Clarkson Row

Noise and vibration report for planning

Penhallow Investments Ltd

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Executive Summary

An environmental noise survey and assessment has been undertaken for the proposed new residential development at Clarkson Row, London.

Noise impacts on the proposed development have been assessed against Local Authority (London Borough of Camden) requirements and guidance in BS 8233:2014. The assessment has also considered guidance in the 'Professional Practice Guidance on Planning and Noise' (ProPG) document.

When assessed against the 'initial risk assessment' criteria of the ProPG, it has been found that the proposed development site is at 'low' to 'medium' risk of adverse effects from noise. The main noise source affecting the site was from rail noise.

In line with the guidance in the ProPG, the national planning policy framework (NPPF) and Local Authority requirements, noise mitigation measures have been suggested to avoid significant adverse effects and mitigate/minimise adverse effects.

The assessment has found that through the use of appropriate glazing, ventilation openings and façade construction, the internal noise criteria of BS 8233:2014 and the London Borough of Camden can be met.

Noise limits for externally mounted plant and equipment associated with the proposed development have been proposed based on the Local Authority requirements and guidance in BS 4142:2014. Plant and equipment noise emissions from the proposed development should not exceed the limits summarised in the table below at the nearest noise-sensitive receptors (NSRs):

Period	Lowest typical measured background noise level (dB $L_{A90,15min}$)	Maximum plant noise level dB $L_{Ar,Tr}$ (without tonal components)	Maximum plant noise rating level dB $L_{Ar,Tr}$ (with tonal components)
Daytime (07:00 – 23:00)	53	43	38
Night-time (23:00 – 07:00)	43	35*	30*
*Due to the low levels of background noise and based on guidance in BS 4142:2014 and BS 8233:2014, plant noise limits below 35 dB $L_{Aeq,T}$ (and 30 dB $L_{Aeq,T}$ for tonal noise) are not considered appropriate in urban areas. Therefore, the noise emission limits above have been limited to these values. However, it should be confirmed that this is acceptable to the London Borough of Camden planning and environmental health teams.			

By meeting the proposed noise emission limits, the planning requirements of the London Borough of Camden should be met.

A vibration survey has also been undertaken due to the site's proximity to rail lines serving Euston station. Vibration levels have been analysed in terms of Vibration Dose Value and compared to the upper limits contained within London Borough of Camden's Local plan. The assessment is summarised below:

Location Ref.	Measurement distance from edge of site	Daytime - VDV_{16h} ($m.s^{-1.75}$)	Night-time - VDV_{8h} ($ms^{-1.75}$)	LBC & BS 6472-1 criteria ($ms^{-1.75}$)
V1	On boundary	0.05	0.04	Residential day: 0.2 to 0.4 Residential night: 0.1 to 0.2
V2		0.06	0.05	
V3		0.05	0.04	
V4	Within development site	0.05	0.04	

The vibration dose values have been found to meet the requirements Camden Council and when assessed against BS 6742-1: 2008[1] are at a level where there is low probably of adverse comment.

[1] BS 6472-1:2008 Guide to evaluation of human exposure to vibration in buildings - Part 1: Vibration sources other than blasting

Based on the assessment of noise and vibration at the proposed development site summarised above, it is considered that with the implementation of appropriate design and noise control measures the site is suitable for residential development.

Contents

1.0 Introduction

Cundall has been instructed by Penhallow Investments Ltd to undertake an environmental noise and vibration survey and assessment for the proposed residential development at Clarkson Row, NW1 7RA.

The purpose of this report is to;

- Review appropriate local and national planning policy and relevant guidance;
- Determine noise level incident on the proposed development site;
- Determine background noise levels at nearby noise-sensitive receptors;
- Carry out an acoustic assessment of the external building fabric requirements and, where appropriate, provide outline mitigation advice;
- Suggest noise emission limits for externally mounted building services plant and equipment associated with the proposed development at nearby receptors.
- Identify vibration levels likely to be incident on the proposed development;
- Calculation vibration dose levels (VDV) at the site and compare them to relevant guidance and planning policy; and
- Determine whether specific vibration mitigation measures are likely to be required;

2.0 Proposed development

Proposals are for a new residential building, comprising eight units, to be located at Clarkson Row. The site is in the London Borough of Camden.

The site is a currently unoccupied plot of land in a mainly residential area, although some light industrial units exist on Clarkson Row. The site is bounded by residential properties and gardens on three sides and by Clarkson Row to the south west. Mornington Crescent runs further to the north west, but line-of-sight is blocked by existing buildings. Rail lines serving Euston Station run beyond Clarkson Row to the west.

