

Brunel Walk Redevelopment and Turner Avenue Estate Improvements

Noise Impact Assessment

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1.0 EXECUTIVE SUMMARY

This report, prepared by Max Fordham LLP Acoustics Team, provides a Noise Impact Assessment supporting the planning submission for the proposed Brunel Walk Redevelopment and Turner Avenue Estate Improvements, and assesses the acoustic suitability of the site.

The dominant noise sources at the proposed site comprise traffic noise from West Green Road to the north, and occasional vehicles passing on Kirkton Road to the east. Some occasional aircraft noise also contributes.

To quantify the existing noise environment at the site, a noise survey was undertaken at the existing Brunel Walk site from Friday 24th to Tuesday 28th September 2021. The results of the noise survey, undertaken at a location central to the site, returned mean (L_{Aeq}) day and night time noise levels of 49 dBA and 46 dBA respectively. Representative background sound levels (i.e. some of the quietest noise levels – levels that are exceeded for 90% of the time) were 42 dBA (day) and 38 dBA (night). As such, noise levels are considered low in and around the site.

Based on the determined noise environment, the scheme has been assessed with respect to appropriate policies and guidance including: Professional Practice Guidance (ProPG) on Planning and Noise, 2017; Acoustics Ventilation and Overheating Residential Design Guide (AVO Guide), 2020; Overheating: Approved Document O (ADO), 2021.

In reference to both the ProPG and AVO risk categories, site noise levels are considered in the ‘Low – Negligible’ risk category. Additionally, indoor noise levels are expected to comply with guidance noise values included in ADO, i.e. the ventilation and overheating strategy proposed for the scheme (MVHR with opening windows for peak ventilation/overheating) is appropriate with respect to noise.

The typical noise levels in external amenity areas of the site, represented by balcony spaces and external surrounding grounds, are predicted to be typically <55 dBA, which represents good amenity space conditions in an urban context, as cited in BS 8233:2014 *Guidance on sound insulation and noise reduction for buildings*.

In conclusion, ambient noise levels at the site are low, and the site is suitable for residential use.

Plant noise limits have been proposed based on the determined representative background sound levels, and the Haringey Council guidance on plant noise. Proposed specific plant noise limits at night, external to the windows of surrounding existing residential properties, have been proposed as 30 dBA, which is considered a very low level.

The new residential blocks will use ASHPs (Air Source Heat Pumps) located on the roof of each block, as a key part of the energy strategy. The ASHPs will be housed in full acoustic enclosures. A noise assessment indicates that even at full duty, plant noise limits are expected to be met.

In conclusion, the site is considered appropriate for residential use, and represents a low impact with respect to noise emissions.

2.0 INTRODUCTION

This report, prepared by Max Fordham LLP Acoustics Team, provides a Noise Impact Assessment supporting the planning submission for the proposed redevelopment of Brunel Walk to provide: 45 new Council rent homes in four buildings ranging from 3 to 4-storeys high including 39 apartments and 6 maisonettes; provision of associated amenity and play space, cycle and refuse/recycling stores and 4 wheelchair parking spaces; reconfiguration and enhancement of existing parking areas and outdoor communal areas and play spaces on the Turner Avenue Estate.

Max Fordham LLP Acoustics Team is a corporate member of the Association of Noise Consultants (ANC).

A glossary of the common acoustic terms used in this report is given in the Appendix, for reference.

2.1 The Site

The site lies at Brunel Walk, Haringey, London, N155HQ and Turner Avenue Estate, Haringey, N15 5DG. Turner Avenue lies on the north border of the site and West Green Road lies further north. The site is mostly surrounded by other residential buildings, with access to the properties along Brunel Walk via Kirkton Road to the east. Brunel walk is currently occupied by five residential units. See Figure 1 for an overview.



Figure 1. Top: Current site location (courtesy Google Maps). Bottom: Proposed site plan, blocks A-D, left to right (courtesy KC+A)

3.0 POLICY AND GUIDANCE

3.1 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.

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 advice (March 2014, latest update July 2019) states in the context of considering when noise is relevant to planning, "noise needs to be considered when new development may create additional noise, or would be sensitive to the prevailing acoustic environment (including any anticipated changes to that environment from activities that are permitted but not yet commenced)." (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.

