



**GRAINGER PLC
RESIDENTIAL DEVELOPMENT
BLUE STAR LAND, BEREWOOD,
WATERLOOVILLE, PO7 7AE**

NOISE IMPACT ASSESSMENT

AUGUST 2024



the journey is the reward

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WATERLOOVILLE, PO7 AE**

NOISE IMPACT ASSESSMENT

AUGUST 2024

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GRAINGER PLC
Residential Development
Noise IMPACT Assessment

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1 Introduction

- 1.1 Mayer Brown Limited (MBL) has been instructed by Grainger Plc to prepare a Noise Impact Assessment to support an outline planning application for the proposed residential development on Blue Star Land, Berewood, Waterloooville, PO7 7AE. The site is located within the local authority of Havent Borough Council (HBC).
- 1.2 The original scheme was for up to 90 residential dwellings and the current revised scheme is for up to 69 residential units.
- 1.3 A Noise Impact Assessment^[1] was prepared by Quantum Acoustics on behalf of MBL in June 2023 to support the outline planning application for the original scheme. A copy of the report is provided in **Appendix A**.
- 1.4 This report is based upon the requirements of British Standard (BS) 8233:2014 "Guidance on sound insulation and noise reduction for buildings" ^[2] and Professional Practice Guidance on Planning and Noise (ProPG) ^[3], and provides the Acoustic Design Statement (ADS) for the proposed development. The purpose of the ADS is to consider any constraints that the existing sound environment may have on the proposed development and whether any specific mitigation measures are required to provide satisfactory internal and external acoustic environments for future residents.
- 1.5 If any potential impacts are identified, outline mitigation measures will be recommended in order to reduce and minimise the effects.
- 1.6 The assessment within this report has been undertaken with integrity, objectivity and honesty in accordance with the Code of Conduct of the Institute of Acoustics (IOA) and ethically, professionally and lawfully in accordance with the Code of Ethics of the Association of Noise Consultants (ANC). This report has been peer reviewed within the MBL Acoustics Team, all of whom are members of IOA to ensure that it is technically robust and meets the requirements of our Quality Management System.

¹ Quantum Acoustics (2023) "Blue Star Land, Berewood, Waterloooville, PO7 7AE. Environmental Noise Survey and Noise Impact Assessment Report (QA23079/ENS)", June 2023, Quantum Acoustics.

² British Standards Institution (2014) British Standard 8233:2014 "Guidance on sound reduction for buildings", February 2014, BSi.

³ Association of Noise Consultants (ANC), Institute of Acoustics (IOA), Chartered Institute of Environmental Health (CIEH) (2017) "ProPG: Planning and Noise. Professional Practice Guidance on Planning and Noise. New Residential Development", May 2017, ANC, IOA and CIEH.

- 1.7 A glossary of acoustic terminology used in this report is provided in **Appendix B.**

2 Site Location

- 2.1 The site, known as Blue Star Land, is currently undeveloped greenfield land, located in Waterlooville, Hampshire, PO7 7AE. A site location plan showing the red line boundary is provided in **Figure 2.1** below.



Figure 2.1: Site Location

- 2.2 There is a small parcel of undeveloped greenfield land immediately located to the north of the site, with Houghton Avenue located approximately 60 m to the north of the site boundary.
- 2.3 There is a large commercial area located approximately 125 m to the north-east of the site on the opposite side of the Hambledon Road (B2150) and Maurepas Avenue (A3) junction. Stores include, Home Bargains, Halfords, Sainsburys, TK Maxx and Matalan, with associated parking.
- 2.4 Maurepas Way (A3) forms the eastern boundary, with a small commercial area located approximately 25 m from the site boundary. Stores include Asda, small independent shops and the Waterloooville Community Centre.
- 2.5 Maurepas Way (A3) is a 2-lane, 2-way dual carriageway, with the carriageways separated by a 2 m central reservation.
- 2.6 Waterloooville Fire Station is located immediately to the south-east of the site, and 2660 (Waterlooville) Squadron Air Training Corps – Air Cadets located immediately to the south of the site.

- 2.7 Existing light industrial / commercial uses are located approximately 250 m north of the site boundary.
- 2.8 Existing residential properties are located to the south / south-east of the site, off Evergreen Close and Forest End.
- 2.9 Existing residential properties are also located to the west of the site, off Hursley Road, Crowder Way, Laxton Leaze, Denniston Dene, Ellison Crescent and Grainger Street.

3.1 The proposed development comprises up to 69 residential dwellings, including drainage, public open space and landscaping. A site layout plan is provided in **Figure 3.1** below.



4 Planning and Design Guidance

National Planning Policy

4.1 The overarching national planning policies relevant to this type of development include:

- National Planning Policy Framework (NPPF) ^[4];
- Noise Policy Statement for England (NPSE) ^[5]; and
- Planning Practice Guidance – Noise (PPG-N) ^[6].

4.2 Further information is provided in **Appendix C**.

Local Planning Policy

4.3 The adopted Local Plan consists of two documents:

- The Core Strategy ^[7]; and
- The Allocations Plan ^[8].

The Core Strategy

4.4 The Core Strategy, adopted in 2011, sets out the strategic plan for development within the area and forms the first part of the Local Plan.

4.5 With regards to noise, Policy CS16 'High Quality Design' States:

"Planning permission will be granted for development that is designed to a high standard, which helps to create places where people want to live, work and relax. All development should demonstrate that its design:

1. *Responds to, draws inspiration from and respects local context and:*

...

e) *The development does not cause unacceptable harm to the amenity of neighbours through smell, the loss of privacy, outlook, noise and overlooking."*

⁴ Department for Levelling Up, Housing & Communities (DLHC) (2023) "National Planning Policy Framework", December 2023, DLHC.

⁵ Department for Environment, Food and Rural Affairs (DEFRA) (2010) "Noise Policy Statement for England", March 2010, DEFRA.

⁶ DLHC (2019) "Planning Practice Guidance – Noise", July 2019, DLHC.

⁷ Havant Borough Council (HBC) (2011) "Havant Borough Core Strategy", (March 2011), HBC.

⁸ Havant Borough Council (HBC) (2014) "Havant Borough Local Plan (Allocations). Adopted Version", July 2024, HBC.

The Allocations Plan

- 4.6 The Allocations Plan, adopted in 2014, identifies sites for specific development, such as housing, employment, retail, recreation and green infrastructure. The document forms the second part of the Local Plan.
- 4.7 Policy WA2 'Waterlooville Mixed Use Allocations' indicates that the Blue Star Land has been allocated for development by HBC within the AP for mixed use development for housing and main town centre uses (Site Name: West of Asda / Blue Star Site | Site Ref / Policy Number: W135).
- 4.8 With regards to noise, Policy DM18 'Protecting New Development from Pollution' states:

"Planning permission will be granted for development provided that projected levels of air, noise, vibration, light, water or other pollution do not have significant negative affect on the amenity of future occupiers or users of the proposed development."

Design Guidance

- 4.9 The overarching design guidance relevant to this type of development include:
- BS 8233:2014 "Guidance on sound reduction for buildings"^[2]; and
 - Professional Practice Guidance on Planning and Noise (ProPG)^[3].
- 4.10 Further information is provided in **Appendix D**.
- 4.11 Paragraph 015 of PPG-N refers to BS 8233 and ProPG, which both recommend the indoor ambient levels within residential dwellings summarised in **Table 4.1** below. It should be noted that the recommended indoor ambient levels are the overall levels (i.e. the total sum of structure-borne and airborne noise sources).

Activity	Location	Daytime (07:00 - 23:00 hours)	Night-time (23:00 - 07:00 hours)
Resting	Living Room	35 dB LAeq, 16hour	-
Dining	Dining Room/Area	40 dB LAeq, 16hour	-
Sleeping (daytime resting)	Bedroom	35 dB LAeq, 16hour	30 dB LAeq, 8hour

Table 4.1: BS 8233:2014 Indoor Ambient Noise Levels

- 4.12 The accompanying NOTE 4 of BS 8233 states:

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

- 4.13 The accompanying NOTE 5 of BS 8233 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.”

- 4.14 ProPG outlines a two-stage assessment process, which comprises an initial site risk assessment and, if required, a second full assessment of four main elements: Good Acoustic Design, Internal Noise Levels, External Amenity Areas and Other relevant issues. This all forms the Acoustic Design Statement (ADS) which provides the overall recommendation to decision makers.
- 4.15 The purpose of the ADS is to consider any constraints that the existing sound environment may have on the proposed development and whether any specific mitigation measures are required to provide satisfactory internal and external acoustic environments for future residents.
- 4.16 If any potential impacts are identified, outline mitigation measures will be recommended in order to reduce and minimise the effects.

5 Existing Sound Environment

- 5.1 In order to establish the existing sound levels characterising the acoustic environment within the vicinity of the site, an environmental sound survey was undertaken by Quantum Acoustics in June 2023 for MBL to support the original planning application. Survey details are provided in the Quantum Acoustics report ^[1].
- 5.2 It is considered that the data and results from the June 2023 survey are still valid and representative of the existing acoustic environment at the proposed development site.
- 5.3 It is noted that there are a couple of typographical errors in section 5.0 'Survey Findings' of the Quantum Acoustics report ^[1]. In table 'L_{eq} Noise Levels' on page 9 and 10, 'Position' (row 14) should refer to Position C and the noise levels in the first column (row 15 to 19) should refer to the measurement date. In table 'Night-time (23:00 – 07:00) L_{Amax} Noise Levels' on page 10, 'Position B' (row 13) should refer to Position C.
- 5.4 A summary of the measured levels (incorporating the corrections above) are provided in **Tables 5.1** and **5.2** below.
- 5.5 Survey details are provided in the Quantum Acoustics report ^[1] provided in **Appendix A**.
- 5.6 Position A was located on the eastern boundary of the site. The ambient noise levels were dominated by road traffic noise from Maurepas Way (A3), with some contribution from birdsong and localised pedestrian movements along Maurepas Way (A3).
- 5.7 Position B was located on the northern boundary of the site. The ambient noise levels were dominated by road traffic from Hambledon Road (B2150) and Maurepas Way (A3) with some contribution from birdsong and distant construction noise from the Phase 3B construction site (during working hours).
- 5.8 Position C was located on the southern boundary of the site. The ambient noise levels were dominated by distant road traffic noise from Maurepas Way (A3), birdsong and distant construction noise from the Phase 3B construction site (during working hours).

5.9 Noise levels across the site were dominated by road traffic noise. It was considered that noise associated with the commercial areas within the vicinity of the site were not audible at the time of the site visit and therefore, did not contribute to the overall measured noise levels.

Location	L _{Aeq} Noise Levels (dB)	
	Daytime (07:00 - 23:00 hours)	Night-time (23:00 - 07:00 hours)
Position A (on the eastern boundary of the site)		
07/06/2023	66	58
08/07/2023	65	58
09/07/2023	66	57
10/07/2023	65	56
Position B (on the northern boundary of the site)		
07/06/2023	59	53
08/07/2023	59	54
09/07/2023	59	52
10/07/2023	58	52
11/07/2023	54	50
Position C (on the southern boundary of the site)		
07/06/2023	54	50
08/07/2023	54	50
09/07/2023	54	49
10/07/2023	51	48
11/07/2023	51	50

Table 5.1: Day and Night L_{Aeq} Noise Levels

Location	L _{Amax} Noise Levels (dB)
	Night-time (23:00 - 07:00 hours)
Position A (on the eastern boundary of the site)	
07/06/2023	73
08/07/2023	75
09/07/2023	75
10/07/2023	73
Position B (on the northern boundary of the site)	
07/06/2023	68
08/07/2023	71
09/07/2023	68
10/07/2023	72
11/07/2023	66
Position C (on the southern boundary of the site)	
07/06/2023	65
08/07/2023	66
09/07/2023	63
10/07/2023	66
11/07/2023	63

Table 5.1: Night L_{Amax} Noise Levels

6 Stage 1: Initial Noise Risk Assessment

- 6.1 With reference to ProPG and the measured ambient sound levels, the initial site risk assessment places the site in the “low” to “medium” risk category during both daytime and night-time. This is illustrated in **Figure 6.1** below.

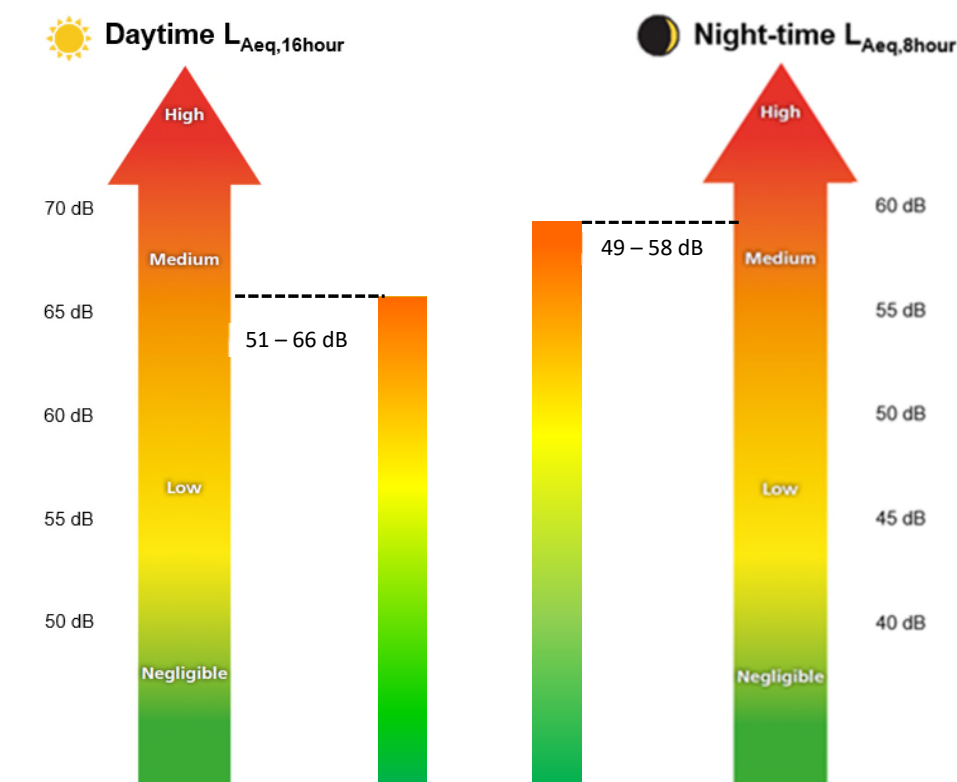


Figure 6.1: ProPG Stage 1 – Initial Site Risk Assessment (Daytime)

- 6.2 For “low” risk sites ProPG states:

“At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impact of noise will be mitigated and minimised in the finished development.”

- 6.3 For “medium” risk sites ProPG states:

“As noise levels increase, the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimise, and which clearly demonstrate that a significant adverse noise impact will be avoided in the finished development.”

7 Stage 2: Acoustic Design Statement

7.1 In accordance with ProPG, if a Stage 2 Acoustic Design Statement is recommended or required, the planning application for a new residential development should include evidence that the following have been considered:

- Check the feasibility of relocating or reducing noise levels from relevant sources.
- Consider options for planning the site or building layout.
- Consider the orientation of proposed building(s).
- Select construction types and methods for meeting building performance requirements.
- Examine the effects of noise control measures on ventilation, fire regulation, health and safety, cost, CDM (construction, design and management) etc.
- Assess the viability of alternative solutions.
- Assess external amenity area noise.

Element 1 – Good Acoustic Design

7.2 The dominant noise source is road traffic on the adjacent main roads and local road network. It is not feasible to relocate or reduce the noise levels from the existing road network (e.g. by replacing the road surface, reducing the speed limit, imposing vehicle restrictions, etc) because it is outside of the client's control.

7.3 Where possible, buildings have been positioned as far back from the local road network as possible and orientated to provide screening across the application site. There is also a buffer zone approximately 50 m in the northern part of the site, which is intended as open space shielding the proposed development from the A3 to the east.

7.4 Where possible, non-habitable rooms (e.g. kitchens, bathrooms, hallways, etc) will be positioned on noisier façade, and habitable rooms (e.g. living rooms, dining rooms, open plan living areas, bedrooms, etc) will be positioned on the quieter façades.

Element 2 – Indoor Ambient Noise Levels

External Building Envelope

- 7.5 In accordance with BS 8233 and ProPG, acceptable internal noise levels are presented in **Section 4** of this report. In addition to the levels in **Table 4.1**, ProPG also suggests that an event level of 45 dB $L_{Amax,fast}$ should not be exceeded more than 10 to 15 times per night.
- 7.6 The overall sound insulation performance of the external building envelope is determined by:
- External noise levels.
 - Sound insulation performance of the individual building elements.
 - The dimensions and proportions of the individual building elements.
 - The acoustic properties of the receiver room.
- 7.7 Indoor ambient noise levels have not been assessed at this stage as they are generally considered as part of the detailed design stage. However, based on the measured noise levels, dwellings with a direct line of sight to Maurepas Avenue (A3) are likely to require an enhanced façade specification (e.g. suitable glazing specification and alternative means of ventilation), with a higher façade specification required the closer the dwelling is located to Maurepas Avenue (A3).