2.1 Noise-sensitive receptors

Existing residential properties are considered to be the nearest noise-sensitive receptors (NSRs).

Figure 1 below shows the proposed development site in relation to the wider surroundings and the NSRs.

Figure 1 – Site location and Noise sensitive receptors

3.0 Assessment criteria

This section of the report outlines the key legislation and guidance relevant to the assessment of noise for a development of this type. The assessment methodology adopted has been based on relevant British Standards and the requirements of the London Borough of Camden.

3.1 Noise Policy Statement for England

The Noise Policy Statement for England (NPSE) was published by Defra in March 2010. The NPSE sets out 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 long term vision is supported by the following aims:

"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."*

3.2 National Planning Policy Framework (NPPF)

The revised National Planning Policy Framework was updated on 19 June 2019 and sets out the government's planning policies for England and how these are expected to be applied.

The NPPF states:

"130. Permission should be refused for development of poor design that fails to take the opportunities available for improving the character and quality of an area and the way it functions, taking into account any local design standards or style guides in plans or supplementary planning documents. Conversely, where the design of a development accords with clear expectations in plan policies, design should not be used by the decision-maker as a valid reason to object to development. Local planning authorities should also seek to ensure that the quality of approved development is not materially diminished between permission and completion, as a result of changes being made to the permitted scheme (for example through changes to approved details such as the materials used).

170. 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. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans;

180. 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; […]

182. Planning policies and decisions should ensure that 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."

3.3 BS 4142:2014+2019 'Methods for rating and assessing industrial and commercial sound' (BS 4142)

BS 4142 provides a methodology for assessing the impacts arising at sensitive receptors due to noise from industrial and commercial activities.

The BS 4142 method involves comparing the rating level of the sound source (the 'specific' noise level plus a range of potential feature corrections) to the measured background sound level in order to estimate its initial impact, as follows:

"Typically, the greater this difference, the greater the magnitude of the impact.

a) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.

b) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.

c) 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."

The standard suggests that the noise source of interest will have a 'low impact' when the 'rating level' of a noise source is less than the existing background noise. It is also important to note that the standard requires that any quantitative assessment results are assessed in light of the context in which the sound occurs.

Regarding background noise levels, BS 4142 states:

"In using the background sound level in the method for rating and assessing industrial and commercial sound it is important to ensure that values are reliable and suitably represent both the particular circumstances and periods of interest. For this purpose, 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 formal BS 4142 impact assessment has not been carried out in this report; however, the principles of the standard have been used to inform the method used.

3.4 BS 8233:2014 'Guidance on sound insulation and noise reduction for buildings'

Table 4 of British Standard 8233:2014 provides guidance on internal ambient noise levels in residential spaces. This table is reproduced below:

Location	Daytime (07:00 to 23:00 hours)	Night-time (23:00 to 07:00 hours)
Living room	≤ 35 dBA $L_{eq,16hour}$	N/A
Dining room	≤ 40 dBA $L_{eq,16hour}$	N/A
Bedroom	≤ 35 dBA $L_{eq,16hour}$	≤ 30 dBA $L_{eq,8hour}$

Table 1 – BS 8233:2014 'indoor ambient noise levels for dwellings'

The following notes should be considered when following the guidance above:

"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;"

In relation to the noise guidelines in *Table 1* above, BS 8233 states:

"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'

BS 8233: 2014 provides the following consideration for façade attenuation when partially open windows are used for ventilation:

"If partially open windows were relied upon for background ventilation, the insulation [of the building façade] *would be reduced to approximately 15 dB".*

3.5 London Plan

Policy D13 of the recently adopted London Plan 2021 states the following regarding planning decisions:

A) The Agent of Change principle places the responsibility for mitigating impacts from existing noise and other nuisance-generating activities or uses on the proposed new noise-sensitive development. Boroughs should ensure that Development Plans and planning decisions reflect the Agent of Change principle and take account of existing noise and other nuisance-generating uses in a sensitive manner when new development is proposed nearby.

B) Development should be designed to ensure that established noise and other nuisance-generating uses remain viable and can continue or grow without unreasonable restrictions being placed on them.

C) New noise and other nuisance-generating development proposed close to residential and other noise-sensitive uses should put in place measures to mitigate and manage any noise impacts for neighbouring residents and businesses.

D) Development proposals should manage noise and other potential nuisances by:

1. *ensuring good design mitigates and minimises existing and potential nuisances generated by existing uses and activities located in the area*
2. *exploring mitigation measures early in the design stage, with necessary and appropriate provisions including ongoing and future management of mitigation measures secured through planning obligations*
3. *separating new noise-sensitive development where possible from existing noise-generating businesses and uses through distance, screening, internal layout, sound-proofing, insulation and other acoustic design measures.*

E) Boroughs should not normally permit development proposals that have not clearly demonstrated how noise and other nuisances will be mitigated and managed.

