly developed by the Institute of Acoustics (IOA), the Association of Noise Consultants (ANC) and the Chartered Institute of Environmental Health (CIEH) to guide Local Planning Authorities (LPA's) and Practitioners in assessing the suitability for residential development on sites predominantly exposed to airborne transport noise. Practitioners in assessing the suitability for residential development on sites predominantly exposed to airborne transport noise.

ProPG introduced a sequential 2-stage approach allowing for early consideration of noise issues at Stage 1 followed by more detailed consideration of noise issues at Stage 2, should this be identified as necessary in Stage 1.

Stage 1 introduces the concept of noise risk categories ranging from Negligible Risk to High Risk to help LPAs in making accelerated straightforward decisions for low risk sites and to provide guidance for more detailed consideration associated with challenging higher risk sites.
Following the outcome of Stage 1, Stage 2 then applies to sites assessed as low to high risk. This stage should not be necessary for sites assessed as negligible risk.

Stage 2 requires consideration be given to four key elements:

- Element 1: Good Acoustic Design Process;
- Element 2: Internal Noise Level Guidelines;
- Element 3: External Amenity Area Noise Assessment; and
- Element 4: Other Relevant Issues.

Further details on these elements are discussed in the acoustic design section of this report. The table below provides a summary of ProPG's noise risk categories and their associated free-field noise levels, along with the assessment implications.

<table>
<tr><th>Risk Category</th><th>Indicative Daytime Noise Levels LAeq,16hr</th><th>Indicative Night-time Noise Levels LAeq,8hr</th><th>Pre-Planning Application Advice</th></tr>
<tr><td>Negligible Risk</td><td><50 dB</td><td>< 40 dB</td><td>Indication that the development site is likely to be acceptable from a noise perspective and application need not normally be delayed on noise grounds.</td></tr>
<tr><td>Low Risk</td><td>50 - 60 dB</td><td>40 - 50 dB</td><td rowspan="2">Indication that the development site is likely to be acceptable provided a good acoustic design process is followed and is confirmed in a detailed Acoustic Design Statement confirming how noise will be mitigated.</td></tr>
<tr><td>Medium Risk</td><td>60 - 70 dB</td><td>50 - 60 dB</td></tr>
<tr><td>High Risk</td><td>> 70 dB</td><td>> 60 dB</td><td>Indication that the development site may be refused on noise grounds unless a good acoustic design process and detailed Acoustic Design statement can demonstrate the significant noise risk can be mitigated.</td></tr>
</table>

Table 2: PROPG Stage 1 - Initial Site Noise Risk Assessment

Notes [1] Noise levels should be assessed without inclusion of the acoustic effect of any scheme specific noise mitigation measures. [2] Noise levels are the combined free-field noise level from all sources of transport noise and may also include industrial/commercial noise where this is present, but not dominant; [3] $L_{Aeq,16hr}$ is for daytime 07:00-23:00, $L_{Aeq,8hr}$ is for night-time 23:00 to 07:00; and [4] An indication that there may be more than ten noise events at night (23:00-07:00) with $L_{Amax,F}$ > 60 dB means the site should not be regarded as negligible risk.

3.4 World Health Organisation

The most recent WHO guidelines 'Environmental Noise Guidelines for the European Region'[v] acknowledge that 'single event noise indicators such as the maximum sound pressure level are warranted in specific situations such as night time railway or aircraft noise events that can clearly elicit awakenings', however, the guidance indicates that 'the relationship between different types of single-event noise indicators and long-term health outcomes at the population level remains tentative' and therefore does not make any recommendations for single event noise indicators.

However, guideline values for community noise in specific environments are presented in the WHO's 'Guidelines for Community Noise'[vi] document. The guideline values are presented below in Table 3.

<table>
<tr><th>Specific Environment</th><th>Critical Health Effect(s)</th><th>dB $L_{Aeq,T}$</th><th>Time Base hours</th><th>dB $L_{Amax,F}$</th></tr>
<tr><td rowspan="2">Outdoor living area</td><td>Serious annoyance, daytime and evening</td><td>55</td><td>16</td><td>-</td></tr>
<tr><td>Moderate annoyance, daytime and evening</td><td>50</td><td>16</td><td>-</td></tr>
<tr><td>Dwelling indoors</td><td>Speech intelligibility and moderate annoyance, daytime and evening</td><td>35</td><td>16</td><td>-</td></tr>
<tr><td>Inside bedrooms</td><td>Sleep disturbance, night-time</td><td>30</td><td>8</td><td>45</td></tr>
<tr><td colspan="5">Notes[1]: For a good sleep, the WHO states that indoor sound pressure levels should not exceed approximately 45 dB LAmax more than 10–15 times per night.</td></tr>
</table>

Table 3: WHO Guideline Noise Values

The Night Noise Guidelines (NNG) for Europe[vii] is described as an extension of the WHO Guidelines for Community Noise publication. The threshold levels of noise exposure presented in the document are described as milestones in the process of evaluating the health consequences of environmental exposure. The health-based guideline values for the assessment and control of night noise exposure were derived from a review of available scientific evidence on the health effects of night noise. These include the effects and threshold levels for night time $L_{Amax,F}$, which are lower than those presented in the WHO community noise guidelines. These revised levels are presented in Table 4 below.

Specific Environment	Critical Health Effect(s)	dB $L_{Aeq,T}$	Time Base hours
Sleep Quality	Waking up in night and/or too early in the morning	dB $L_{Amax,F}$	42

Table 4: WHO Night-Time Noise Guidelines

4 Environmental Noise Survey

4.1 Unattended Baseline Noise Survey

Unattended continuous monitoring of existing noise levels was undertaken within the proposed development site. The monitoring location is shown as LT1 in Figure 1.1 of Appendix 1.

The equipment used during the survey is presented in Table 5 below.

Monitoring Location	Façade/Free-Field	Manufacturer	Model No.	Description	Serial No.	Calibration Date
LT1	Free-field	Larson Davis	LxT	Sound Level Meter	0006489	April 2026
-	-	Larson Davis	CAL200	Acoustic Calibrator	12981	April 2026

Table 5: Sound Monitoring Equipment

The sound level meter was powered by dry cell batteries and stored inside a weatherproof security box.

Measurements were obtained using the 'F' time weighting and A-weighting frequency network. The equipment was calibrated before and after the survey to generate a calibration level of 114.0 dB at 1 kHz.

15-minute measurements of $L_{Amax,F}$, $L_{Aeq,15min}$ and $L_{A90,15min}$ noise levels were obtained between 13:30hrs Thursday 12th June and 08:45 hrs on Tuesday 17th June 2025. 1-minute measurements of $L_{Amax,F}$ were also obtained.

Measurements at LT1 were made in free-field conditions.

4.2 Weather Conditions

Weather conditions during the site visits are presented below in Table 6.

Site Visit	Date and Time	Weather Conditions
Noise Monitoring Equipment Setup	12/06/2025 13:30hrs	Dry; 22 °C; 70% humidity; windspeed <0.5m/s.
Noise Monitoring Equipment Collection	17/06/2025 08:45hrs	Dry; 18 °C; 70% humidity; windspeed <0.5m/s.