Purge Ventilation

- 7.8 Building Regulations Approved Document F (ADF1)⁹ requires that adequate provision is made for purge ventilation. Purge ventilation is the process of removing high concentrations of pollutants and water vapour released from occasional activities or accidental releases, such as painting and smoke from burnt food respectively. Since the need for purge ventilation is by its definition “occasional”, this is normally achieved by giving the residents the ability to open their windows. Whilst noise intrusion may increase as a result of windows being open, this occasional and temporary occurrence can be considered acceptable, particularly as occupants are “in control” of both the timing and duration of purge ventilation being required.
- 7.9 Providing purge ventilation through open windows for this development site is considered acceptable and in line with ProPG advice.

⁹ Building Regulations 2010 Approved Document F Ventilation Volume 1: Dwellings – 2021 Edition

Thermal Comfort

7.10 While overheating is now primarily a matter for Building Regulations through Approved Document O (ADO) ^[10], it is recommended to consider and assess thermal comfort vs noise as outlined within the AVO guide ^[11].

7.11 ADO states the following requirements to internal noise levels:

“Windows are likely to be closed during sleep hours if noise within the bedrooms exceeds the following limits:

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

7.12 The AVO guide outlines a two-stage assessment procedure with an initial site risk assessment and followed by a detailed assessment for “high risk” sites. The approach is summarised in **Figure 7.1** below.

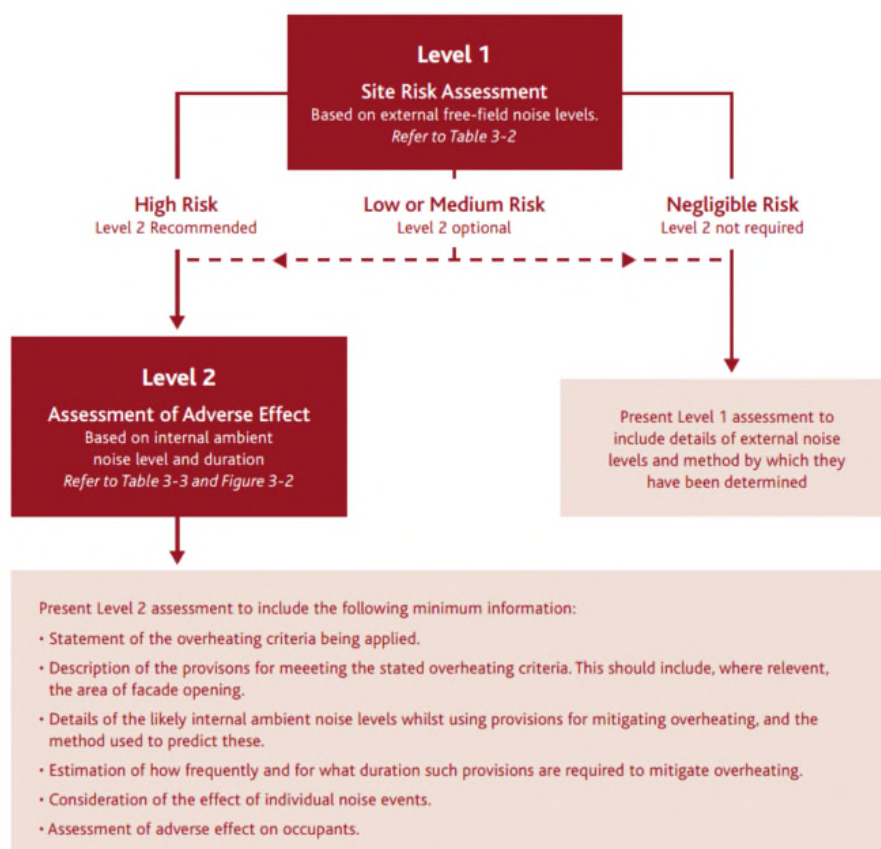


Figure 7.1: Two-level Noise Assessment Procedure – Overheating Condition

¹⁰ Department of Levelling Up, Housing and Communities (2022) Approved Document O “Overheating”, June 2022.

¹¹ Association of Noise Consultants (ANC) and Institute of Acoustics (IOA) (2020) “Acoustics Ventilation and Overheating: Residential Design Guide – Ver 1.1” January 2020. ANC & IOA.

- 7.13 The amount of noise attenuation provided via an open window depends upon the opening type and the degree to which the window is open. It is generally accepted within the UK ^[12] that when opening windows to reduce internal temperatures, the noise attenuation provided by an open window would be between approximately 9 and 15 dB (i.e. 9 dB fully open window / 15 dB slightly open).
- 7.14 With reference to ADO requirements level, and assuming the lower value of 9 dB, measured external levels should then not exceed the following levels:
- 49 dB $L_{Aeq,8hr}$ (between 23:00 and 07:00 hours).
 - 64 dB $L_{Amax,F}$ more than 10 times a night (between 23:00 and 07:00 hours).
- 7.15 Indoor ambient noise levels have not been assessed at this stage as they are generally considered as part of the detailed design stage. However, based on the measured sound levels, as summarised in **Table 5.1** and **Table 5.2**, the initial Level 1 Site Risk Assessment indicates that it is unlikely that open windows can be relied upon for the purpose of mitigating overheating during night-time.
- 7.16 Notwithstanding the above, where facades have lower incident sound levels, e.g. facades facing away from the A3, it may be possible to use open windows as a means of mitigating overheating. However, that is subject to verification during the detailed design stage.

Element 3 – External Amenity Areas

3D – Modelling

- 7.17 BS 8233 states:

“For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic

¹² NANR116: “Open/closed window research” – Sound Insulation Through Ventilated Domestic Windows, April 2007. The Building Performance Centre, School of the Built Environment Napier University for the Department of Environment, Food and Rural Affairs (DEFRA)

transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.”

- 7.18 Based on the measured sound levels, a 3D sound model has been built using CadnaA computer modelling software to determine the sound levels across the whole of the site, based on the current masterplan.
- 7.19 An upper target of 55 dB $L_{Aeq,16hr}$ has been adopted. **Figure 7.1** provides the daytime (07:00 to 23:00 hours) ambient noise levels across the open application site at 1.5 m above local ground level to represent ground floor.



Figure 7.3: External Ambient Noise Levels – Daytime

- 7.20 From **Figure 7.3** it can be seen that the recommended criteria of 55 dB $L_{Aeq,16hr}$ for external amenity areas can be achieved in the majority of areas due to the site layout and barrier screening provided by the proposed buildings.
- 7.21 Where required, additional mitigation can be provided with localised screening for individual plots (e.g. garden fences).

Element 4 – Other Relevant Issues

- 7.22 The conclusions of Element 1 to 3 indicates that the development implements “good acoustic design” as far as practicable possible due to site location and the constraints that the existing acoustic environment presents.
- 7.23 Indoor ambient noise levels can be adequately controlled in line with the guidance outlined in ProPG and BS 8233:2014.
- 7.24 Section 3 of ProPG determines that the Stage 1 and 2 assessments should lead to one of four recommendations:
- A. Planning consent may be granted without any need for noise conditions;*
 - B. Planning consent may be granted subject to the inclusion of suitable noise conditions;*
 - C. Planning consent should be refused on noise ground in order to avoid significant adverse effects (“avoid”); or*
 - D. Planning consent should be refused on noise grounds in order to prevent unacceptable adverse effects (“prevent”).*
- 7.25 The initial Stage 1 site risk assessment indicates that the site can be considered “Low” to “Medium” risk, leading to the more detailed Stage 2 assessment. The Stage 2 assessment confirms, that “good acoustic design” is implemented as far as practicable possible within the proposed scheme, and dwellings have been designed to control indoor ambient noise levels to acceptable levels.
- 7.26 The sound levels L_{Aeq} across the external amenity areas are below 55 dB for the majority of parcels, with the exception of small areas which have a direct line of site to Maurepas Avenue (A3) and currently no screening.
- 7.27 Notwithstanding the above, it is considered that sound levels for external amenity areas comply with the recommended limits.

8 Summary & Conclusion

- 8.1 Mayer Brown Limited (MBL) has been instructed by Grainger Plc to prepare a Noise Impact Assessment to support an outline planning application for the proposed residential development on Blue Star Land, Berewood, Waterloooville, PO7 7AE. The site is located within the local authority of Havent Borough Council (HBC).
- 8.2 The original scheme was for up to 90 residential dwellings and the revised scheme is for up to 69 residential units.
- 8.3 This report is based on the ProPG methodology which refers to the requirements of British Standard 8233:2014 to demonstrate that the condition above can be achieved.
- 8.4 A baseline sound survey was carried out by Quantum Acoustics on behalf of MBL in June 2023 to support the original planning application.
- 8.5 The ProPG Stage 1 initial Site Risk Assessment concluded that the development site would be categorised as being “Low” to “Medium” risk for both daytime and night-time. While this indicates a low risk of adverse noise impacts on future occupants, a ProPG Stage 2 assessment has been carried out. It demonstrates that:
- the proposed development follows good acoustic design to mitigate any potential noise impacts as far as practical possible;
 - the proposed development can be designed to secure acceptable internal ambient noise levels;
 - the proposed development provides external amenity areas where noise levels are below the upper recommended limit; and
 - the proposed development is considered compliant with relevant national and local planning policies.
- 8.6 Based on the above, it is concluded, that the proposed development complies with noise related national and local planning polices and guidance.

APPENDIX A: Quantum Acoustics Report

Blue Star Land
Berewood
Waterlooville
PO7 7AE

Environmental Noise Survey and
Noise Impact Assessment Report

20 June 2023

Client: Mayer Brown Ltd

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QA23079/ENS

Document Control

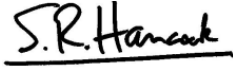
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Role	Name	Signature	Date
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For Information

Please Note

Quantum Acoustics Ltd have prepared this report with generally accepted acoustic consultancy principles, using all reasonable skill, care and diligence. This is as per the terms agreed between Quantum Acoustics Ltd and our Client. Information referred to herein which may have been provided by third parties should not be assumed to have been checked and verified by Quantum Acoustics Ltd, unless specifically confirmed to the contrary. Both confidential and commercially sensitive information is contained within this document, and as such it should not be disclosed to third parties. Any third party choosing to rely on this document does so at their own risk.

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1.0 INTRODUCTION

Quantum Acoustics Ltd have been appointed to prepare this Noise Assessment which accompanies an outline planning application for the proposed residential development of Blue Star Land, Waterlooville.

The application seeks to deliver up to 90 residential dwellings, including associated drainage and public space.

As part of the Noise Assessment, an environmental noise survey has been undertaken. This report presents our methodology and findings.

The data obtained may be used, in due course, as the basis for various acoustic assessment and design purposes.

2.0 SITE DESCRIPTION

The location of the proposed development in relation to the local transport infrastructure is shown below, outlined in red.



Figure 1: Site Plan (OpenStreetMap 2022, Ordnance Survey)

The site, known as Blue Star land, is located adjacent to a Major Development Area to the West of Waterloo

To the north, the site adjoins an area of open land.

To the east, the site adjoins Maurepas Way (A3 road) beyond which there is a commercial area occupied by Asda Superstore Waterlooville.

To the south, the site adjoins a mix of residential and commercial buildings. To the southwest, the site bounds a residential building. To the southwest is occupied by the 2260 (Waterlooville) Squadron Air Training Corps - Air Cadets buildings, which are themselves surrounded by residential dwellings.

To the west of the site comprises land of residential use. To the northwest the site adjoins Peasgood Lane, a residential road beyond which there are residential buildings. Towards the southwest, the site adjoins Phase 3B, a residential development currently under construction.

3.0 PROPOSED DEVELOPMENT

The application seeks to deliver up to 90 residential dwellings, including associated drainage and public space.

The Illustrative Landscape Masterplan arrangement of the site is shown below:



4.0 ENVIRONMENTAL NOISE SURVEY

4.1 Survey Period Automated

An automated environmental noise survey was undertaken from approximately 10:00 hours on Wednesday 7th June 2023 to approximately 08:00 hours on Monday 12th June 2023.

Weather conditions were mainly dry and with light winds. The conditions were therefore deemed generally suitable for the measurement of environmental noise.

4.2 Measurement Procedure

Noise monitoring equipment was located at the following locations:

Position	Description
Position A	Towards the eastern boundary of the site. The microphone was fixed to a pole attached to the fire station fence and suspended approximately 1.5m above the A3 road surface in free field conditions
Position B	Towards the north of the site boundary. The microphone was fixed to a pole and suspended approximately 2.5m above the local ground level in free field conditions.
Position C	Towards the south site boundary. The microphone was fixed to a pole and suspended approximately 1.8m above the local ground level in free field conditions.

Noise monitoring equipment was located as shown on the following plan.



Figure 2: Site Plan (OpenStreetMap 2022, Ordnance Survey)

The monitoring equipment at Positions A, B and C was configured to record the L_{A90} , L_{Aeq} and L_{Amax} , fast sound pressure level over consecutive 15-minute periods to provide a detailed time history profile showing fluctuations in noise levels. The equipment was also configured to undertake higher resolution (1 second) logging to assist with the identification and discrimination of noise events.

4.3 Equipment

Details of the equipment used for the survey are summarized in the following table:

Description	Manufacturer	Type	Serial Number
Type 1 Sound Level Meter	Svantek	971A	124674
Type 1 Sound Level Logger	Convergence	mk4	FvUL9WS8X8XgBNgQ4rZFD
Type 1 Sound Level Logger	Convergence	mk4	ANnerl068V2XIpnQw0JZHD
Acoustic Calibrator	Svantek	SV 33B	99005

Calibration certificates for the equipment, traceable to national standards, used in this survey are available upon request. Calibration checks were carried out prior to and on completion of the survey, with no significant calibration drift observed.

5.0 SURVEY FINDINGS

The following section uses the following acoustic terms:

A-weighted noise levels are frequency-weighted in a way that approximates the frequency response of the human ear and allows sound levels to be expressed as a single figure value. The A-weighted level is therefore a measure of the subjective loudness, rather than physical amplitude.

