Former Holloway Prison
Noise Impact Assessment

Peabody

MAX FORDHAM

Former Holloway Prison

Noise Impact Assessment

P01 – Planning

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1.0 INTRODUCTION

Max Fordham LLP has been appointed to provide acoustic advice relating to the Development. Max Fordham LLP is a full member of the Association of Noise Consultants.

Noise generated from construction and demolition activities and traffic is outside the scope of this Noise Impact Assessment.

There are no obvious sources of ground-borne vibration close to the site and therefore no vibration assessment has been undertaken.

This report, submitted as part of the Application for Full Planning Permission presents:

- summary results of a noise survey undertaken by WSP (acoustic engineer responsible for the Environmental Statement Noise and Vibration Chapter),
- an assessment of site suitability of the site for noise from transport sources, and a description of the strategy to achieve appropriate internal ambient noise levels,
- plant noise emission upper limits, and a description of the strategy to achieve these limits,
- internal sound insulation targets, and a description of the strategy to achieve these limits.

1.1 The Site

The Development is located in the London Borough of Islington ("LBI") on the site of the former Holloway Prison. The main source of noise at the site is the A503 (Camden Road/Parkhurst Road), running along the south-east perimeter of the site, a busy road with up to 4 lanes. This includes a multi-road junction between Camden Road, Hillmarton Road and Camden Road.

All other boundaries of the site are to residential properties, along Dalmeny Avenue (to the south-west), Trecastle Way and Penderyn Way (to the north-west) and Bakersfield (to the north). These roads are residential roads with much lower levels of traffic.

Existing noise sensitive receptors are identified in the Avison Young document *Environmental Impact Assessment (EIA) Scoping Report – Redevelopment of the Former Holloway Prison, Islington* (May 2020).

Table 1: Identified noise sensitive receptors

NSR Ref	Description
N	Dwellings located on the eastern and southern end of Bakersfield Dwellings on Crayford Road Dwellings on Holloway Estate at the end of Parkhurst Road
NE	Dwellings within Holloway Estate Dwellings on Parkhurst Road
SE	Dwellings within Holloway Estate Dwellings on Parkhurst Road
S	Dwellings at 275 Camden Road
SW	Dwellings on Dalmeny Avenue
NW	Dwellings on Trecastle Way Dwellings on Penderyn Way

An aerial image of the site showing the site boundary and nearest noise sensitive receptors is shown in Figure 1.

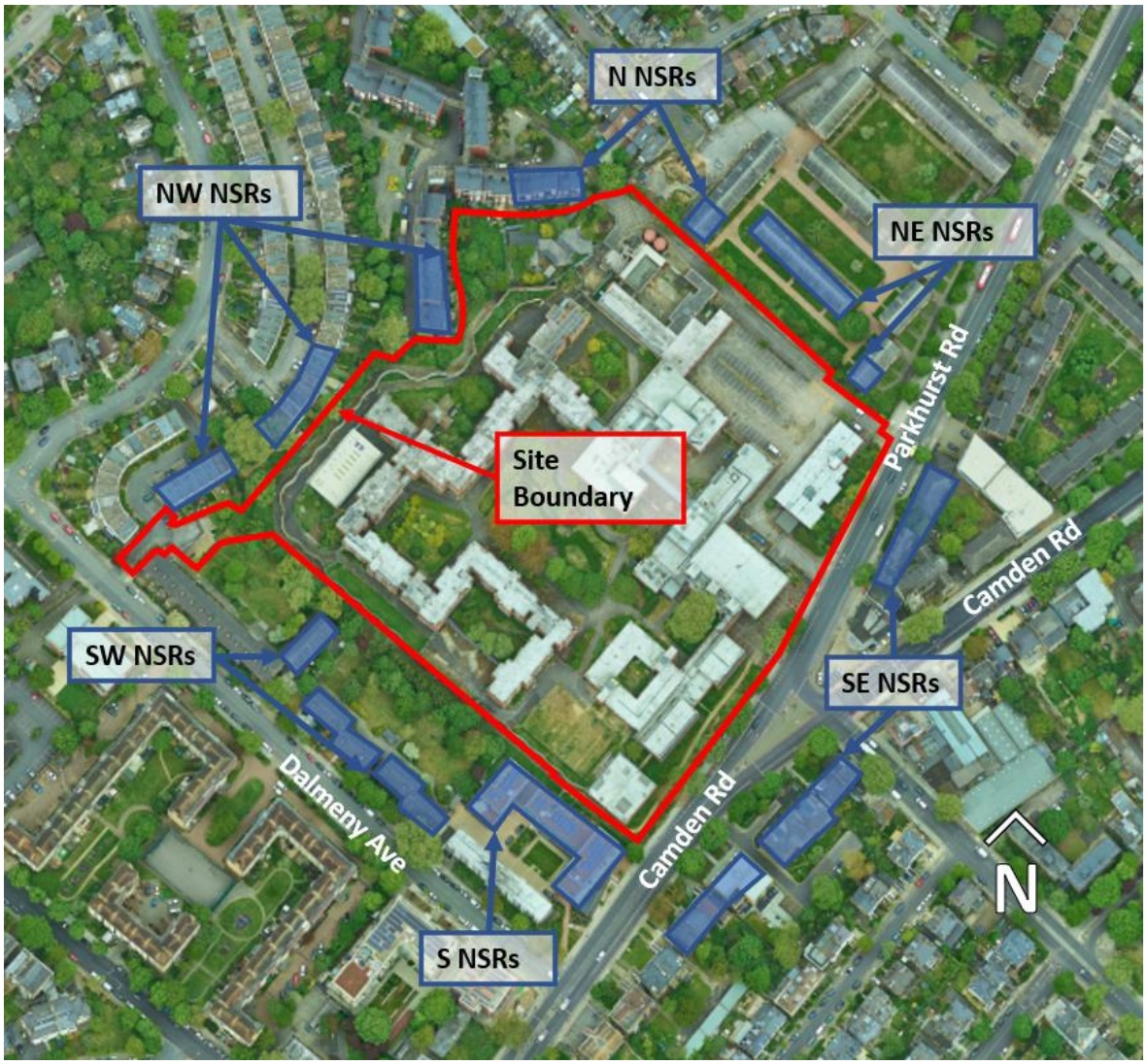

Figure 1: Aerial image of site, showing noise sensitive receptors (NSRs) and the site boundary

1.2 The Development

The Development comprises:

> *"Phased comprehensive redevelopment including demolition of existing structures; site preparation and enabling works; and the construction of 985 residential homes including 60 extra care homes (Use Class C3), a Women's Building (Use Class F.2) and flexible commercial floorspace (Use Class E) in buildings of up to 14 storeys in height; highways/access works; landscaping; pedestrian and cycle connections, publicly accessible park; car (blue badge) and cycle parking; and other associated works."*

The Development is divided into plots. These are shown on Figure 2. Property uses by plot are as follows:

Plot A

- 235 residential units
- Communal outdoor space for residents

Plot B

- 321 residential units
- Communal outdoor space for residents
- Commercial floorspace

Plot C

- 155 residential units
- Women's Building
- Commercial floorspace

Plot D

- 183 residential units
- Communal outdoor space for residents
- Residents' facilities including concierge

Plot E

- 91 residential units

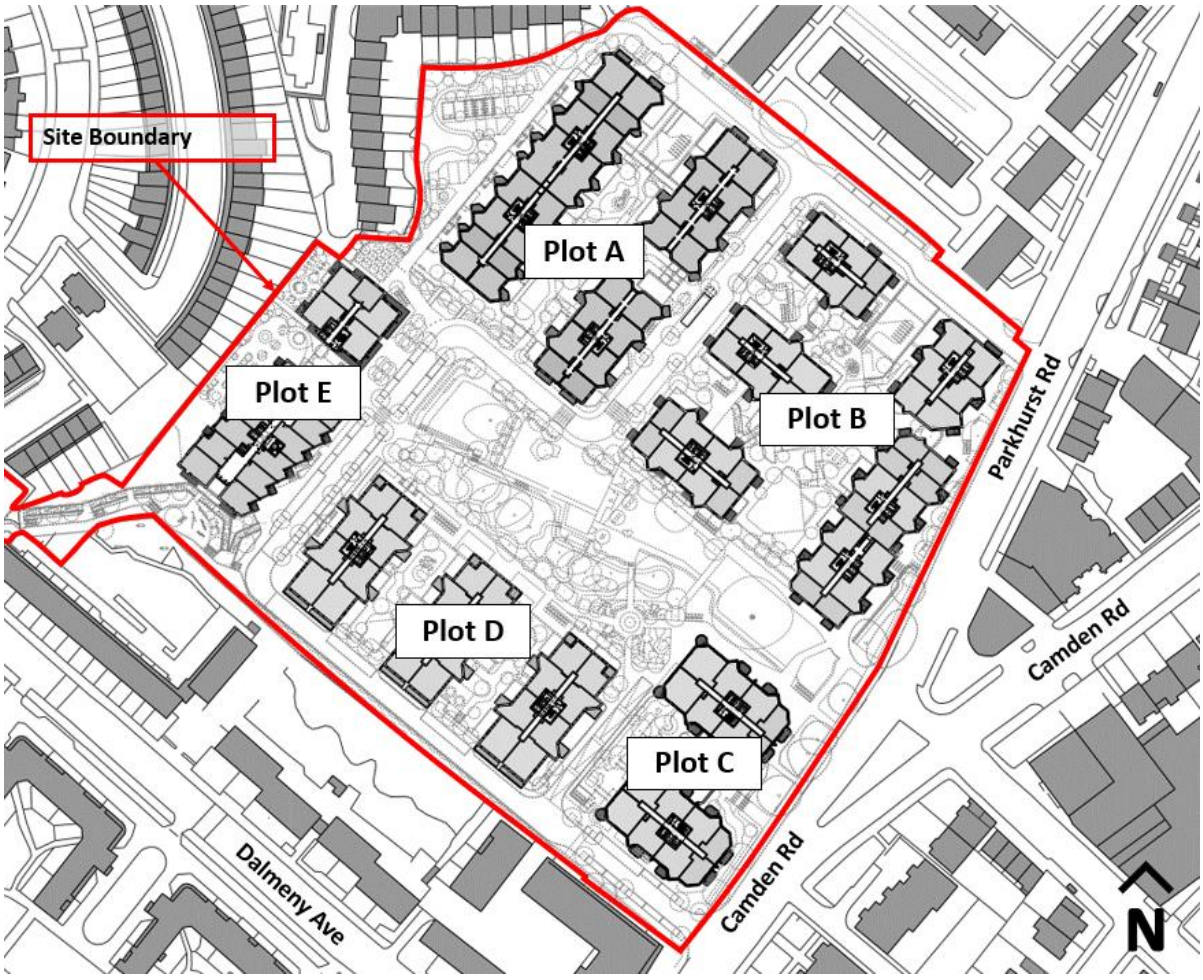

Figure 2: Typical residential floorplan of Development identifying plot layout

2.0 LEGISLATION, POLICY AND GUIDANCE CONTEXT

2.1 National Planning Policy

National Planning Policy Framework
Planning Policy Guidance Note 24 (PPG24), which was generally used for overall guidance to planners regarding environmental noise, particularly for residential sites, was replaced in March 2012 by the more general advice given in the National Planning Policy Framework (NPPF).

The NPPF (last update, July 2021) states in paragraph 174e), that planning policies and decisions should contribute to and enhance the natural and local environment by "preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability." Furthermore, it states in paragraphs 185 and 187 that planning policies and decisions 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 [paragraph 185 a)],
- identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason [paragraph 185 b)], and
- 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 [paragraph 187].

Noise Policy Statement for England
The NPPF document also refers to the Noise Policy Statement for England (March 2010). The Noise Policy Statement for England (NPSE) sets out (paragraph 1.6) the long term vision of Government noise policy: "Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development."

The NPSE also states: "Excessive noise can have wide-ranging impacts on the quality of human life, health (for example owing to annoyance or sleep disturbance) and use and enjoyment of areas of value such as quiet places and areas with high landscape quality."

The NPSE also cites (in the Explanatory Note section) the following three aims:

- First aim of the NPSE: Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.
- Second aim of the NPSE: Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.
- Third aim of the NPSE: Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

The NPSE also states (paragraph 2.2) that "examples of noise management can be found in many areas including reducing noise source; the use of the land use and transport planning systems, compensation measures, the statutory nuisance and licensing regimes and other related legislation."

The NPSE (in the Explanatory Note section) also 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. In simple terms, below this level, there is no detectable effect on health and quality of life due to noise.
- LOAEL – Lowest Observed Adverse Effect Level: this is the level above which adverse effects on health and quality of life can be detected.

- SOAEL – Significant Observed Adverse Effect Level: this is the level above which significant adverse effects on health and quality of life occur.

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

The NPSE acknowledges (paragraph 2.15) that it is not possible to have a single objective noise-based measure that is mandatory and applicable to all sources of noise in all situations.

Planning Practice Guidance
The government's Planning Practice Guidance web pages provide advice of various issues, including noise (https://www.gov.uk/guidance/noise--2). The noise advice (March 2014, last 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)." (Paragraph: 001, Reference ID: 30-001-20190722, Revision date: 22-07-2019.)

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. The Noise Exposure Hierarchy Table (Paragraph: 005, Reference ID: 30-005-20190722, Revision date: 22-07-2019) is reproduced here:

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

In summary, with respect to National Planning Policy, neither the Planning Practice Guidance pages, nor the National Planning Policy Framework or Noise Policy Statement for England documents, provide quantitative advice such as the use of absolute noise limits. Thus, authorities still generally interpret and express national and local non-quantitative policies by issuing quantitative noise-related planning conditions.

2.2 Regional Policy and Guidance

London Plan 2021

London Plan (March 2021) includes Policy D14 Noise, which states that in order to reduce, manage and mitigate noise to improve health and quality of life, residential and other non-aviation development proposals should manage noise by:

1) avoiding significant adverse noise impacts on health and quality of life

2) reflecting the Agent of Change principle as set out in Policy D13 Agent of Change
3) mitigating and minimising the existing and potential adverse impacts of noise on, from, within, as a result of, or in the vicinity of new development without placing unreasonable restrictions on existing noise-generating uses
4) improving and enhancing the acoustic environment and promoting appropriate soundscapes (including Quiet Areas and spaces of relative tranquillity)
5) separating new noise-sensitive development from major noise sources (such as road, rail, air transport and some types of industrial use) through the use of distance, screening, layout, orientation, uses and materials – in preference to sole reliance on sound insulation
6) where it is not possible to achieve separation of noise-sensitive development and noise sources without undue impact on other sustainable development objectives, then any potential adverse effects should be controlled and mitigated through applying good acoustic design principles
7) promoting new technologies and improved practices to reduce noise at source, and on the transmission path from source to receiver.

The Mayor's Ambient Noise Strategy, 2004
The aim of the Mayor's ambient noise strategy (*Sounder City* The Mayor's Ambient Noise Strategy, Greater London Authority 2004) seeks "to minimise the adverse impacts of noise on people living and working in, and visiting London using the best available practices and technology within a sustainable development framework".

One of the three "key issues" identified by the strategy is:

- Reducing noise through better planning and design of new housing.

Other initial priorities include:

- Reducing noise through better planning and design, where London's growth in people and jobs presents challenges, but redevelopment and refurbishment also offer opportunities – high density, mixed-use development can create quiet outdoor spaces away from traffic.

Sustainable Design and Construction – Supplementary Planning Guidance (2014)
The Supplementary Planning Guidance Document (SPG) (Greater London Authority, Sustainable Design and Construction – Supplementary Planning Guidance 2014), which was published as part of The London Plan 2011 Implementation Framework, provides guidance on sources of noise, ways to mitigate noise emitted by developments, ways to mitigate the impact of noise on developments and some detailed design considerations.