Table 6: Weather Conditions for Site Visit

A history of the weather conditions during the continuous survey period has been obtained from an internet source (www.wunderground.com).

Analysis of the data captured during the unattended monitoring shows a period of dry and calm weather. There was a period of rainfall between 22:00hrs and 23:30hrs on Friday 13th June. Analysis of the measured noise data during this period indicates that the background $L_{A90,T}$ noise levels were elevated. As such, this period has been removed from further analysis.

The weather conditions obtained for the noise survey period is summarised in Figure 1.11 of Appendix 1.

4.3 Unattended Noise Survey Results

The results of the unattended noise measurement survey at LT1 are presented graphically in Figure 1.12 of Appendix 1, tabulated in Table 2.1 of Appendix 2 and summarised in Table 7 below.

There were isolated periods of atypical data at 13:00hrs on Saturday 14th June and at 20:30hrs on Sunday 15th June. These periods, along with the period of rainfall described above have been removed in the analysis presented below in Table 7.

The operating times of the adjacent construction site are understood to be between 08:00hrs and 18:00hrs between Monday and Friday, and between 08:00hrs and 13:00hrs on Saturday. Considering the relatively low levels measured at the site, these periods haven't been removed from the analysis. The assessment is therefore considered to provide a worst case measure of the noise levels at the development site.

Date	Measured Free-field Noise Levels, dB					
	Daytime (07:00 - 23:00)			Night-time (23:00 - 07:00)		
	$L_{Amax,F}$	$L_{Aeq,16hr}$	$L_{A90,16hr}$	$L_{Amax,F}$	$L_{Aeq,8hr}$	$L_{A90,8hr}$
Thu 12/06/25[1]	62(51-81)	47	42	55(45-72)	47	42
Fri 13/06/25	65(52-76)	48	42	56(43-67)	45	39
Sat 14/06/25	65(51-74)	51	46	57(46-71)	46	42
Sun 15/06/25	63(49-78)	47	43	56(46-67)	47	42
Mon 16/06/25	64(52-73)	48	41	55(44-71)	46	41
Tue 17/06/25[1]	64(59-74)	48	44	-	-	-
Average	***64(62-65)***	***48***	***43***	***56(55-57)***	***46***	***41***

Table 7: Summary Of Unattended Noise Measurements, LT1

Notes:
[1] Incomplete daytime period due to equipment setup; and
[2] Incomplete daytime period due to equipment collection.

At LT1, the results of the unattended noise measurements show that with periods of atypical data and rainfall removed, ambient day time $L_{Aeq,16hr}$ sound levels produced an arithmetic average of 48 dB $L_{Aeq,16hr}$. The ambient night-time $L_{Aeq,8hr}$ sound levels produced an arithmetic average of 46 dB $L_{Aeq, 8hr}$.

5 Assessment of Noise Levels

5.1 ProPG Stage 1 Assessment

Following ProPG guidance, a Stage 1 – Initial Site Noise Risk assessment has been undertaken to characterise the application site in terms of the likely risk of adverse effects from noise on the future occupants of the development.

Analysis of the measured site noise levels presented in Table 7 indicates a 'Negligible Risk' for daytime (50 – 60 dB L_{Aeq}) and 'Low Risk' for the night- time (40 – 50 dB L_{Aeq}) periods, according to ProPG's Stage 1 – Initial Site Risk Assessment.

5.2 ProPG Stage 2 Assessment

Element 1 - Good Acoustic Design Process

Section 5 of Pro:PG contains guidance on the sequence of stages to be followed in the planning and early acoustic design of a new development. Section 5.4 of Pro:PG outlines a general approach to determining appropriate noise control measures including the following suggested steps:

a) Check the feasibility of reducing noise levels and/or relocating noise sources;
b) Consider options for planning the site or building layout;
c) Consider the orientation of proposed building(s);
d) Select construction types and methods for meeting building performance requirements;
e) Examine the effects of noise control measures on the requirements for ventilation, fire, health & safety, cost, CDM etc; and
f) Assess the viability of alternative solutions.

The designer should then decide which of the following options can be applied to reduce noise levels:

a) Quietening or removing the source of noise;
b) Attenuating the sound on its path to the receiver;
c) Obstructing the sound path between source and receiver;
d) Improving the sound insulation of the building envelope; and
e) Using agreements to manage noise.

The sound levels on site are mainly influenced by distant road traffic and are deemed to be relatively low. It is considered that no additional noise mitigation measures other than appropriate sound insulation of the building envelope would be necessary.

Element 2 - Internal Noise Level Guidelines

Internal Ambient Noise Level Assessment

BS 8233:2014 contains recommended guideline levels of 35 dB $L_{Aeq,T}$ for resting inside bedrooms and living rooms during the daytime, 40 dB $L_{Aeq,T}$ for dining areas and 30 dB $L_{Aeq,T}$ for sleeping inside bedrooms at night.

The ambient sound was observed to be consistent across the development site and therefore, the measured data obtained from LT1 is considered representative of the expected noise levels on all facades of the proposed dwellings.

The approximate sound reduction value for standard thermal double glazing is 30dB R_w.

Using the measured external noise levels, and taking this typical sound reduction performance into consideration, internal noise levels have been predicted inside the habitable rooms at development site. The results are summarised in Table 8.

Receptor I.D.	Façade	Calculated Daytime Free-Field Noise Level $L_{Aeq,16hr}$	Estimated Daytime Internal Noise Level, dB $L_{Aeq,16hr}$ [1]	Calculated Night-Time Free-Field Noise Level $L_{Aeq,8hr}$	Estimated Night-Time Internal Noise Level, dB $L_{Aeq,8hr}$ [1]
LT1	All	49	19	46	16

Table 8: Assessment of Estimated Daytime and Night-Time Noise Levels
Notes: [1] assuming a 30 dB(A) reduction for closed windows.

Based on the assumed typical facade reduction described above, the noise predictions show that internal noise levels within habitable rooms on the development would achieve the daytime and night-time guideline levels of 35dB $L_{Aeq,16hr}$ and 30dB $L_{Aeq, 8hr}$.

Internal Maximum Noise Level Assessment

Maximum $L_{Amax,F}$ noise levels generated at night have also been considered at the proposed development site.

WHO guideline noise criteria set an internal sleep disturbance noise limit of 42 dB $L_{Amax,F}$ for the onset of critical health effects, which is a level which should not be exceeded on a regular basis. Based on an interpretation that for a noise to be regular, it needs to occur several (i.e., more than two) times per hour, the $L_{Amax,F}$ noise needs to be based upon an average of at least 10-15 events that are typical in nature.

The 90th percentile of 61 dB $L_{Amax, F}$ (free-field), calculated using the 1-minute night-time $L_{Amax,F}$ noise levels measured at LT1, has been used to determine internal $L_{Amax, F}$ noise levels within bedrooms.

The typical facade reduction described above are then used to estimate internal $L_{Amax,F}$ noise levels at the development and is presented in Table 9 below.