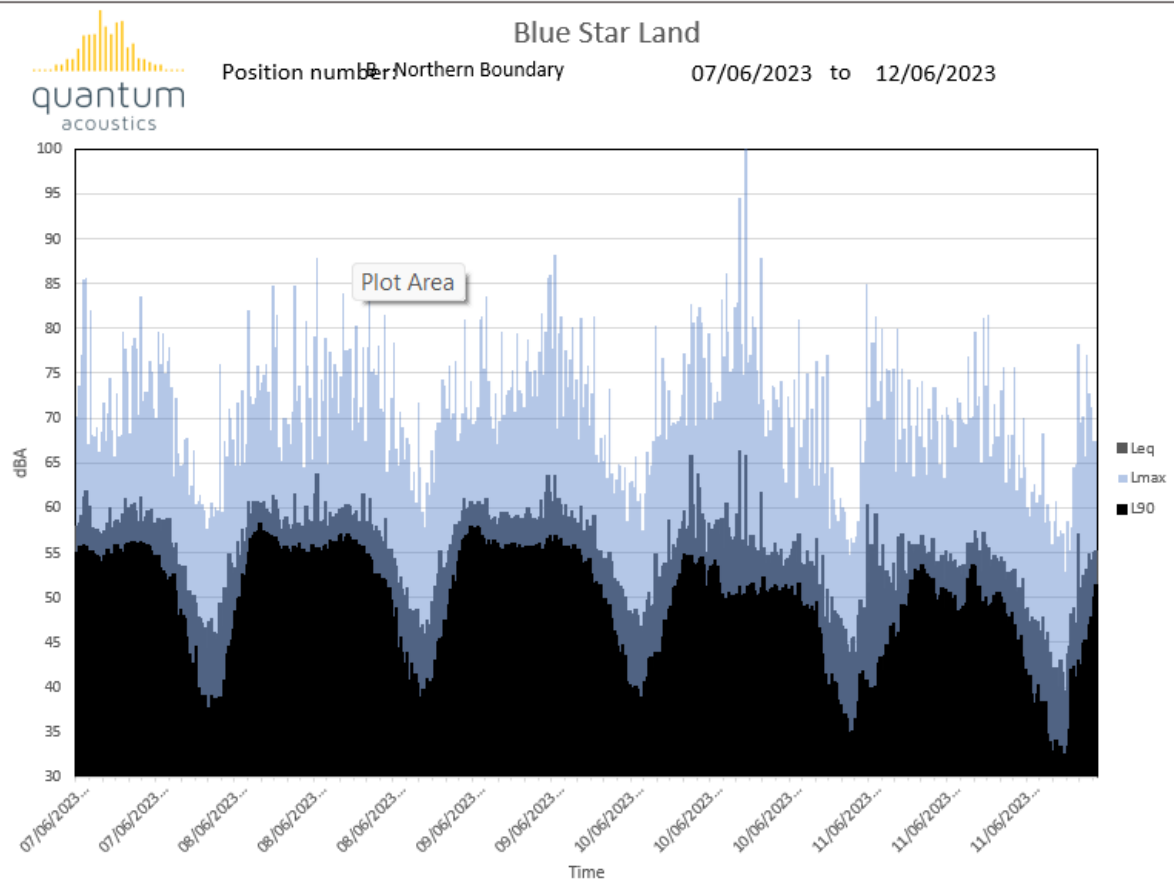
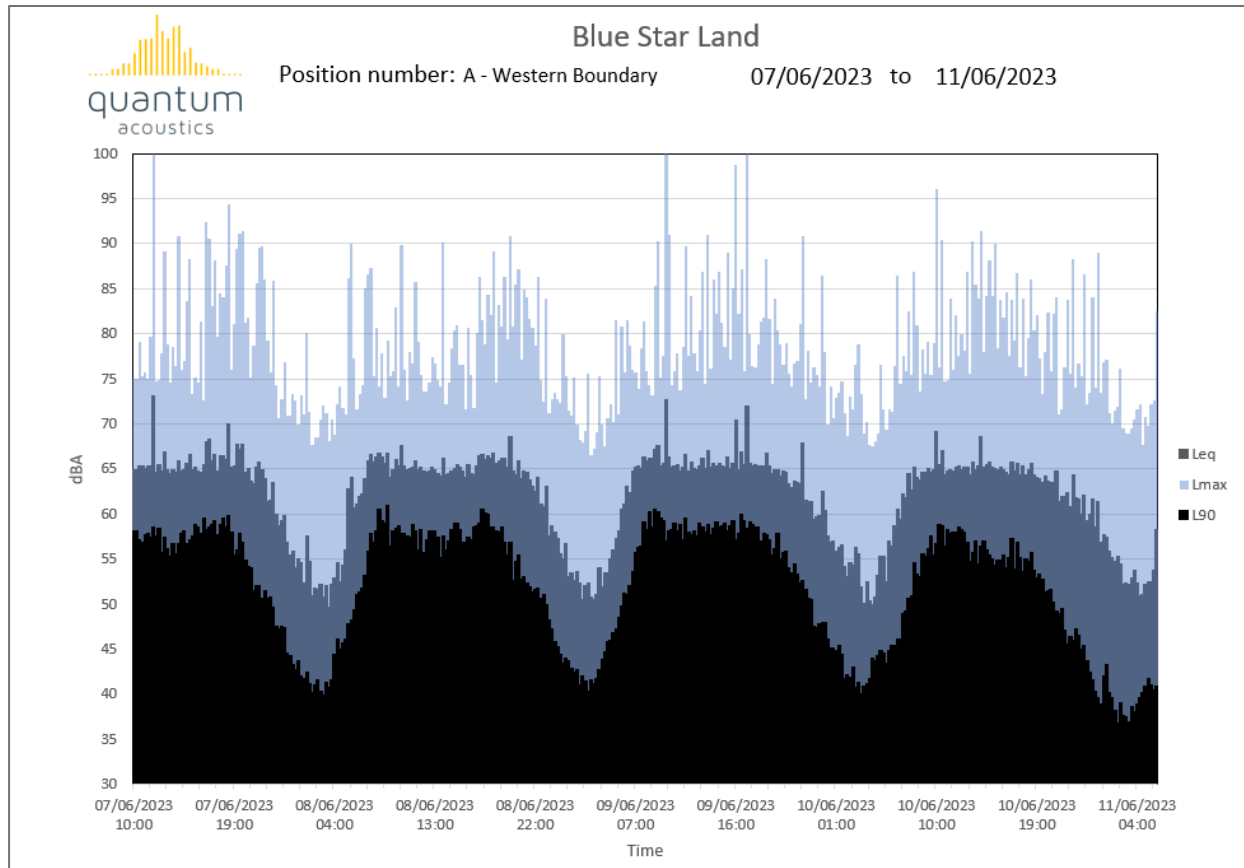
L_{90} is the noise levels that is exceeded for 90% of the measurement period. It reflects the quiet periods during that time and is often referred to as the "background noise level". It is often used as a basis for setting noise emission criteria.

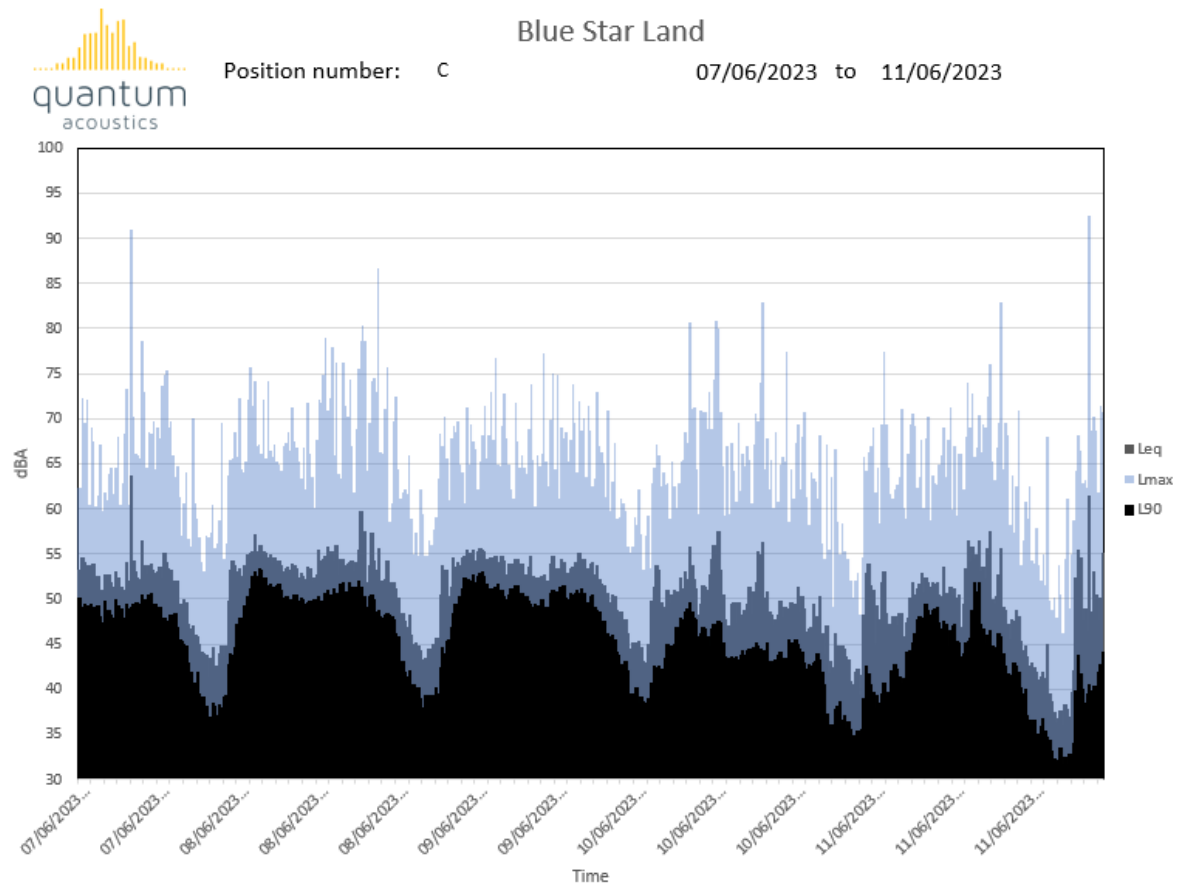
L_{eq} is the level of a notional continuous sound that would deliver the same sound energy as the actual fluctuating sound over the measurement period. This may be thought of as the "average" level during the measurement period.

L_{max} is the maximum noise level during the measurement period.

5.1 Noise Level Results

The noise survey results are presented in the graphs overleaf, showing the A-weighted L_{90} , L_{eq} and L_{max} noise levels measured during each consecutive 15-minute period of the survey.





The measured daytime ($L_{Aeq,16\text{ hour}}$) and night-time ($L_{Aeq,8\text{ hour}}$) are presented in the table below:

L _{eq} Noise Levels		
Position A	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)
07/06/2023	66	58
08/06/2023	65	58
09/06/2023	66	57
10/06/2023	65	56
Position B	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)
07/06/2023	59	53
08/06/2023	59	54
09/06/2023	59	52
10/06/2023	58	52
11/06/2023	54	50

L _{eq} Noise Levels		
Position	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)
65	54	50
66	54	50
63	54	49
66	51	48
63	51	50

The measured representative night-time (23:00 – 07:00) L_{max} noise levels are presented in the table below:

Night-time (23:00 – 07:00) L _{max} Noise Levels	
Position A	L _{max} Noise Levels
07/06/2023	73
08/06/2023	75
09/06/2023	75
10/06/2023	73
Position B	L _{max} Noise Levels
07/06/2023	68
08/06/2023	71
09/06/2023	68
10/06/2023	72
11/06/2023	66
Position B	L _{max} Noise Levels
07/06/2023	65
08/06/2023	66
09/06/2023	63
10/06/2023	66
11/06/2023	63

5.2 Noise Climate

Ambient noise levels at monitoring Position A were clearly dominated by road traffic noise from Maurepas Way (A3), with some contribution from birdsongs and localised pedestrian movements along Maurepas Way.

At Position B, the subjectively dominant noise source was road traffic from Hambledon Rd (B2150) and Maurepas Way (A3) with birdsongs contributions and some distant construction noise from the Phase3B construction site (during working hours).

Noise levels towards the south of the development, at Position C were dominated by distant traffic noise from Maurepas Way (A3), birdsong and distant construction noise from the Phase3B construction site (during working hours).

Noise levels across the development site were dominated by road traffic noise. Noise levels towards the west of the site were lower due to distance attenuation, further reducing towards the south due the inherent acoustic screening afforded by the massing of the existing building preventing the direct line of sight to the dominant noise source (A3).

During site attendances it was also noted that noise associated with business uses in the vicinity of the site was not audible at the time of the visit, therefore did not contribute to the overall measured noise levels.

6.0 RELEVANT PLANNING POLICIES AND NOISE ASSESSMENT GUIDANCE

6.1 Noise Policy Statement for England

The Noise Policy Statement for England (NPSE) was published in March 2010. The NPSE is the primary statement of noise policy for England and applies to all forms of noise other than occupational noise. The NPSE sets out the long term vision of Government noise 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.”

“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 Explanatory Note to the NPSE introduces guidance to assist in defining the adverse impacts:

NOEL – No Observed Effect Level

This is the level below which no effect can be detected and below which there is no detectable effect on health and quality of life due to noise.

LOAEL – Lowest Observable 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.

These categories are further discussed in the Planning Practice Guidance section below.

The NPSE acknowledges that it is not possible to have a single objective noise level based measure that is mandatory and applicable to all sources of noise in all situations.

6.2 Planning Practice Guidance

The government's Planning Practice Guidance is a web based resource and provide advice on various issues, including noise (<https://www.gov.uk/guidance/noise--2>). The advice (March 2014, latest update July 2019) states in the context of considering when noise is relevant to planning, "noise needs to be considered when new development may create additional noise, or would be sensitive to the prevailing acoustic environment (including any anticipated changes to that environment from activities that are permitted but not yet commenced)."

The Planning Practice Guidance pages also include more explanation of the effect level categories noted above, providing an explanatory Noise Exposure Hierarchy Table, which explores how actions such as a requirement for noise mitigation, or prevention of a development, might be assessed with respect to whether noise levels are considered above the category thresholds.

No Observed Effect Level			
Not present	No effect	No Observed Effect	No specific measures required
Present 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
Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			

Present and disruptive	The noise causes a material change in behaviour 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 change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Present and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable hard, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

6.3 National Planning Policy Framework

The National Planning Policy Framework (NPPF) was first published in 2012, replacing the existing Planning Policy Guidance Note 24 (PPG24) “Planning and Noise”, and sets out the government’s planning policies for England and how these are expected to be applied.

The latest revision of the NPPF (July 2021) states that planning system should contribute to, and enhance, the natural and local environment by (amongst others) “preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, water or noise pollution or land stability.”

NPPF advises that planning policies and decisions should ensure:

“...new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development.” [In doing so they should] “mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life” and “identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.”

“...new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or ‘agent of change’) should be required to provide suitable mitigation before the development has been completed.”

The NPPF makes reference to the Noise Policy Statement for England.

6.4 Local Authority Policy/Guidance

The Blue Star land has been allocated for development by Havant Borough Council for almost a decade. Firstly, within the adopted Havant Borough Local Plan (Allocations) July 2014, for mixed use development of housing and main town centre uses, and then within the Local Plan that was withdrawn in March 2022 Blue Star land for residential development of up to 90 dwellings.

The Havant Housing Delivery Position Statement (March 2022) identifies Blue Star land as site WV4, where the principle of development is accepted for an indicative amount of 90 dwellings.

The following planning condition associated to the application number APP/10/00828 is relevant to the development site:

- 16 *"No relevant phase of the development hereby permitted shall commence until a scheme for protecting proposed dwellings and their gardens from noise from the London Road has been submitted and approved in writing by the Local Planning Authority. Those dwellings shall not be occupied until the implementation of all works forming part of such approved noise protection scheme has been completed in full accordance with all detailed components of such scheme.*

Reason: To Safeguard the amenity of occupiers and having due regard to policies CS16 and DM10 of the Havant Borough Core Strategy 2011 which form part of the Local Development Framework. "

6.5 The World Health Organisation (WHO) Guidelines 1999

The Guidelines for Community Noise (World Health Organisation, 1999) included values for community noise in specific environments.

It is important to note that the WHO Guidelines are aspirational, as illustrated by the National Noise Incidence Study (NNIS, 2000), which indicates that 55% of the population of England and Wales are exposed to external noise levels above 55 dB $L_{Aeq, 16\text{hour}}$ day. A National Physical Laboratory (NPL) report (with reference CMAM 16, dated September 1998) reviewing the original 1980 WHO Guidelines and the 1995 draft version of the current Guidelines stated:

"Exceedances of the WHO guideline values do not necessarily imply significant noise impact and indeed, it may be that significant impacts do not occur until much higher degrees of noise exposure are reached."

"As such, it would be unwise to use the WHO guidelines as targets for any form of strategic assessment, since, given the prevalence of existing noise exposure at higher noise levels, there might be little opportunity for and little real need for any across the board major improvements. On the other hand, the most constructive use for the WHO guidelines will be to set thresholds above which greater attention should be paid to the various possibilities for noise control action when planning new developments. It is important to make clear at this point that exceedances do not necessarily imply an over-riding need for noise control, merely that the relative advantages and disadvantages of noise control action should be weighed in the balance."

To prevent moderate annoyance in outdoor living areas, such as gardens and balconies of dwellings, the WHO guideline value is 50 dB $L_{Aeq, 16h}$. This can be described as an upper limit for the average noise level

across the daytime and evening period (07:00h to 23:00h). The corresponding guideline value to prevent serious annoyance is stated as 55 dB $L_{Aeq, 16h}$.

However, it is again noted that these levels are aspirational in nature, as described above.

In terms of the internal noise environment, in order to achieve maximum speech intelligibility and to avoid moderate annoyance, the guideline value for noise levels within dwellings is stated as 35 dB $L_{Aeq, 16h}$ (covering the day and evening 07:00h to 23:00h). The corresponding value for the night period (23:00h to 07:00h) to avoid sleep disturbance is 30 dB $L_{Aeq, 8h}$.

Additionally in terms of sleep disturbance, a guideline value of 45 dB L_{Amax} is given. In relation to this value, the Guidelines state:

“When the background noise is low, noise exceeding 45 dB L_{Amax} should be limited, if possible...”

“For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB L_{Amax} more than 10–15 times per night...”

6.6 WHO Environmental Noise Guidelines 2018

An updated version of the Guidelines was published in October 2018. It constitutes a significant revision of the 1999 Guidelines, rather than comprising minor amendments. In relation to road traffic and railway noise, the guidance states the following:

Road Traffic Noise

For average noise exposure, the GDG strongly recommends reducing noise levels produced by road traffic below **53 decibels (dB) L_{den}** as road traffic noise above this level is associated with adverse health effects.

For night noise exposure, the GDG strongly recommends reducing noise levels produced by road traffic during night time below **45 dB L_{night}** , as night-time road traffic noise above this level is associated with adverse effects on sleep.

To reduce health effects, the GDG strongly recommends that policy-makers implement suitable measures to reduce noise exposure from road traffic in the population exposed to levels above the guideline values for average and night noise exposure. For specific interventions, the GDG recommends reducing noise both at the source and on the route between the source and the affected population by changes in infrastructure.

Railway Noise

For average noise exposure, the GDG strongly recommends reducing noise levels produced by railway traffic below **54 dB L_{den}** , as railway noise above this level is associated with adverse health effects.