The SPG also refers to policies in the 2011 version of the London Plan:

- Areas identified as having positive sound features or as being 'quiet areas' should be protected from noise, and enhanced where possible. (London Plan 2011 Policies 3.2, 7.15).
- Noise should be reduced at source and then designed out of a scheme to reduce the need for mitigation measures. (London Plan 2011 Policies 3.2, 5.3, 7.6, 7.15).

2.3 Local Policy

See section 3.3.

2.4 Other Regulations, Guidance, Policy and Standards

Approved Document Part E of the Building Regulations – Resistance to the passage of sound (2003 edition, incorporating 2004, 2010, 2013 and 2015 amendments)
Approved Document Part E of the Building Regulations is one of a series of documents that has been approved and issued by the Secretary of State for the purposes of providing practical guidance with respect to the

requirements of Part E of Schedule 1 to the Building Regulations 2010. These concern protection for dwelling houses, flats and rooms for residential purposes against sound from other parts of the same building and from adjoining buildings, and for protection against sound within a dwelling house etc. Reverberation in the common parts of buildings containing flats or rooms for residential purposes, and acoustics in schools, are also covered.

World Health Organization Guidelines for Community Noise (1999)
The World Health Organization Guidelines for Community Noise sets out guideline limits for noise in specific environments. These form the basis for the BS 8233 Indoor Ambient Noise Levels, which are for continuous anonymous noise. In addition to this, there is also a guideline upper level for single sound events inside bedrooms at night of 45 dB L_{AFmax}.

British Standard 8233 (2014)
BS 8233:2014 – *Guidance on sound insulation and noise reduction for buildings* (BS 8233) provides guidance on internal ambient noise levels, resulting from break-in of external environmental noise that should not be exceeded in various locations within dwellings.

In addition, BS 8233 provides guidance on desirable noise levels in areas that are intended to be used for external amenity space.

British Standard 4142 (2014) +A1:2019
BS 4142:2014+A1:2019 - *Methods for Rating and Assessing Industrial and Commercial Sound* addresses the likelihood of adverse impact from noise generated by plant equipment. A noise rating is determined and compared with the existing local background sound level, and several cumulative acoustic feature corrections to the noise rating are available to apply where appropriate. For example if the noise includes a distinguishable tone, impulse, intermittency or other readily distinguishable sound characteristic.

BS 4142:2014 seeks to determine a "representative" background sound level, stating that "…the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods".

The assessment of the impact depends upon the margin by which the rating level of the specific sound source exceeds the background sound level but also promotes a consideration of the context in which the sound occurs when making an assessment. BS 4142:2014 states that an initial estimate of the impact of the specific sound is made by subtracting the measured background sound level from the rating level, while considering the following points:

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

Note then, a BS 4142:2014 assessment may deduce a low impact where the specific sound level is approaching the background sound level, and thus may conclude that the specific noise is acceptable.

3.0 KEY DESIGN AND ASSESSMENT CRITERIA

This section provides summaries of the main design and assessment criteria for the scheme.

More information on the legislative, policy, guidance and standards relating to this Noise Impact Assessment can be found in section 2.0.

3.1 ProPG (2017)

The ProPG: Planning & Noise – Professional Practice Guidance on Planning & Noise (ProPG), issued May 2017, provides guidance on a recommended approach to the management of noise within the planning system in England. It was published in associated with the Institute of Acoustics, the Association of Noise Consultants and the Chartered Institute of Environmental Health.

The guidance incorporates a noise risk assessment as well as design guidance for internal noise levels and noise levels in external amenity areas, and assessments of other relevant issues.

The guidance in the ProPG applies to new residential development that will be exposed predominantly to airborne noise from transportation sources.

It proposes a two-stage approach:

Stage 1 – an initial noise risk assessment of the proposed development site; and

Stage 2 – a systematic consideration of four key elements comprising:

- Element 1 – demonstrating a "Good Acoustic Design Process";
- Element 2 – observing internal "Noise Level Guidelines";
- Element 3 – undertaking an "External Amenity Area Noise Assessment"; and
- Element 4 – consideration of "Other relevant issues".

An "Acoustic Design Statement" should be prepared and delivered as part of the approach and should be commensurate to the corresponding level of risk determined in Stage 1.

The initial noise risk assessment is summarised in Figure 1 of the ProPG document and is reproduced below.

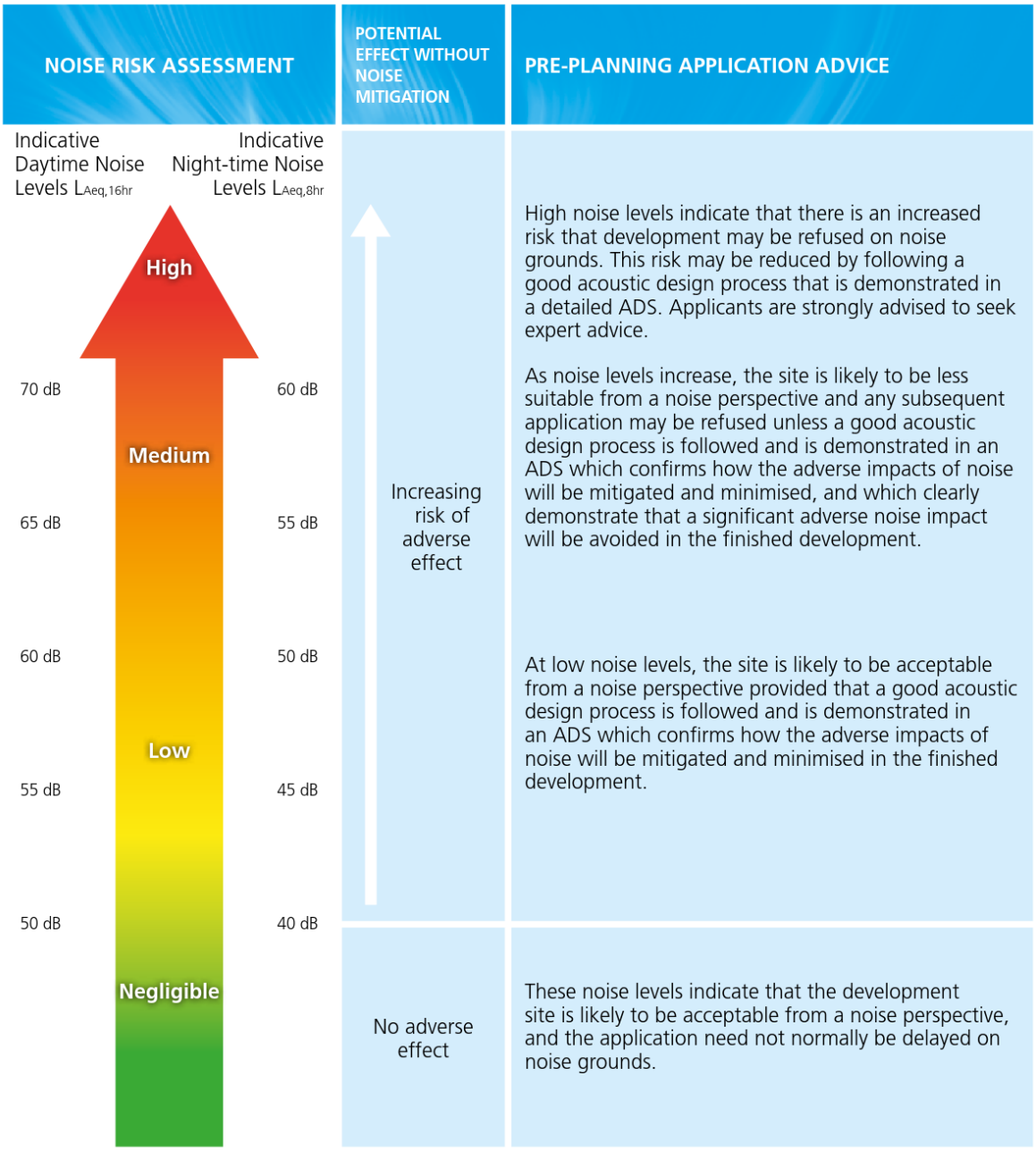

Figure 3: Figure 1 of the ProPG document, reproduced in full, summarising the Initial Site Noise Risk Assessment process

3.2 AVO Guide (2020)

The *Acoustics Ventilation and Overheating: Residential Design Guide"* (January 2020) published by the Association of Noise Consultants, provides guidance for the assessment of acoustics with consideration given to ventilation and overheating designs.

Internal noise levels advised by BS 8233:2014 should be achieved whilst providing Approved Document F whole dwelling ventilation. However the AVO Guide considers it reasonable however 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 basis for this is that the overheating condition occurs for only part of the time, and that during this period, the occupant may accept a trade-off between acoustic and thermal conditions as they have some control over their environment.

A two-level assessment procedure is recommended to estimate the potential impact on occupants in the case of the overheating condition. The Level 1 site risk assessment is based on external free-field noise levels and the assumed scenario of a partially open window used to control overheating. Where a "High" risk is identified, a Level 2 assessment is recommended. The AVO Level 1 and Level 2 assessments are shown in Figure 4 and Figure 5.

Table 3-2 Guidance for Level 1 site risk assessment of noise from transport noise sources [Note 1] relating to overheating condition

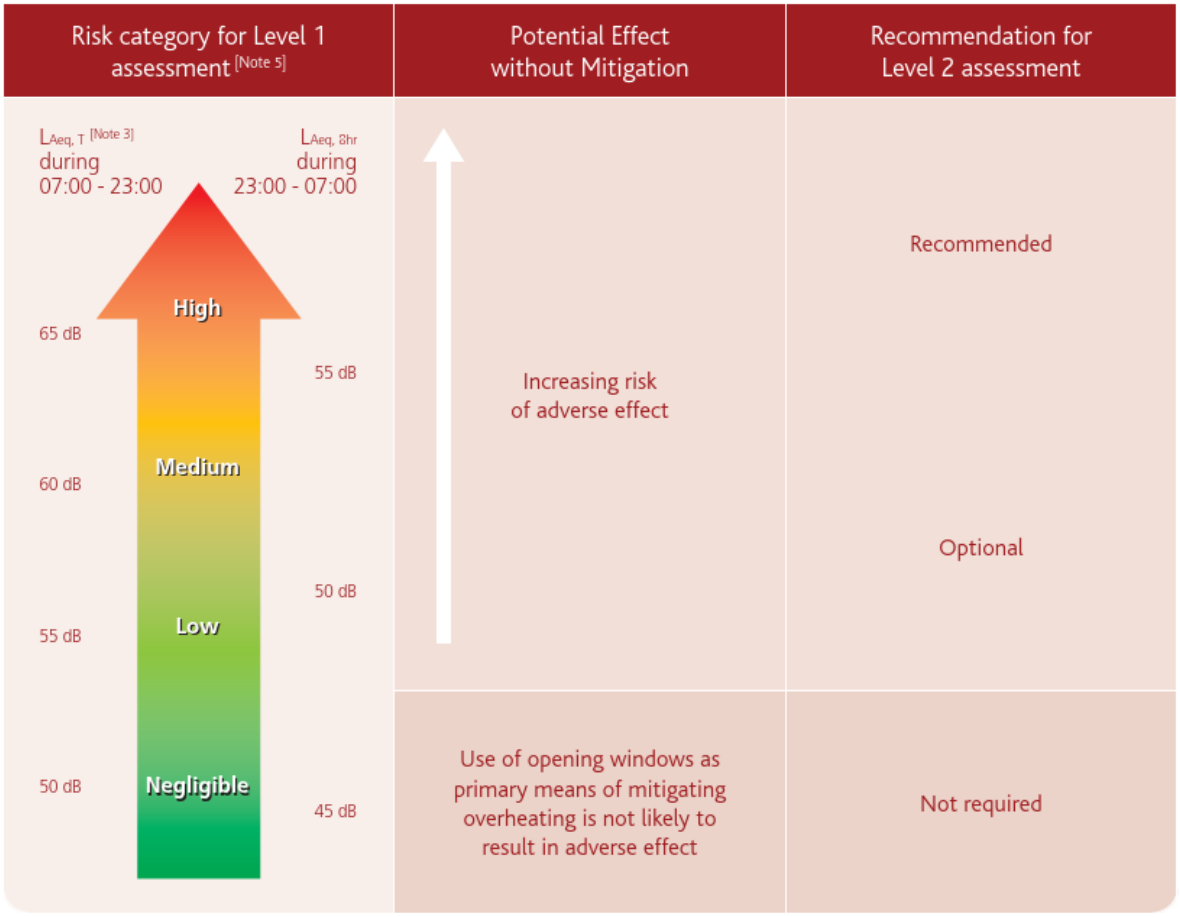

Figure 4 – Reproduction of Table 3-2 of the AVO Guide, showing the Level 1 site risk assessment

Table 3-3 Guidance for Level 2 assessment of noise from transport noise sources[Note 1] relating to overheating condition

Internal ambient noise level [Note 2]			Examples of Outcomes [Note 5]	
$L_{Aeq,T}$ [Note 3] during 07:00 – 23:00 [Note 6]	$L_{Aeq,8h}$ during 23:00 – 07:00	Individual noise events during 23:00 – 07:00 [Note 4]		
> 50 dB	> 42 dB	Normally exceeds 65 dB $L_{AF,max}$	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 $L_{AF,max}$ 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.

Figure 5 – Reproduction of Table 3-3 of the AVO Guide, showing the Level 2 assessment

3.3 Local Authority Requirements

The local authority is the London Borough of Islington (LBI).

Development Plan
The Current Adopted Development Plan for LBI comprises:

- London Plan (March 2021)
- LBI Core Strategy (February 2011)
- LBI Development Management Policies Development Planning Document ('DPD') (June 2013)
- LBI Local Plan Policies Map (June 2013)

Appendix 10 of the Development Management Policies DPD sets out noise exposure categories and standards.

Draft Local Plan
LBI submitted a draft Local Plan to the Secretary of State on 12 February 2020. This comprises the following:

- Draft Islington Local Plan Strategic and Development Management Policies (September 2019) with Modifications for Consultation (March 2021) ('Draft Local Plan 2019, as modified 2021')
- Draft Islington Local Plan Site Allocations (September 2019) with Modifications for Consultation (March 2021) ('Draft Site Allocations 2019, as modified 2021')
- Draft Islington Local Plan Policies Map (September 2019) with Post Submission Policies Map Changes (January 2021) ('Draft Policies Map 2019, as modified 2021')

Appendix 2 of the Draft Local Plan 2019 sets out requirements for Noise Assessments. The Proposed Development has been assessed with respect to these emerging requirements.

Noise standards for residential use
Appendix 2 of the Draft Local Plan 2019 contains effect level values for proposed residential developments affected by transport noise (Table A2.1 of the appendix). These are reproduced in Figure 6.

Table A2.1: Noise levels applicable to noise sensitive residential development proposed in areas of existing transportation noise (road/rail/mixed)

Assessment Location	Period	LOAEL (Green)	LOAEL to SOAEL (Amber)	SOAEL (Red)
1m from a noise sensitive façade	Day	<50dBA $L_{Aeq\ 16\ hour}$	50-72dBA $L_{Aeq\ 16\ hour}$	>72dBA $L_{Aeq\ 16\ hour}$
	Night	<40dBA $L_{Aeq\ 16\ hour}$	40-72dBA $L_{Aeq\ 8\ hour}$ <82dBA L_{AFmax}	>72dBA $L_{Aeq\ 8\ hour}$ >82dBA LAFmax
Inside a resting room (e.g. living room)	Day	<35dBA $L_{Aeq\ 16\ hour}$	35-45dBA $L_{Aeq\ 16\ hour}$	>45dBA $L_{Aeq\ 16\ hour}$
Inside a sleeping room (e.g. bedroom)	Day	<35dBA $L_{Aeq\ 16\ hour}$	35-45dBA $L_{Aeq\ 16\ hour}$	>45dBA $L_{Aeq\ 16\ hour}$
	Night	<30dBA $L_{Aeq\ 8\ hour}$ <42dBA L_{AFmax}	30-40dBA $L_{Aeq\ 8\ hour}$	>40dBA $L_{Aeq\ 8\ hour}$
Inside a dining room	Day	<40dBA $L_{Aeq\ 16\ hour}$	40-45dBA $L_{Aeq\ 16\ hour}$	>45dBA $L_{Aeq\ 16\ hour}$
Outdoor living space (free field)	Day	<50dBA $L_{Aeq\ 16\ hour}$	50-55dBA $L_{Aeq\ 16\ hour}$	>55dBA $L_{Aeq\ 16\ hour}$
Note: Day periods are defined as 0700-2300; night periods are defined as 2300-0700.				