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.

3.2 Regional Policy and Guidance

The London Plan 2021

The new 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 (*Souder City The Mayor's Ambient Noise Strategy*, Greater London Authority 2004), included here for context, sought "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 was:

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

Other initial priorities included:

- 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) 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 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 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 Policies 3.2, 5.3, 7.6, 7.15).

Haringey Development Management DPD

Adopted in July 2017, the relevant policy related to noise pollution contained in the Haringey Management Development DPD is **Policy DM23 Environmental Protection – Noise and Vibration**, which states the following:

"The Council will seek to ensure that new noise sensitive development is located away from existing or planned sources of noise pollution. Proposals for potentially noisy development must suitably demonstrate that measures will be implemented to mitigate its impact. A noise assessment will be required to be submitted if the proposed development is a noise sensitive development, or an activity with the potential to generate noise."

Also in **Policy 4.60**:

"Noise pollution can adversely impact on the amenity and health of building occupiers as well as the wider public. The Council will seek to ensure that new developments both minimise noise pollution and appropriately manage its impact. Noise sensitive development (such as housing, schools and health facilities) should be located away or appropriately separated from major sources of noise. The Council will expect that mitigation measures are considered and incorporated into the design process prior to the submission of an application."

3.3 Expected Planning Conditions

Internal noise conditions

We expect that delivering BS 8233 internal noise conditions (see Section 2.6 below) is required. The planning condition may also reference the ProPG (see Section 2.7 below) defined 45 dB L_{Aeq} night-time internal limit (exceeded no more than 10 times a night).

Plant noise limits

We expect a planning condition with respect to plant noise, i.e. applicable to the roof-top Air Source Heat Pumps (ASHPs) to be as given in this recent example:

6. Noise arising from the use of the Air Source Heat Pump shall not increase the existing background noise level (LA_{90} 15mins) when measured (LA_{eq} 15mins) 1 metre external from the nearest residential or noise sensitive premises. The applicant shall also ensure that vibration/structure borne noise derived from the use does not cause noise nuisance within residential or noise sensitive premises.
Reason: To protect the amenity of surrounding residential properties.

The “shall not increase the existing background” requirement means that the total combined plant noise level must be 10 dB below the existing background sound level. This principle has been confirmed by Jennifer Barrett (ASB Specialist (Noise), by email 11/01/20), noting also that Haringey reviews each application on a case-by-case basis.

Vibration

As the site is at least 200 m from the nearest rail tracks and Tube tunnels (to the east), and 100 m from the nearest main road (A504 to the north), vibration will not be an issue for this site.

3.4 Building Regulations Part E

As new build flats/maisonettes, the dwellings must deliver the minimum required performance standards in Building Regulations 2010 *Resistance to the passage of sound* Approved Document E (2003 edition incorporating 2004, 2010, 2013, 2015 revisions).

3.5 BS 4142:2014

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.

3.6 BS 8233:2014

Environmental noise contribution

This standard is typically referred to in residential planning conditions. Noise levels from environmental noise ingress, under normal background ventilation conditions, shall not exceed the limits given in Table 1.

It is generally regarded that the levels in Table 1 represent the ‘*Lowest observed adverse effect level*’ (LOAEL) thresholds.

Location	$L_{Aeq,16hr}$ Daytime (7am – 11pm)	$L_{Aeq,8hr}$ Night Time (11pm – 7am)
Living Room	35dB	-
Dining Room	40dB	-
Bedroom	35dB	30dB

Table 1. BS8233 recommended internal noise levels. External noise sources only.

Noise from lifts

BS 8233 (2014) gives recommendations for maximum noise levels from lifts, as shown in Table 2.

Room	Maximum noise level, L_{AFmax} dB
Bedroom	25 (max)
Living room	30 (max)
Other areas	35 (max)

Table 2. BS 8233 guideline levels for noise levels from lifts in living accommodation.