Calculation Receptor	Façade	Calculated Free-field Night-Time Noise Level $L_{Amax,F}$	Predicted Night-Time Internal Noise Level, dB $L_{Amax,F}$ [1]
R1	All	61	31

Table 9: Assessment On Estimated $L_{amax,F}$ Levels Based on Typical Maximum Events
Note: [1] assuming a 30 dB(A) reduction for windows closed.

The results indicate that the WHO $L_{Amax,F}$ criteria would be achieved within bedrooms on the development, assuming glazing providing a 30dB sound reduction.

Element 3 - External Amenity Area Noise Assessment

External amenity areas are proposed for individual dwellings across the development site.

The measured noise levels are representative of the expected external noise levels in the proposed external amenity areas. The measured noise level of 49dB falls below the desirable guideline level of 50 dB presented in BS8233.

Therefore, a good standard of amenity can be expected within the garden areas.

Element 4 – Assessment of Other Relevant Issues

Element 4 is intended to consider other potential noise issues and/or sources that may be introduced by the proposed development.

It is understood that air source heat pumps are proposed at the development, but the final specification of plant is not yet finalised.

The potential impact of fixed items of plant could cause disturbance when in operation. This will require consideration and will likely be subject to Local Authority requirements.

Based on experience of other projects within the borough, Hillingdon often implements noise conditions in planning permissions based on BS 4142 methodology, and request that the plant noise is at least 5 dB quieter than background noise when measured at the nearest residential receptor.

Background sound levels have been derived for the daytime (07:00 to 23:00) and night-time (23:00 to 07:00) periods based on the data at LT1. The results of the analysis at LT1 produced the more onerous limits which have been adopted as the basis for the rating level limits in this assessment.

Modal statistical analysis of the background $L_{A90,T}$ sound levels is presented in Figure 1.13 of Appendix 1 for the daytime and night-time periods.

This statistical analysis indicates that the most commonly occurring $L_{A90,15min}$ sound levels during the daytime and night-time periods were 43 dB and 39 dB, respectively.

Using the background sound levels derived from the unattended noise survey, the following plant rating noise levels should be considered a maximum, when measured at the nearest noise sensitive receptors to the site.

- Daytime (07:00 – 23:00) – 38dB $L_{Ar, Tr}$; and
- Night-time (23:00 – 07:00) – 34dB $L_{Ar,Tr}$.

6 Noise Mitigation Strategy

6.1 Glazing Options

Based on the noise assessment, it is considered that:

- Standard double glazing which can provide a minimum sound level difference of 30dB should be used for habitable rooms on the development.

An example of a suitable glazing product is presented in Table 10 below.

Façade	Sound Insulation Requirements (R_w)	Appropriate Glazing Specification
All Habitable Rooms	Rw 30dB	4mm glass / 16mm air cavity / 4mm glass

Table 10: Appropriate Glazing Specification for Development

6.2 Ventilation Strategy

The results demonstrate that with appropriate glazing, desirable internal conditions can be achieved. However, the development will also need to incorporate a background ventilation system in compliance with Approved Document F.[viii].

Approved Document F presents four main ventilation systems for delivering a background ventilation strategy. Three of these require the inclusion of passive vents in the façades of habitable rooms, whereas a continuous mechanical supply and extract system with heat recovery (MVHR – System 4) does not require passive vents.

It is important to note that, when windows are closed, the potential level difference between external and internal noise must also take into account the type of Approved Document F compliant ventilation system used. According to the *Acoustics, Ventilation and Overheating: Residential Design Guide* (January 2020), the potential level difference associated with standard double glazing and the various ventilation systems ranges from approximately 21 dB (assuming two standard trickle vents) to 27 dB (with System 4 ventilation and no trickle vents).

To avoid compromising the sound insulation of the façades, any trickle vents used should achieve a minimum Dn,e value of 30 dB (when open).

6.3 Overheating

The internal assessment has shown that with an appropriate scheme of façade construction, adequate protection against existing external noise can meet the BS 8233:2014 guideline values.

Consideration has also been given to the internal noise levels when windows to habitable rooms are open, for example, during the summer months, to help combat overheating.

Paragraph 3.3 of AD-O states that windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits.

- 40dB $L_{Aeq,T}$, averaged over 8 hours (between 11pm and 7am); and
- 55dB L_{AFmax}, more than 10 times a night (between 11pm and 7am).

Assuming a 10 dB[ix] difference between an external free-field noise level and internal noise level, an indication of internal $L_{Aeq,8hr}$ and $L_{Amax,F}$ noise levels have been estimated, assuming windows are open for cooling purposes. The results are presented below in Tables 11 and 12 for the calculated internal ambient and maximum noise levels, respectively.

Calculation Receptor	Predicted Free-field Night-Time Noise Level $L_{Aeq,8hr}$	Windows - Closed Predicted Night-time Internal Noise Level, dB $L_{Aeq,8hr}$[1]
All Development	46	36

Table 11: Estimate of Internal $L_{aeq,T}$ Noise Levels – Windows Open

[1] allows for 10dB reduction through an open window.

Calculation Receptor	Predicted Free-field Night-Time Noise Level $L_{Amax,F}$	Windows - Closed Predicted Night-time Internal Noise Level, dB $L_{Amax,F}$ [1]
All Development	61	51

Table 12: Estimate of Internal $L_{amax,F}$ Noise Levels – Windows Open

[1] allows for 10dB reduction through an open window;.

Results

The results of the assessment have shown that during the night-time period, the estimated internal $L_{Aeq,8hr}$ noise level in bedrooms falls below the noise limits set-out in AD-O.

The assessment also indicates that opening windows for cooling purposes during the night-time period would also meet the 55 dB $L_{Amax,F}$ noise limit specified in AD-O.

Therefore, for the Part O assessment for Building Regulations, bedroom windows can be modelled as open at nighttime.

7 Conclusion

NRG Consulting have been commissioned to undertake an acoustic report to support a planning application for the proposed residential development at **Hayes Park West, Hayes Park, Uxbridge, UB4 8FE.**

The proposed development comprises the redevelopment of the existing multi storey car park to provide residential dwellings.

The existing ambient noise environment has been established through unattended noise monitoring.

An assessment of predicted internal noise levels has been undertaken and advice has been given on the design of the building envelope to ensure that internal noise levels inside habitable rooms fall within guideline limits recommended in BS 8233: 2014 and WHO Guidelines. A recommended glazing strategy, to ensure desirable internal conditions can be achieved in all habitable rooms on the development, is presented in Section 6.

With windows open to help combat overheating, bedrooms will not experience internal noise levels from transportation sources which exceed the limits presented in Approved Document O. This risk of adverse noise impact is low and for the purposes of an overheating assessment, windows can be modelled as open during the night-time.

Based on the ProPG approach followed in this assessment, our recommendation to the decision maker with regard to noise is that the development site is acceptable from a noise perspective and application need not be refused on noise grounds.