Figure 6: Extract of Table A2.1 of Appendix 2 of the Draft Local Plan 2019 showing noise effect levels applicable to noise sensitive residential development proposed in areas of existing transportation noise (road/rail/mixed)

In addition, internal residential design target upper limits are also given. These are reproduced in Figure 7.

Table A2.2: internal design targets for sound insulation in dwellings

Room type	Noise level
Bedrooms	35dBA $L_{Aeq\ 16\ hour}$†, 30 dBA $L_{Aeq\ 8\ hour}$*, 45dBA L_{AFmax}*
Living rooms	35dBA $L_{Aeq\ 16\ hour}$†
Dining rooms	40dBA $L_{Aeq\ 16\ hour}$†
* - Night-time between 23:00-07:00; † - Daytime between 07:00-23:00.	

Figure 7: Extract of Table A2.2 of Appendix 2 of the Draft Local Plan 2019 showing internal design targets (upper limits) for internal ambient noise levels in dwellings

The 10th highest individual L_{AFmax} event in any night should be determined and the noise level from this event will be used to inform the above mitigation design target.

Industrial and Commercial Noise Sources

The following requirements are provided in Appendix 2 of the Draft Local Plan 2019:

> *16. To assess industrial and commercial noise sources, BS4142:2014 'Methods for rating and assessing industrial and commercial sound' must be used. The following criteria will apply:*
>
> *"The design and installation of new items of fixed plant shall be such that when operating the cumulative noise level $L_{Aeq\ Tr}$ arising from the proposed plant, measured or predicted at 1m from the*

facade of the nearest noise sensitive premises, shall be a rating level of at least 5dB(A) below the background noise level $L_{AF90Tbg}$. The measurement and/or prediction of the noise should be carried out in accordance with the methodology contained within BS4142:2014."

17. Where installations of mechanical plant are proposed, a noise assessment with valid predictions must submitted as part of the application. The background sound level will be defined as the typical minimum value. Any assessment should include a valid assessment of the acoustic features. Where data is not available for plant, site measurement to verify this will be required. As per BS4142:2014, any assumptions made for character will need to be justified and may need further analysis to validation. It is advised that a post installation verification report is carried out, with noise measurements of the plant, to demonstrate compliance with the design criterion.

19. Standby and emergency plant noise is a growing noise issue with the Borough. With emergency or standby plant, the same criteria will apply.

Internal Sound Insulation

The following requirements for sound insulation and mixed use buildings are provided in Appendix 2 of the Draft Local Plan 2019:

22. Any development which includes residential floorspace adjacent to non-residential uses must submit an assessment of the internal sound transfer, including for any development which may increase noise impacts in existing multi-use buildings. Some examples of where an assessment would be required are:

- *a new development incorporating an A4 bar on the ground floor and residential flats above;*
- *conversion of an existing ground floor A1 shop to an A3 restaurant where there is an existing residential flat above; or*
- *conversion of an office sharing a party wall with a light industrial use into a residential dwelling*

23. In some cases, an airborne sound insulation standard will be specified rather than requiring compliance with a noise rating criterion.

24. Party walls, floors and ceilings between the non-residential premises and residential floorspace should be designed to achieve the following minimum airborne sound insulation weighted standardised level difference:

- *For A4 premises, D1\D2 premises such as places of worship, concert halls, community space for hire or B2\B8 industrial premises, standards will be judged on a case by case basis depending on the exact nature of the use. Greater than 60dB $D_{nT,w+}C_{tr}$ is likely to be necessary*
- *For A3 or A5 premises or large A1 cafes, shops and supermarkets: At least 55dB $D_{nT,w+}C_{tr}$*
- *For small A1 cafés or shops: At least 50dB $D_{nT,w+}C_{tr}$*

25. Where non-residential uses are placed above residential floorspace there are likely to be impact noise issues. An impact sound insulation limit will be specified. These will be determined on a case by case basis and in such cases specialist advice and assessment will be necessary.

Proposed modifications to these standards are provided in the Islington *Strategic and Development Management Policies – Modifications for consultation* document (March 2021). The modified text is reproduced, with changes identified in blue and ~~red~~.

22. Any development which includes residential floorspace adjacent to non-residential uses must submit an assessment of the internal sound transfer, including for any development which may increase noise impacts in existing multi-use buildings. Some examples of where an assessment would be required are:

- *a new development incorporating an ~~A4~~ bar (Sui Generis) on the ground floor and residential flats above;*

- *conversion of an existing ground floor premises ~~A1 shop~~ to an ~~A3~~ restaurant where there is an existing residential flat above; or*
- *conversion of an office sharing a party wall with a light industrial use into a residential dwelling*
- *conversion of an existing ground floor shop to a gym or nursery where there is an existing residential flat above*

23. In some cases, an airborne sound insulation standard will be specified rather than requiring compliance with a noise rating criterion.

24. Party walls, floors and ceilings between the non-residential premises and residential floorspace should be designed to achieve the following minimum airborne sound insulation weighted standardised level difference:

- *For ~~A4 premises~~ drinking establishments, ~~D1\D2~~ Sui Generis/F.2 premises such as places of worship, concert halls, community space for hire or B2\B8 industrial premises, standards will be judged on a case by case basis depending on the exact nature of the use. Greater than 60dB DnT,w + Ctr is likely to be necessary*
- *For cafes and restaurants ~~A3~~ or ~~A5~~ Take away premises or large ~~A1 cafes, shops~~ and supermarkets: At least 55dB DnT,w + Ctr*

25. Where non-residential uses are placed above residential floorspace or high impact generating uses such as gyms are placed on the ground floor and residential above there are likely to be impact noise issues. An impact sound insulation limit will be specified. These will be determined on a case by case basis and in such cases specialist advice and assessment will be necessary.

External Noise Emissions from Internal Activity

The following requirements for the assessment of noise from proposed "new or intensified cultural and/or night-time economy uses" are provided in Appendix 2 of the Draft Local Plan 2019:

20. Assessments for noise from proposed new or intensified cultural and/or night-time economy uses must include consideration to amplified and unamplified music, human voices, footfall and vehicle movements and other general activity. The criteria in Table A2.3 must be used to measure and assess the noise impact including LAeq and LAFmax metrics and appropriate frequencies. Where it is not possible to achieve suitable and sufficient internal noise levels for proposed noise sensitive receptors despite appropriate mitigation proposals, due to the totality of noise from existing entertainment venues, then planning permission will not be granted.

Table A2.3 of the Appendix is reproduced in Figure 8.

Table A2.3: Noise limits for entertainment noise

Position	Time	Criteria
External	0900-2300	$L_{Aeq,5min}$ EN minus $L_{Aeq,5min}$ or $L_{A90,5min}$ WEN = 0 to +5 dBA
		$L_{Ceq,5min}$ EN minus $L_{Ceq,5min}$ or $L_{C90,5min}$ WEN = 0 to +5 dBC
	2300-0900	$L_{Aeq,5min}$ EN minus $L_{Aeq,5min}$ or $L_{A90,5min}$ WEN = -5 to +3 dBA
		$L_{Ceq,5min}$ EN minus $L_{Ceq,5min}$ or $L_{C90,5min}$ WEN = -10 to +3 dBC
Internal	0900-2300	EN = Noise Rating NR25-35 Leq,5mins
		$L_{Ceq,5min}$ EN minus $L_{Ceq,5min}$ or $L_{C90,5min}$ WEN = -10 to +5 dBC
	2300-0900	EN = Noise Rating NR15-25 Leq,5mins
		$L_{Ceq,5min}$ EN minus $L_{Ceq,5min}$ or $L_{C90,5min}$ WEN = -10 to 0 dBC
EN = Representative, or predicted, entertainment noise level WEN = Representative noise level without the entertainment noise, measured or predicted 1 m from the facade of noise-sensitive premises.		

Figure 8: Extract of Table A2.3 of Appendix 2 of the Draft Local Plan 2019 showing noise limits for entertainment noise

4.0 NOISE SURVEY

4.1 Measurements

The noise survey was conducted by WSP, who provided the raw survey data for use in this report. WSP are full members of the Association of Noise Consultants.

The noise survey consisted of six unattended long-term measurements and seven attended short-term (spot) measurements. All measurements were undertaken in October 2019 with the exception of long-term measurement P7, which took place in June 2021. Measurement locations are shown on Figure 9.

Measurements are summarized in Table 2 (short-term measurements) and Table 3 (long term measurements).

Table 2: Short-term night-time measurement summary information

Measurement Location	Type	Date and time	Duration	Description
A	Short term attended	03/10/2019 00:14:13	5 min	On Trecastle Way (1.5m AGL, free-field)
B	Short term attended	03/10/2019 00:22:51	5 min	On Penderyn Way (1.5m AGL, free-field)
C	Short term attended	03/10/2019 00:40:57	5 min	On Bakerside, easternmost point (1.5m AGL, free-field)
D	Short term attended	03/10/2019 00:51:43	5 min	On Crayford Road, easternmost point (1.5m AGL, free-field)
E	Short term attended	03/10/2019 01:01:45	5 min	Within Holloway Estate, westernmost point (1.5m AGL, free-field)
F	Short term attended	03/10/2019 01:09:29	5 min	On Parkhurst Road, between Islington Arts Factory and adjacent flats (1.5m AGL, free-field)
G	Short term attended	03/10/2019 01:19:23	5 min	Just off Dalmeny Avenue, in courtyard next to flats 52-70 & 72-122 (1.5m AGL, free-field)

Table 3: Long-term measurement summary information

Measurement Location	Type	Start date and time	End date and time	Notes
P1	Long term unattended	01/10/2019 12:00	01/10/2019 15:00	Survey ended after 3 hrs
P2	Long term unattended	01/10/2019 12:00	07/10/2019 10:00	
P3	Long term unattended	01/10/2019 12:00	05/10/2019 03:00	
P4	Long term unattended	01/10/2019 12:00	07/10/2019 11:00	
P5	Long term unattended	01/10/2019 13:00	02/10/201915:00	
P6	Long term unattended	01/10/2019 13:00	07/10/2019 11:00	
P7	Long term unattended	23/06/2021 16:00	27/06/2021 17:00	

Figure 9: Measurement locations (short-term: A-G, long-term: P1-P7)

4.2 Results

Noise levels from the short-term measurements are reported on Table 4.

Table 4: Short term night-time measurement results

Location	L_{AFmax} dB	$L_{Aeq,5m}$ dB	$L_{AF10,5m}$ dB	$L_{AF90,5m}$ dB	Notes
A	63	38	38	34	Quiet (away from significant source), distant road traffic clear and dominant
B	52	37	39	35	Quiet (away from significant sources), distant road traffic clear and dominant, cyclist arriving home (door slam)
C	58	38	40	35	Quiet (away from significant source), distant road traffic clear and dominant, sirens briefly
D	51	40	42	36	Quiet (away from significant source), distant road traffic clear and dominant, single car locally
E	55	43	45	38	Quiet (away from significant source), distant road traffic clear and dominant, sirens briefly
F	76	65	70	48	Frequent traffic on Parkhurst Road dominant
G	58	44	45	40	Quiet (away from significant source), distant road traffic clear and dominant + plus local "fan" type noise (possibly from boiler flue)

Table 5 reports the measured noise levels at the long-term measurement locations.

Daytime refers to 07.00-23.00. Night-time refers to 23.00-07.00.

Table 5: Summary long term measurement results

Location	$L_{Aeq,daytime}$ dB	$L_{Aeq,night\text{-}time}$ dB	$L_{A90,15min,day}$ dB(1)	$L_{A90,15min,night}$ dB(1)	L_{AFmax} dB(2)
P1	70(3)	-	-	-	-
P2	52	48	45	40	63
P3	49	42	38	34	62
P4	54	51	47	42	66
P5	52	45	42	38	62
P6	49	44	39	36	59
P7	69	66	59	50	85

Notes:
(1) The representative LA90 is derived by the 40th percentile value of 15 minute measurements (see below)
(2) The L_{AFmax} is the 10th highest event recorded during the night-time on average across the measurement period
(3) 3 hour measurement only

Representative background noise level

BS 4142:2014 seeks to determine a "representative" background sound level, stating that "…the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods". A definitive method of selecting a representative background sound level is not prescribed in BS 4142:2014, although an example is presented where the modal value is selected from a statistical analysis.

In our experience, a reasonable approach is to adopt the repeatable method of selecting the 40th percentile value of the L_{A90} data periods. This generally accounts for potentially unrepresentative high values and untypical events, while usually representing values near the median of the remaining 'valid' distribution.

The emerging LBI requirements are that the assessment is to be undertaken in accordance with BS 4142:2014 and that background noise is to be defined as "typical minimum". The approach of taking the 40th percentile is considered consistent with the emerging LBI requirements.

5.0 NOISE IMPACT ASSESSMENT

5.1 Predicted Façade Noise Levels

To assess the impact of environmental noise on the facades of the proposed development, an environmental noise model was created with the industry standard 3D modelling software package SoundPlan. The contribution of noise from nearby roads was estimated using data from the attended and unattended noise survey measurements in conjunction with noise data published by the Department for Environment, Food and Rural Affairs (DEFRA) external noise-mapping. Noise models were generated for average daytime, average night-time and maximum night-time scenarios.

Façade noise maps of the modelled scenarios are shown in this section.