Policy D14 of the recently adopted London Plan 2021 states the following regarding planning decisions:

A) 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:

4. *avoiding significant adverse noise impacts on health and quality of life*
5. *reflecting the Agent of Change principle as set out in Policy D13 Agent of Change*
6. *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*
7. *improving and enhancing the acoustic environment and promoting soundscapes (including Quiet Areas and spaces of relative tranquillity)*
8. *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*

9. *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*
10. *promoting new technologies and improved practices to reduce noise at source, and on the transmission path from source to receiver.*

B) Boroughs, and others with relevant responsibilities, should identify and nominate new Quiet Areas and protect existing Quiet Areas in line with the procedure in Defra's Noise Action Plan for Agglomerations.

3.6 ProPG – Professional Practise Guidance on Planning and Noise

The 'Professional Practice Guidance on Planning & Noise – New Residential Development' (ProPG) was produced to provide practitioners with guidance and a recommended approach for the assessment of noise impact on residential developments during the planning stage.

The primary goal of the ProPG is to:

"Assist the delivery of sustainable development by promoting good health and wellbeing through the effective management of noise."

The document seeks to do this by:

"Encouraging a good acoustic design in and around proposed new residential development having regard to national policy on planning and noise"

The ProPG advocates a two-stage approach to facilitate *"…straightforward accelerated decision making for lower risk sites and assists proper consideration of noise issues where the acoustic environment is challenging".*

The recommended approach is summarised below:

- Stage 1 – an initial noise risk assessment of the proposed development site; and
- Stage 2 – a systematic consideration of four key elements.
  - Element 1 – Demonstrating a "Good Acoustic Design Process";
  - Element 2 – Observing internal "Noise Level Guidelines";
  - Element 3 – Undertaking an "External Amenity Area Noise Assessment"; and
  - Element 4 – consideration of "Other relevant Issues".

In addition to the above, the ProPG states:

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

Having followed the recommended approach, the ProPG suggests that the noise practitioner should be able to make one of four recommendations to the relevant planning decision maker:

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 grounds 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").

Whilst the assessment outlined in this report does not necessarily constitute a full assessment in accordance with the ProPG, the assessment methodology and criteria used have been based on the principals and guidance outlined in the ProPG document.

3.7 Local policies – The London Borough of Camden

The site falls within the London Borough of Camden (LBC). Policy A4 of the Camden Local Plan adopted June 2017 gives details of the local authority planning policy where *"uses sensitive to noise are proposed close to an existing source of noise or when development that is likely to generate noise is proposed".* It states that: *"Development should have regard to Camden's Noise and Vibration Thresholds (Appendix 3)."*

Camden's Planning Guidance document on Amenity, adopted in March 2018 contains a chapter on noise and vibration and has been referenced as guidance for the application of the noise policies and thresholds contained within Camden's Local Plan.

3.7.1 Proposed developments likely to be sensitive to noise

Table B from Appendix 3 of LBC's Local Plan sets out noise levels applicable to noise-sensitive residential developments proposed in areas of existing noise. It is reproduced for reference overleaf:

Dominant Noise Source	Assessment Location	Design Period	LOAEL (Green)	LOAEL to SOAEL (Amber)	SOAEL (Red)
Anonymous noise such as general environmental noise, road traffic and rail traffic ~	Noise at 1 metre from noise sensitive façade/free field	Day	<50dB$L_{Aeq,16hr}$*	50dB to 72dB$L_{Aeq,6hr}$*	>72dB$L_{Aeq,16hr}$*
		Night	<45dB$L_{Aeq,8hr3}$ <40 dB$L_{Aeq,8hr}$**	45dB to 62dB$L_{Aeq,8hr}$* >40dBL_{night}**	>62dB$L_{Aeq,8hrs}$*
	Inside a bedroom	Day	<35dB$L_{Aeq,16hr}$	35dB to 45dB$L_{Aeq,16hr}$	>45dB$L_{Aeq,16hr}$
		Night	<30dB$L_{Aeq,8hr}$ 42dB$L_{Amax,fast}$	30dB to 40dB$L_{Aeq,16hr}$ 40dB to 73dB$L_{Amax,fast}$	>40dB$L_{Aeq,8hr}$ >73dB$L_{Amax,fast}$
	Outdoor living space (free field)	Day	<50dB$L_{Aeq,16hr}$	50dB to 55dB$L_{Aeq,6hr}$	>55dB$L_{Aeq,16hr}$

Figure 2 – Table B of Appendix 3 of the Camden Local Plan

3.7.2 Noise thresholds

Camden's policy evaluates noise in terms of various 'effect levels' described in the Planning Practice Guidance:

- NOEL – No Observed Effect Level;
- LOAEL – Lowest Observed Adverse Effect Level;
- SOAEL – Significant Observed Adverse Effect Level.