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[i] Department for Environment, Food and Rural Affairs (DEFRA). Noise Policy Statement for England (NPSE), 2010.
[ii] Department of Communities and Local Government. National Planning Policy Framework, 2024
[iii] British Standard BS 8233: 2014. Guidance on sound insulation and noise reduction in buildings.
[iv] Institute of Acoustics (IOA), Association of Noise Consultants (ANC) and Chartered Institute of Environmental Health (CIEH), "Professional Practice Guidance on Planning & Noise," 2017.
[v] World Health Organisation. 2018. Environmental Noise Guidelines for the European Region.
[vi] World Health Organisation. 1999. Guidelines for Community Noise.
[vii] World Health Organisation. Night Noise Guidelines for Europe. 2009..
[viii] The Building Regulations 2010. Approved Document F.
[ix] Approved Document O: Noise Guide. November 2024.

Appendix 1

Figure 1.1: Location Of Proposed Development Site and Unattended Nosie Monitoring Location

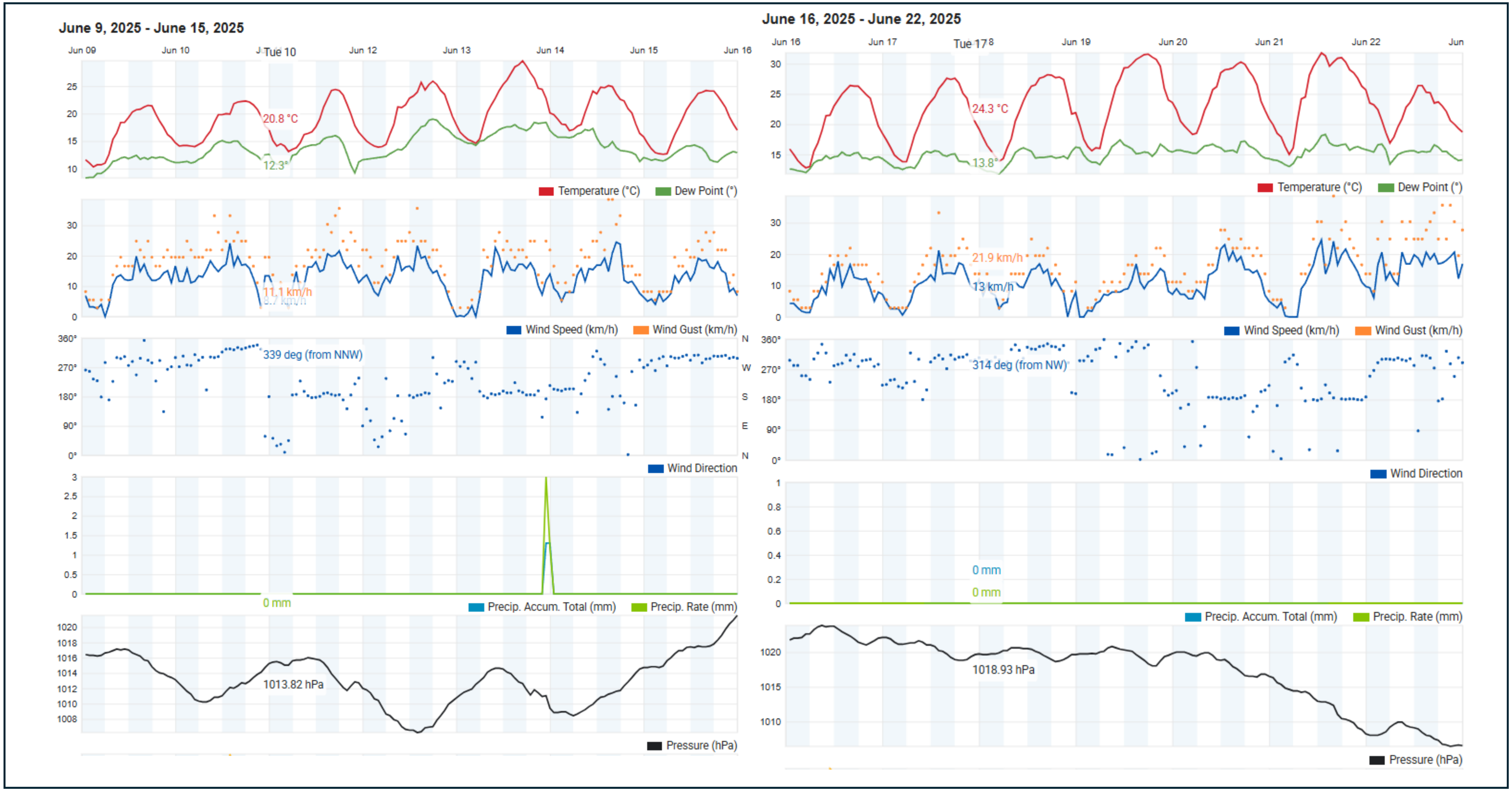