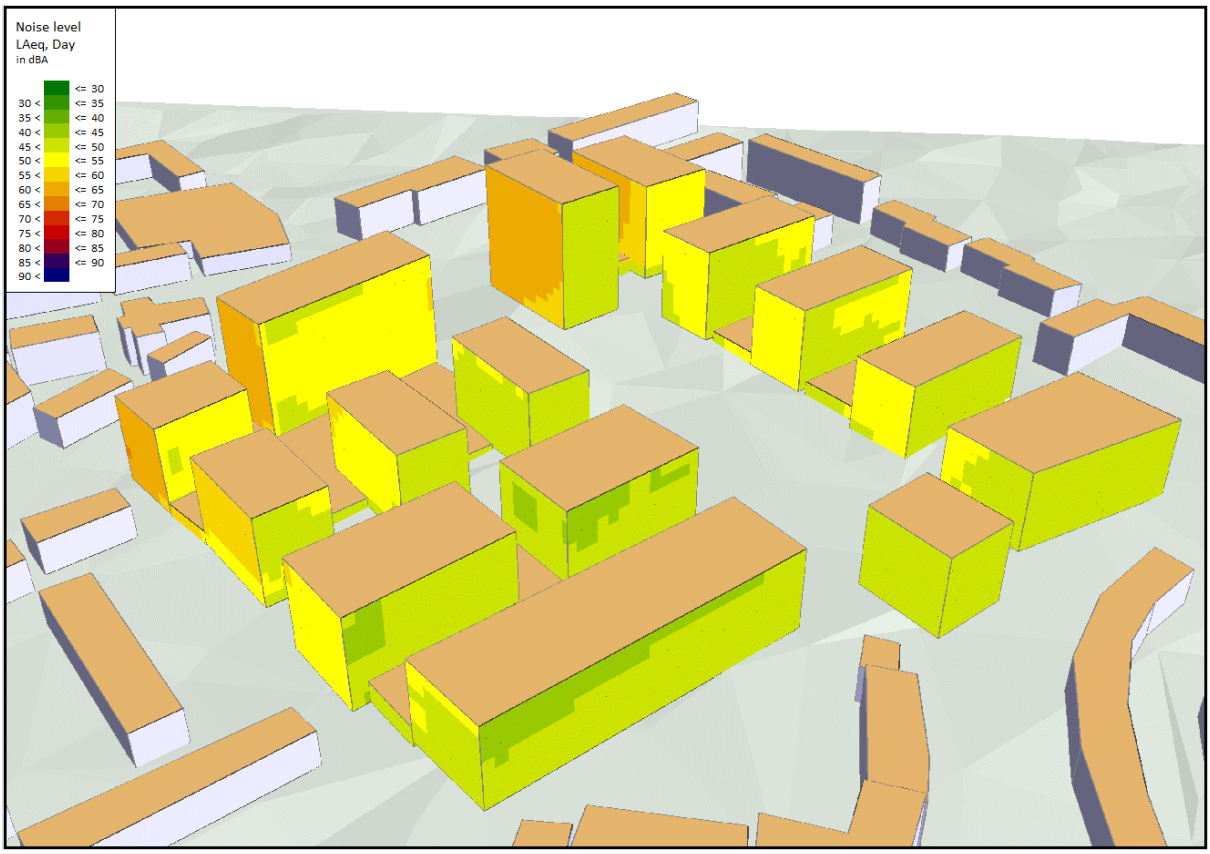

Figure 10: Average noise levels, daytime, view from north

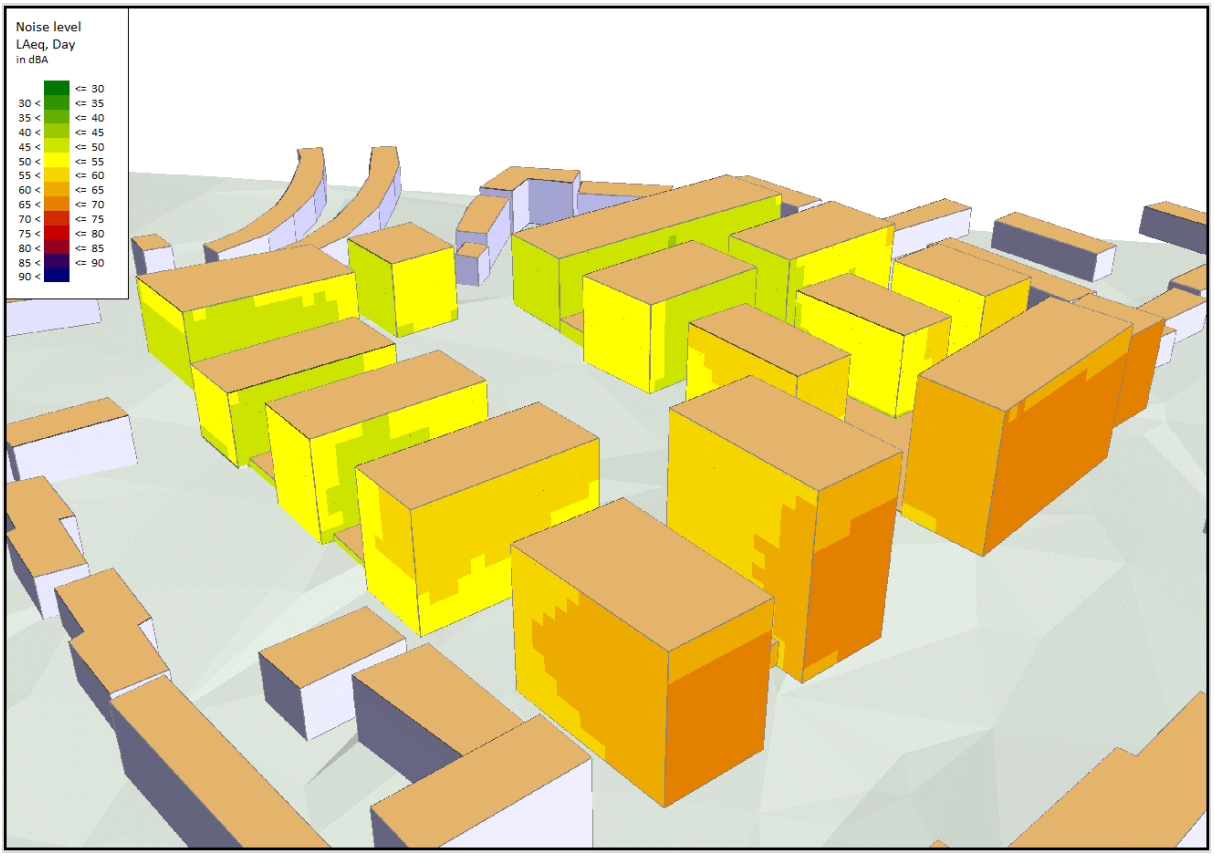

Figure 11: Average noise levels, daytime, view from south

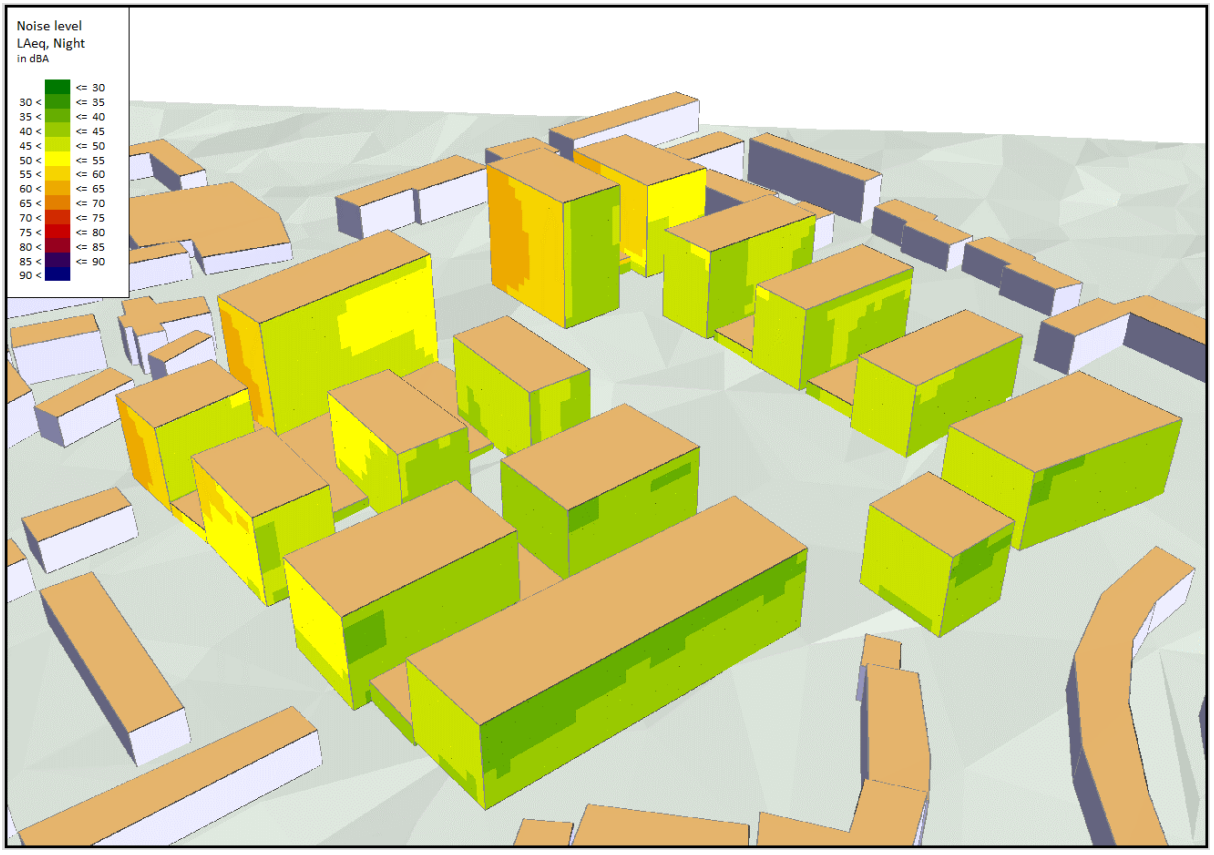

Figure 12: Average noise levels, night-time, view from north

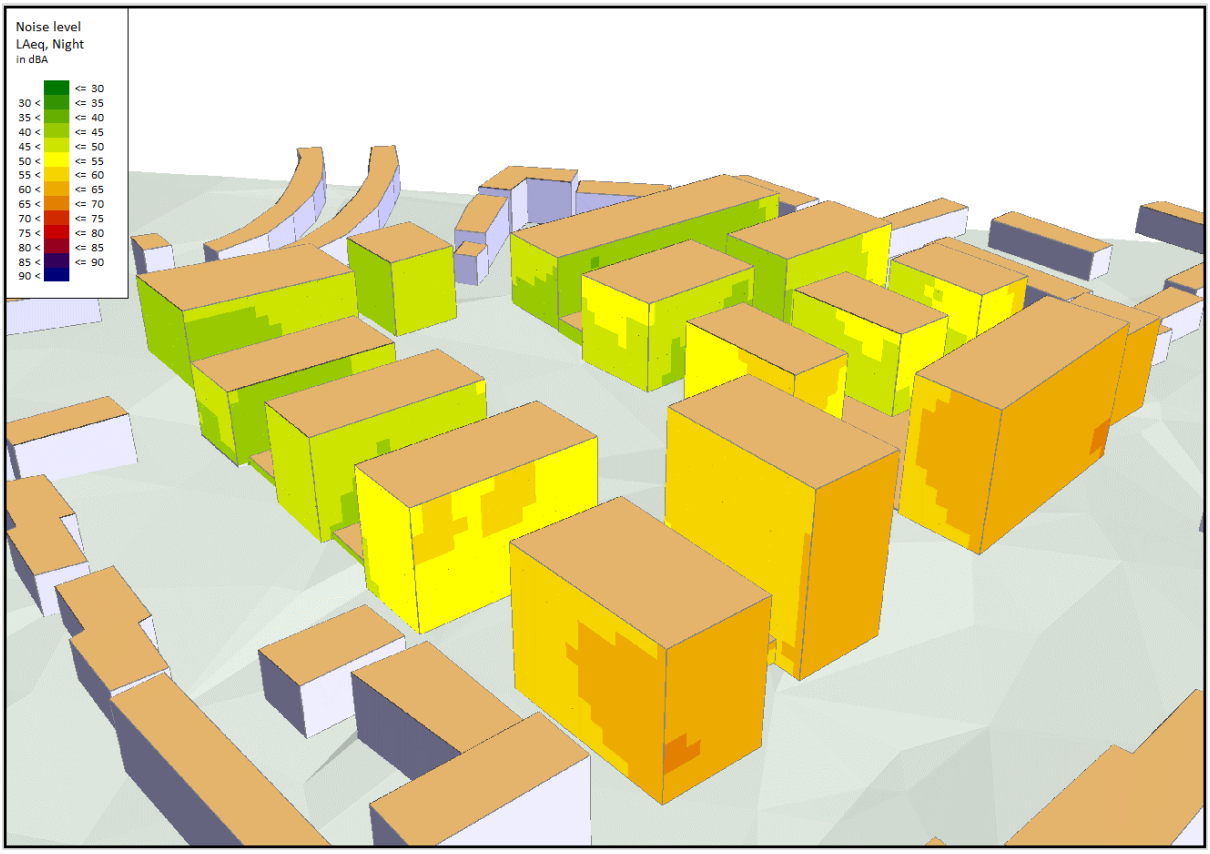

Figure 13: Average noise levels, night-time, view from south

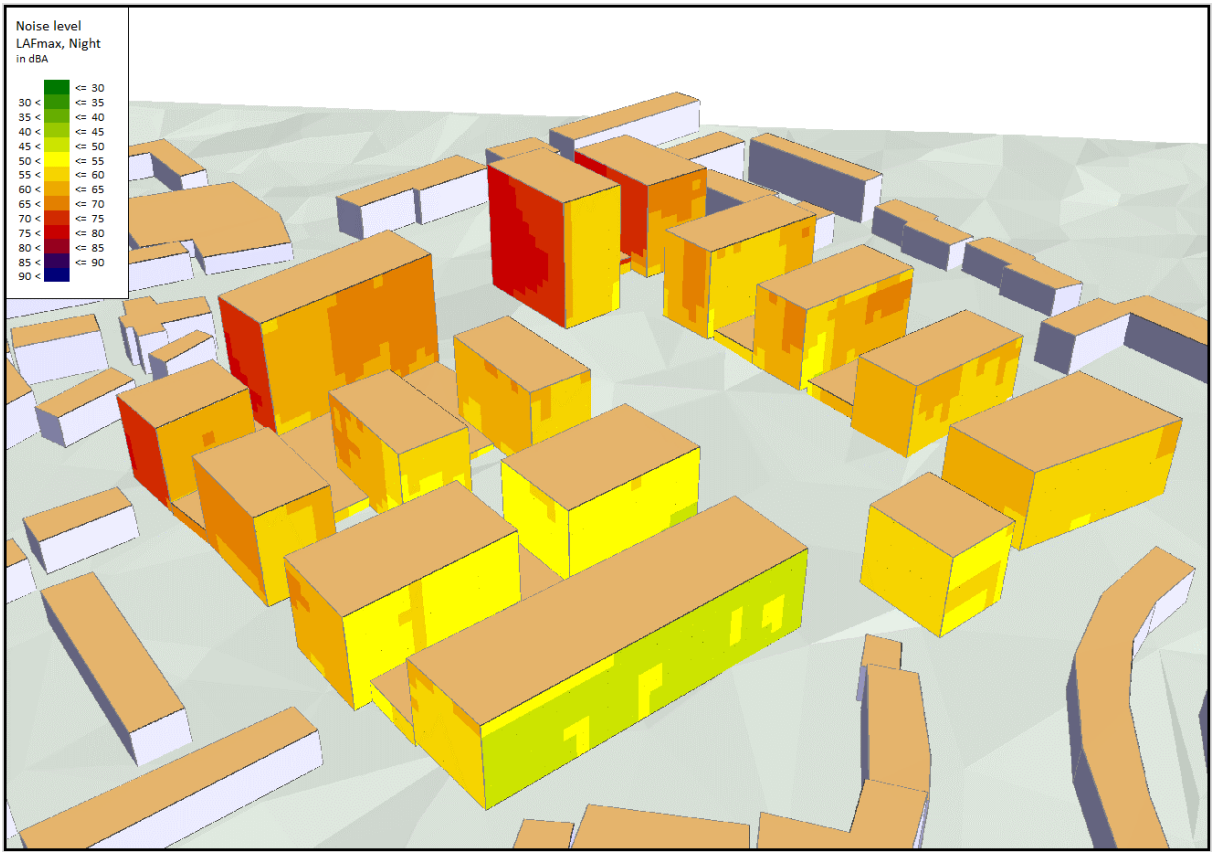

Figure 14: Maximum noise levels, night-time, view from north

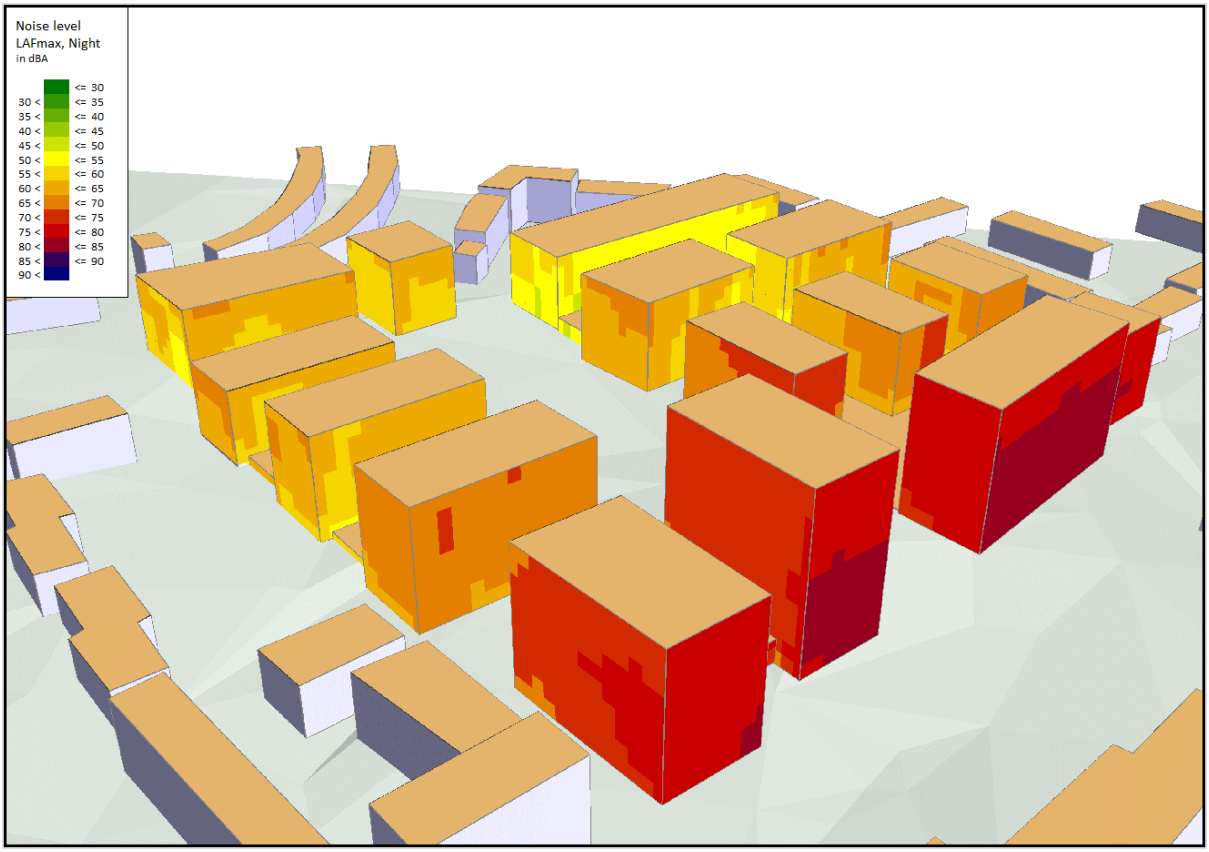

Figure 15: Maximum noise levels, night-time, view from south

5.2 ProPG Initial Site Risk Assessment and AVO Level 1 Site Risk Assessment

The predicted daytime average façade noise levels are generally in the range 40-70 dBA and night-time average façade noise levels generally in the range 35-65 dBA. This indicates a wide range of noise exposure risk on the site, primarily dependent on proximity and line-of-sight to Camden Road/Parkhurst Road.

ProPG Initial Site Risk Assessment
During the daytime, road-facing facades may experience a medium/high risk of adverse effect, whilst at quieter parts of the site, the risk may be negligible. At night-time, road facing facades may experience a high risk of adverse effect at whilst quieter parts of the site a negligible risk can be expected.

At the higher levels of risk, the ProPG pre-planning application guidance is as follows:

> *"High noise levels indicate that there is an increased risk that development may be refused on noise grounds. This risk may be reduced by following a good acoustic design process that is demonstrated in a detailed ADS. Applicants are strongly advised to seek expert advice.*
>
> *"As noise levels increase, the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised, and which clearly demonstrate that a significant adverse noise impact will be avoided in the finished development."*

AVO Level 1 Site Risk Assessment
Similarly, an AVO Level 1 assessment suggests negligible to high risk, depending on proximity to Camden Road/Parkhurst Road. The recommendation is therefore to consider internal noise levels in more detail as part of a Level 2 assessment.

5.3 Internal Ambient Noise Levels (From Transportation Sources)

In order to achieve the appropriate noise levels within dwellings (defined in section 3.3), the façade must provide a minimum sound insulation performance. This is calculated based on the noise level incident on the façade and the required internal noise level. An outside-to-inside level difference is obtained from these values for different types of room at a given façade location, and then a required sound insulation performance of the façade elements can be calculated.

The key parts of the façade to be considered are: solid elements, glazing and any ventilation openings.

Ventilation Openings
Approved Document F "whole dwelling" ventilation is to be provided to each dwelling via a mechanical ventilation and heat recovery (MVHR) system. Opening windows would therefore not be required for ventilation.

The ventilation system should be designed so as to not compromise the sound insulation performance of the façade. This will likely involve in-duct attenuators.

It should be noted that internal noise level targets are generally not applicable under purge ventilation conditions (as defined in Building Regulations Part F).

External Glazing
As ventilation will be provided by a ducted system, the performance of the façade is primarily dependent on the acoustic performance of external windows.