For night noise exposure, the GDG strongly recommends reducing noise levels produced by railway traffic during night time below **44 dB L_{night}** , as night-time railway noise above this level is associated with adverse effects on sleep.

To reduce health effects, the GDG strongly recommends that policy-makers implement suitable measures to reduce noise exposure from railways in the population exposed to levels above the guideline values for average and night noise exposure. There is, however, insufficient evidence to recommend one type of intervention over another.

The L_{den} is an equivalent sound level that represents the situation over the full 24-hour day, taking account of the L_{day} (0700-1900h), with a penalty of 5dB(A) for evening noise $L_{evening}$ (1900-2300h) and a penalty of 10dB(A) for night time noise L_{night} (2300-0700). The L_{night} index is equivalent to the $L_{Aeq, 8h}$ index as used in other standards such as BS 8233 (but not necessarily with the same numerical guidelines).

The guidance no longer specifies L_{Amax} criteria but states in section 2.2.2:

"In many situations, average noise levels like the L_{den} or L_{night} indicators may not be the best to explain a particular noise effect. Single-event noise indicators – such as the maximum sound pressure level ($L_{A,max}$) and its frequency distribution – are warranted in specific situations, such as in the context of night-time railway or aircraft noise events that can clearly elicit awakenings and other physiological reactions that are mostly determined by $L_{A,max}$. Nevertheless, the assessment of the relationship between different types of single-event noise indicators and long-term health outcomes at the population level remains tentative. The guidelines therefore make no recommendations for single-event noise indicators."

As with the 1999 WHO document, the guideline values in the 2018 document represent aspirational targets to be achieved in the long term, rather than values that should immediately be adopted into relevant policy.

This is reflected in the following excerpt from the government's Aviation 2050 consultation document (which relates to aircraft noise, but the principle of the statement is relevant to other noise sources):

"The government is considering the recent new environmental noise guidelines for the European region published by the World Health Organisation (WHO). It agrees with the ambition to reduce noise and to minimise adverse health effects, but it wants policy to be underpinned by the most robust evidence on these effects, including the total cost of action and recent UK specific evidence which the WHO report did not assess."

Therefore, other current standards and guidance, such as BS 8233, still represent the most relevant and appropriate basis for assessment.

6.7 British Standard BS 8233:2014

Guideline values for dwellings with respect to internal and external noise levels are included in BS 8233:2014 Guidance on sound insulation and noise reduction for buildings (BSi).

The standard states 50 dB $L_{Aeq, T}$ as being desirable as a steady state noise level not to be exceeded in gardens. It also states 55 dB $L_{Aeq, T}$ as an upper guideline value. The time period T is usually taken to be the 16-hour day (07:00h to 23:00h).

Paragraph 7.7.3.2 of the standard goes on to say the following:

"For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq, T}$, with an upper guideline value of 55 dB $L_{Aeq, T}$ which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas

adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.

Other locations, such as balconies, roof gardens and terraces, are also important in residential buildings where normal external amenity space might be limited or not available, i.e. in flats, apartment blocks, etc. In these locations, specification of noise limits is not necessarily appropriate. Small balconies may be included for uses such as drying washing or growing pot plants, and noise limits should not be necessary for these uses. However, the general guidance on noise in amenity space is still appropriate for larger balconies, roof gardens and terraces, which might be intended to be used for relaxation. In high-noise areas, consideration should be given to protecting these areas by screening or building design to achieve the lowest practicable levels. Achieving levels of 55 dB LAeq,T or less might not be possible at the outer edge of these areas, but should be achievable in some areas of the space."

It can be seen that external noise levels, especially on small balconies to apartment blocks, are not proposed to be a controlling index by which suitability of a residential site is defined.

Therefore, when designing noise sensitive developments that incorporate gardens or other external amenity areas, the intent shall be to provide an area for each property in which the noise levels are consistent with these standards. Where these standards cannot be achieved, then reasonable measures shall be employed to provide screening or other forms of mitigation so as to minimise the noise levels in the external amenity areas.

An important principle here is that sustainable development sites will often be exposed to relatively high levels of environmental noise, and while means are available to insulate internal spaces, they are not always available to protect external spaces. Strict adherence to the enforcement of such external noise criteria would preclude development in the majority of areas considered for development in semi-urban or urban environments or in areas in the vicinity of transportation noise sources. This is why the external standards shall be viewed as targets or triggers of mitigation measures rather than thresholds not to be exceeded in all circumstances.

Buildings can be designed to achieve specific levels of insulation against external noise. It is reasonable, therefore, to set specific internal noise standards as the test of whether a development satisfies the requirements of the NPPF and the aims of the NPSE. In essence, these require a high-quality design that achieves a good standard of amenity.

Guidance in respect of indoor ambient noise levels is contained in Table 4 of BS 8233:2014 and tabulated below.

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

Note 7 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.

The previous edition of BS 8233 included quantitative guidance with respect to night-time L_{Amax} noise levels in bedrooms. BS 8233:2014 does not provide such guidance, however in paragraph 7.7.5.1.1 it is noted that the recommendations for ambient noise in hotel bedrooms are similar to those for living accommodation and Table H.3 in Annex H.3 gives example night-time L_{Amax} limits in hotel bedrooms of 45-55 dB.

The WHO study informing the 1999 Guidelines derived the L_{Amax} night time noise standard on the basis of 10 to 15 occurrences per night.

6.8 ProPG: Planning and Noise (2017)

ProPG is a guidance document prepared by a working group consisting of representatives of the Association of Noise Consultant (ANC), Institute of Acoustics (IOA) and Chartered Institute of Environmental Health (CIEH). It provides professional practice guidance on Planning and Noise with regard to new residential development that will be exposed to airborne noise from transport sources. It is also noted that good professional guidance should have regard to any reasonably foreseeable changes to existing, and/or new sources, as well as sources currently effecting the site.

ProPG provides two stages of assessment, the first being an initial site risk assessment and the second being a full assessment. The second is only necessary when the initial risk assessment and circumstances dictate.

Stage 1: Initial Site Noise Risk Assessment

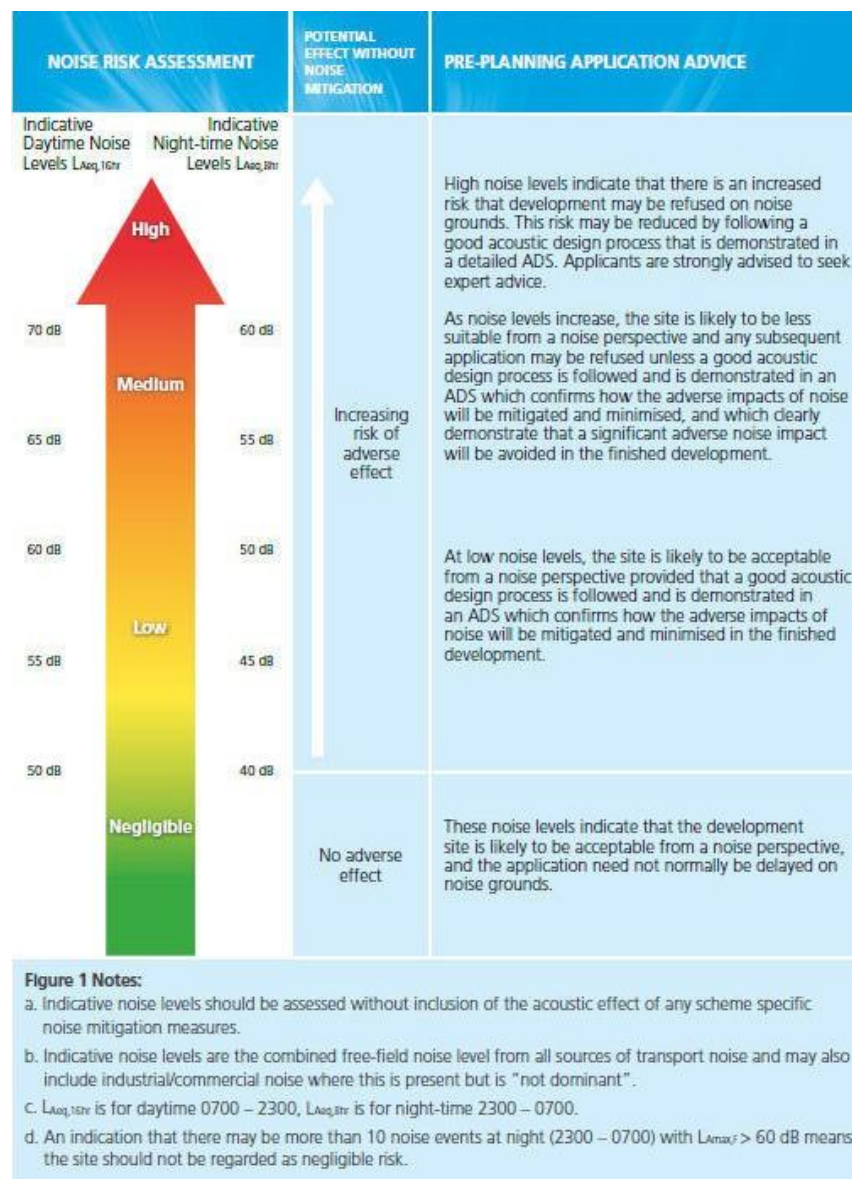
ProPG suggests that a Stage 1 initial site risk assessment should be undertaken on all sites at the earliest possible opportunity in order to gauge the potential effect of noise on future residential premises, without the benefit of any noise mitigation measures.

It is important to note that the initial 'Stage 1' assessment at a proposed residential development is not the basis for the eventual recommendation to the decision maker. It is intended to highlight the importance of good acoustic design within a scheme. For example, a site with a high risk of adverse effect without noise mitigation may not necessarily be unsuitable for development; however, the importance

of good acoustic design provided by experts would be critical at such a site, with a detailed acoustic design statement provided.

ProPG states that a site which displays a low risk of adverse effect without noise mitigation is more likely to be acceptable from a noise perspective, provided that a good acoustic design process is followed, and sites with no risk of adverse effect need not normally be delayed on noise grounds.

The criteria provided for Stage 1 assessment of the L_{Aeq} noise levels for day and night within the initial site risk assessment are provided below:



The initial noise risk assessment also considers the effect of L_{Amax} maximum noise levels at night (2300-0700h), where the guidance states:

"An indication that there may be more than 10 noise events at night (2300 – 0700) with $L_{Amax,F} > 60$ dB means the site should not be regarded as a negligible risk."

Stage 2: Overview

Stage 2 of the ProPG guidance provides a systematic consideration of key elements of acoustic design. The guidance advocates a proportional, risk based approach to the Stage 2 assessment. The Stage 1 risk assessment should inform whether careful consideration is required, with the detailed input of specialist acoustic consultants essential at higher risk sites, or straightforward accelerated decision making potentially possible in relation to lower risk sites.

Stage 2: Element 1 – Good Acoustic Design Process

ProPG states that a good acoustic design process is an implicit part of achieving the requirements of government noise policy, as set out in the NPSE and NPPF, and outlined in Supplementary Document 1 of the ProPG.

However, it is also stated that good acoustic design does not simply constitute compliance with recommended internal and external criteria, if the solution adversely affects living conditions within the spaces, and hence the quality of life of the inhabitants. The following example is provided:

“Using fixed unopenable glazing for sound insulation purposes is generally unsatisfactory and should be avoided; occupants generally prefer the ability to have control over the internal environment using openable windows, even if the acoustic conditions would be considered unsatisfactory when open. Solely relying on sound insulation of the building envelope to achieve acceptable acoustic conditions in new residential development, when other methods could reduce the need for the approach, is not regarded as good acoustic design.”

Applicants must therefore consider all possibilities for mitigation including but not limited to:

- Checking the feasibility of relocating, or reducing noise levels from relevant sources;
- Considering options for planning the site or building layout;
- Considering the orientation of proposed building(s);
- Selecting construction types and methods for meeting building performance requirements;
- Assessing the viability of alternative solutions;
- Assessing external amenity area noise;
- Examining the effects of noise control measures on ventilation, fire regulation, health and safety, cost, CDM (construction, design and management) etc.

Stage 2: Element 2 – Internal Noise Level Guidelines

ProPG considers the guidance provided within BS 8233:2014 to be suitable for the assessment of internal noise levels. However, the ProPG provides additional commentary. The following table reproduces the internal ambient criteria provided within Figure 2 of ProPG. The guidance from BS 8233:2014 is displayed in black, with additional comments and criteria from ProPG in blue:

Activity	Location	0700h to 2300h	2300h to 0700h
Resting	Living room	35 dB $L_{Aeq, 16h}$	-
Dining	Dining room/area	40 dB $L_{Aeq, 16h}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq, 16h}$	30 dB $L_{Aeq, 8h}$ 45 dB $L_{Amax,F}$ (Note 4)

NOTE 4 Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$, depending on the character and number of events per night. Sporadic noise events could require separate values. *In most circumstances in noise sensitive rooms at night (e.g., bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45dB $L_{Amax,F}$ more than 10 times a night. However, where it is not reasonably practicable to achieve this guideline then the judgement of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number, distribution, predictability and regularity of noise events (see Appendix A [which advocates reference to available dose-response relationships appropriate for the types of noise source being considered]).*

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

It should be noted that the guidance above includes criteria for L_{Amax} noise levels, along with further guidance relating to the assessment of maximum levels in Note 4.

Stage 2: Element 3 – External Amenity Area Noise Assessment

With regard to external amenity spaces, ProPG references the guidance provided within

BS 8322:3014, section 6. ProPG presents a statement summarising BS 8233:2014 section 6 which states:

“The acoustic environment of external amenity areas that are an intrinsic part of the overall design should always be assessed and noise levels should ideally not be above the range 50 – 55 dB $L_{Aeq, 16h}$ ”

The standard continues:

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

ProPG also references guidance within the PPG on noise, which states:

“If external amenity spaces are an intrinsic part of the overall design, the acoustic environment of those spaces should be considered so that they can be enjoyed as intended”.

It is highlighted within ProPG that both BS 8233:2014 and the PPG on noise require a decision to be made as to whether or not external amenity areas are intrinsically important to the required design. However, it is noted that the PPG also states that noise impacts may be partially offset if the residents of affected dwellings are provided, through the design of the development or the planning process, with access to alternative spaces as set out in paragraph A3.6 of this appendix.

ProPG section 2.51 states that Local Planning Authorities (LPAs) will be best placed to provide guidance in relation to what is ‘relatively quiet’, as the concept will inherently vary between scenarios.

The advice in section 2.52 of ProPG highlights the increased importance of LPAs protecting publicly accessible external amenity spaces in areas that typically exhibit heightened existing noise climates, such as cities, where development is necessary but private external amenity areas below 55 dB $L_{Aeq,16hour}$ are not practicable. Publicly accessible spaces such as parks and squares in these areas may be providing respite for nearby residents and, therefore, should be protected.

Stage 2: Element 4 – Assessment of Other Relevant Issues

This section of the guidance relates to all other relevant issues and seeks to build upon relevant national and local planning and noise policies. Examples are provided including, but not limited to, the following:

- Compliance with relevant national and local policy
- Magnitude and extent of compliance with ProPG
- Likely occupants of the development
- Acoustic design v unintended adverse consequences
- Acoustic design v wider planning objectives

Other issues specific to the site may be added by the LPA, where relevant.

6.9 Acoustics, Ventilation and Overheating Guide, AVO 2020

In addition to considering internal noise levels under background ventilation conditions, it is appropriate to consider the interaction between internal noise levels and means of controlling overheating. Increased ventilation flow is commonly provided as a means to control thermal comfort, but this is not controlled under Building Regulations.

The Association of Noise Consultants document Acoustics, Ventilation and Overheating Guide (AVO) provides guidance for internal noise criteria when additional ventilation is required for thermal comfort. The three main methods for providing additional ventilation by the guidance are:

- Passive Ventilative Cooling: Introducing external air to a space to provide a cooling effect without the use of fans. The most common method is to use open windows, but other façade openings can also be used. Note that trickle vents do not enable sufficient airflow to have a significant cooling effect.
- Mechanical Ventilative Cooling: Using fans to introduce external air to a space to provide a cooling effect. Due to the airflow required, this type of system often involves significant plant and duct size requirements.
- Comfort Cooling: Using a mechanical system to cool the air within a space to achieve a user-defined setpoint. This type of system will require some form of mechanical device to cool the air, such as a fan coil unit (FCU).

Where windows are opened in order to provide passive ventilative cooling to a residential building, the AVO guidance states that it is reasonable for the internal ambient noise levels to be higher than those set out in BS 8233:2014 for background ventilation:

'It is suggested here that the desirable internal noise standard within Table 4 of BS 8233:2014 should be achieved when providing adequate ventilation as defined by ADF whole dwelling ventilation. However, it is considered reasonable to allow higher levels of internal ambient noise from transport sources when higher rates of ventilation are required in relation to the overheating condition.'