In addition, BS8233 provides guidance on desirable noise levels in areas that are intended to be used for external residential amenity space (such as gardens and patios). It states 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 also recognises that these guidelines are not achievable in all circumstances where development might be desirable, such as higher noise areas in cities, where a compromise between elevated noise levels and other factors may be warranted. While these guidelines are generally used in consideration of residential amenity, it is reasonably to note that general urban external areas that are exposed to noise levels no more than 55 dB $L_{Aeq,T}$ are likely to provide a relatively good quality noise environment.

3.7 ProPG (2017)

Professional Practice Guidance (ProPG) on Planning and Noise (2017) “New Residential Development”, provides a framework to give “an early indication of the likely initial suitability of the site for new residential development from a noise perspective and the extent of the acoustic issues that would be faced”. It is only applicable for transport noise sources but may include industrial/commercial sources provided they are not dominant.

Figure 2 below reproduces ProPG’s Figure 2, which gives an overview of how increasing noise levels at site (day and night) may affect the noise risk assessment and planning advice.

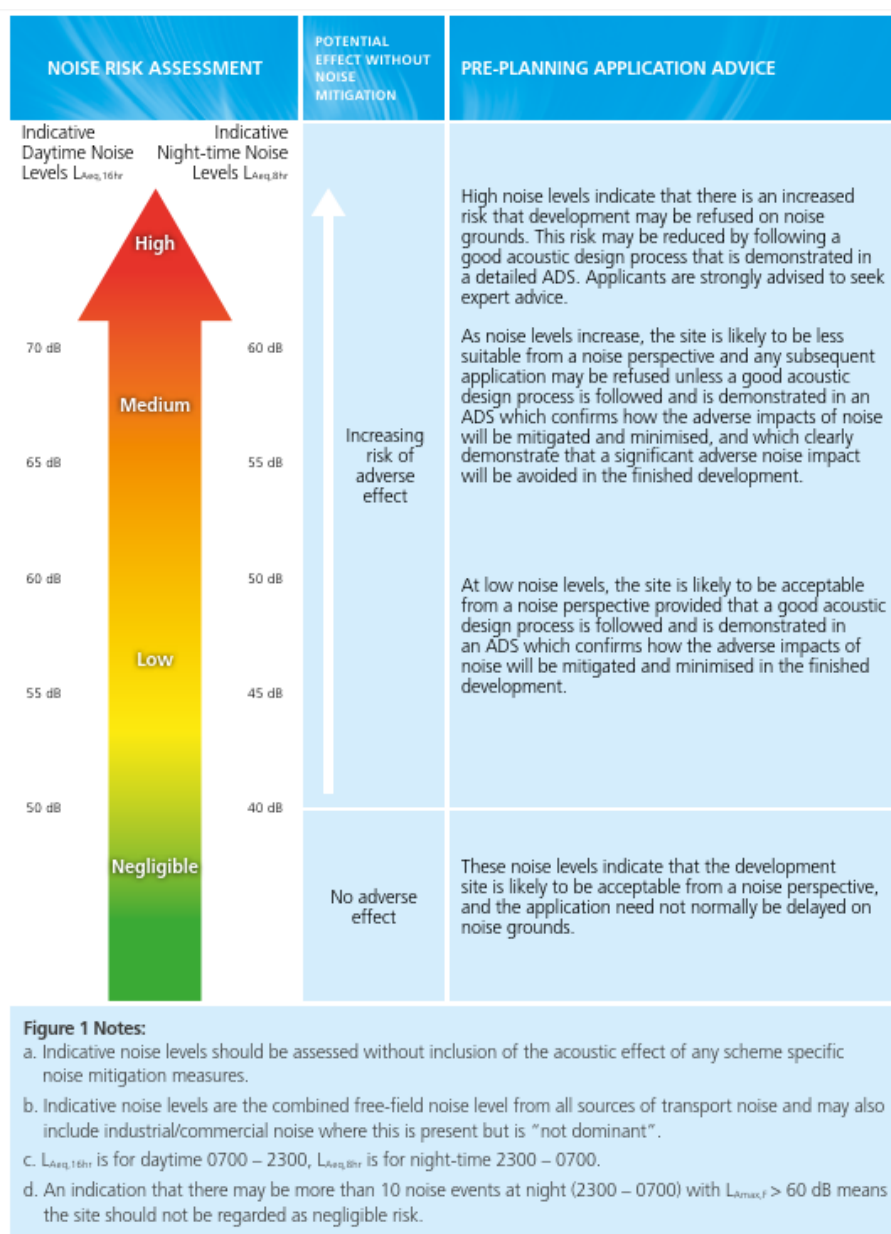


Figure 1. Stage 1– Initial Site Noise Risk Assessment

Figure 2. ProPG site noise initial risk assessment.