This assumes the solid elements of the façade are relatively acoustically robust, with a minimum required performance of approximately 52 dB R_w. This is achievable with typical cavity masonry constructions.

An example internal noise level calculation for the most affected bedroom is provided in the Appendix.

The acoustic performance required of external glazing to meet the internal noise level upper limits in living rooms is shown in Figure 16 and Table 6 below. The colours in the mark-up refer to the colours in the table.

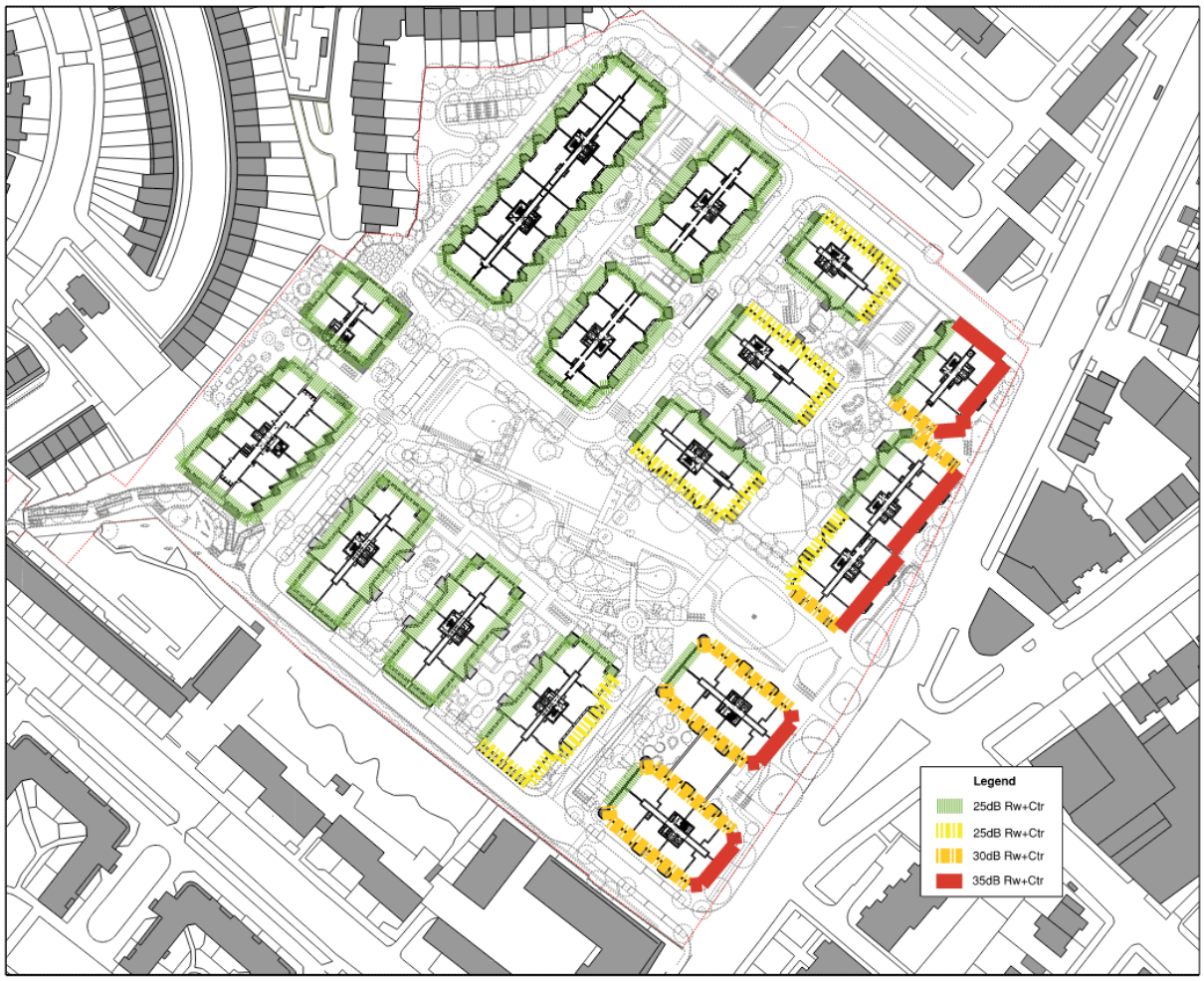

Figure 16 – Required glazing performance for external living room windows

Table 6: Glazing performance and example build-ups for external living room windows

Daytime average façade noise level $L_{Aeq,16hr}$	Min. acoustic performance R_w+C_{tr}	Example glazing build-up
< 55dB	25 dB	Any standard double glazing
55 - 60dB	25 dB	Any standard double glazing
60 - 65dB	30 dB	6-12-6 or 4-14-6 double glazing or similar
65 - 70dB	35 dB	6-12-10.8lam double glazing with an acoustic laminate pane

The acoustic performance required of external glazing to meet the internal noise level upper limits in bedrooms is shown in Figure 6 and Table 7. The colours in the mark-up refer to the colours in the table.

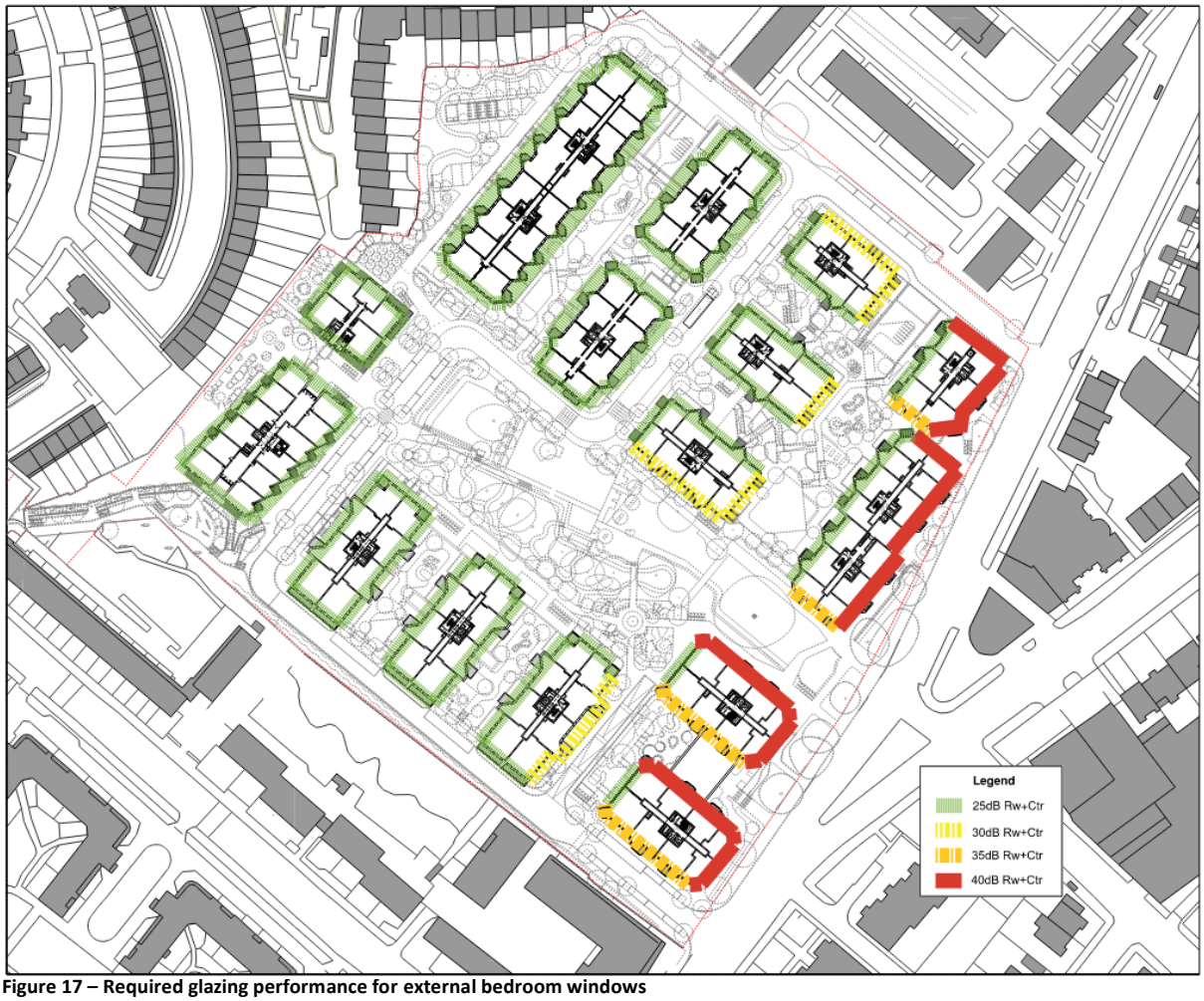

Figure 17 – Required glazing performance for external bedroom windows

Table 7: Glazing performance and example build-ups for external bedroom windows

Night-time average noise level $L_{Aeq,8hr}$	Night-time maximum noise level L_{AFmax}	Min. acoustic performance R_w+C_{tr}	Example glazing build-up
< 55dB	< 70dB	25 dB	Any standard double glazing
55 - 60dB	70 - 75dB	30 dB	6-12-6 or 4-14-6 double glazing or similar
60 - 65dB	75 - 80dB	35 dB	6-12-10.8lam double glazing with an acoustic laminate pane
65 - 70dB	80 - 85dB	40 dB	Very robust double glazed unit (both elements laminated) or internal secondary glazed element (in combination with double glazing)

5.4 Acoustics and Overheating

The client intention is to provide overheating mitigation by passive means for as much of the Development as possible, i.e. the desire is to avoid providing active cooling. However, providing passive façade openings (e.g. opening windows or louvres) compromises the overall acoustic performance of a façade, meaning higher internal noise levels are to be expected. Acoustic comfort should therefore be considered in dwellings during the overheating condition.

The AVO Guide Level 2 assessment provides a framework with which to assess internal ambient noise levels relating to the overheating condition. For this Development, a strategy is proposed that is sensitive to the risk categories defined in the Level 2 assessment:

- Daytime: using passive openings, avoid exceeding **45 dB L_{Aeq}** across as much of the Development as possible;
- Night-time: using passive openings, avoid exceeding **40 dB L_{Aeq}** across as much of the Development as possible.

Achieving these targets is consistent with:

- not exceeding the LBI SOAEL for internal noise levels in living rooms and bedrooms (daytime) and bedrooms (night-time);
- meeting a level that is 5 dB (daytime) and 2 dB (night-time) below the AVO Level 2 assessment "red" categories where noise may result in a material change in behaviour;
- is consistent with meeting the Approved Document [X] – Overheating (January 2021 consultation document) requirement to "not normally exceed" the night-time upper limit of 40 dB $L_{Aeq,T}$.