The guidance suggests an initial 'Level 1' assessment which utilises a risk-based approach, using a number of risk categories ranging from 'negligible' to 'high' that correlate to external noise levels. Where the 'Level 1' assessment shows that it is a high-risk site, it recommends that a 'Level 2' assessment is conducted where the internal noise levels during the overheating condition are predicted. Where the site is a Low or Medium risk the 'Level 2' assessment is optional. Table 3-2 of the standard, showing the risk categories for Level 1 assessment, along with the notes are reproduced below:

Risk category for Level 1 assessment [Note 5]	Potential Effect without Mitigation	Recommendation for Level 2 assessment
$L_{Aeq, T}$ [Note 5] during 07:00 - 23:00 $L_{Aeq, Tbr}$ during 23:00 - 07:00 65 dB High 55 dB 60 dB Medium 50 dB 55 dB Low 50 dB Negligible 45 dB	Increasing risk of adverse effect	Recommended Optional
	Use of opening windows as primary means of mitigating overheating is not likely to result in adverse effect	Not required

AVO Guide Table 3-2: Guidance for Level 1 site risk assessment of noise from transport noise sources relating to overheating condition.

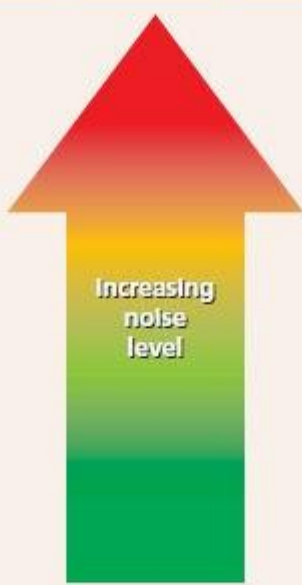
- Note 1: The noise levels suggested assuming a steady road traffic noise source but may be adapted for other types of transport. All levels are external free-field noise levels.
- Note 2: The values presented in this table should not be regarded as fixed thresholds and reference can also be made to the relevant dose-response relationships [15, 17].
- Note 3: A decision must be made regarding the appropriate averaging period to use. The average period should reflect the nature of the noise source, the occupancy profile and times at which overheating might be likely to occur. Further guidance can be found within the 2014 IEMA Guidelines.
- Note 4: Refer also to references [1, 17, 18, 22] for further guidance regarding individual noise events. Where 78dB L_{AFmax} is normally exceeded during the night time period (2300-0700), a Level 2 assessment is recommended.
- Note 5: The risk of an adverse effect occurring will also depend on how frequently and for what duration the overheating condition occurs. Refer to Figure 3

- Note 6: To evaluate the risk category for a dwelling, all three aspects of external noise exposure (i.e. daytime, night time and individual noise events) should be evaluated. The highest risk category for any of the three aspects applies.

The following information is required for a Level 2 assessment:

- Statement of the overheating criteria being applied;
- Description of the provision for meeting the stated overheating criteria. This should include, where relevant, the area of façade opening;
- Details of the likely internal ambient noise levels whilst using provisions for mitigating overheating, and the method used to predict these;
- Estimation of how frequently and for what duration such provisions are required to mitigate overheating;
- Consideration of the effect of individual noise events;
- Assessment of adverse effect on occupants.

The noise levels within habitable rooms, with the cooling strategy in place, is then calculated and compared to the thresholds provided within Table 3-3 “Guidance for Level 2 assessment of noise from transport noise sources relating to overheating condition”. This table is reproduced below:

Internal ambient noise level [Note 2]			Examples of Outcomes [Note 5]	
$L_{Aeq,T}$ [Note 3] during 07:00 – 23:00 [Note 6]	$L_{Aeq,dn}$ during 23:00 – 07:00	Individual noise events during 23:00 – 07:00 [Note 4]		
> 50 dB	> 42 dB	Normally exceeds 65 dB $L_{AEP,max}$	Noise causes a material change in behaviour e.g. having to keep windows closed most of the time	Avoiding certain activities during periods of intrusion. Having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.
			Increasing likelihood of impact on reliable speech communication during the day or sleep disturbance at night	At higher noise levels, more significant behavioural change is expected and may only be considered suitable if occurring for limited periods. As noise levels increase, small behaviour changes are expected e.g. turning up the volume on the television; speaking a little more loudly; having to close windows for certain activities, for example ones which require a high level of concentration. Potential for some reported sleep disturbance. Affects the acoustic environment inside the dwelling such that there is a perceived change in quality of life. At lower noise levels, limited behavioural change is expected unless conditions are prevalent for most of the time. [Note 8]
≤ 35 dB	≤ 30 dB	Do not normally exceed $L_{AEP,max}$ 45 dB more than 10 times a night	Noise can be heard, but does not cause any change in behaviour	Noise can be heard, but does not cause any change in behaviour, attitude, or other physiological response [Note 9]. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.

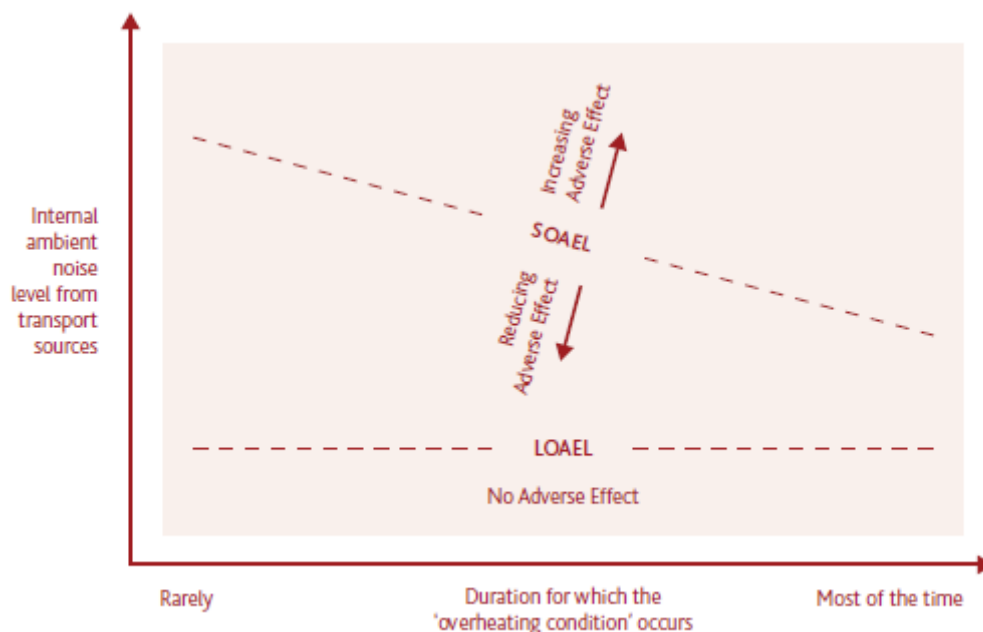
AVO Guide Table 3-3: Guidance for Level 2 assessment of noise from transport noise sources [note 1]
relating to overheating condition.

- Note 1: The noise levels suggested in Tables 3-2 and 3-3 assume a steady road traffic noise.
- source but may be adapted for other types of transport.
- Note 2: The values presented in this table should not be regarded as fixed thresholds and reference can also be made to relevant dose-response relationships such as those

described in a DEFRA 2014 study [15, 21, 22]. With the exception of individual noise events, the references [15,21]

- are based on evidence drawn from external noise levels. There is currently very little robust evidence linking internal averaged noise levels with health outcomes and occupant behaviour. Internal ambient noise levels would normally be considered for living rooms and bedrooms during the daytime. At night, the levels would normally only be applicable to bedrooms.
- Note 3: A decision must be made regarding the appropriate averaging period to use. The average period should reflect the nature of the noise source, the occupancy profile and times at which overheating might be likely to occur. Further guidance can be found within the 2014 IEMA Guidelines.
- Note 4: Refer to references [1, 17, 18, 22] for further guidance regarding individual noise events. The $L_{AF,max}$ indicator associated with the upper category is intended for road traffic; it may be more appropriate to use the “one additional noise-induced awakening” method for noise from rail traffic or aircraft.
- Note 5: The potential for adverse effects will also depend on how frequently and for what duration the overheating condition occurs. Refer to Figure 3-2.
- Note 6: The daytime levels presented in this table may not be appropriate for residential care homes or other situations where conditions for daytime resting are known to be of particular importance.
- Note 7: When evaluating the potential for adverse effect, all three aspects of noise exposure (i.e., daytime, night-time and individual noise events) should be evaluated.
- Note 8: BS 8233 states that where development is considered necessary or desirable, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved.
- Note 9: It is known that physiological responses do occur at lower levels of L_{AFmax} than 45 dB.

As detailed in Note 5 above, the level of assessed impact varies depending on the duration for which the ‘overheating condition’ occurs. Figure 3-2 provides qualitative guidance on combined effect of internal ambient noise level and duration for the overheating situation and is reproduced below:



AVO Guide Figure 3-2: Qualitative guidance on combined effect of internal ambient noise level and duration for the overheating situation.

6.10 Approved Document O

The Building Regulation 2010 provides guidance to ensure an overheating strategy is usable.

Section 3 advises the following:

“In locations where external noise may be an issue (for example, where the local planning authority considered external noise to be an issue at the planning stage), the overheating mitigation strategy should take account of the likelihood that windows will be closed during sleeping hours (11pm to 7am).”

Windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits.

- a. 40dB LAeq,T, averaged over 8 hours (between 11pm and 7am).*
- b. 55dB LAFmax, more than 10 times a night (between 11pm and 7am).*

Where in-situ noise measurements are used as evidence that these limits are not exceeded, measurements should be taken in accordance with the Association of Noise Consultants' Measurement of Sound Levels in Buildings with the overheating mitigation strategy in use.

NOTE: Guidance on reducing the passage of external noise into buildings can be found in the National Model Design Code: Part 2 – Guidance Notes (MHCLG, 2021) and the Association of Noise Consultants' Acoustics, Ventilation and Overheating: Residential Design Guide (2020).”

7.0 SITE SUITABILITY – PROPG STAGE 1 ASSESSMENT

Based on the data collected from the site noise survey (results presented in section 5.0 above), the following ProPG Stage 1 assessment can be made.

For presentation purposes the measured noise levels at all positions have been plotted against the site and addressed in accordance with the ProPG “stage 1 Initial Site Noise Risk Assessment” guidance.

The figure below presents an initial risk assessment of daytime noise levels:



The initial daytime noise risk assessment indicates a *Low” to “medium” risk.

The figure below presents an initial risk assessment of night-time noise levels:



As seen from above, the initial night time noise risk assessment indicated a “low” to “medium” risk across the site.

The above figures clearly show the significance of road traffic noise characterising the western side of the site having the greatest noise risk, with the western side of the site characterising as having a low noise risk. This is inherent from the current acoustic screening provided by the mass of the existing building.

For “low” sites, the ProPG states:

“At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts on noise will be mitigated and minimised in the finished development.”

For “medium” risk sites, ProPG states:

“As noise levels increase, the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless a good acoustic design process is followed and is demonstrated in an ADFS which confirms how the adverse impacts of noise will be mitigated and minimised, and which clearly demonstrate that a significant adverse noise impacts will be avoided in the finished development.”

It is therefore concluded that the measured noise levels demonstrate the site is likely to be acceptable from a noise perspective, provided a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development.

8.0 PROPG ELEMENT ONE – GOOD ACOUSTIC DESIGN (MITIGATION)

The ProPG references a preferred hierarchy of strategies that represent a “good acoustic design process”. These include the following:

- Reducing noise “at source” and or relocating the noise source;
- Providing “buffer” zones to maximise the spatial separation between noise source and receiver locations;
- Reducing noise propagation across the site by way of introducing acoustic screening (e.g. barriers, earth bunds etc)
- Optimise the acoustic screening provided by the proposed development by creating “barrier” blocks to reduce the noise propagation across the site and in particular, protect external amenity areas;
- Optimise the orientation and internal layout of buildings to reduce the noise exposure on noise sensitive rooms (positioning non-habitable rooms on the greater noise risk side of the building with sensitive rooms located on the acoustically screened facades); and
- Using the building envelope to mitigate noise to acceptable levels by way of ensuring the correct specification of external fabric constructions are used.

As noted previously, the dominant noise source affecting the site is taken to be road traffic noise from Maurepas Way (A3 Road). Clearly, such a noise source cannot be “removed” or “relocated”, any scope to provide “at source” mitigation (through the use of “low noise” road surface or enforcing a reduction of speed limit) would therefore fall beyond the gift of the developer. As such, the dominant noise source cannot be reduced or relocated.

Sound energy naturally decreases with increasing distance from the source. Therefore, the creation of “buffer zones”, or the avoidance of construction in areas that are most heavily affected by noise is an effective strategy to mitigate against the potential adverse effects of noise.

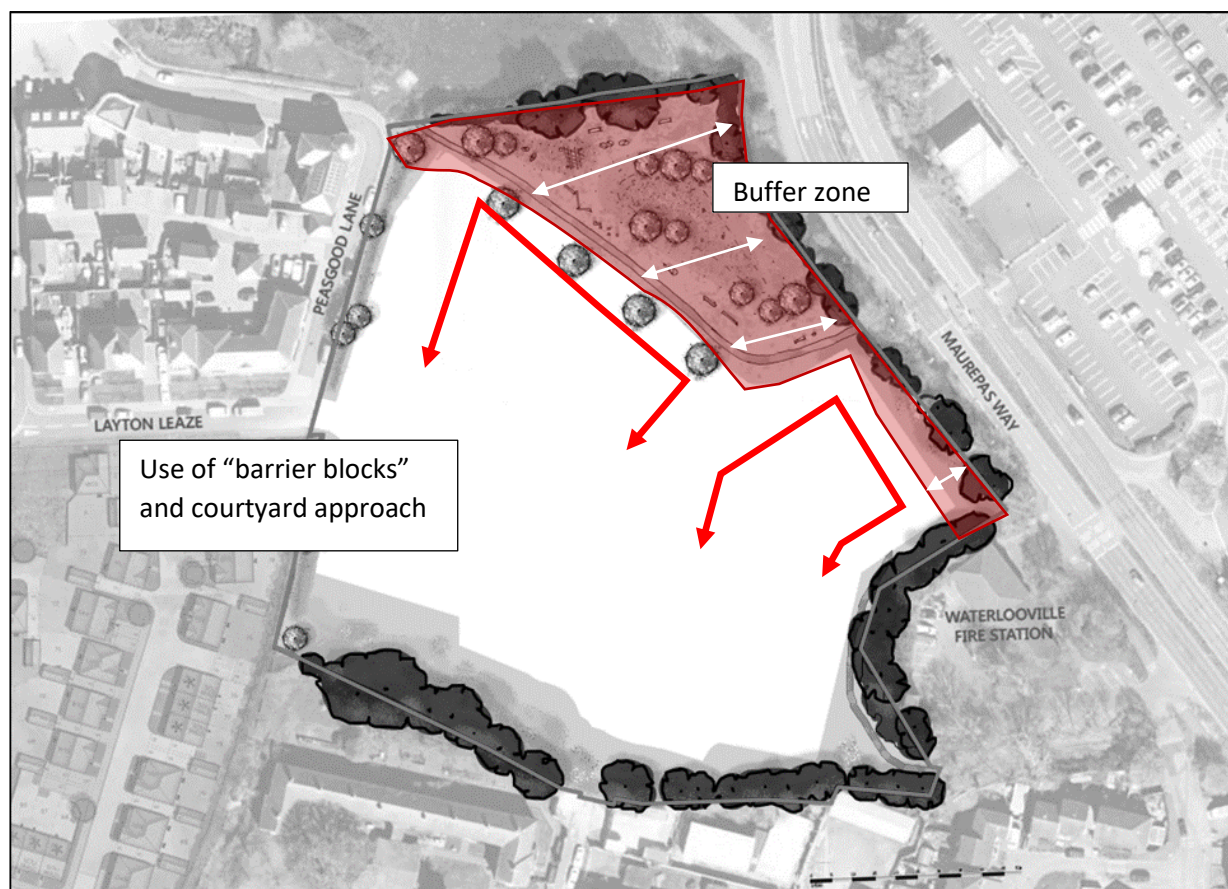
Notwithstanding the above, and considering how noise propagates, relying entirely on distance to reduce noise levels can result in an unproductive use of land. This is because noise typically decreases 3dB per doubling of distance from the source (i.e., if the development was set back 50m from the noise source, an additional 50m of land would be needed in order to achieve a 3dB reduction). It is for this reason that buffer zones should be implemented and balanced alongside other design requirements, such as the need to promote the efficient use of the site.

The proposed development proposals incorporate a buffer zone along the northeastern boundary of the site, moving the development parcel line more than 30m from the edge of the A3, and increasing up to 50m towards the north of the development.

Buildings can also be strategically spaced and positioned to operate as “barrier blocks” to provide some degree of acoustic screening. The development could use a strong massing to the southeastern of the site. The largest benefit can be achieved where buildings are orientated “parallel” to the noise sources to be protected against.