Figure 1.11: Weather Conditions During Unattended Noise Survey

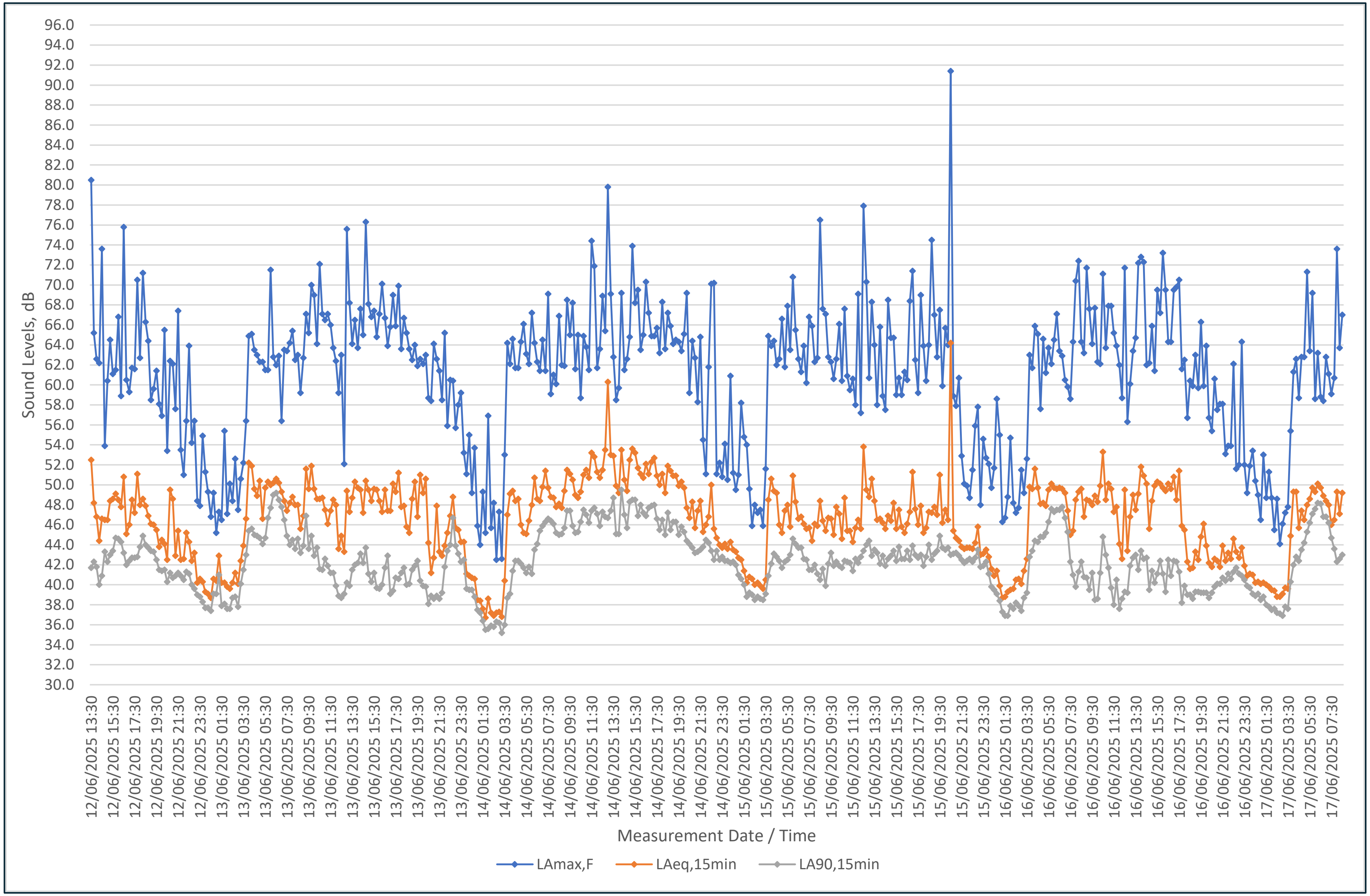

Figure 1.12: Time History of Unattended Noise Survey Data - LT1

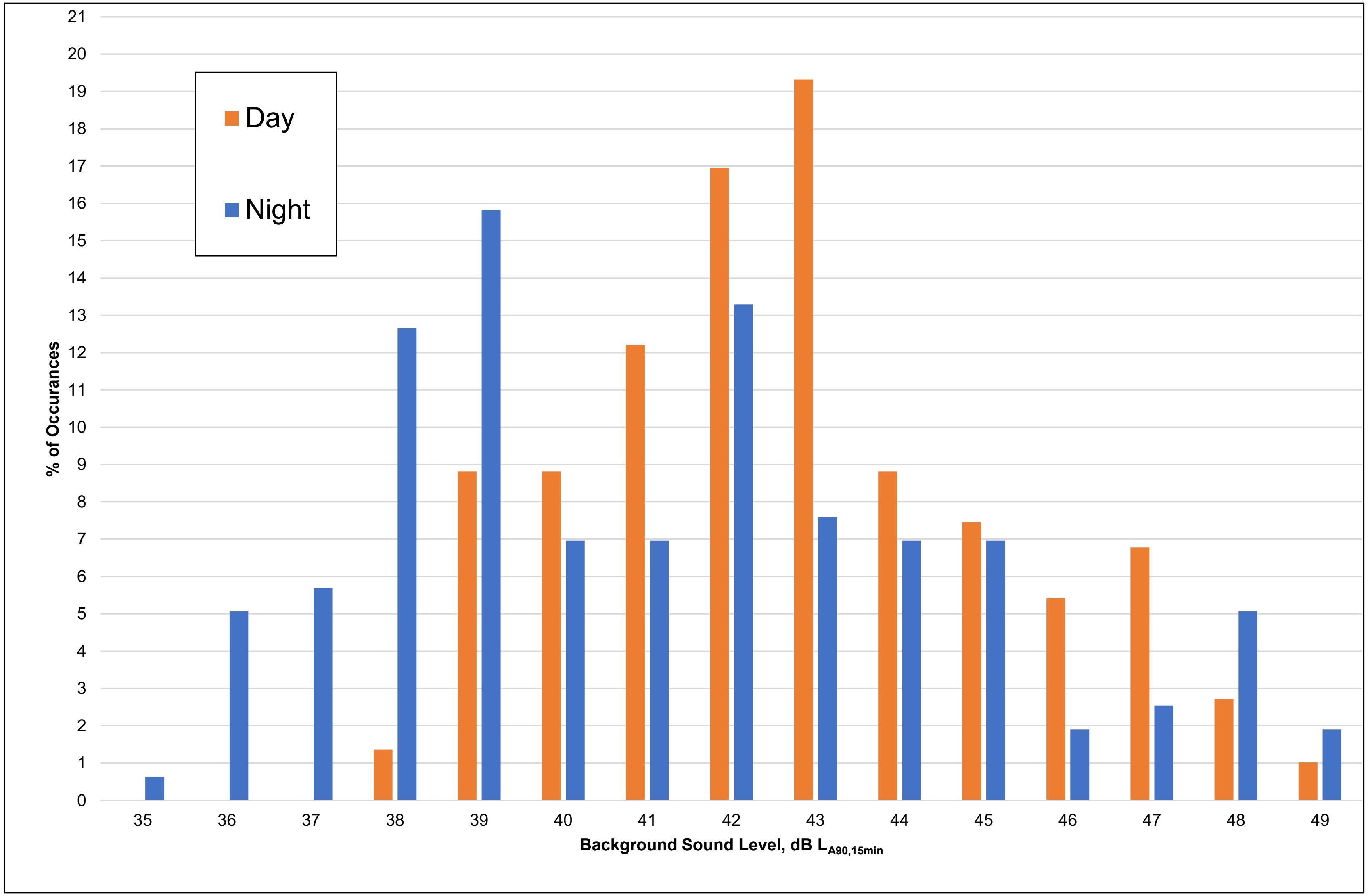

Figure 1.13: Statistical Analysis of Measured Daytime and Night-time $L_{A90,15min}$ noise levels

Appendix 2

Date of Measurement	Start Time	Measured Free-field Sound Levels, dB		
		$L_{Amax,F}$	$L_{Aeq,8hr}$	$L_{A90,15min}$
Thursday 12th June 2025	13:30	80.5	52.5	41.7
	13:45	65.2	48.2	42.3
	14:00	62.6	46.8	41.8
	14:15	62.2	44.4	40.0
	14:30	73.6	46.6	40.9
	14:45	53.9	46.5	43.3
	15:00	60.4	46.5	42.3
	15:15	64.5	48.4	43.0
	15:30	61.1	48.6	43.4
	15:45	61.5	49.1	44.7
	16:00	66.8	48.5	44.6
	16:15	58.9	47.8	44.3
	16:30	75.8	50.8	43.2
	16:45	60.5	45.1	42.0
	17:00	59.3	46.0	42.4
	17:15	61.7	48.5	42.7
	17:30	61.6	47.2	42.7
	17:45	70.5	51.1	42.8
	18:00	62.7	48.0	43.8
	18:15	71.2	48.6	44.9
	18:30	66.3	47.9	44.0
	18:45	64.4	46.9	43.7
	19:00	58.5	46.1	43.4
	19:15	59.6	46.0	43.3
	19:30	61.4	45.5	42.5
	19:45	58.1	43.8	41.5
	20:00	56.9	44.5	41.4