It is proposed that these internal noise levels are achieved by providing passive façade openings equivalent to approximately 3% of the floor area of a domestic room. This is 50% more than the assumption in the Level 1 assessment of the AVO Guide that a "partially open window" would provide 13 dB outside-to-inside level difference.

In our estimation, a partially opening window providing an open area of approximately 3% of the floor area can achieve an outside-to-inside level difference of approximately 10 dB. Acoustically attenuating louvres can achieve improvement upon this.

The strategy is to therefore:

- provide opening windows to mitigate overheating where external noise levels allow this;
- provide acoustically attenuating louvres where external noise levels are too high to achieve the internal targets with opening windows;
- provide mechanical cooling via tempered MVHR systems where the external noise levels are too high to achieve the targets in a practical way with any passive openings.

It should be noted that all dwellings will be provided with openable windows. If an occupant chooses to open windows to provide higher free areas than would be required to achieve the proposed internal noise levels, then higher noise levels are to be expected.

A potential daytime acoustic façade strategy to meet the proposed internal noise level upper limits in the overheating condition is shown in Figure 18 and Table 8. The colours in the mark-up refer to the colours in the table.

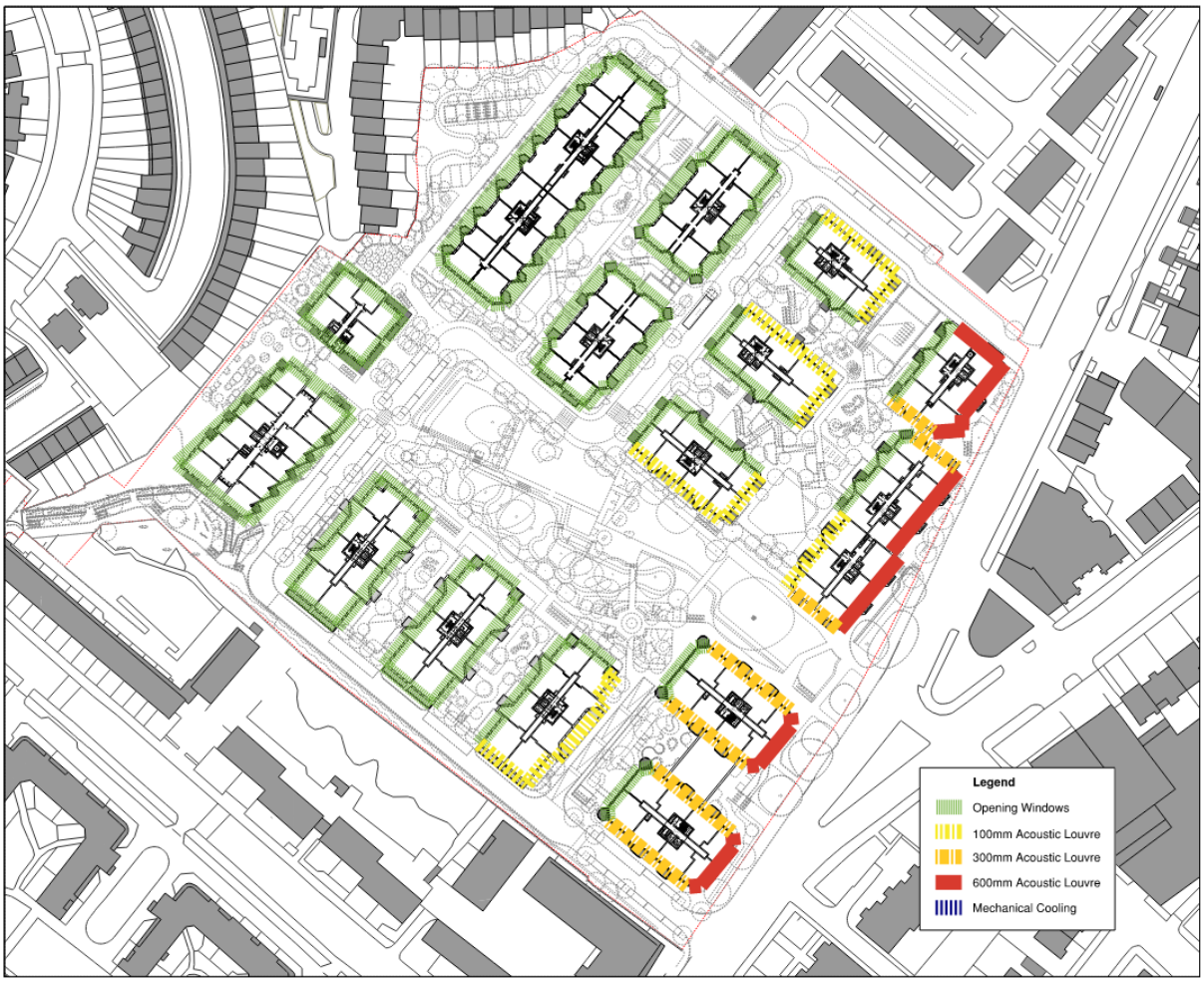

Figure 18 – Potential daytime acoustic façade strategy for overheating conditions (living rooms)

Table 8: Potential passive openings for acoustic façade strategy for overheating conditions (living rooms)

Daytime average noise level, $L_{Aeq,16hr}$	Acoustic façade strategy for overheating conditions
< 55dB	Opening Windows
55 - 59dB	100 mm acoustic louvre
60 - 65dB	300 mm acoustic louvre
65 - 67dB	610 mm acoustic louvre
> 67	Mechanical cooling

A potential night-time acoustic façade strategy to meet the proposed internal noise level upper limits in the overheating condition is shown in Figure 19 and Table 9. The colours in the mark-up refer to the colours in the table.

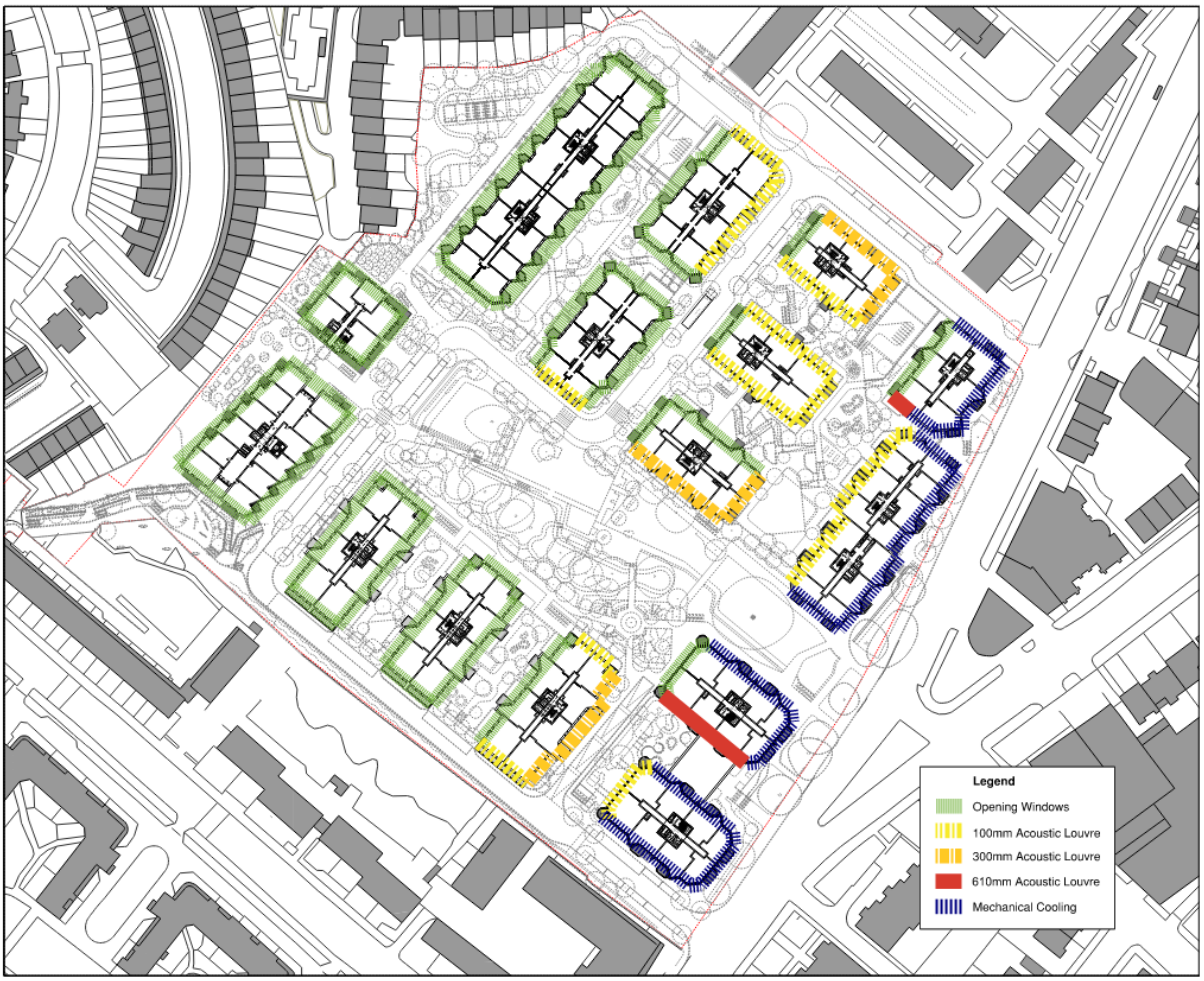

Figure 19 – Potential night-time acoustic façade strategy for overheating conditions (bedrooms)

Table 9: Potential passive openings for acoustic façade strategy for overheating conditions (night-time)

Night-time average noise level, $L_{Aeq,8hr}$	Acoustic façade strategy for overheating conditions
< 50dB	Opening Windows
50 - 54dB	100 mm acoustic louvre
55 - 60dB	300 mm acoustic louvre
60 - 62dB	610 mm acoustic louvre
> 62	Mechanical cooling

The acoustic mark-ups show potential façade strategies to meet acoustic requirements only. The overall façade and overheating strategy for any given dwelling should be coordinated with the client and architect at subsequent design stages.

The potential strategies are based on acoustic data for specific acoustic louvres. Should different products be specified, then the strategy (i.e. the ranges) may shift depending on the performance of the product.

5.5 External Amenity Space

The façade noise maps show that daytime average noise levels range between 40-70 dBA across the development. This is primarily dependent on proximity and line-of-sight to Camden Road/Parkhurst Road. Noise levels at private external balconies therefore fall within all three noise effect levels given in Appendix 2 of the Draft Local Plan 2019.

The majority of Camden Road/Parkhurst Road facing balconies on Buildings B4, B5, B6, C1 and C2 have partial-height solid balustrades, which will provide some shielding from direct noise from the roads.

Other external amenity space is also to be provided as part of the Development. Predicted noise levels at these locations are given in Table 10

Table 10: Predicted noise levels at communal external amenity space

Open Space	Description	Predicted noise level ($L_{Aeq,T}$)
Public Garden	Central public open space within the Development. Publicly accessible.	50-65 dB (depending on location)
Nature Garden	Public open space north-west of Plot A. Publicly accessible.	<50 dB
Women's Garden	Garden that serves the Women's Building to Plot C. Not publicly accessible.	45-55 dB
Communal Resident Garden	Communal Garden serving residents of Plot A.	45-50 dB
Communal Resident Garden	Communal Garden serving residents of Plot B.	50-60 dB
Communal Resident Garden	Communal Garden serving residents of Plot D.	50-55 dB
Communal Resident Garden	Communal Garden serving residents of Plot E.	45-55 dB
Extra Care Garden	Garden that serves the 60 extra care homes to Plot E.	<50 dB
Rooftop Gardens	Communal gardens at roof level which serve the residents of Plot A	~51 dB
Rooftop Gardens	Communal gardens at roof level which serve the residents of Plot B	55-60 dB
Rooftop Gardens	Communal gardens at roof level which serve the residents of Plot C	55-60 dB
Rooftop Gardens	Communal gardens at roof level which serve the residents of Plot D	50-55 dB
Rooftop Gardens	Communal gardens at roof level which serve the residents of Plot E	<50 dB

As with private balconies, the predicted noise levels at communal external amenity space is also expected to vary, depending on location, across all noise effect levels given in Appendix 2 of the Draft Local Plan 2019.

BS 8233 and ProPG

BS 8233:2014 provides the following criteria for noise levels in external amenity space:

"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."

The ProPG Stage 2 Assessment (Element 3: External Amenity Area Noise Assessment) makes reference to BS 8233 and also provides further commentary on assessing noise in external amenity space where guideline upper limits are not met:

"Where, despite following a good acoustic design process, significant adverse noise impacts remain on any private external amenity space (e.g. garden or balcony) then that impact may be partially off-set if the residents are provided, through the design of the development or the planning process, with access to: ….

- *a relatively quiet, protected, nearby, external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings; and/or*
- *a relatively quiet, protected, publically accessible, external amenity space (e.g. a public park or a local green space designated because of its tranquillity) that is nearby (e.g. within a 5 minutes walking distance)."*

Whilst some private balconies and parts of the communal external amenity space exceed the recommended levels defined in BS 8233:2014, there are parts of the Development that do provide sufficiently quiet noise levels. This may therefore serve to partially offset the impact of the noisier external areas.

5.6 External Noise Emissions from Internal Activity

As part of the Women's Building, building C1 is to contain a Large Multipurpose Room that may be used for large scale functions such as dance, theatre and conferences. Amplified music and speech is therefore to be expected.

The noise emissions criteria contained in Table A2.3 of the Draft Local Plan 2019 (see Figure 8) are defined at a point 1m from the façade of noise sensitive premises in relation to existing background (L_{A90} and L_{C90}) or ambient (L_{Aeq} and L_{Ceq}) noise.

The nearest existing noise sensitive receptor to the Large Multipurpose Room is NSR SE with the nearest façade approximately 54m from Building C1. The adopted measured background noise levels at this location are 59 dB L_{A90} (daytime) and 50 dB L_{A90} (night-time). Ambient noise levels (L_{eq}) are higher so it is therefore conservative to design to meet the Table A2.3 targets relative to background noise levels. Measured noise levels have been provided in terms as single-figure A-weighted values.

The representative or predicted entertainment noise levels ("EN") should therefore be no more than 64 dB $L_{Aeq,5min}$ during the daytime (09.00-23.00) and 53 dB $L_{AEq,5min}$ at night (23.00-09.00).

Non-residential elements of Plot C are to be mechanically ventilated and cooled. The acoustic performance of the façade is therefore dependent on the performance of the glazing, assuming ventilation paths are

appropriately attenuated. It is considered relatively straightforward to meet these targets with moderately enhanced glazing, and that the glazing performance that will be selected to insulate against traffic noise ingress to this space will likely be sufficient to comfortably meet the requirements at the identified nearest existing NSR.

Noise between this space and new residential elements above is to be controlled to meet in situ internal sound insulation requirements (see section 5.8).

5.7 External Noise Emissions from Fixed Plant

Plant Noise Targets at Existing Noise Sensitive Receptors
Plant noise at the nearest existing noise sensitive receptors is to be limited to the values shown in Table 11.