Protection can be further enhanced by creating ‘courtyard’ type arrangements providing quiet external amenity areas and reducing the noise levels across the development.

As seen from the figure below, the design proposals incorporate an acoustic buffer zone, a strong massing and a courtyard approach which will help to minimise road noise levels across the development.



The orientation and internal layout can be also optimised to protect sensitive rooms such as bedrooms locating them on the acoustically screened facades, avoiding direct view to the A3.

As such, it is concluded that the proposed development land has been developed following a good acoustic design process which helps minimise noise impacts. Further mitigation can be implemented through the design in the more detailed phase.

9.0 PROPG ELEMENT 2 – INTERNAL NOISE LEVELS

As referenced in Section 5 of this report, BS8233: 2014 and the ProPG set out recommended values for internal daytime ($L_{Aeq, 16\text{hour}}$) and night-time ($L_{Aeq, 8\text{hour}}$) noise levels. The noise levels presented are considered to represent a LOAEL in line with national planning policy guidance.

During night-time periods, the WHO/ProPG guidelines suggest a LOAEL would occur when an event should level of $45\text{dB } L_{Amax, fast}$ is not exceeded more than 10-15 times per night.

It should be noted that the level of sound insulation required to achieve the aforementioned design goals will be determined by a number of factors, including:

- Noise levels incident on a particular façade. More significant levels of sound insulation will be expected for facades looking “towards” adjoining roads, as opposed to units looking “away” from such sources.
- The acoustic conditions of the receiving room;
- The sound insulation capabilities of the individual building elements;
- The relative proportion of building elements; and
- The acoustic conditions of the receiving room.

9.1 Incident Noise Levels

Based on the calculated incident noise levels, after applying a distance correction, the results of the noise monitoring undertaken suggest that the “worst case” noise levels on the southeastern of the development land (overlooking A3) are in the order of 62dB $L_{Aeq, 16\text{hour}}$ (daytime) and 55dB $L_{Aeq, 8\text{hour}}$ (night-time), where buffer zone is reduced.

Due to the inherent acoustic screening provided by the existing building to the southeast of the site, and the distance attenuation, the levels on measure the south of the site are 54dB $L_{Aeq, 16\text{hour}}$ (daytime) and 50dB $L_{Aeq, 8\text{hour}}$ (night-time). These levels are taken to be representative of the centre of the development once the development buildings are in place, providing that a good acoustic design, as described on section 8 above, is followed.

The proposed development will, as a matter of course, include the use of thermal double glazing (to comply with the statutory thermal requirements of Approved Document L1A of the Building Regulations 2010, as amended) and an appropriate scheme of ventilation (to comply with the statutory requirements of Approved Document F and Approved Document O? of the Building Regulations 2010, as amended).

The use of standard thermal double glazing and non-acoustic ventilators will typically provide adequate sound insulation to control noise intrusion into building at daytime sound levels up to around 56dB $L_{Aeq, 16\text{hour}}$ and night-time sound levels of around 51dB $L_{Aeq, 8\text{hour}}$.

It follows that the noise level characterising the majority of the site should be readily controlled by the mitigation that will be inherently embedded within the scheme design control proposals (i.e. use of standard thermal double glazing and alternative means of ventilation). However, facades with direct sight of view to the A3 would require higher performance requirements.

Subject to the effectiveness of the higher order mitigation measures outlined above that can be integrated into the scheme design, any residual mitigation necessary to secure appropriate internal noise levels would need to be achieved through the appropriate specification of external building fabric elements and, if necessary, alternative means of ventilation.

Finalised acoustic performance requirements should be determined during the detailed design stage of the project, based on finalised internal general arrangement proposals and construction proposals.

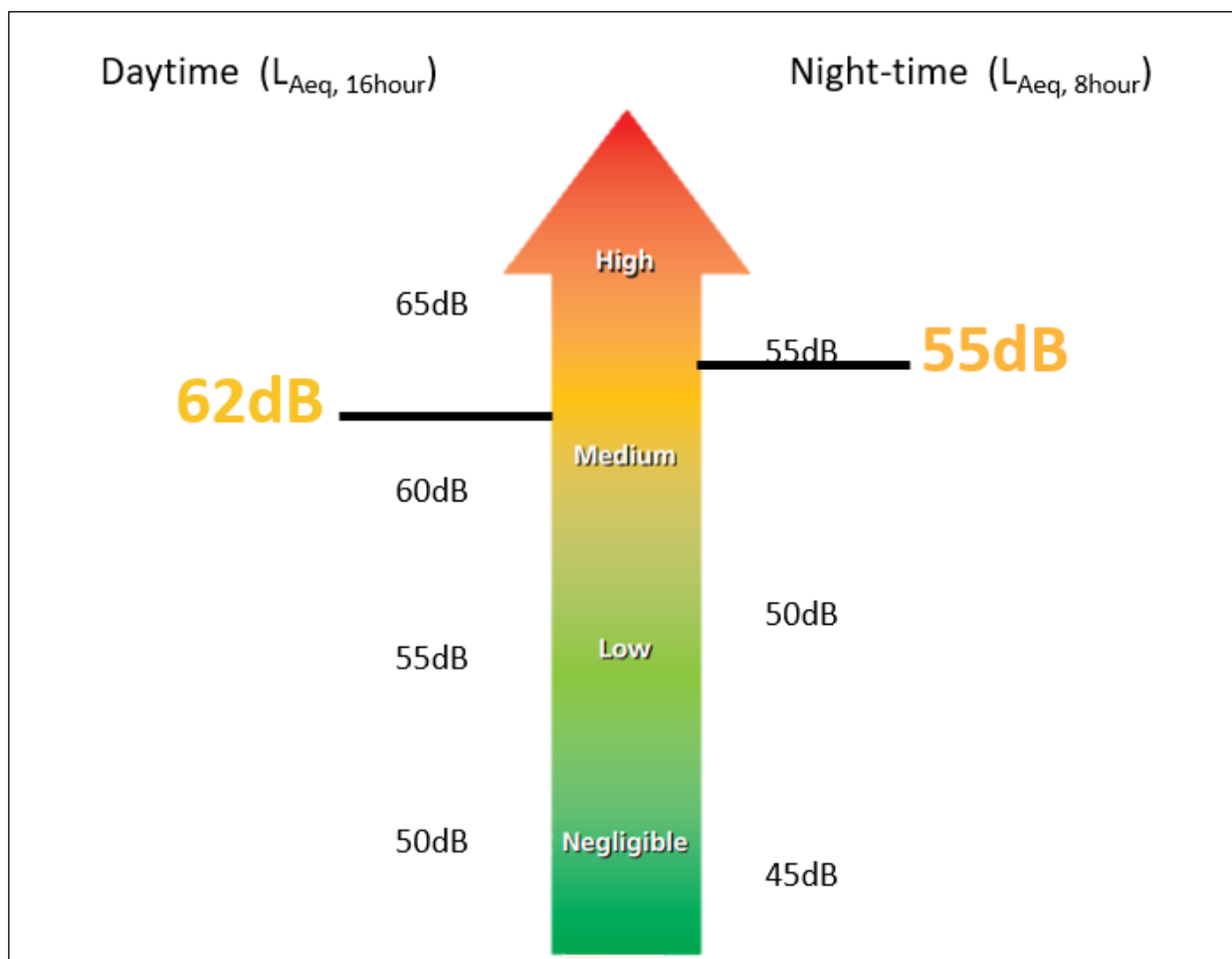
It is, therefore, concluded that the proposed development will provide acceptable indoor noise levels for future residents.

9.2 Thermal Comfort

Based on the calculated incident noise levels an initial Stage 1 risk assessment has been undertaken in line with the AVOG. Such guidance is aimed to help identify when external noise levels might indicate a “significant” risk of adverse health and quality of life, if reliance is placed on the use of openable windows to minimise the risk of overheating.

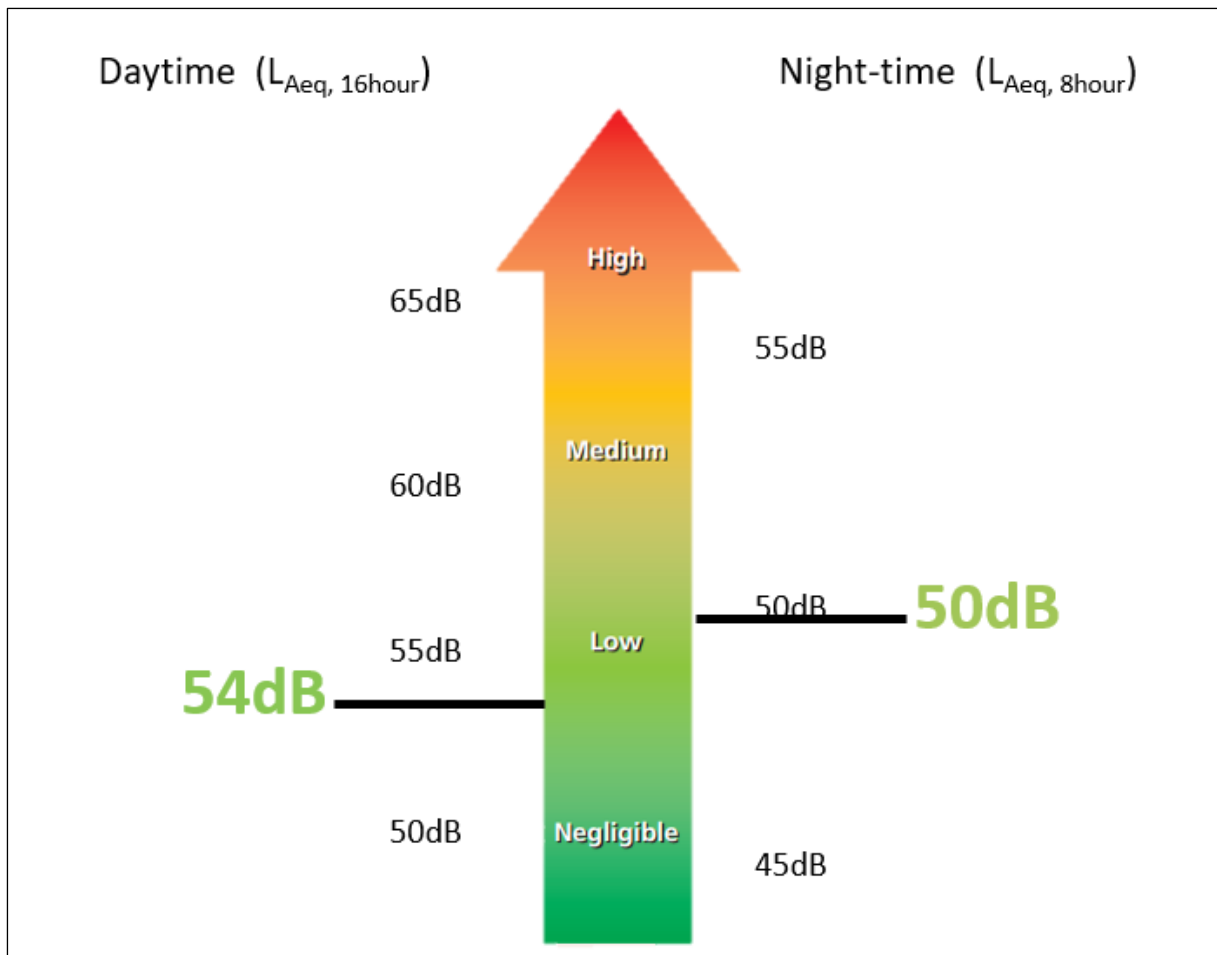
A separate assessment has been undertaken for potential facades located at the southwestern corner of the development land, overlooking A3 Road and facades located towards the centre of the development land that would benefit from acoustic screening from the development massing.

The results of the level one assessment for facades overlooking A3 are presented below.



The above figure shows at “worst case” incident noise levels for facades overlooking A3 are categorised as having a “medium” daytime noise risk. For night-time periods those same facades present as having a “low” risk of overheating when assessed in line with the AVOG Stage 1 assessment.

A Stage 1 assessment for levels could be experience at facades located toward the centre of the development land is presented in the figure below.



The above figure shows at “worst case” incident noise levels for facades towards the centre of the development area categorised as having a “low” daytime and night-time noise risk when assessed in line with the AVO stage 1 assessment.

Following the guidance provided by Acoustics, Ventilation and Overheating Guide 2020 and Approved Document O the calculated incident noise levels are suitably low to ensure using opening windows as the primary means of mitigating overheating is not likely to result in adverse effect in the majority of the site.

There could be however a potential risk of overheating on buildings located on the southwestern of the site overlooking the A3. Consideration may need to be given to whether there is a need for additional mechanical ventilation/cooling to be provided to avoid the risks of excess heat.

The potential for such risks should be minimised in the first instance through the appropriate specification of the buildings to minimise any potential for overheating. The implementation of other acoustic design strategies, as outlined above, should also be followed to reduce noise levels to a minimum and optimise opportunities for natural ventilation, before considering the need for less sustainable mechanical strategies.

10.0 PROPG ELEMENT 3 – EXTERNAL AMENITY AREAS

As set out in Section 5 of this report, a noise level of 50 dB $L_{Aeq,16hr}$ is a desirable target for noise in external amenity areas. 55 dB $L_{Aeq,16hr}$ is suggested as an upper target in BS 8233:2014, although the standard also highlights that these are aspirational targets and not criteria intended for strict application in order to judge the suitability of a site for residential development.

The measurement data presented earlier in the report suggests that amenity spaces provided on the majority of the development site should be fully comply with the aforementioned noise targets.

Buildings located on the south eastern corner of the site would be exposed to higher levels of traffic noise. However, strong massing parallel to the A3 could protect any amenity area located on the opposite façade. As such, noise levels in private amenity areas would be minimised as far as practicable through the implementation of ‘acoustic screening’.

It is therefore concluded that external amenity areas would comply with the noise targets.

11.0 AGENT OF CHANGE OBLIGATIONS

It should be noted that Paragraph 187 of the NPPF draws specific attention to the need to ensure that new development is compatible with existing businesses and community facilities and introduces and “agent of change” principle.

As noted earlier in this report, neighbouring land uses in the vicinity of the site are predominantly residential or commercial. As such it is material to note that the automated survey work presented earlier in this report presents measurement which include contributions from all sources. This will, in addition to general environmental noise, include any noise associated with the existing neighbouring commercial/industrial uses in the locality of the site.

During site attendance, noise associated with these uses was not constant nor readily discernible in the context of the otherwise prevailing noise environment. Thus, any noise associated with local commercial units was does not have a dominant influence on the existing noise environment.

It should be noted that the mitigation set out earlier has been recommended to “mitigate and reduce to a minimum” the adverse impact of noise. Whilst the proposed protection is primarily aimed at controlling environmental noise (as such noise is categorised to be the dominant noise source), the mitigation will also be effective in mitigating and reducing a minimum any residual contributions associated with any neighbouring land uses.

It is also material to note that there are existing residential properties in closer proximity to such existing commercial uses which appear to be satisfactorily co-located with these existing uses. As such the principle of residential development within the surrounding location of the proposed development site is already well established.

It can there be concluded that there is no acoustic conflict between the proposed development and continued use of any existing neighbouring commercial uses.

12.0 CONSTRUCTION NOISE AND VIBRATION

Potential noise and vibration impact during the construction phase of the development include:

- Direct noise impacts due to noise from construction plant, machinery and processes;
- Direct vibration impacts due to vibration from construction plant, machinery and processes; and
- Indirect noise and vibration impacts due to construction traffic on neighbouring roads.

At this stage, detailed information relating to the construction programme, plant, etc. is not available. As such, a detailed, quantitative assessment of construction noise and vibration has not been undertaken.

There are residential receptors to the west and south of the site., which are considered to have “high” sensitivity noise. Given the proximity of the dwellings, construction noise has the potential to have an adverse impact. It is therefore recommended that noise and vibration effects during the construction phase of the works are mitigated through the use of appropriate operative and management controls, implemented through the use of a Construction Environmental Management Plan (CEMP). In principle, such measures will include:

- A general need for any contractor to implement the “best practicable means” for undertaking the works in line with the general guidance of BS5228:2009+A1:2014 (Parts 1 and 2);
- The use of prefabricated materials wherever possible;
- Optimising the Site layout to locate noise generating activities as far as possible away from sensitive receptors;
- Good housekeeping and management;
- Controlling of Site traffic and setting up of access routes away from sensitive receptors;
- Review of plant and activities to ensure noise minimisation measures are in place and operating;
- Provision of noise monitoring during activities likely to affect sensitive receptors;
- The use of ‘silenced’ plant and equipment to be used;
- The provision of screening around those parts of the Site at which activities are likely to generate noise;
- Noise generating plant would be located at a low level and as distant as possible from sensitive receptor;
- Plant would operate at low speeds, where possible, and incorporate automatic low speed idling;
- All plant would be properly maintained (greased, blown silencers replaced, saws kept sharpened, teeth set and blades flat, worn bearings replaced, etc.);
- Consideration to be given to temporary screening or enclosures for static noisy plant to reduce noise emissions and plant should be certified to meet any relevant standards;
- Early and good public relations with the adjacent tenants and occupants of buildings will also reduce the likelihood of complaints;
- Controlling the opening hours of the Site; and
- Implementing an appropriate regime of proactive noise monitoring to ensure mitigation is effective.