ProPG generally recommends that the design shall deliver BS 8233 internal noise levels but makes the additional recommendation that individual noise events in bedrooms should not normally exceed 45 dB L_{AFmax} on more than 10 occasions per night.

It is acknowledged that these limits do not apply when windows or vents are opened for purge ventilation. As such, it is a design team decision as to whether internal noise levels are acceptable under overheating conditions and purge, i.e. when vents or windows are opened.

3.8 Acoustics Ventilation and Overheating Guide (2020)

The noise levels described in BS 8233 and ProPG apply when the dwelling is being ventilated at the Part F whole dwelling ventilation rate. However, the system providing background ventilation does not typically provide sufficient ventilation to mitigate peak overheating, which is often controlled by opening windows to provide a significantly higher rate of ventilation.

The Association of Noise Consultants (ANC) and Institute of Acoustics (IOA) have published the document *Acoustics Ventilation and Overheating Residential Design Guide* (“AVO Guide”, Version 1.1 January 2020), which provides guidance on how to assess these conditions. Figure 3 below reproduces the AVO Guide’s Table 3-2 which provides a ‘Level 1’ risk assessment guide based on external free field ambient noise levels for dwellings relying on opening windows to mitigate summertime overheating.

Risk category for Level 1 assessment ^[Note 5]	Potential Effect without Mitigation	Recommendation for Level 2 assessment
$L_{Aeq, T}$ ^[Note 3] during 07:00 - 23:00 $L_{Aeq, 9hr}$ during 23:00 - 07:00 65 dB High 55 dB 60 dB Medium 50 dB 55 dB Low 50 dB Negligible 45 dB	↑ Increasing risk of adverse effect	Recommended Optional
	Use of opening windows as primary means of mitigating overheating is not likely to result in adverse effect	Not required

Figure 3. AVO Guide (2020) Table 3-2. Guidance for Level 1 site risk assessment based on external free field ambient noise levels.

Should a Level 1 assessment show that external noise levels are likely to be significant (we would suggest, in the medium and high-risk category), the AVO Guide's Table 3-3 which provides a 'Level 2' risk assessment guide based on internal noise levels would need to be used.

As will be seen below, the external noise levels at site are relatively low, and so a Level 1 assessment is considered adequate as discussed below.

3.9 Approved Document Part O (2021)

The recently introduced Building Regulations Approved Document O (Overheating) has various non-ventilation requirements/guidance that should be satisfied as part of a compliant overheating control strategy. With regards to noise it states:

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

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

1. 40dB $L_{Aeq,T}$, averaged over 8 hours (between 11pm and 7am)
2. 55dB $L_{AF,max}$, more than 10 times a night (between 11pm and 7am)”

These noise levels are not presented as limits to be met within bedrooms, merely as the levels which noise is likely to cause occupants to sacrifice their thermal comfort to manage their acoustic comfort. It references the use of the ANC ‘*Acoustics, Ventilation and Overheating: Residential Design Guide*’ (2020).

The industry response to how the noise statements in Approve Document O will be implemented by Building Control, is not yet clear. However we comment below on the likely effect on this scheme.

4.0 NOISE ENVIRONMENT

The main noise sources at the proposed site are traffic noise from West Green Road to the north, and occasional vehicles passing on Kirkton Road to the east. A noise survey was required as part of the design process, in order to determine:

- External *ambient* mean (and maximum) noise levels during the day and night, in order to define the acoustic performance of the façade (including ventilation and glazing). The aim is to provide suitable internal noise levels under normal background ventilation conditions, as well as a consideration of the internal noise levels during overheating.
- External *background* sound noise levels, which represent the typical lowest noise levels likely to be experienced at the site, in order to set plant noise limits at the nearest sensitive receptors.

The next section presents the results of noise surveys to determine the above parameters.