Table 11: Plant noise limits at nearest existing noise sensitive receptors

NSR Ref	Description	Background noise (daytime) dB $L_{A90,15min}$	Background noise (night-time) dB $L_{A90,15min}$ dB	Rating noise upper limit (daytime) $L_{Ar,Tr}$ dB	Rating noise upper limit (night-time) $L_{Ar,Tr}$ dB
N	Dwellings located on the eastern and southern end of Bakersfield Dwellings on Crayford Road Dwellings on Holloway Estate at the end of Parkhurst Road	38	34	33	29
NE	Dwellings within Holloway Estate Dwellings on Parkhurst Road	45	40	40	35
SE	Dwellings within Holloway Estate Dwellings on Parkhurst Road	59	50	54	45
S	Dwellings at 275 Camden Road	47	42	42	37
SW	Dwellings on Dalmeny Avenue	42	38	37	33
NW	Dwellings on Trecastle Way Dwellings on Penderyn Way	39	36	34	31

Daytime: 07.00-23.00 Night-time: 23.00-07.00

Plant Noise Targets at Noise Sensitive Receptors as Part of this Scheme
Noise from plant and building services will be designed to meet the following upper limits at the facades of dwellings forming part of the Development:

- 40 dB $L_{Aeq,T}$ (daytime 07.00-23.00)
- 35 dB $L_{Aeq,T}$ (night-time 23.00-07.00)

Typically, this is a more onerous target than the upper limits for existing receptors due to proximity and potential line of sight.

Noise from plant and building services will be designed so as to not exceed 50 dB $L_{Aeq,T}$ at all external amenity spaces forming part of the Development.

Mechanical Plant Equipment
The most significant noise generating plant equipment to be installed as part of the Development are air source heat pumps located on the roofs of a number of buildings.

The locations are as follows:

- Building A4
- Building B2
- Building C1
- Buildings D1 and D3
- Building E2

In addition, other plant equipment includes:

- a number of VRF units on the roof of Building C2.
- kitchen fans on the roof of Building C2
- ventilation equipment to all occupied spaces including mechanical ventilation and heat recovery (MVHR) units for all dwellings
- a number of potential smaller items of ventilation and cooling plant on Buildings B4, B5 and B6.

Compared to the ASHPs, noise from these items are not expected to be materially significant. Noise from internal MVHR units will be controlled with in duct attenuators as necessary.

The location of the main roof top plant areas is shown in Figure 20.

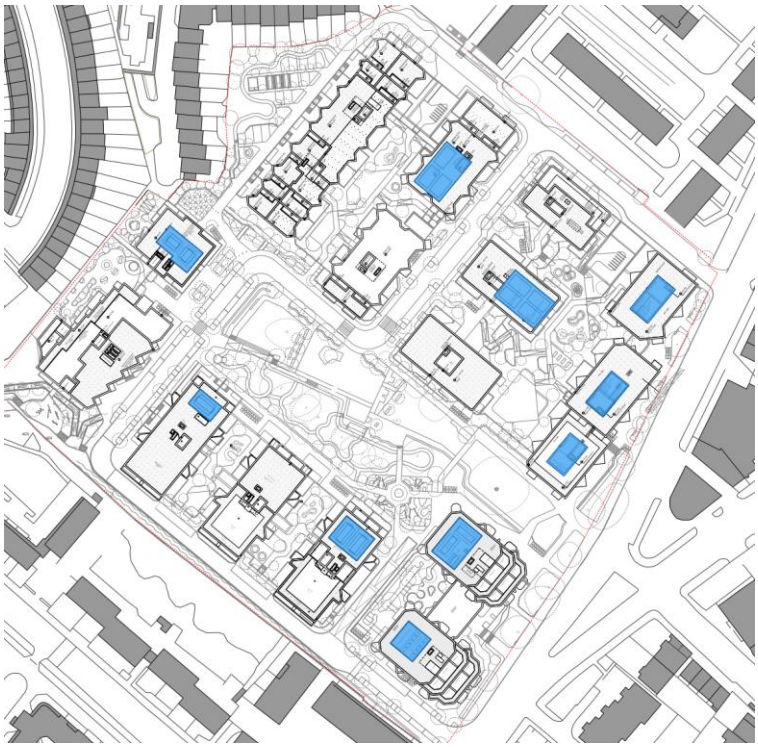

Figure 20: Main roof plant locations shown in blue

Noise Control Strategy
The following noise control strategy is to be implemented at all rooftop ASHP areas:

- all ASHPs to be supplied with “bolt-on” acoustic attenuation kits, with acoustically attenuated air paths to all intakes and exhausts,
- all ASHP plant areas are to be enclosed with a solid-sided noise screen (with an open top), with a minimum height equal to the height of all equipment within the enclosure,
- some ASHPs to incorporate night-time “set-back” to limit noise levels at night where necessary. This may be required at some locations e.g. where night-time background noise level is low, or where there are a large number of heat pumps on a particular roof.

The VRF units on Building C2 do not need attenuation packs but will be located within a solid sided enclosure.

Plant Noise Assessment
In order to demonstrate the noise control strategy is capable of meeting the targets, a plant noise emissions calculation is provided in the appendix for one of the most affected noise sensitive receptors – a Holloway Estate building located at the north-western end of Parkhurst Road, at the northern corner of the Development site. It can be seen that the LB Islington requirements are met, and that a BS 4142 assessment suggests that

the specific sound source would have a low impact, depending on the context. The overall scheme is therefore expected to meet the requirements at all NSR locations.

Emergency Plant
The Development includes an emergency generator. This is located internally in the lower ground floor of Block A. Air inlets and outlets can be provided with in duct attenuation in order to meet the requirements defined in section 3.3.

5.8 Internal Sound Insulation

The lower floors of some plots include non-residential uses. Table 12 presents a review of separating walls and floors between dwellings and non-residential uses, with an adopted in situ airborne sound insulation performance based on the LBI requirements described in section 3.3.

Table 12: Identified adjacencies between non-residential uses and residential rooms

Building	Element	Non-Resi use	Non-resi floor	Resi floor	Min. In Situ Performance $D_{nTw}+C_{tr}$
B6	Wall	Commercial	UG	UG	55
B6	Floor	Commercial	LG	UG	55
B6	Floor	Commercial	UG	1	55
B5	Wall	Commercial	UG	UG	55
B5	Floor	Commercial	LG	UG	55
B5	Floor	Commercial	UG	1	55
B4	Wall	Commercial	UG	UG	55
B4	Floor	Commercial	UG	1	55
C1	Floor	Women's Building potential Multipurpose Room (Small/Medium)	UG	1	50
C1	Floor	Women's Building potential Multipurpose Room (Large – Double height)	UG	1	65
C2	Floor	Women's Building potential creche	UG	1	55
C2	Floor	Women's Building potential café	UG	1	55
C2	Floor	Women's Building potential Multipurpose Room (Small/Medium)	UG	1	50
C2	Floor	Women's Building potential Multipurpose Room (Large – Single height)	UG	1	60
D1	Wall	Residents' facilities potential Gym/Spin Studio	LG	LG	60 (Gym) 65 (Spin)
D1	Floor	Residents' facilities potential Gym/Spin Studio	LG	UG	60 (Gym) 65 (Spin)
D2	Floor	Residents' facilities foyer with potential (Concierge/Reception/Workspace/ Dining)	LG	UG	55
D2	Wall	Residents' facilities potential CCTV room	UG	UG	50
D2	Floor	Residents' facilities potential reception	UG	1	50
D2	Floor	Residents' facilities potential CCTV room	UG	1	50
D3	Wall	Residents' facilities potential dining area	LG	LG	55
D3	Floor	Residents' facilities potential cinema	LG	UG	65
E1	Wall	Communal Space	G	G	55
E1	Floor	Communal Space	G	1	55
E1	Wall	Assisted Bathing	G	G	55
E1	Floor	Assisted Bathing	G	1	55

A separating wall and floor strategy has been developed with the architect to provide sufficiently robust constructions to meet these performance requirements.

Structural floors comprise in situ concrete slabs of varying depths. Strategies to meet the performance requirements generally comprise:

- floating floor systems above concrete slabs, specified where necessary,
- robust ceiling constructions below concrete slabs, in some cases including resilient or spring hung systems, specified where necessary.

The overall floor constructions will be developed with the architect at subsequent design stages. In some instances, the client will provide some parts of the Development to a shell and core level of fit-out. In these instances, it is understood the client can include requirements for ceiling installations in tenant leases as necessary.

6.0 CONCLUSION

The Development is located to the north-west of Camden Road and Parkhurst Road, a busy road with up to four lanes. Other roads surrounding the Development are residential, with much lower levels of traffic.

Noise measurements were undertaken by WSP in 2019 and 2021. The raw survey data was provided for use in this Noise Impact Assessment, and to assist with the acoustic design of the Development.

The key assessment, design criteria and guidance for the Development comprise ProPG (2017), AVO Guide (2020) and the LBI Draft Local Plan 2019.

ProPG Initial Site Risk Assessment and AVO Level 1 Site Risk Assessment
In order to assess the impact of environmental noise on the facades of the Development, a 3D environmental noise model was created.

The predicted daytime average façade noise levels are generally in the range 40-70 dBA and night-time average façade noise levels generally in the range 35-65 dBA. This indicates a wide range of noise exposure risk on the site, primarily dependent on proximity to Camden Road/Parkhurst Road.

The ProPG Initial Site Risk Assessment suggests that during the daytime, road-facing facades may experience a medium/high risk of adverse effect, whilst at quieter parts of the site, the risk may be negligible. At night-time, road facing facades may experience a high risk of adverse effect at whist quieter parts of the site a negligible risk can be expected.

At the higher levels of risk, the ProPG pre-planning application guidance is as follows:

> *"High noise levels indicate that there is an increased risk that development may be refused on noise grounds. This risk may be reduced by following a good acoustic design process that is demonstrated in a detailed ADS. Applicants are strongly advised to seek expert advice.*
>
> *"As noise levels increase, the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised, and which clearly demonstrate that a significant adverse noise impact will be avoided in the finished development."*

Similarly, an AVO Level 1 assessment suggests negligible to high risk, depending on proximity to Camden Road/Parkhurst Road. The recommendation is therefore to consider internal noise levels in more detail as part of a Level 2 assessment.

Internal Ambient Noise Levels – Whole Dwelling Ventilation scenario
Internal ambient noise level requirements in residential rooms are given in the LBI Draft Local Plan 2019. These levels are to be achieved with the following measures:

- mechanical ventilation and heat recovery systems providing "whole dwelling" ventilation (i.e. with closed windows);
- acoustically rated glazing, specified as necessary;
- masonry wall constructions.

Internal Ambient Noise Levels – Overheating scenario
During hotter periods, passive openings are to be provided where possible to mitigate overheating. The acoustic strategy is to use passive openings to avoid exceeding relaxed upper limits of **45 dB L_{Aeq}** (daytime 07.00-23.00) and **40 dB L_{Aeq}** (night-time 23.00-07.00) across as much of the Development as possible.

Achieving these targets is consistent with:

- not exceeding the LBI SOAEL (Draft Local Plan 2019) for internal noise levels in living rooms and bedrooms (daytime) and bedrooms (night-time);
- meeting a level that is 5 dB (daytime) and 2 dB (night-time) below the AVO Level 2 assessment "red" categories where noise may result in a material change in behaviour.

This is to be achieved by:

- provide opening windows to mitigate overheating where external noise levels allow this;
- provide acoustically attenuating louvres where external noise levels are too high to achieve the internal targets with opening windows;
- provide mechanical cooling via tempered MVHR systems where the external noise levels are too high to achieve the targets in a practical way with any passive openings.

It should be noted that all dwellings will be provided with openable windows. If an occupant chooses to open windows to provide higher free areas than would be required to achieve the proposed internal noise levels, then higher noise levels are to be expected.

External Amenity Space
Noise levels at private balconies and at communal external amenity space vary across all three noise effect levels identified in Appendix 2 of the LBI Draft Local Plan 2019 for outdoor living space.

The guideline values identified in BS 8233:2014 and ProPG are exceeded at some locations, but at other locations, including publicly accessible locations, predicted noise levels are sufficiently quiet to meet them. This may therefore serve to partially offset the impact of the noisier external areas. This is consistent with guidance given in Element 3 of the ProPG Stage 2 Assessment (External Amenity Area Noise Assessment).

External Noise Emissions from Fixed Plant
External plant noise emissions from plant equipment are to meet rating noise level upper limits that are 5 dB below the adopted background noise levels at all identified noise sensitive receptors.

The most significant noise generating plant equipment to be installed as part of the Development are air source heat pumps (ASHPs) located on the roofs of a number of buildings.

The following noise control strategy is to be implemented at all rooftop ASHP areas:

- all ASHPs to be supplied with "bolt-on" acoustic attenuation kits, with acoustically attenuated air paths to all intakes and exhausts,
- all ASHP plant areas are to be enclosed with a solid-sided noise screen (with an open top), with a minimum height equal to the height of all equipment within the enclosure,
- some ASHPs to incorporate night-time "set-back" to limit noise levels at night where necessary. This may be required at some locations e.g. where night-time background noise level is low, or where there are a large number of heat pumps on a particular roof.

Noise from MVHR and other ventilation equipment is to be attenuated as necessary with in duct attenuators.

A number of other items of plant equipment are to be located on top of some of the buildings. Noise from these additional items is not considered to be significant in comparison to noise from the ASHPs.

The Development includes an emergency generator. This is located internally in the lower ground floor of Block A. Air inlets and outlets can be provided with in duct attenuation in order to meet the requirements of the LBI Draft Local Plan 2019.

Internal Sound Insulation
The lower floors of some plots include non-residential uses. Separating walls and floors between non-residential and residential uses are to be designed to be sufficiently robust to meet the requirements of the LBI Draft Local Plan 2019.

External Noise Emissions from Internal Activity

Noise from events taking place in Building C1 in the Women's Building Large Multipurpose Room is expected to meet Draft Local Plan 2019 noise limits at the nearest noise sensitive receptors with a sealed façade (with mechanically ventilated and cooled spaces) and suitably robust glazing specifications.

7.0 APPENDICES

7.1 BS 8233 Noise Ingress Calculation

This appendix presents an example calculation of internal noise levels in one of the most affected bedrooms at night. The calculation follows the method given in Annex G of BS 8233:2014, which itself is based on the method given in BS EN 12354-3. The calculation tables presented are consistent with Tables G.1 and G.2 of the Annex.

The equation and associated terms are reproduced as follows:

$$L_{eq,2} = L_{eq,ff} + 10\log_{10}\left(\frac{A_0}{S}10^{\frac{-D_{n,e}}{10}} + \frac{S_{wi}}{S}10^{\frac{-R_{wi}}{10}} + \frac{S_{ew}}{S}10^{\frac{-R_{ew}}{10}} + \frac{S_{rr}}{S}10^{\frac{-R_{rr}}{10}}\right) + 10\log_{10}\left(\frac{S}{A}\right) + 3$$

$L_{eq,ff}$	is the equivalent continuous sound pressure level outside the room elements under consideration. Note this is a free field value;
A_0	is a reference absorption area of 10 m^2 and is independent of frequency;
S_f	is the total facade area in square metres (m^2) of the room in question;
S_{wi}	is the area in square metres (m^2) of the windows of the room;
S_{ew}	is the area in square metres (m^2) of the external wall of the room;
S_{rr}	is the area in square metres (m^2) of the ceiling of the room;
S	is the total area in square metres (m^2) of elements through which sound enters the room, i.e. $S_f + S_{rr}$;
$D_{n,e}$	is the insulation of the trickle ventilator measured according to BS EN ISO 10140;
R_{wi}	is the sound reduction index (octave band value) of the window;
R_{ew}	is the sound reduction index (octave band value) of the external wall;
R_{rr}	is the sound reduction index (octave band values) of the roof/ceiling;
A	is the equivalent absorption area of the receiving room being considered;
3	is a correction factor;

Assumptions and Clarifications

- No inclusion has been made for performance of the ventilation system as in duct attenuators are to be sized to ensure that there is no contribution to internal noise levels via this path.
- Th equivalent absorption area of the room under consideration is based on bedroom with a mid-frequency reverberation time of 0.4s, which is reasonable for a small bedroom where a large proportion of the floor area is occupied by the bed.
- Octave band noise data was not provided by the acoustician (WSP) conducting the noise surveys. A representative spectrum has been adopted based on noise measurements undertaken by Max Fordham LLP of a similar busy road in London. The spectrum has been normalised to correspond to the A-weighted predicted average noise levels in the worst case at the façade of the Development. The adopted spectrum is shown in Table 13.