LBC set out three basic design criteria for proposed developments:

- *"Green – where noise is considered to be at an acceptable level* [LOAEL];
- *Amber – where noise is observed to have an adverse effect level, but which may be considered acceptable when assessed in the context of other merits of the development* [LOAEL to SOAEL];
- *Red – where noise is observed to have a significant adverse effect level."* [SOAEL]

3.7.3 Plant noise limits

Appendix 3 of the Camden Local Plan Adoption details the noise thresholds set out by the LBC. The following is stated with regards to industrial and commercial noise sources:

"A relevant standard or guidance document should be referenced when determining values for LOAEL and SOAEL for non-anonymous noise. Where appropriate and within the scope of the document it is expected that British Standard

4142:2014 'Methods for rating and assessing industrial and commercial sound' (BS 4142) will be used. For such cases a 'Rating Level' of 10 dB below background (15 dB if tonal components are present) should be considered as the design criterion)."

In addition to the above, London Borough of Camden has previously stated that assessments should be based on the typical measured background noise level, $L_{A90,15min}$[2].

3.7.4 Vibration thresholds

Table A of appendix 3 of the Camden Local Plan gives vibration levels from uses such as railways, roads, leisure. and entertainment premises and/or plant or machinery at which planning permission will not normally be granted.

This is reproduced in the table below:

Vibration description and location of measurement	Period	Time	Vibration Levels (Vibration Dose Values)
Vibration inside critical areas such as a hospital operating theatre	Day, evening and night	00:00-24:00	0.1 VDV ms-1.75
Vibration inside dwellings	Day and evening	07:00-23:00	0.2 to 0.4 VDV ms-1.75
Vibration inside dwellings	Night	23:00-07:00	0.13 VDV ms-1.75
Vibration inside offices	Day, evening and night	00:00-24:00	0.4 VDV ms-1.75
Vibration inside workshops	Day, evening and night	00:00-24:00	0.8 VDV ms-1.75

Figure 3 – Table A of appendix A of Camden Local Plan – Vibration upper limits.

The table shows upper limits of permissible Vibration Dose Values for day time and night time periods.

[2] Email correspondence between Jon Barnard of Cundall and Edward Davis of Camden Council dated 27/11/2020.

4.0 Environmental noise and vibration survey

4.1 Measurement times and locations

An environmental noise survey was carried out between 1 and 3 December 2020. This survey consisted of a long-term sound level meter continuously logging noise levels at the site with the aim to:

- Measure existing noise levels at the site which will be representative of those incident upon the proposed development; and;
- Measure existing background noise levels representative of those at the nearest NSRs to the proposed development.

Vibration measurements have also been carried out at the site to measure and calculate existing Vibration Dose Values.

Table 2 below describes the measurement times and locations in more detail.

Measurement position	Measurement type	Measurement start time	Measurement end time	Duration	Comments
N	Environmental noise	01 December 2020, 20:00	03 December 2020, 13:00	41 hours	Mounted on pole at site boundary. Considered to be a free field measurement. 16-hour day time measurement taken on 02 December. 8- hour night time measurements taken on 01 and 02 December
V1	Vibration	All measurements taken on 03 December 2020 between 11:00 and 13:00		10 mins	Measurements taken on pavement on boundary of site. Subjective impressions during the measurements were that train movements were imperceptible.
V2				12 mins	
V3				11 mins	
V4				10 mins	

Table 2 – measurement times and locations

Figure 4 shows the noise and vibration measurement positions in relation to the site and the NSRs.