4.1 Noise surveys

An unattended noise survey was undertaken at the site of the proposed Brunel Walk redevelopment to determine the existing noise environment from Friday 24th to Tuesday 28th September 2021. This data is used for the site suitability considerations included in this report.

Figure 4 shows the locations of the long-term unattended survey (L1), and short term attended measurement (S1) undertaken around the site.

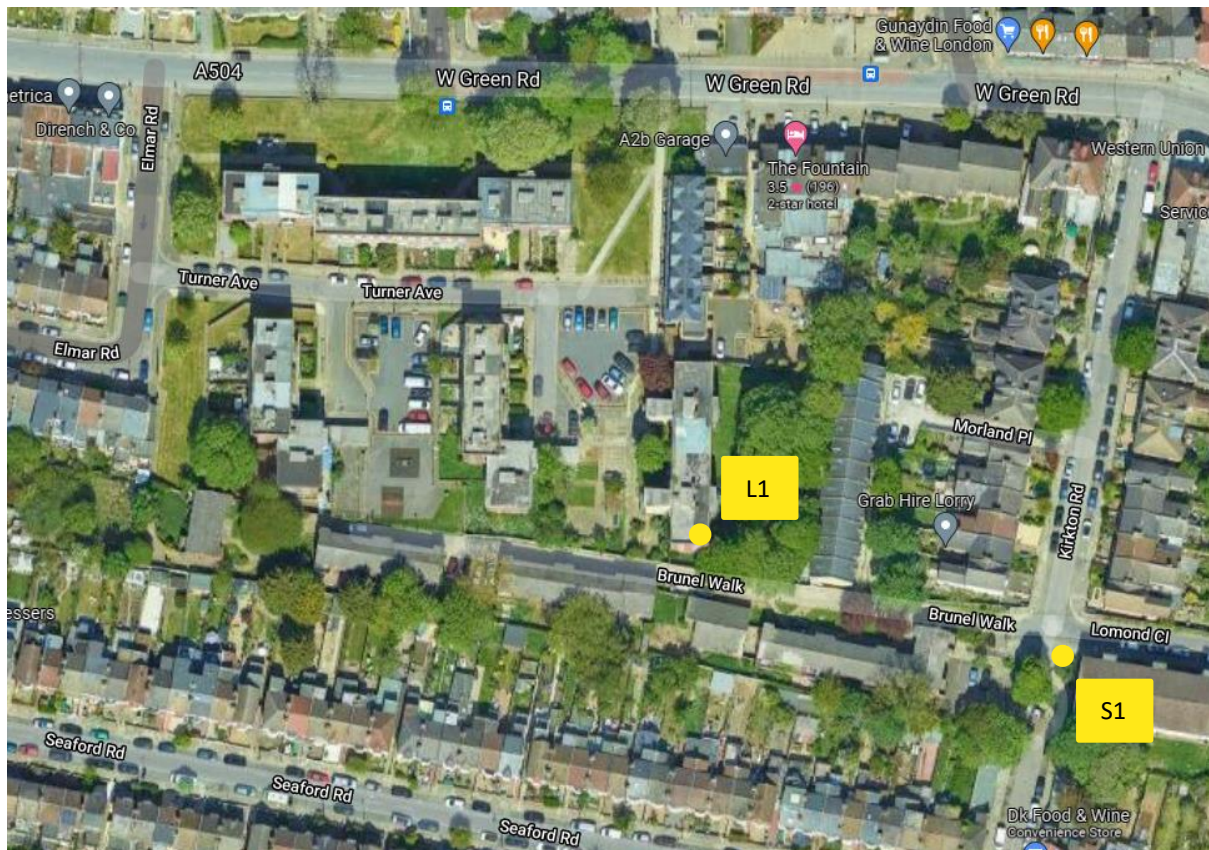


Figure 4. Aerial image (courtesy Google Maps) of the site showing noise survey locations.

The locations were selected to provide a reasonable coverage across the whole proposed scheme by setting up a long-term survey on the roof of a 4-storey block of flats on Turner Avenue to cover the middle area of Brunel Walk, as well as a spot measurement at the entrance to the site to account for noise on Kirkton Road, shown in Figure 4. Location L1 was considered an appropriate location to determine the general local representative background sound level.