With regard to noise monitoring, it is suggested that the potential effects of construction noise are most appropriately assessed by reference to fixed noise limits, as promoted in Annex E.2 of BS 5228-1:2009 +A1:2014: "Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise". This states:

"Noise from construction and demolition sites should not exceed the level at which conversation in the nearest building would be difficult with the windows shut. [...] Noise levels, between say 07.00 and 19.00 hours, outside the nearest window of the occupied room closest to the site boundary should not exceed:

70 decibels (dBA) in rural, suburban and urban areas away from main road traffic and industrial noise;

75 decibels (dBA) in urban areas near main roads in heavy industrial areas

Given the location of the site, a value of 70B_{L_{Aeq,12hours}} is considered to represent an appropriate SOAEL for construction noise.

The LOAEL is taken to be 55dB_{L_{Aeq,12hours}}, this being aligned with the upper guideline value for daytime noise level determined WHO guidance for external daytime environmental noise levels of 55 dB_{L_{Aeq,16hr}}.

Construction noise will be temporary and this is reflected in the noise impact levels indicated above. Notwithstanding this, if work activity causes a prolonged exposure to noise, the potential effect on receptors may be greater than indicated above and give rise to an unacceptable effect. Based on advice given in Annex E of BS 5228-1, it is therefore considered that additional significance should be given to an effect exceeding the SOAEL of 75dB, where such a noise impact is predicted to occur on 10 or more days of working in any 15 consecutive days, or for a total of 40 days in any six-month period.

Combining the above magnitude and temporal criteria, gives the following refined noise effect matrix for construction noise:

Combined Noise Magnitude and Temporal Criteria	Magnitude of Impact
Daytime noise level less than 55dB _{L_{Aeq,T}}	Negligible
Daytime noise level between 55 and 75 dB _{L_{Aeq,T}}	Low
Daytime noise level greater than 75 dB _{L_{Aeq,T}} (For a period less than 10 days of working in any 15 consecutive days, or for a total of less than 40 days in any six month period)	Medium
Daytime noise level greater than 75 dB _{L_{Aeq,T}} (For a period more than 10 days of working in any 15 consecutive days, or for a total of more than 40 days in any six month period)	High

With regard to construction vibration, the following potential effects need to be considered:

- the potential effect of vibration on the structure of neighbouring buildings and
- the potential effect of vibration on occupants within those buildings

Vibration can potentially cause cosmetic damage and in the extreme, structural damage. Criteria for a significant vibration effect have therefore been aligned with guidance for cosmetic damage set out in BS 5228-2. Such criteria should safeguard building from structural damage, whilst vibration below the threshold can be considered to be negligible since there would not be no effect. Recommended values are presented in Table below.

Type of Building	Peak Particle Velocity (PPV) in Frequency Range of 4 Hz to 15 Hz	Peak Particle Velocity (PPV) in Frequency Range of 15 Hz and Above
Reinforced or framed structures	50 mm/s at 4 Hz and above	
Industrial and heavy commercial buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

The potential effect of vibration on occupants within buildings can be assessed based on the guidance of Annex B of BS 5228-2, as show in the below table.

Peak Particle Velocity (PPV)	Impact	Magnitude of Effect
0.14mm/s	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.	Negligible
0.3 mm/s	Vibration might be just perceptible in residential environments	Minor
1.0 mm/s	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents	Medium

Guidance in BS 5228-1:2009+A1:2014 suggests that vibration effects will not normally be significant beyond a distance of around 20m from the construction works. The nearest noise sensitive receptors to the site are generally beyond this initial scoping distance and, as such, it is considered unlikely that vibration associated with construction works will have any significant adverse impact on neighbouring noise sensitive receptors.

It is therefore recommended that construction vibration is also mitigated through the use of appropriate operative and management controls, implemented through the use of a Construction Environmental Management Plan (CEMP). In principle, such measures will include:

- A general need for any contractor to implement the “best practicable means” for undertaking the works in line with the general guidance of BS5228:2009+A1:2014 (Parts 1 and 2);

- Optimising the Site layout to locate vibration generating activities as far as possible away from sensitive receptors;
- Good housekeeping and management;
- Review of plant and activities to ensure noise minimisation measures are in place and operating;
- Where reasonably practicable, plant and/or methods or working causing significant levels of vibration (e.g. use of percussive breakers) should be replaced by other less intrusive plant and/or working methods;
- Consideration should be given to rotary bored piling methods (e.g. continuous flight auger injected piling) rather than driven piling techniques (should piling be required);
- Prior to piling, any known or suspected obstructions which could impede piling operations (and represent a risk of increased vibration) should be removed;
- The possible use of cut-off trenches (which can help control vibration in a similar to manner to the control of airborne noise with a screen or barrier);
- Early and good public relations with the adjacent tenants and occupants of buildings will also reduce the likelihood of complaints;
- Controlling the opening hours of the Site; and
- Implementing an appropriate regime of proactive vibration monitoring to ensure mitigation is effective.

13.0 ROAD TRAFFIC NOISE IMPACT

Proposed development traffic flows have been provided by the project's transport consultants Mayer Brown.

We understand the completed development will not significantly increase road traffic on existing roads. Increase in road traffic noise affecting existing receptors, due to the completed development, would be less than 2 dBA, which would be subjectively insignificant.

This magnitude of change is considered to be Negligible to Minor short term magnitude and Negligible long-term magnitude in accordance with the Tables 3.54a and 3.5b of the LA111 Revision 2 - Design Manual for Roads and Bridges.

The short-term magnitude of change is determined to be not significant.

Laxton Leaze is a small residential road which connects directly with the access road. The predicted percentage increase in traffic is large due to the low existing baseline, which is estimated to be only circa 30 AADT. However, put in context, the noise levels with the development traffic would be below the LOAEL and background levels and would be subjectively insignificant.

14.0 CONCLUSIONS

Quantum Acoustics have undertaken a fully automated environmental noise survey to establish the existing noise levels. The noise survey concluded that the site is dominated by road traffic noise associated with the A3.

The potential risk of the site has been assessed in accordance with national and local planning policies and guidance and a ProPG Stage One and Stage Two assessment has been undertaken.

It has been concluded that the scheme has been developed to minimise noise impacts and therefore follows a good acoustic design process.

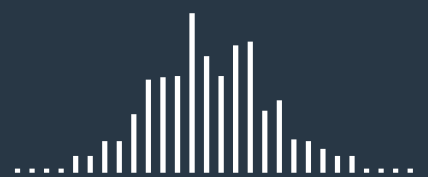
Internal noise criteria have been proposed with reference to internal noise levels contained in BS8233:2014.

The proposed development does not raise any agent of change concerns in relation to existing neighbouring business or community use facilities.

It is concluded that the proposed development should not give rise to any significant or other adverse impact on the health and or quality of life for future occupants of the development.

It is recommended that the potential impact construction phase noise and vibration is controlled through appropriate operative, and management controlled implemented through a Construction Environmental Management Plan.

The proposed development therefore fully complies with noise related national and local planning policies.



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APPENDIX B: Acoustic Glossary

General

A vibrating surface or turbulent fluid flow will cause pressure fluctuations in the surrounding air. These pressure fluctuations are perceived by the human ear as "sound".

Measurement Units

The human ear can detect sound pressures as low as about 20 µPa, and can tolerate (for short periods) sound pressures as high as 200 Pa, an amplitude range of 10 million times. To take account of this huge amplitude range, sound pressure levels (often written in "acoustic shorthand" as SPL or Lp) are quantified using a logarithmic scale, the decibel (dB) scale. This is based on a reference pressure of 20µPa, thus a sound pressure of 20µPa would equate to 0dB and a pressure of 200Pa would equate to 140dB.

Frequency (Pitch) Characteristics

The sound received at any particular location is not solely influenced by the sound pressure level, the frequency characteristics (pitch) of the noise is also an important factor. Noise audible to a human (with "normal" hearing), typically covers the frequency range 20 Hertz to 20,000 Hertz, Hertz (Hz) are defined as the number of times the sound pressure fluctuates in one second. "Low" pitched sounds fluctuate less times per second than "high" pitched sounds. Whilst humans are capable of detecting a wide range of frequencies, the ear is not equally sensitive to all frequencies – the ear is most sensitive at frequencies towards the middle of the audible range and less sensitive to the lower and higher frequencies.

To take account of this frequency response, sound pressure fluctuations are normally quantified by applying a frequency-weighting network or filter which simulates the frequency response of the ear. In essence, this means that more significance is given to the frequencies at which the ear is most sensitive and less significance to those at which the ear is less sensitive. Noise measurements relating to human reaction are generally made using an "A-weighting" network. These measurements are reported as A-weighted decibels or dB(A). The A-weighted sound pressure level is written in "acoustic shorthand" as L_A.

Variation of Sound with Time

It will be appreciated that the sound pressure level of most noise sources will fluctuate with time. In order to take account of the way in which the human ear perceives noise, it is normal for the sound pressure level to be quantified using a time weighting network, to mimic the speed of response of the human ear. The standardised setting for most types of noise is a "Fast" time weighting.

The manner in which sound fluctuates with time can also influence the subjective manner in which noise is perceived. Noise can be continuous (showing no significant variation with time as in the case of a fan), intermittent (i.e. the noise is transient in it's nature, such as a train pass-by) or impulsive (i.e. there is a sudden build up of noise - this can range from "clanking" types sounds as might be experienced next to railway goods yard or a high energy discharge such as an explosion)

Measurement of Sound

Sound pressure levels are measured using equipment comprising a pressure-sensitive microphone, associated amplifier, frequency weighting network, time weighted network and output indicator. In its simplest form this is a small hand-held instrument called a sound level meter. More sophisticated instrumentation (a sound level analyser) is also available which allows the real-time output of the frequency characteristics of the sound to be quantified.

Comparison of Sound Levels

To put the significance of noise measurement into context, the following Table presents the A-weighted sound pressure level of some typical sources:

Sound Pressure Level, dB(A)	Typical Noise Source . Activity
160	Saturn Rocket Taking Off
140	Military Jet Taking Off at 30m
100	Nightclub
90	Heavy goods vehicle driving past at 7m
80	Busy urban road
70	Domestic vacuum cleaner at 3m
60	Busy office environment
55	Normal speech at 1m
40	Whispered conversation at 2m
30	Bedroom at night (BS 8233: 1999)
20	Remote country location
0	Threshold of hearing – a very eery silence

Addition of Sound Levels

It is important to note that the use of a logarithmic scale to describe noise does not allow normal arithmetic addition. This means that two noise sources each generating a level of, say, 60dB(A) will not generate a combined sound level of 120dB(A). The values must be added logarithmically, which would actually yield a combined sound level of 63dB(A) in this example.

Subjective Perception of Sound Levels Changes

With regard to the human perception of sound level changes, the human ear:

- Cannot generally perceive a sound level difference of less than 3dB(A)
- Will perceive a sound level difference of 4-5dB(A) as "noticeable"
- Will perceive a sound level difference of 10dB(A) as a doubling (or halving) of loudness.

Acoustic Terminology

As stated previously, most sources of noise will fluctuate with time. In order to characterize such noise, it is therefore normal to represent the noise climate using a variety of noise parameters and statistical indices. The most commonly adopted noise parameters are described below:

$L_{Aeq,T}$

This is the equivalent continuous A-weighted sound level measured over a specified time period “T”. This is the notional continuous sound level which, over the time T, contains the same amount of energy as the actual fluctuating sound being measured. This parameter is widely accepted as being the most appropriate noise descriptor for most environmental noise and the effects of noise on humans.

$L_{Amax,fast}$

This is maximum A-weighted sound pressure measured with a fast frequency response recorded during the stated measurement period. It is typically used to characterise the highest sound level caused during a noise event.

$L_{A90,T}$

This is the A-weighted sound pressure level exceeded for 90% of the specified time period “T”. It is normally used to describe the underlying background noise level of an environment since it inherently excludes the effects of transient noise sources.

Noise Rating (NR) Level

When describing noise from building services installations, it is common to express noise levels in terms of a Noise Rating (NR) Level. The NR level is determined by plotting the measured frequency spectrum of a noise against a series of reference curves, which roughly approximate to equal loudness values. This method permits higher sound levels at low frequencies corresponding to the sensitivity of the human ear. The NR level is defined as the value of the highest curve “touched” by the plotted frequency spectrum. For typical sources of building services noise, the overall A-weighted sound level is numerically around 5-6dB higher than the NR level of the noise.

Airborne Sound Insulation Measurement Parameters

The ability of a building element to reduce airborne noise can be described by a number of different parameters relevant to both laboratory and on-site performance evaluation. In general, the higher these values, the better the resistance of the construction to the transmission of airborne sound. The most commonly used parameters include:

R_w

The “**Weighted Sound Reduction Index**” (R_w) is a single value measure of the intrinsic sound reduction capabilities of a construction, as measured in an acoustic laboratory. Measurement values are determined in accordance with the BS EN ISO 10140 series of standards and weighted in accordance with BS EN ISO 717-1: 2013.

R'_w

The “**Weighted Apparent Sound Reduction Index**” (R'_w) is a single value measure of the apparent sound reduction capabilities of a construction, when installed on-site (which will normally be some way lower than the laboratory value due to less favourable installation conditions, the quality of workmanship, etc.). Measurement values are determined in accordance with the BS EN ISO 10140 series of standards and weighted in accordance with BS EN ISO 717-1: 2013. In practice, the R'_w of a construction can only be reliably determined if “direct” sound transfer through the partition can confidently be taken as the dominant noise transfer path (i.e. there is no “flanking” sound transmission).

D_w

The “**Weighted Sound Level Difference**” (D_w) is a single value measure of the on-site sound reduction between two rooms. This value inherently includes “direct” sound transmission through any separating construction and “flanking” transmission through other building elements.

Measurement values are determined in accordance with BS EN ISO 140-4: 1998 (for Building Regulations compliance purposes) or BS EN ISO 16283-1: 2014 and weighted in accordance with BS EN ISO 717-1: 2013.

$D_{nT,w}$

The “**Weighted Normalised Flanking Level Difference**” ($D_{nT,w}$) is a single figure measure of the sound reduction between two rooms solely due to sound transmission through a specified flanking path. This parameter is frequently used to provide an indication of the sound reduction capabilities of suspended ceiling and raised access floor constructions where there is common void between adjacent rooms or as a measure of sound that may be transmitted between rooms through external curtain walling. Measurements are undertaken in accordance with BS EN ISO 10848-2: 2017 and weighted in accordance with BS EN ISO 717-1: 2013.

Impact Sound Insulation Measurement Parameters

Some building elements also have the potential to generate “impact” noise, for example due to human “footfall” on floor structures, or the impact of rainfall on lightweight roofing components. A variety of parameters are again available to define the amount of noise likely to be generated. In general, the lower these values, the less sound the construction will generate as a result of impacts. Typical measurements parameters include:

$L_{nT,w}$

The “**Standardised Impact Sound Pressure Level**” is a “single number” rating describing the intrinsic impact sound insulation capabilities of a construction (such as a floor system) as measured in an acoustic laboratory. Values are determined in a vertical sound transmission suite by locating a “tapping machine” in the upper room of the suite and measuring the amount of sound radiated by the floor in the room below. Measurement values are determined in accordance with the BS EN ISO 10140 series of standards and weighted in accordance with BS EN ISO 717-2: 2013.

$L_{nT,w}$

The “**Normalised Flanking Impact Sound Pressure Level**” is a “single number” rating describing the amount of flanking sound that would be transmitted to an adjoining space (separated by a partition) due to impacts on the test sample. It is, for example, used to indicate the amount of noise that may be generated due to footfall noise on a raised access floor system. Values are determined in a horizontal sound transmission suite by locating a “tapping machine” one side of a separating partition built off the test sample and measuring the amount of noise radiated by the floor in the adjoining space on the other side of the partition. Measurement values are determined in accordance with BS EN ISO 10848-2: 2017 and weighted in accordance with BS EN ISO 717-2: 2013.

Room Acoustic Measurements

T

The “**Reverberation Time**” (T) of a room is defined as the time taken for the sound energy produced by a source (RT) to decay by 60 dB after the source has been switched off. The reverberation time of a space can be calculated by considering the volume of the room and the areas and sound absorption qualities of room surface finishes. Small, “soft” rooms tend to give low reverberation times, whilst large, “hard” rooms tend to give long reverberation times.

α_p

The “**Practical Acoustic Absorption Coefficient**” (α_p) is a measure of how much sound energy is absorbed by a building element at a particular frequency, as measured in accordance with BS EN ISO 354: 2003.