Table 13: Representative average night-time noise level at most affected residential facade (night-time)

Parameter	125Hz	250Hz	500Hz	1kHz	2kHz	A-Weighted
L_{Aeq} (dB)	64	63	61	61	57	65

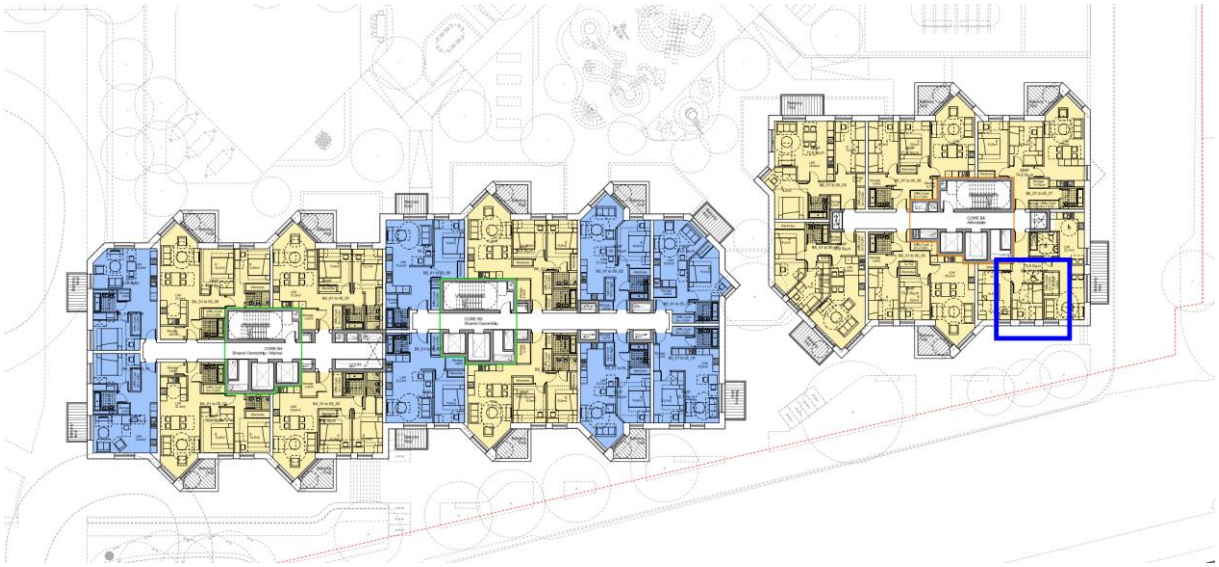

Figure 21: Extract of proposed first to fifth floor Plot B layout showing Buildings B4, B5 and B6, and the location of the bedroom used in the example calculation (identified in blue)

Table G.1 Data used in the calculation of the noise level inside a room

Terms that are frequency dependent								
		Single-figure	Octave band centre frequency Hz					A weighted level
Term	Description	rating	125	250	500	1000	2000	dBA
$L_{eq,ff}$			64	63	61	61	57	65
$D_{n,e}$	MVHR							
R_{wi}	10/20/8.8laminated	45	28	36	43	47	49	
R_{ew}	Brick/block cavity wall	52	41	45	45	54	58	
R_{rr}								
A			6	7	9	9	12	

Terms that are not frequency dependent				
Term	Derivation	Value m^2		
S_f	Facade area (including window)	8.99		
S_r	Roof area (exposed side)	0		
S_{wi}	Window area	3.08		
S_{ew}	$S_f - S_{wi}$	5.91		
S_{rr}	Area of ceiling	0		
S	$S_f + S_{rr}$	8.99		
A_0	Reference absorption area given in BS EN ISO 10140-2	10		
NOTE The expected precision of this calculation is ±2 dB.				

Table G.2 The calculation of the noise level inside a room

Term from equation (G.1)	Reference letter of result	Octave band centre frequency Hz					A weighted level
		125	250	500	1000	2000	dBA
$L_{eq,ff}$	A	64	63	61	61	57	65
$D_{n,e}$		0	0	0	0	0	
$\frac{A_0}{S} 10^{\frac{-D_{n,e}}{10}}$	B	0.00000	0.00000	0.00000	0.00000	0.00000	
R_{wi}		28	36	43	47	49	
$\frac{S_{wi}}{S} 10^{\frac{-R_{wi}}{10}}$	C	0.00054	0.00009	0.00002	0.00001	0.00000	
R_{ew}		41	45	45	54	58	
$\frac{S_{ew}}{S} 10^{\frac{-R_{ew}}{10}}$	D	0.00005	0.00002	0.00002	0.00000	0.00000	
R_{rr}		0	0	0	0	0	
$\frac{S_{rr}}{S} 10^{\frac{-R_{rr}}{10}}$	E	0.00000	0.00000	0.00000	0.00000	0.00000	
$10\log_{10}(B+C+D+E)$	F	-32.3	-39.7	-44.2	-50.2	-52.7	
A (furnished)		6	7	9	9	12	
$10 \log \frac{S}{A}$	G	1.7	0.9	-0.1	-0.1	-1.3	
$L_{eq,2}$	A+F+G+3	36.1	27.2	19.5	13.8	6.4	
A-weighting dB		-16	-9	-3	0	1	
$L_{eq,2+A\text{-}weighting}$		20.1	18.2	16.5	13.8	7.4	
$L_{Aeq,2}$ is obtained by combining these values using equation (G.2).							
A-weighted level in the room $L_{eq,2}$ is							**23.9**

Figure 22: Example BS 8233:2014 Annex G calculation (based on BS 12354-3 method) internal noise level calculation for most affected bedroom

7.2 External Plant Noise Emissions – Example Calculation

This appendix presents an example daytime and night-time plant noise emissions calculation at what is one of the more affected noise sensitive receptors: a Holloway Estate building located at the north-western end of Parkhurst Road, at the northern corner of the Development site. The NSR is identified in Figure 1 and Table 1, and in Figure 23.

All equipment selections at this stage are indicative and subject to change.

Noise contribution is only predicted from the nearest new roof plant area to the noise sensitive receptor. This is considered a reasonable approach given the relative distance of other roof plant areas and/or barrier effect created by other buildings.

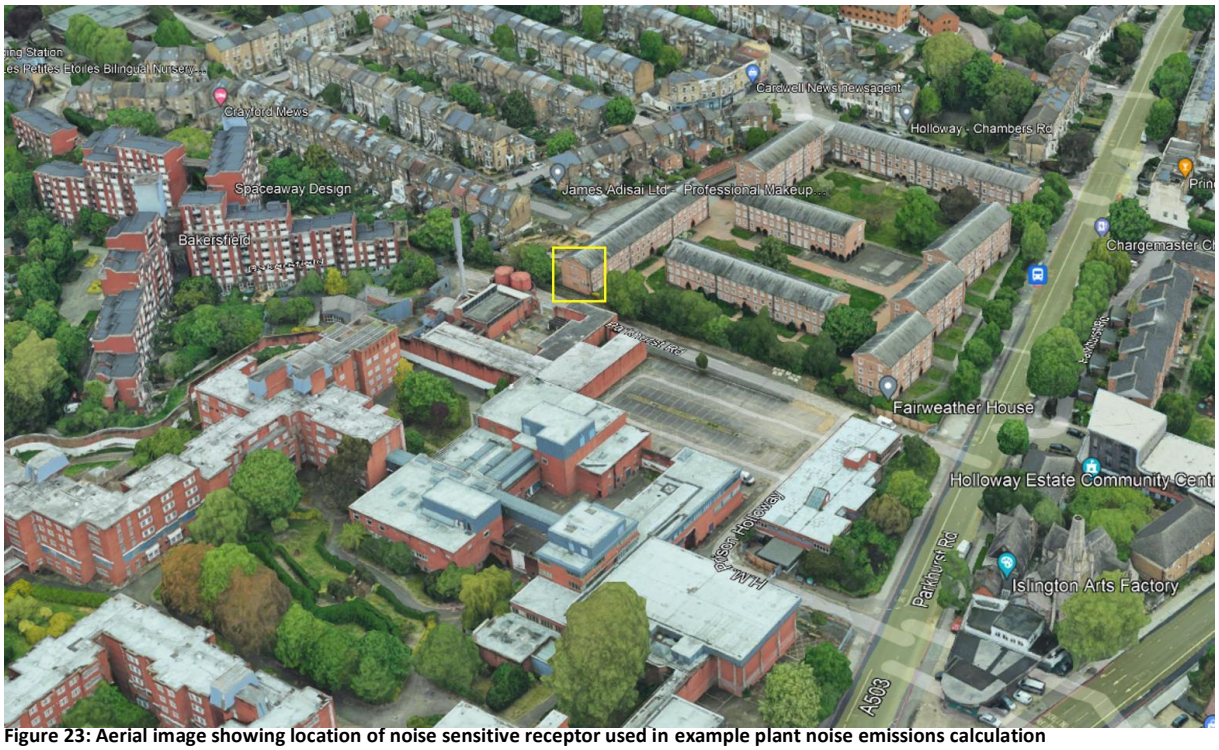

Figure 23: Aerial image showing location of noise sensitive receptor used in example plant noise emissions calculation

The nearest external plant are the ASHPs located on the roof of Building A4. The calculation is presented in Figure 24.

NSR N - DAYTIME (07.00-23.00)	**Notes**	3 no. ASHP 190, full duty						
Distance source-barrier (m)	1.3							
Distance barrier-receiver (m)	40.5	i.e.	41.8 m (total distance to receiver)					
Barrier relative height (m) - See Note 1	0.8							
Path difference (m)	0.23							
Octave band centre frequency (Hz)	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
Combined sound power level 3 no. ASHPs, full duty	98	96	95	96	92	83	80	77
Attenuation: ISOpac 18 - Attenuation pack	5	10	14	19	23	21	20	18
Total sound power emitted into environment (dB)	93	86	81	77	69	62	60	59
Barrier Attenuation (dB)	7	8	10	12	15	18	20	23
Specific sound (SPLs) at sensitive facade (dB)	46	37	30	24	14	4	-1	-5
Specific sound level at senstive façade (dBA)	27	dB LAeqTr						
BS 4142 acoustic feature correction	2	dB	("Just perceptible tonality" - Joint Nordic method)					
BS 4142 rating level	29	dB LArTr						
Representative background sound level @NSR5	38	dB LAF90 Daytime 07.00-23.00						
Excess of rating level over background level	-9	dB						
LB Islington Requriement:	33	dB LArTr						
Excess of rating level over LB Islington requirement	-4	dB						
Assessment against LB Islington requirement	Compliant							
BS 4142 Assessment	Low impact, depending on the context							

NSR N - NIGHT-TIME (23.00-07.00)		Notes	3 no. ASHPs, including 2 dB night-time set back					
Distance source-barrier (m)	1.3							
Distance barrier-receiver (m)	40.5	i.e.	41.8 m (total distance to receiver)					
Barrier relative height (m) - See Note 1	0.8							
Path difference (m)	0.23							
Octave band centre frequency (Hz)	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
Combined sound power level 3 no. ASHPs, set back by 2 dB	96	94	93	94	90	81	78	75
Attenuation: ISOpac 18 - Attenuation pack	5	10	14	19	23	21	20	18
Total sound power emitted into environment (dB)	91	84	79	75	67	60	58	57
Barrier Attenuation (dB)	7	8	10	12	15	18	20	23
Specific sound (SPLs) at sensitive facade (dB)	44	35	28	22	12	2	-3	-7
Specific sound level at senstive façade (dBA)	25	dB LAeqTr						
BS 4142 acoustic feature correction	2	dB	("Just perceptible tonality" - Joint Nordic method)					
BS 4142 rating level	27	dB LArTr						
Representative background sound level @NSR5	34	dB LAF90 Night-time 23.00-07.00						
Excess of rating level over background level	-7	dB						
LB Islington Requriement:	29	dB LArTr						
Excess of rating level over LB Islington requirement	-2	dB						
Assessment against LB Islington requirement	Compliant							
BS 4142 Assessment	Low impact, depending on the context							

Equipment data								
ASHP: Trane CXAF 190 (Extra Low Noise mode)	91	dB LwA (A-weighted)						
Octave band centre frequency (Hz)	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
ASHP Sound Power Level spectrum (dB) - See Note 2	93	91	90	91	87	78	75	72
ASHP Sound Power Level spectrum (dB) including 2 dB set-back - See Notes 3 and 4	91	89	88	89	85	76	73	70
Octave band centre frequency (Hz)	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
Attenuator insertion loss (dB): Conabeare Acoustics ISOpac 18	5	10	14	19	23	21	20	18

Notes
1) Barrier values are for geometry relative to line-of-sight axis between source and receiver
2) ASHP data does not include sound power level in the 63Hz octave band. A proxy value has been adopted.
3) Units set back at night in order to meet targets at facades of the Development
4) "Set-back" spectrum assumed to be 2 dB lower in all octave bands.

Figure 24: Example daytime and night-time calculation of plant noise emissions from Building A4 at the nearest northern NSR

7.3 Glossary of Acoustic Terminology

SOUND PRESSURE LEVEL (SPL), L (dB). The sound level measured on a logarithmic scale, with unit decibel dB. A free-field SPL refers to a level determined far enough from surfaces or facades, apart from the ground, so as not to be influenced by reflections from those surfaces.

A-WEIGHTED SOUND PRESSURE LEVEL (SPL), L_A (dBA). A-weighted SPL values (or noise levels) are 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.

EQUIVALENT CONTINUOUS A-WEIGHTED SPL, $L_{Aeq,T}$ (dBA). Energy weighted average of the A-weighted sound pressure level over a time period, T. The level of a notional continuous sound that would deliver the same A-weighted sound energy as the actual fluctuating sound over the course of the defined time period, T.

MAXIMUM A-WEIGHTED SPL, L_{Amax} (dBA). The maximum A-weighted sound pressure level measured. If not specified, usually assumed to mean L_{AFmax}, i.e. L_{Amax} determined with a 'fast' (F) sound level meter time constant of 125 ms.

PERCENTILE NOISE LEVEL $L_{A1,T}$, $L_{A10,T}$, $L_{A90,T}$ (dBA). The value of the A-weighted sound pressure level that is exceeded for N% of any given time interval, T. For example $L_{A1,T}$ is the value that is exceed for 1% of the measurement period.

BACKGROUND SOUND LEVEL, $L_{A90,T}$ (dBA)
The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90% of a given time interval ,T, measured using time weighting, and quoted to the nearest whole number of decibels.

SOUND REDUCTION INDEX, R (dB). The sound reduction index of an element such as a wall, floor, door or window describes proportion of incident sound that is not transmitted by that element. R varies with frequency and can be expressed either in terms of the fraction of incident sound energy that is transmitted or in terms of the difference in SPL on either side of the element.

WEIGHTED SOUND REDUCTION INDEX, R_W (dB). A value calculated from the frequency dependent values of sound reduction index, measured in a laboratory and weighted according to a method described in BS EN ISO 717-1. This allows the sound reduction of an element to be expressed in terms of a single value.

SPECTRUM ADAPTATION TERM C_{tr} (dB). A correction to be added to (for example) R_W values to account for the effect of enhanced low frequency content typical of urban traffic noise spectra. Thus sound reduction index values can be quoted as R_W+C_{tr}.

SPECIFIC SOUND SOURCE
The sound source being assessed.

SPECIFIC SOUND LEVEL, $L_s = L_{Aeq,Tr}$ (dBA)
The equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T_r.

NOISE RATING LEVEL, $L_{Ar,Tr}$ (dBA)
The A-weighted specific sound level plus any adjustment for characteristic features of the sound (for example if the sound features impulsive or tonal components).