	20:15	65.5	44.1	41.5
	20:30	53.4	42.5	40.3
	20:45	62.4	49.5	41.2
	21:00	62.1	48.6	40.7
	21:15	57.6	42.9	40.9
	21:30	67.4	45.4	41.2
	21:45	53.5	42.5	40.9
	22:00	51.0	42.6	40.5
	22:15	56.4	45.2	41.3
	22:30	63.9	44.3	41.1
	22:45	54.2	42.4	40.0
	23:00	56.4	43.2	39.6
	23:15	48.4	40.2	39.0
	23:30	47.9	40.6	38.8
	23:45	54.9	40.3	38.3
Friday 13th June 2025	00:00	51.3	39.3	37.7
	00:15	49.3	39.1	37.7
	00:30	46.8	38.7	37.4
	00:45	49.2	40.6	39.1
	01:00	45.2	40.4	39.1
	01:15	47.3	42.9	41.0
	01:30	46.5	40.2	37.9
	01:45	55.4	40.2	38.1
	02:00	47.1	39.8	37.6
	02:15	50.1	39.6	37.6
	02:30	48.4	40.2	38.7
	02:45	52.6	41.2	38.8
	03:00	47.5	40.1	37.8
	03:15	50.6	42.4	40.1
	03:30	52.2	43.9	41.5

	03:45	56.4	46.6	43.0
	04:00	64.9	52.2	45.4
	04:15	65.1	51.9	45.6
	04:30	63.5	49.6	45.0
	04:45	63.0	48.9	44.9
	05:00	62.3	50.4	44.7
	05:15	62.3	46.6	44.1
	05:30	61.5	49.7	44.7
	05:45	61.5	50.3	46.7
	06:00	71.5	50.0	47.7
	06:15	62.8	50.2	49.0
	06:30	62.0	50.6	49.2
	06:45	62.9	50.2	48.5
	07:00	56.4	49.3	47.8
	07:15	63.5	48.4	46.5
	07:30	63.4	47.4	44.9
	07:45	64.2	48.2	44.0
	08:00	65.4	48.8	44.5
	08:15	62.5	48.0	43.6
	08:30	63.0	48.0	44.6
	08:45	59.2	45.6	43.2
	09:00	62.7	46.9	43.9
	09:15	67.1	51.6	46.9
	09:30	65.2	49.6	43.6
	09:45	70.0	51.9	44.9
	10:00	69.0	49.6	42.9
	10:15	64.1	48.6	43.7
	10:30	72.1	48.6	41.6
	10:45	67.1	48.7	41.5
	11:00	66.5	47.5	42.6

	11:15	67.1	46.1	41.9
	11:30	66.0	47.4	41.2
	11:45	63.7	48.5	41.2
	12:00	62.4	48.0	39.9
	12:15	59.2	43.6	38.9
	12:30	63.0	44.9	38.7
	12:45	52.1	43.3	39.1
	13:00	75.6	49.4	40.2
	13:15	68.2	47.3	39.9
	13:30	64.1	48.7	41.5
	13:45	66.5	50.3	42.0
	14:00	63.7	49.7	42.2
	14:15	67.6	49.5	43.1
	14:30	65.0	47.2	42.2
	14:45	76.3	50.4	43.7
	15:00	68.1	49.5	41.1
	15:15	66.8	48.4	40.3
	15:30	67.4	49.6	41.2
	15:45	64.8	49.5	39.7
	16:00	67.1	48.4	39.6
	16:15	70.1	47.3	40.0
	16:30	66.7	49.5	41.7
	16:45	63.9	47.4	42.9
	17:00	65.8	47.4	39.1
	17:15	69.0	50.1	39.4
	17:30	65.9	49.3	40.7
	17:45	69.9	51.2	40.6
	18:00	63.6	47.8	41.2
	18:15	66.7	47.9	41.7
	18:30	65.2	45.8	40.0

	18:45	63.6	45.2	40.1
	19:00	62.5	48.6	41.5
	19:15	64.0	50.3	41.9
	19:30	61.9	46.8	42.4
	19:45	62.6	51.0	40.4
	20:00	62.1	49.2	39.9
	20:15	63.0	50.6	39.8
	20:30	58.7	44.2	38.1
	20:45	58.4	41.2	38.9
	21:00	64.1	42.7	38.6
	21:15	62.6	47.9	38.9
	21:30	61.4	43.3	38.6
	21:45	58.5	42.9	39.2
	22:00	65.2	43.9	41.8
	22:15	55.9	45.2	43.4
	22:30	60.5	46.9	44.0
	22:45	60.4	48.8	46.7
	23:00	55.7	45.7	43.9
	23:15	58.0	45.5	43.1
	23:30	59.2	44.3	42.3
	23:45	53.2	44.3	42.5
Saturday 14th June 2025	00:00	51.1	41.1	39.6
	00:15	55.0	40.9	39.5
	00:30	49.2	40.7	39.5
	00:45	53.7	40.6	38.8
	01:00	45.9	38.5	37.5
	01:15	44.0	38.4	37.2
	01:30	49.3	37.6	36.4
	01:45	45.2	36.7	35.5
	02:00	56.9	38.6	35.6

	02:15	45.7	37.2	35.9
	02:30	48.2	36.9	35.8
	02:45	42.5	37.2	36.3
	03:00	47.3	37.3	36.2
	03:15	42.6	36.8	35.2
	03:30	53.0	40.4	36.0
	03:45	64.2	47.0	38.7
	04:00	62.1	49.1	39.1
	04:15	64.6	49.4	41.4
	04:30	61.7	48.4	42.4
	04:45	61.7	48.6	42.4
	05:00	64.3	46.0	42.1
	05:15	66.1	45.2	41.7
	05:30	63.1	45.1	41.2
	05:45	62.1	46.4	41.8
	06:00	67.2	48.0	41.1
	06:15	64.2	50.7	43.5
	06:30	62.3	48.6	44.1
	06:45	61.4	48.4	45.4
	07:00	64.5	49.8	45.9
	07:15	61.4	51.4	46.3
	07:30	69.1	49.7	46.6
	07:45	59.1	48.8	46.4
	08:00	61.0	48.7	46.1
	08:15	60.1	47.8	45.2
	08:30	66.9	48.1	45.0
	08:45	62.0	47.7	45.1
	09:00	61.9	49.4	45.7
	09:15	68.5	51.5	47.4
	09:30	65.0	51.1	47.4

	09:45	68.2	50.5	45.9
	10:00	61.6	49.0	45.2
	10:15	65.0	48.7	45.3
	10:30	58.7	49.3	46.3
	10:45	64.9	51.0	47.5
	11:00	63.8	51.5	47.0
	11:15	61.5	50.7	46.2
	11:30	74.4	53.2	47.4
	11:45	71.9	52.8	47.7
	12:00	61.7	51.3	47.1
	12:15	63.6	50.7	45.9
	12:30	68.9	51.5	47.3
	12:45	65.4	53.5	46.8
	13:00	79.8	60.3	46.7
	13:15	69.1	53.0	47.4
	13:30	62.8	52.9	48.7
	13:45	58.5	49.9	45.1
	14:00	59.7	49.2	45.1
	14:15	69.2	53.5	49.5
	14:30	61.5	50.5	47.0
	14:45	62.6	49.4	45.7
	15:00	64.8	52.5	48.3
	15:15	73.9	53.6	48.5
	15:30	68.2	53.2	48.5
	15:45	69.5	51.7	46.9
	16:00	63.5	51.1	48.0
	16:15	65.0	50.7	47.2
	16:30	70.3	52.1	46.9
	16:45	67.2	51.1	47.7
	17:00	64.9	52.3	47.9