α_w

The “**Weighted Absorption Coefficient**” (α_w) is a single figure measure of the overall sound absorption capabilities of a building element determined in accordance with BS EN ISO 11654: 1997.

APPENDIX C: National Planning Policy

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National Planning Policy Framework

C.1. Current governmental guidance for the determination of planning applications is given in the “National Planning Policy Framework” (NPPF) ^[1], published in July 2021 and revised in December 2023.

C.2. Paragraph 180 of the NPPF advises:

“Planning policies and decisions should contribute to and enhance the natural and local environment by:

.....

- e) 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.”*

C.3. With specific regard to noise, paragraph 191 of the NPPF states:

“Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

- a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*
- b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and*
- c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.”*

C.4. With regard to “adverse” impacts and “significant adverse” impacts, the NPPF directs the reader to the advice contained in DEFRA’s “Noise Policy Statement for England”

¹ Department for Levelling Up, Housing & Communities (DLHC) (2023) “National Planning Policy Framework”, December 2023, DLHC.

(NPSE) ^[2]. This Policy Statement introduces the concept of a “Significant Observed Adverse Effect Level” (SOAEL), “Lowest Observed Adverse Effect Level” (LOAEL) and “No Observed Adverse Effect Level” (NOAEL). These are concepts aligned with toxicology outcomes derived from guidance given by the World Health Organisation.

Noise Policy Statement for England

- C.5. Whilst the intent of the NPSE in relation to the NPPF is clear, the NPSE does not provide any quantitative threshold values for each identified level of “effect”, but highlights 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 Practice Guidance

- C.6. The application of national planning is amplified in the government’s “National Planning Practice Guidance” (PPG) ^[3] published in July 2019. This seeks to help clarify understanding the perception of noise effects, potential outcomes of noise exposure and actions that should be taken to align decision making with the NPPF.
- C.7. Paragraph 001 (Ref. 30-001-20190722) outlines when noise should be considered in relation to planning, i.e., *“...when a development may create additional noise, or would be sensitive to the prevailing acoustic environment (including any anticipated changes to that environment from activities that are permitted but not yet commenced).”*
- C.8. In line with the NPPF concept of basing decision making on the identification of “adverse” or “significant adverse” impacts on health and quality of life, the PPG aligns its guidance with the NPSE. Specifically in relation to noise, the table overleaf summarises this guidance:

² Department for Environment, Food and Rural Affairs (DEFRA) (2010) “Noise Policy Statement for England”, March 2010, DEFRA.

³ DLHC (2019) “Planning Practice Guidance – Noise”, July 2019, DLHC.

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

Table A.1 : PPG Noise Exposure Hierarchy Table

- C.9. Whilst the NPPF and the associated PPG outlines the framework to ensure the satisfactory development of land in relation to potential noise impacts, the policies and guidance do not provide any specific technical guidance defining what may be considered an “adverse” or “significant adverse” impact.
- C.10. The guidance does, in Paragraph 015 (Reference ID: 30-015-20190722) of PPG, make reference to a number of ‘industry standard’ guidance documents, including but not limited to British Standard (BS) 8233:2014 “Guidance on sound insulation and noise reduction for buildings” ^[4] and “Professional Practice Guidance on Planning and Noise” (ProPG) ^[5], to assist in quantifying when noise may have a particular effect. The paragraph does, however, clarify:

“Some of these documents contain numerical criteria. These values are not to be regarded as fixed thresholds and as outcomes that have to be achieved in every circumstance”.

⁴ British Standards Institution (2014) British Standard 8233:2014 “Guidance on sound reduction for buildings”, February 2014, BSi.

⁵ Association of Noise Consultants (ANC), Institute of Acoustics (IOA), Chartered Institute of Environmental Health (CIEH) (2017) “ProPG: Planning and Noise. Professional Practice Guidance on Planning and Noise. New Residential Development”, May 2017, ANC, IOA and CIEH.

APPENDIX D: Design Guidance

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Professional Practice Guidance on Planning and Noise

- D.1. Professional Practice Guidance on Planning and Noise (ProPG) ^[1] was published in May 2017 by the Association of Noise Consultants (ANC), Institute of Acoustics (IOA) and Chartered Institute of Environmental Health (CIEH), with the purpose of promoting good acoustic design for new residential development in England.
- D.2. ProPG outlines a two-stage assessment process as shown in **Figure D.1** below. The approach comprises Stage 1: Initial Site Risk Assessment and, if required, Stage 2: Full Assessment, which consists of four main elements: Element 1: Good Acoustic Design, Element 2: Internal Noise Levels, Element 3: External Amenity Areas and Element 4: Other Relevant Issues.

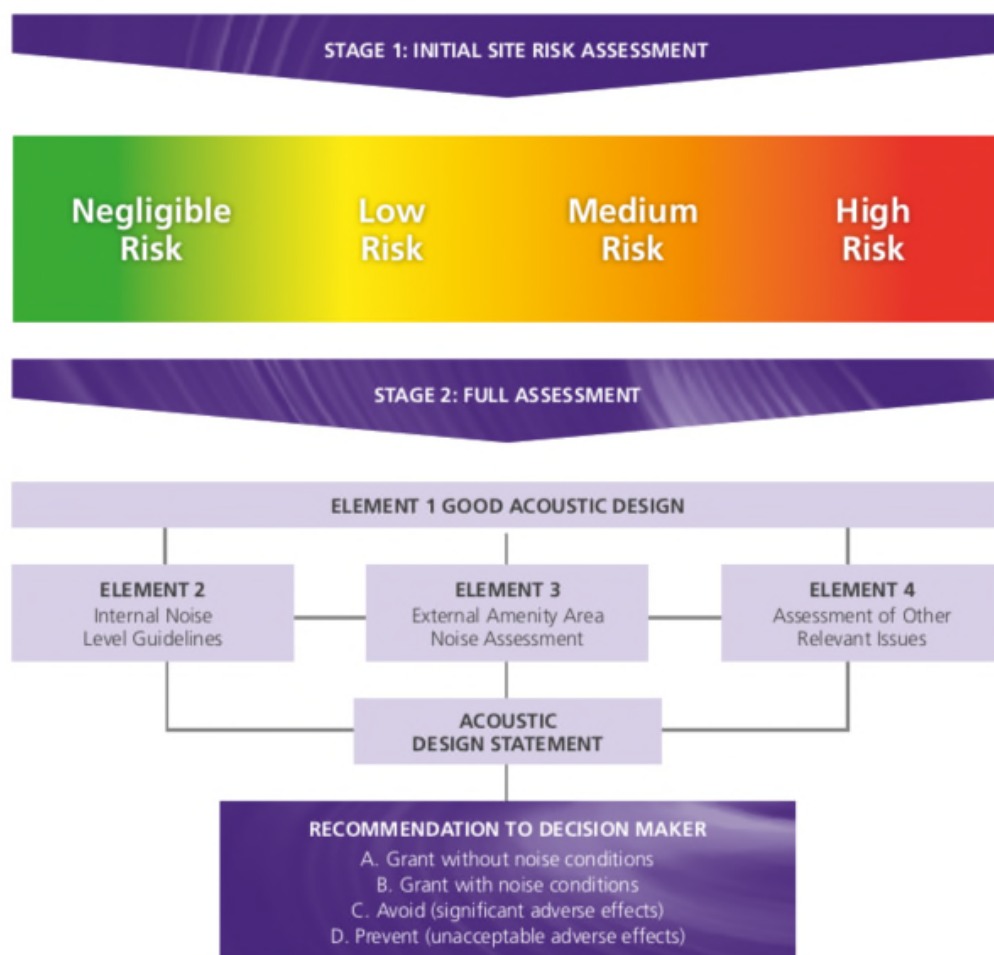


Figure D.1: ProPG - Assessment Approach (Source: ProPG, Figure 4)

¹ Association of Noise Consultants (ANC), Institute of Acoustics (IOA), Chartered Institute of Environmental Health (CIEH) (2017) "ProPG: Planning and Noise. Professional Practice Guidance on Planning and Noise. New Residential Development", May 2017, ANC, IOA and CIEH.

- D.3. This forms the Acoustic Design Statement (ADS), which provides the overall recommendation to the decision makers. An ADS for a site assessed as high risk should be more detailed than a site assessed as low risk and an ADS should not be necessary for a site assessed as negligible risk.
- D.4. The Stage 1: Initial Site Noise Risk Assessment follows the guidance as shown in **Figure D.2** below.

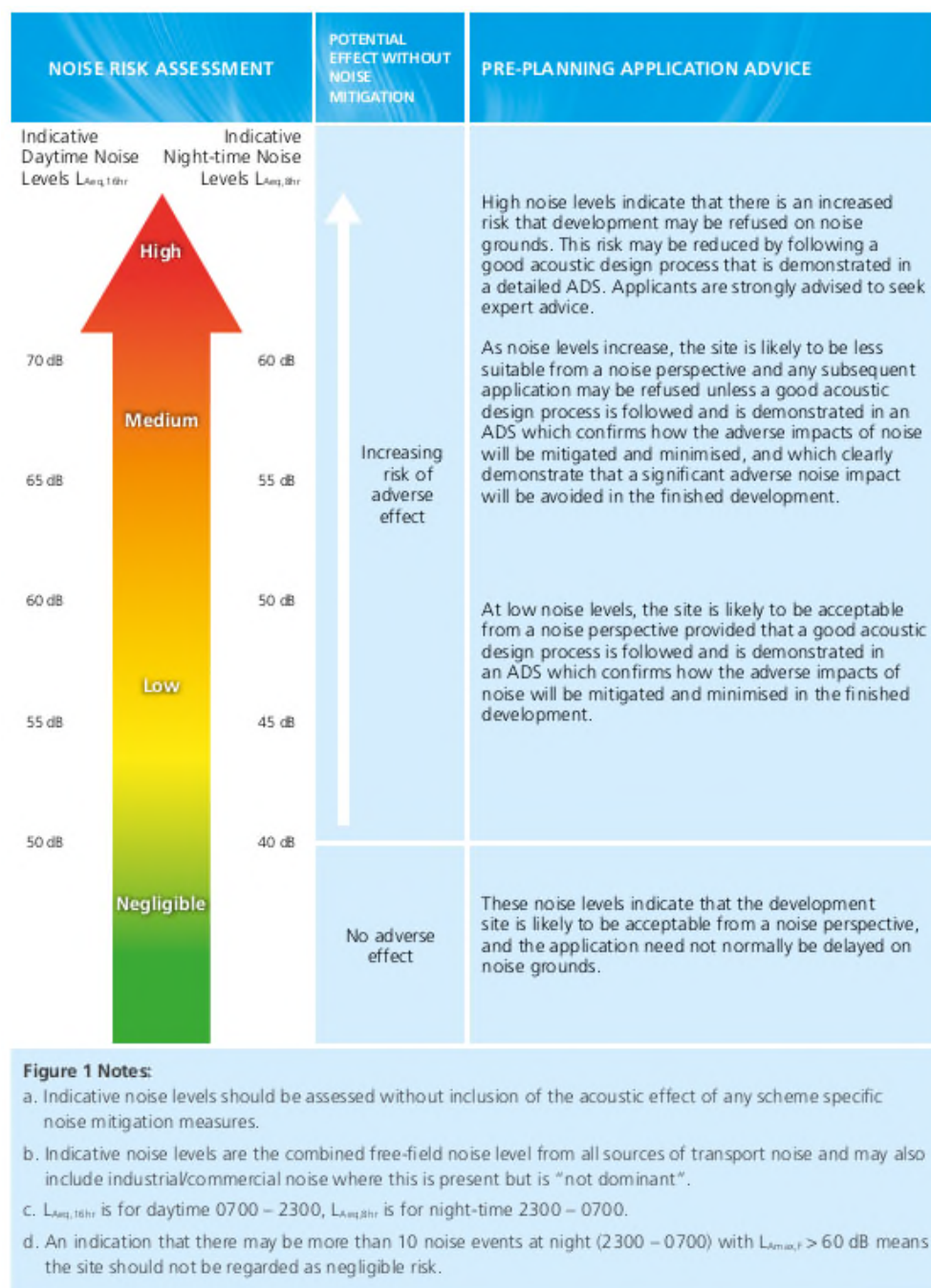


Figure D.2: ProPG - Stage 1: Initial Site Risk Assessment (Source: ProPG, Figure 1)

Stage 2 Element 1: Good Acoustic Design Process

D.5. ProPG states that planning applications for new residential development should include evidence that the following have been properly considered:

- The feasibility of relocating or reducing noise levels from relevant sources.
- Options for planning the site or building layout.
- Orientation of proposed building(s).
- Select construction types and methods for meeting building performance requirements.
- Examine the effects of noise control measures on ventilation, fire regulation, health and safety, cost, 'construction, design and management' (CDM) etc.
- The viability of alternative solutions.
- External amenity area noise.

Stage 2 Element 2: Internal Noise Level Guidelines

D.6. ProPG states that suitable guidance on internal noise levels can be found in British Standard (BS) 8233:2014 "Guidance on sound reduction for buildings" ^[2], as shown in **Figure D.3** below.

² British Standards Institution (2014) British Standard 8233:2014 "Guidance on sound reduction for buildings", February 2014, BSi.

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

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

NOTE 2 The internal L_{Aeq} target levels shown in the Table are based on the existing guidelines issued by the WHO and assume normal diurnal fluctuations in external noise. In cases where local conditions do not follow a typical diurnal pattern, for example on a road serving a port with high levels of traffic at certain times of the night, an appropriate alternative period, e.g. 1 hour, may be used, but the level should be selected to ensure consistency with the internal L_{Aeq} target levels recommended in the Table.

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

NOTE 4 Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax, F}$, depending on the character and number of events per night. Sporadic noise events could require separate values. In most circumstances in noise-sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45dB $L_{Amax, F}$ more than 10 times a night. However, where it is not reasonably practicable to achieve this guideline then the judgement of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number, distribution, predictability and regularity of noise events (see Appendix A).

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

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

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

Figure D.3: ProPG - Internal Noise Level Guidelines (Source: ProPG, Figure 2)

Stage 2 Element 3: External Amenity Area Noise Assessment

- D.7. ProPG refers to the design ranges in BS 8233:2014 "Guidance on sound reduction for buildings", which states that the acoustic environment of external amenity areas that are an intrinsic part of the overall design should always be assessed, and noise levels should ideally not be above the range 50 – 55 dB $L_{Aeq, 16 \text{ hr}}$.

Stage 2 Element 4: Other Relevant Issues

D.8. The ProPG states that the following other relevant issues, should be considered, where appropriate, including:

- compliance with relevant national and local policy;
- the magnitude and extent of compliance with the ProPG criteria;
- the likely occupants of the development;
- the acoustic design compared to unintended adverse consequences; and
- acoustic design against wider planning considerations.

British Standard 8233:2014 “Guidance on sound insulation and noise reduction for buildings”

D.9. For dwellings, BS 8233:2014 provides guideline values for indoor ambient noise levels in spaces when they are unoccupied. A summary of the levels recommended in paragraph 7.7.1 of subclause 7.7 and Table 4 of BS 8233:2014 for rooms used for resting, dining and sleeping are summarised in **Table D.1** below.

Activity	Location	Daytime (07:00 - 23:00 hours)	Night-time (23:00 - 07:00 hours)
Resting	Living Room	35 dB LAeq, 16hour	-
Dining	Dining Room/Area	40 dB LAeq, 16hour	-
Sleeping (daytime resting)	Bedroom	35 dB LAeq, 16hour	30 dB LAeq, 8hour

Table C.1: BS 8233:2014 Indoor Ambient Noise Levels in Dwellings

D.10. The guidance in paragraph 7.7.1 of Section 7.7 of BS 8233:2014 applies to external noise as it affects the internal acoustic environment from sources without a specific character. The paragraph states, including the accompanying note:

“... Occupants are usually more tolerant of noise without a specific character than, for example, that from neighbours which can trigger complex emotional reactions. ...”

“NOTE Noise has a specific character if it contains features such as a distinguishable, discrete and continuous tone, is irregular enough to attract attention, or has strong low-frequency content, in which case lower noise limits might be appropriate.”

D.11. Note 7 of the following text states the following:

“NOTE 7 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.”

D.12. In relation to external noise levels, the second paragraph of 7.7.3.2 states that:

"For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$ with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.

Other locations, such as balconies, roof gardens and terraces, are also important in residential buildings where normal external amenity space might be limited or not available, i.e. in flats, apartment blocks, etc. In these locations, specification of noise limits is not necessarily appropriate. Small balconies may be included for uses such as drying washing or growing pot plants, and noise limits should not be necessary for these uses. However, the general guidance on noise in amenity space is still appropriate for larger balconies, roof gardens and terraces, which might be intended to be used for relaxation. In high-noise areas, consideration should be given to protecting these areas by screening or building design to achieve the lowest practicable levels. Achieving levels of 55 dB $L_{Aeq,T}$ or less might not be possible at the outer edge of these areas, but should be achievable in some areas of the space."