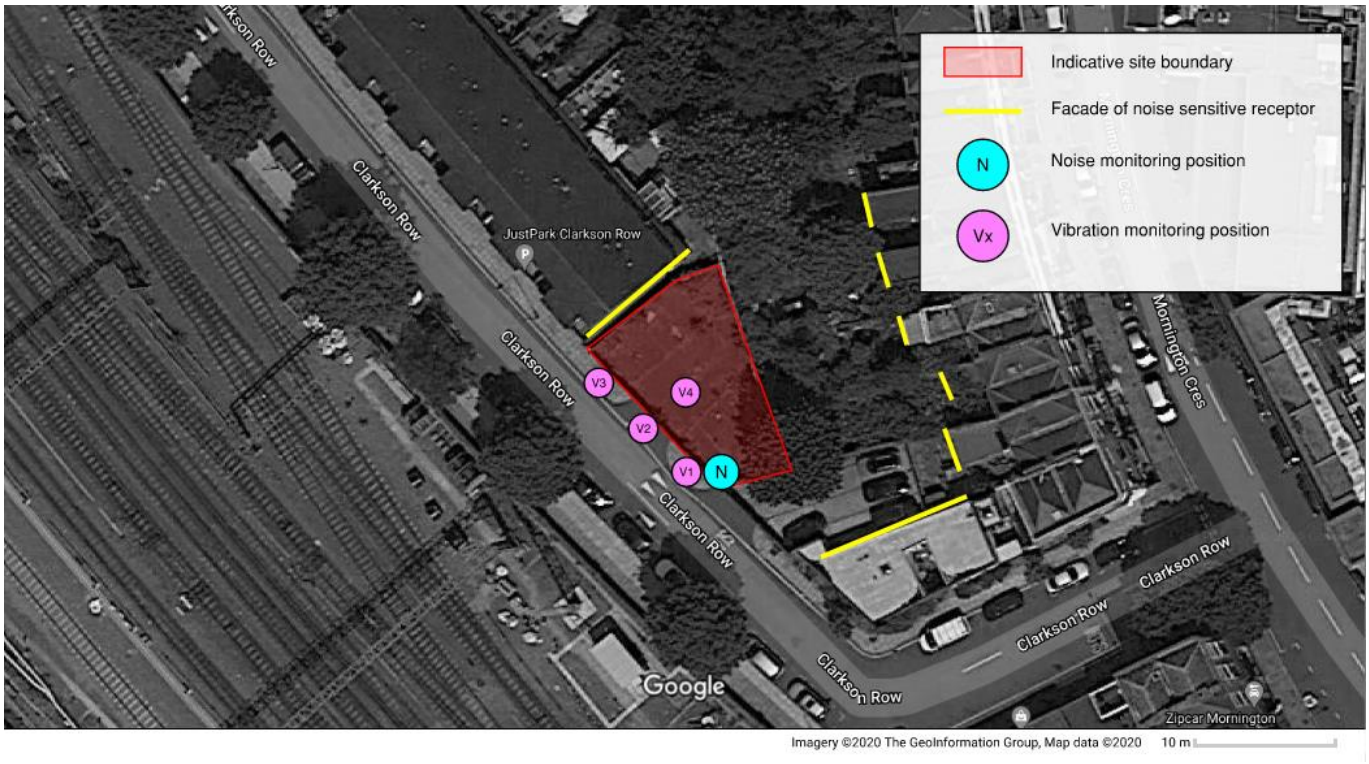

Figure 4 – measurement positions

4.2 Measurement equipment

Table 3 below provides relevant details of the equipment used for the baseline noise survey. The sound level meters used conform to BS EN 60650 type 1 accuracy and were field calibrated before and after use.

Equipment	Manufacturer & model	Serial number
Sound level meter	01dB Fusion	11766
Sound level meter	Norsonic Nor140	1405754
Calibrator	Casella 120/1	2651966
Sound level meter	01dB Fusion	11403
Calibrator	01dB Cal31	35054817
Accelerometer	Acoem CAC1005000	10668
DIN Plate	Acoem	-

Table 3 – Noise and vibration survey equipment

Copies of external calibration certificates are available upon request.

Measurements were made of various noise descriptors, but the key indices in this assessment are as follows:

- $L_{Aeq,T}$: the continuous equivalent A-weighted noise level over a given time period, T;
- $L_{A90,T}$: the noise level exceeded for 90% of the measurement period T, referred to as the 'background' noise level;
- $L_{AFMax,T}$: the maximum sound level over each measurement period.

4.3 Weather conditions

Weather conditions were noted on site as being dry and bright. The measurement position was sheltered from wind. These conditions are considered conducive to noise measurements. Rain was noted on the final day of surveying. This data has not been used as part of this assessment.

4.4 Existing noise climate

An appraisal of the noise climate was carried out whilst on site to set up and collect the sound level meter. It was determined that the noise climate during the evening was dominated by noise from rail. The noise climate during the daytime was dominated by rail noise, although there was some construction works from a site to the south west.

4.5 Survey results

The results of the noise and vibration survey are given in the following sections.