	17:15	64.9	52.7	48.0
	17:30	65.7	50.9	46.6
	17:45	63.2	50.0	45.5
	18:00	68.3	51.1	46.5
	18:15	63.6	49.2	45.0
	18:30	67.2	51.9	47.2
	18:45	65.9	51.4	45.5
	19:00	64.1	50.9	46.3
	19:15	64.5	50.9	46.3
	19:30	64.3	49.9	45.0
	19:45	63.4	50.3	45.8
	20:00	65.1	49.7	45.3
	20:15	69.2	47.7	44.4
	20:30	59.2	46.7	44.1
	20:45	64.4	48.3	43.7
	21:00	62.7	45.7	43.2
	21:15	58.3	47.4	43.3
	21:30	64.8	48.4	43.5
	21:45	54.5	45.3	43.8
	22:00	51.1	46.0	44.5
	22:15	61.8	46.8	44.2
	22:30	70.1	50.0	43.4
	22:45	70.2	45.6	42.5
	23:00	51.1	44.7	43.4
	23:15	52.2	44.0	42.5
	23:30	50.8	43.7	42.8
	23:45	54.1	44.1	42.4
Sunday 15th June 2025	00:00	50.5	43.6	42.4
	00:15	60.9	44.3	42.2
	00:30	51.2	43.5	42.3

	00:45	49.5	43.3	42.0
	01:00	51.0	42.7	41.0
	01:15	58.2	42.5	40.6
	01:30	54.8	41.4	40.0
	01:45	54.0	40.2	38.8
	02:00	49.6	40.8	39.2
	02:15	45.9	40.6	39.0
	02:30	48.0	40.0	38.5
	02:45	47.2	40.2	38.8
	03:00	47.5	39.9	38.6
	03:15	45.9	39.6	38.5
	03:30	51.6	40.5	39.1
	03:45	64.9	48.5	40.9
	04:00	63.9	50.6	42.1
	04:15	64.4	49.4	43.1
	04:30	62.0	49.2	42.8
	04:45	62.6	46.0	42.4
	05:00	66.6	45.2	41.7
	05:15	61.8	47.4	42.3
	05:30	67.9	48.0	42.5
	05:45	63.5	45.8	43.0
	06:00	70.8	50.9	44.6
	06:15	65.5	48.3	44.1
	06:30	62.6	46.6	43.7
	06:45	61.3	46.8	43.7
	07:00	63.9	46.1	42.6
	07:15	60.2	45.6	42.5
	07:30	66.8	45.7	41.5
	07:45	65.9	44.4	41.5
	08:00	62.3	46.1	42.0

	08:15	62.7	45.9	41.1
	08:30	76.5	48.4	40.5
	08:45	67.6	46.4	41.6
	09:00	67.1	45.4	39.9
	09:15	62.8	46.7	42.1
	09:30	62.3	46.6	43.2
	09:45	60.6	45.0	41.9
	10:00	62.6	47.8	42.3
	10:15	66.1	47.1	41.9
	10:30	60.4	44.6	41.7
	10:45	67.6	48.7	42.4
	11:00	60.9	45.4	42.3
	11:15	59.5	45.4	42.2
	11:30	60.6	44.3	41.4
	11:45	58.0	45.7	42.6
	12:00	69.1	46.5	42.2
	12:15	57.2	45.6	42.8
	12:30	77.9	53.8	43.4
	12:45	70.3	49.5	44.0
	13:00	60.7	48.8	44.4
	13:15	68.3	50.6	42.9
	13:30	64.0	48.4	43.5
	13:45	58.0	46.5	43.2
	14:00	65.8	46.6	42.1
	14:15	58.9	46.2	42.9
	14:30	57.5	45.6	41.9
	14:45	68.5	46.9	42.6
	15:00	64.7	46.4	42.9
	15:15	64.7	48.2	43.4
	15:30	59.0	45.6	42.4

	15:45	60.7	47.5	43.8
	16:00	59.0	45.8	42.6
	16:15	61.3	45.2	42.6
	16:30	60.5	46.1	43.4
	16:45	68.4	47.3	42.5
	17:00	71.4	51.3	43.9
	17:15	62.5	47.6	43.0
	17:30	59.2	46.0	42.7
	17:45	69.0	47.9	43.0
	18:00	63.9	45.2	41.9
	18:15	60.4	45.7	42.8
	18:30	64.0	47.3	44.0
	18:45	74.5	47.2	42.5
	19:00	67.0	47.8	43.1
	19:15	62.8	47.0	43.4
	19:30	67.5	51.0	44.9
	19:45	59.9	46.2	43.7
	20:00	65.7	47.5	43.5
	20:15	64.0	46.5	43.7
	20:30	91.4	64.2	43.0
	20:45	58.9	45.4	43.1
	21:00	57.9	44.7	43.2
	21:15	60.7	44.4	42.9
	21:30	52.9	43.8	42.5
	21:45	50.1	43.6	42.2
	22:00	49.9	43.7	42.4
	22:15	48.7	43.7	42.6
	22:30	51.5	43.6	42.3
	22:45	55.9	44.2	42.7
	23:00	57.8	45.8	43.5

	23:15	48.0	43.0	41.8
	23:30	54.6	43.1	41.9
	23:45	52.7	43.5	42.3
Monday 16th June 2025	00:00	52.1	42.8	41.1
	00:15	49.7	41.6	39.8
	00:30	51.7	40.9	39.5
	00:45	58.6	41.4	39.1
	01:00	55.0	39.9	38.4
	01:15	46.3	38.7	37.3
	01:30	46.7	38.8	36.9
	01:45	48.8	39.3	36.9
	02:00	54.7	39.5	37.9
	02:15	48.2	39.6	37.6
	02:30	47.2	40.5	38.2
	02:45	47.7	40.6	37.9
	03:00	51.5	40.1	37.4
	03:15	49.2	41.4	38.7
	03:30	52.6	42.6	39.2
	03:45	63.0	49.8	42.8
	04:00	61.7	49.6	43.4
	04:15	65.9	51.6	44.4
	04:30	65.1	49.7	44.3
	04:45	57.6	48.1	44.8
	05:00	64.6	48.2	44.8
	05:15	61.2	47.9	45.2
	05:30	63.7	49.5	46.3
	05:45	62.1	50.1	47.6
	06:00	64.5	49.7	47.3
	06:15	67.1	49.6	47.5
	06:30	63.4	49.7	47.5