4.5.1 Noise results

Period	Measurement duration, T (hrs)	Ambient noise level $L_{Aeq,T}$ (dB)	Typical background noise level $L_{A90,15min}$ (dB)	Representative maximum noise level* $L_{AFmax,5mins}$ (dB)
Daytime (07:00-23:00)	16 hours	60	53	-
Night-time (23:00-07:00)	8 hours	53	43	72
* $L_{AFmax,5mins}$ values used for this assessment are those which occurred no more than 10-15 times during the night-time period, in line with WHO guidelines. L_{AFmax} values are not applicable for daytime periods.				

Table 4 – noise survey results

Full survey can be made available upon request.

4.5.2 Vibration results

Measured vibration data was used to predict vibration dose values (VDVs ref. BS 6472).

Table 5 summarises the 16-hour daytime and 8-hour night-time VDVs calculated from the VDV measurements made on site.

It is important to note that both the 16-hour daytime and 8-hour night-time VDVs have been calculated based on daytime measurements that include daytime train pass-by frequencies. The predicted VDV will therefore be based on the assumption that this frequency of rail traffic will continue all day and all night. During the night-time period especially, rail movements are likely to be reduced and therefore in this respect, the assessment can be viewed as a worst-case scenario.

Location Ref.	Measurement distance from edge of site	Daytime - VDV_{16h} ($ms^{-1.75}$)	Night-time - VDV_{8h} ($ms^{-1.75}$)	BS 6472-1 criteria* ($ms^{-1.75}$)
V1	On boundary	0.05	0.04	Residential day: 0.2 to 0.4 Residential night: 0.1 to 0.2
V2		0.06	0.05	
V3		0.05	0.04	
V4	Within development site	0.05	0.04	
* These criteria correspond to the "low probability of adverse comment" presented in BS 6472-1.				

Table 5 – Calculated vibration dose values (VDV)

4.5.3 Assessment of vibration impact

The calculated vibration dose values summarised in Table 5 are significantly below London Borough of Camden criteria and therefore it is considered that no additional assessment or mitigation measures will be required.

It is also noted that the determined VDV values are significantly below the value for 'low probability of adverse comment' for residential properties given in BS 6472-1. This suggests that 'adverse comment is not expected'.

It is understood that some train operators are running a reduced service running out of Euston station due to the ongoing COVID-19 pandemic. However, this is not considered to have significantly affected the calculated Vibration Dose Values and the results are considered reliable.

5.0 Noise assessment

This assessment has been carried out with reference to guidance in the ProPG document (although this is not a full assessment in accordance with the ProPG). In line with this, an initial site risk assessment has been undertaken for the development.

This section presents a "Stage 1" initial noise risk assessment for the site based on the guidance in the ProPG.

The Stage 1 assessment of the ProPG process aims to provide an indication of the likely risk of adverse effects on future residential development as a result of the existing noise climate around the proposed development site. The ProPG states that this risk assessment should not include any subsequent mitigation to be included as part of the development proposal.

5.1 Measured noise levels

Data from the noise survey showed measured daytime ambient noise levels of 60 dB $L_{Aeq,T}$ and measured night-time ambient noise levels of 53 dB $L_{Aeq,T}$.

Typical maximum noise levels measured during the night-time period were did not exceed 72 dB $L_{AFmax,5min}$ more than 10 times on the most exposed façade.

Figure 5 shows the noise risk assessment levels and the corresponding pre-application planning advice.

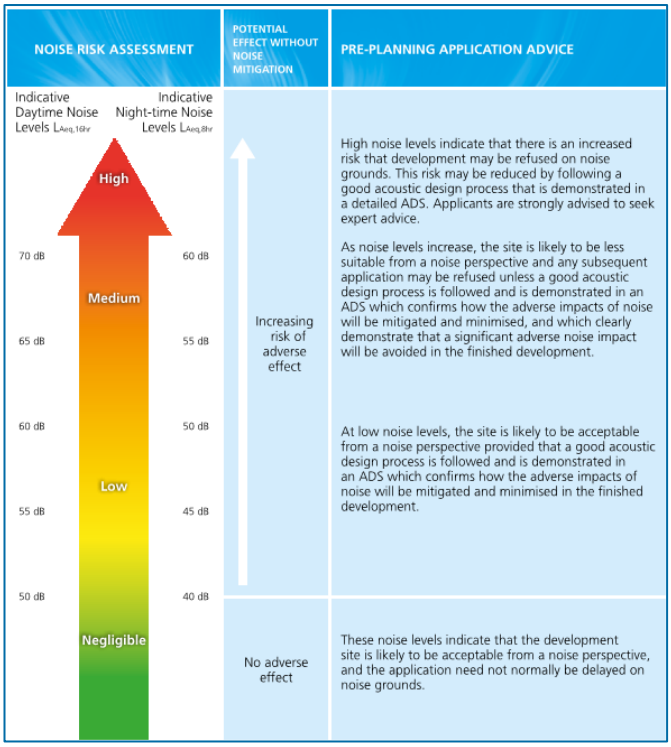

Figure 5 – ProPG Stage 1 risk assessment table (Fig.1 ref. ProPG)

It can be seen that the daytime and night-time noise levels at the location of the proposed new dwellings (60 and 53 dB $L_{Aeq,T,}$ respectively) fall within the "low" to "medium" risk categories from adverse effects due to noise.

In the context of LBC's noise assessment, measured noise levels fall within the "amber" category. For proposed development sites which fall within this category, LBC's Local Plan states:

"where noise is observed to have an adverse effect level, but which may be considered acceptable when assessed in the context of other merits of the development."

The following section addresses suitable acoustic design and mitigation measures that could be applied to the proposed development.

6.0 Glazing and ventilation

In order to meet the planning conditions of LBC, internal noise levels must meet the requirements given in section 3.7.2

Calculations have been undertaken to determine a suitable facade sound insulation strategy for the development based on the "more rigorous" method detailed in annex G.2.1 of BS 8233:2014 which is in turn based on the calculation method given in BS EN ISO 12354-3.

These calculations have been based on the following assumptions:

- Calculations are based on noise likely to be incident on the most exposed building façade
- It has been assumed that 100% of the façade is glazed (this is likely to represent a worst-case assessment)
- A reverberation time of 0.5 seconds has been assumed for habitable rooms
- Room geometry based on a typical bedroom taken from architects plans for the project

These calculations have identified the required sound insulation to be provided by the façade in order to comply with the Camden Council requirements.

For simplicity, only the most onerous glazing requirement has been shown.

Measured noise level (dB)	Internal ambient noise level criteria (dB)	Calculated sound insulation requirement for glazing
Daytime: 60 dB $L_{Aeq,16hr}$	35 dB $L_{Aeq,16hr}$	30 dB $R_w + C_{tr}$
Night-time: 53 dB $L_{Aeq,8hr}$	30 dB $L_{Aeq,8hr}$	
Night-time: 72 dB $L_{AFmax,5min}$	42 dB $L_{AFmax,5min}$	

Table 6 – Glazing calculations

Based on these calculations, glazed elements on the façades will need to provide 30 dB $R_w + C_{tr}$ sound insulation to allow the LBC criteria to be achieved. Table 7 below provides an example glazing specification capable of providing the maximum level of sound insulation required.

Calculated maximum sound insulation requirement for glazing (dB)	Example window construction capable of achieving the sound insulation requirement
30 dB $R_w + C_{tr}$	▪ 10 mm glass; ▪ 6 - 16 mm air cavity; ▪ 6 mm glass

Table 7 – Glazing requirements

Glazing specification is based on data supplied by Pilkington; however, alternative configurations and manufacturers are also capable of meeting the sound insulation requirements. Any glazing used in the building should be reviewed against octave band survey data to check the required internal ambient noise levels can be achieved.

6.1 Ventilation

6.1.1 Whole dwelling ventilation

It is a requirement of the Building Regulations that 'whole dwelling ventilation' is provided to residential spaces when occupied.

The main methods of providing supply air for this level of ventilation are:

- Façade openings (such as trickle vents); or

- A mechanical air supply system (such mechanical ventilation and heat recovery (MVHR).

Should facade openings be required as part of the ventilation strategy they are a potential 'weak point' in the building façade and therefore need to provide an appropriate level of noise attenuation.

The minimum sound insulation requirements for any ventilation openings in the building façade have been calculated to be 35 dB $D_{n,e,w}$.

It is important to note that this requirement assumes a single ventilation opening in relevant rooms. Should more than one opening be necessary in a space, the required sound insulation will need to be increased by '+ 10 Log N', where N is the number of ventilators. For example, should two ventilators be required in a space, the required performance would be 38 dB $D_{n,e,w}$.

Mechanical ventilation solutions, such as MVHR, generally have an inherently high level of sound insulation. However, where air intakes / exhausts are situated on louder facades this should be reviewed and if required appropriate attenuation should be included as part of the system to meet the BS 8233 / LBC INGLs.