	06:45	62.9	49.6	47.8
	07:00	60.5	49.2	46.7
	07:15	59.8	47.4	45.3
	07:30	58.6	45.0	42.3
	07:45	64.3	45.4	41.0
	08:00	70.4	48.5	39.8
	08:15	72.4	49.3	41.3
	08:30	64.3	49.6	42.3
	08:45	63.2	46.8	40.8
	09:00	71.7	48.5	40.7
	09:15	67.6	48.4	39.5
	09:30	64.1	48.0	41.2
	09:45	67.7	48.9	38.5
	10:00	62.3	48.3	38.6
	10:15	62.1	49.9	41.2
	10:30	71.1	53.3	44.8
	10:45	63.7	48.5	43.0
	11:00	67.9	50.1	41.7
	11:15	67.9	49.6	39.7
	11:30	65.2	47.3	38.0
	11:45	63.9	47.8	40.5
	12:00	62.0	44.1	37.6
	12:15	58.7	42.6	38.6
	12:30	71.7	49.5	39.3
	12:45	56.3	43.4	39.2
	13:00	60.1	46.8	41.9
	13:15	63.4	49.0	42.7
	13:30	64.7	47.5	43.0
	13:45	72.2	49.1	41.5
	14:00	72.8	51.8	43.4

	14:15	72.3	50.9	42.6
	14:30	62.0	50.1	42.7
	14:45	62.2	45.6	39.5
	15:00	65.9	48.4	41.4
	15:15	61.4	49.9	40.2
	15:30	69.5	50.3	41.1
	15:45	67.2	50.1	42.4
	16:00	73.2	49.7	41.1
	16:15	69.5	49.4	39.3
	16:30	64.3	50.1	42.5
	16:45	64.3	49.6	40.9
	17:00	69.5	50.8	42.4
	17:15	69.8	48.5	42.3
	17:30	70.5	51.4	41.3
	17:45	61.6	45.9	38.2
	18:00	62.5	45.5	39.9
	18:15	56.7	42.3	39.0
	18:30	60.4	41.6	39.0
	18:45	59.9	41.7	38.6
	19:00	63.0	43.3	39.3
	19:15	59.7	42.5	39.3
	19:30	66.3	44.8	39.2
	19:45	59.9	46.1	39.2
	20:00	63.9	43.9	39.2
	20:15	56.7	42.2	38.7
	20:30	55.4	41.8	39.2
	20:45	60.6	42.6	39.8
	21:00	57.5	42.4	40.1
	21:15	58.1	41.8	40.1
	21:30	58.1	43.9	40.7

	21:45	53.1	42.4	40.4
	22:00	53.9	43.2	41.1
	22:15	53.9	42.6	40.6
	22:30	62.1	44.6	41.3
	22:45	51.6	43.3	41.7
	23:00	52.0	42.7	41.1
	23:15	64.3	43.7	40.9
	23:30	52.0	41.9	40.5
	23:45	49.2	40.9	39.9
Tuesday 17th June 2025	00:00	51.9	41.1	39.7
	00:15	53.4	41.0	39.1
	00:30	50.4	40.2	38.9
	00:45	49.0	40.3	39.1
	01:00	46.5	40.1	38.5
	01:15	53.0	40.2	38.8
	01:30	48.7	40.0	38.0
	01:45	51.3	39.8	37.8
	02:00	48.7	39.5	37.5
	02:15	45.5	39.4	37.6
	02:30	48.6	38.8	37.2
	02:45	44.1	38.8	37.1
	03:00	46.1	39.1	36.9
	03:15	47.2	39.7	37.8
	03:30	47.8	39.6	37.6
	03:45	55.4	44.9	40.3
	04:00	61.3	49.3	42.0
	04:15	62.6	49.3	42.8
	04:30	58.7	45.7	42.4
	04:45	62.8	47.4	43.5
	05:00	62.8	46.5	44.2

	05:15	71.3	48.0	45.3
	05:30	63.4	48.6	46.2
	05:45	69.2	49.7	47.1
	06:00	58.6	49.3	47.6
	06:15	63.2	50.1	48.2
	06:30	58.8	49.7	48.1
	06:45	58.4	48.9	46.8
	07:00	62.8	48.4	46.8
	07:15	61.1	48.0	46.2
	07:30	59.1	46.0	44.7
	07:45	60.7	46.5	43.6
	08:00	73.6	49.3	42.3
	08:15	63.7	47.1	42.6
	08:30	67.0	49.2	43.0

Table 2.1: Measured Noise Levels at LT1

Appendix 3

Noise

Noise is defined as unwanted sound. The range of audible sound is from 0 to 140 dB. The frequency response of the ear is usually taken to be around 18 Hz (number of oscillations per second) to 18000 Hz. The ear does not respond equally to different frequencies at the same level. It is more sensitive in the mid-frequency range than the lower and higher frequencies and because of this, the low and high frequency components of a sound are reduced in importance by applying a weighting (filtering) circuit to the noise measuring instrument. The weighting which is most widely used and which correlates best with subjective response to noise is the dBA weighting. This is an internationally accepted standard for noise measurements.

For variable sources, such as traffic, a difference of 3 dBA is just distinguishable. In addition, a doubling of traffic flow will increase the overall noise by 3 dBA. The 'loudness' of a noise is a purely subjective parameter, but it is generally accepted that an increase/ decrease of 10 dBA corresponds to a doubling/ halving in perceived loudness. Noise is measured on a logarithmic scale in decibels (dB) because of the ears' sensitivity to a wide range of pressure changes. The sound pressure level (SPL) of a signal is denoted by the symbol Lp and defined by the equation Lp = 10 log (p/po)2 where p is the root mean square pressure of the signal and po is the reference sound pressure (2 x 10-5 Pa).

An indication of the range of sound pressure levels commonly found in the environment is given below:

Location	L_{pAdB}(A)
Normal threshold of hearing	-10 to 20
Music halls and theatres	20 to 30
Living rooms and offices	30 to 50
Inside motor vehicles	50 to 70
Industrial premises	70 to 100
Burglar alarms at 1 m	100 to 110
Jet aircraft on take-off	110 to 130
Threshold of pain	130 to 140

External noise levels are rarely steady, but rise and fall according to activities within an area. In attempt to produce a figure that relates this variable noise level to subjective response, a number of noise indices have been developed. These include:

i) The L_{Amax} noise level

This is the maximum noise level recorded over the measurement period.

ii) The L_{Aeq} noise level

This is “equivalent continuous A-weighted sound pressure level, in decibels” and is defined in British Standard BS 7445 as the “ value of the A-weighted sound pressure level of a continuous, steady sound that, within a specified time internal, T, has the same mean square sound pressure as a sound under consideration whose level varies with time”.

It is a unit commonly used to describe construction noise and noise from industrial premises and is the most suitable unit for the description of other forms of environmental noise. In more straightforward terms, it is a measure of energy within the varying noise.

iii) The L_{A10} noise level

This is the noise level that is exceeded for 10% of the measurement period and gives an indication of the noisier levels. It is a unit that has been used over many years for the measurement and assessment of road traffic noise.

iv) The L_{A90} noise level

This is the noise level that is exceeded for 90% of the measurement period and gives an indication of the noise level during the quieter periods. It is often referred to as the background noise level and is used in the assessment of disturbance from industrial noise.

Community response to environmental noise sources is dependent on both acoustic and non-acoustic factors. The acoustic factors include absolute noise level, changes or exceedances of background and ambient levels as well as the characteristics, time, duration and frequency of noise.