6.1.2 Purge ventilation

The only time windows will be required to be open for the purpose of ventilation will be for occasional 'purge' ventilation. With respect to noise levels during purge ventilation, the ProPG states the following:

'*It should also be noted that the internal noise level guidelines are generally not applicable under 'purge ventilation' conditions as defined by Building Control Approved Document F, as this should only occur occasionally (e.g. to remove odour from painting and decorating or from burnt food).'*

It is therefore not considered necessary to further consider noise levels during purge ventilation conditions and using windows for this purpose is unlikely to result in any significant adverse effects.

6.1.3 Thermal comfort (overheating)

It is understood that mechanical comfort cooling is proposed for some parts of the development. In other areas, relief from overheating will rely on "ventilative cooling" (opening windows). When windows are open, internal noise levels will be increased. The impact this will have on future residents will depend on how often the windows in these areas will need to be opened.

To assess these impacts in more detail it will be necessary to estimate / predict how often the building is likely to overheat and therefore how often residents would be exposed to increased internal noise levels. If considered necessary, potential noise impacts could be mitigated by reducing the amount of time the building is likely to overheat or providing relief from overheating via alternative methods than open windows.

6.1.4 External amenity areas

In relation to noise levels in external amenity spaces (outdoor living space), ProPG / BS 8233: 2014 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 $L_{Aeq,16hr}$'.

This is also referred to in the London Borough of Camden's requirements, as shown in Figure 2.

External noise levels of 60 dB $L_{Aeq,16hr}$ have been measured on site. This is above the 55 dB $L_{Aeq,T}$ upper limit identified by BS 8233 annoyance' criteria and LBC's Significant Observed Adverse Effect Level.

However, external amenity areas in the proposed development are only included for 50% of the proposed apartments and are located on the roof of the proposed development. The building edge and wall / balustrade will likely to provide up to approximately 10 dB of "line of sight" screening attenuation for a significant portion of these roof top amenity areas, thereby reducing the noise level to approximately 50 dB $L_{Aeq,16hour}$, which is at the low end of LBCs amber category which states:

"Amber – where noise is observed to have an adverse effect level, but which may be considered acceptable when assessed in the context of other merits of the development [LOAEL to SOAEL];"

It should also be noted that BS 8233 provides the following guidance in relation to noise in external amenity areas:

"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 LAeq,T, with an upper guideline value of 55 dB LAeq,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."

6.2 Summary of site suitability assessment

An initial noise risk assessment, based on the guidance in the ProPG, has been carried out for the proposed site. It has been found that, without mitigation in place, the site would be at 'low' to 'medium' risk of adverse effects on future residents as a result of noise without mitigation.

Therefore, an assessment of internal and external noise levels has been undertaken and mitigation advice has been provided, in the form of proposed glazing, façade and ventilation opening acoustic performance requirements.

With the implementation of these measures it is likely that the BS 8233 / ProPG and LBC internal and external noise level guideline levels can be achieved.

It is therefore considered that the site is suitable for residential development assuming appropriate mitigation measures are included in the design.

7.0 Plant noise emission limits

Noise emission limits for new plant and equipment have been set at the façades of the nearest noise sensitive receptors based on London Borough of Camden planning guidance.

Noise emission limits for new plant and equipment are summarised below.

Period	Typical measured background noise level (dB $L_{A90,15min}$)	Maximum plant noise level (dB $L_{Aeq,T}$)	Maximum plant noise level with tonal features (dB $L_{Aeq,T}$)
Daytime (07:00 – 23:00)	53	43	38
Night-time (23:00 – 07:00)	43	35*	30*
* In situations where external background noise levels are low, BS 4142:2014 +A1: 2019 states that "BS 8233 indicates that 35 dBA sound level from the plant, equating to an internal noise level of around 25 dBA or lower [with an open window], with no significant acoustically distinguishing characteristics, is suitable for a bedroom." Therefore, it is proposed that noise emission limits not lower than 35 dB $L_{Aeq,T}$ (or 30 dB $L_{Aeq,T}$ with acoustic characteristics) are acceptable. However, this should be confirmed with Camden Council Planning and / or Environmental Health Department			

Table 8 – Proposed plant noise limits

Plant noise emission limits apply to the cumulative noise levels from all new items of plant operating at their maximum duty and are applicable at 1 metre from the window of the nearest noise sensitive receptors.

It is understood that air source heat pumps are proposed at roof level, within acoustic enclosures. However, at this point in the design, no detailed specifications or time of operation have been set out for buildings services installations associated with the proposed development. Suitable attenuation measures should be specified (e.g. acoustic screening or acoustic attenuators) where required to comply with these noise emission limits.

When detailed information regarding new plant and equipment is available, a more detailed noise assessment should be undertaken based on the specific plant to be installed, its location, acoustic features and any noise control measures.

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