A Class 1 sound level meter made consecutive 15-minute noise measurements over the L1 survey period of 96 hours. The microphone of the sound level meter was mounted on tripods externally, approximately 1.3 m above roof level. The position was free-field, and in accordance with the principles of BS 7445. A weather protection kit was used. An in-situ calibration check was undertaken at the beginning and the end of the measurement period, and no significant drift was observed. A microphone windshield was used during all measurements.

Details on measurement equipment used during the survey period can be found in Appendix A. All equipment owned or hired by Max Fordham is subject to regular calibration checks traceable to national standards.

Figure 5 shows the long-term noise survey data for L1, indicating maximum, mean and background noise levels ($L_{AFmax,15min}$, $L_{Aeq,15min}$ and $L_{AF90,15min}$ parameters respectively).

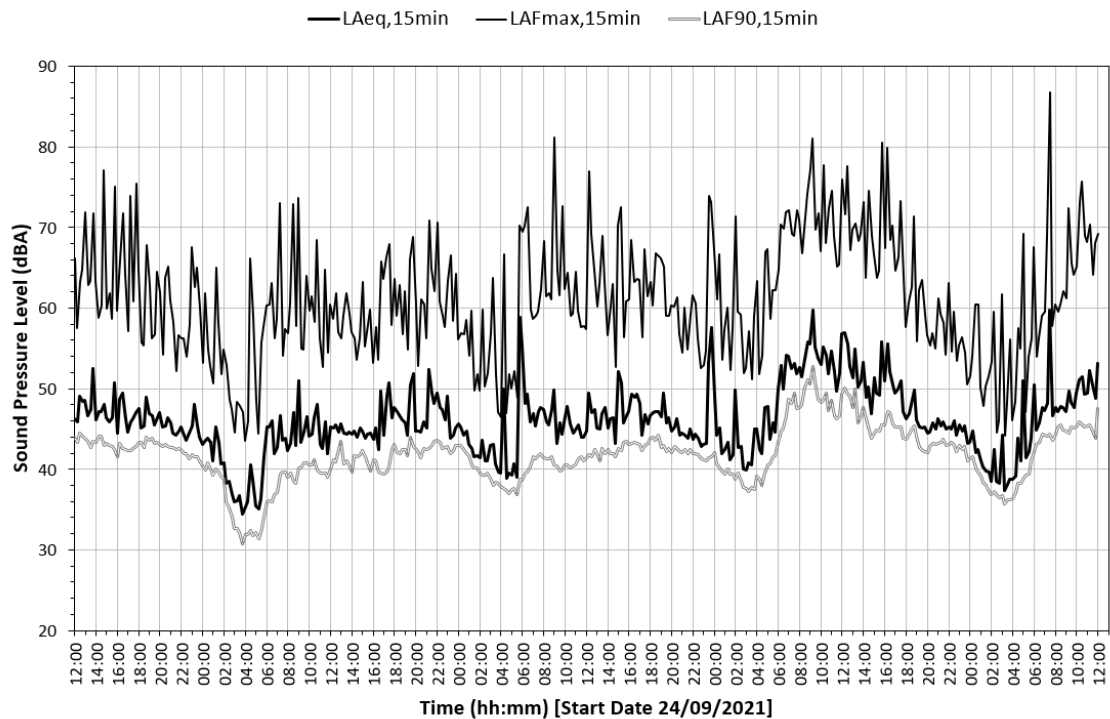


Figure 5. The 96-hour noise survey data at location L1, showing L_{Aeq} , L_{AFmax} and L_{AF90} data for consecutive 15-minute measurement periods (data plotted at measurement period start times).

Weather conditions (assessed by use of hyperlocal weather site Dark Sky) for the first half of the survey are not considered to have affected the survey results, with conditions being dry and mean wind speeds below 5 m/s. However, wind speed increased on the final full day (Monday 27th), accompanying rain showers – and increased noise levels are apparent in Figure 5. While contribution from rain noise (on surrounding surfaces, trees, roads etc) may represent useful data, the effect of wind on the microphone windshield is suspected. To be conservative, results from the start of Monday 27th until the end of the survey have been removed, with the remaining data used for analysis shown in Figure 6.

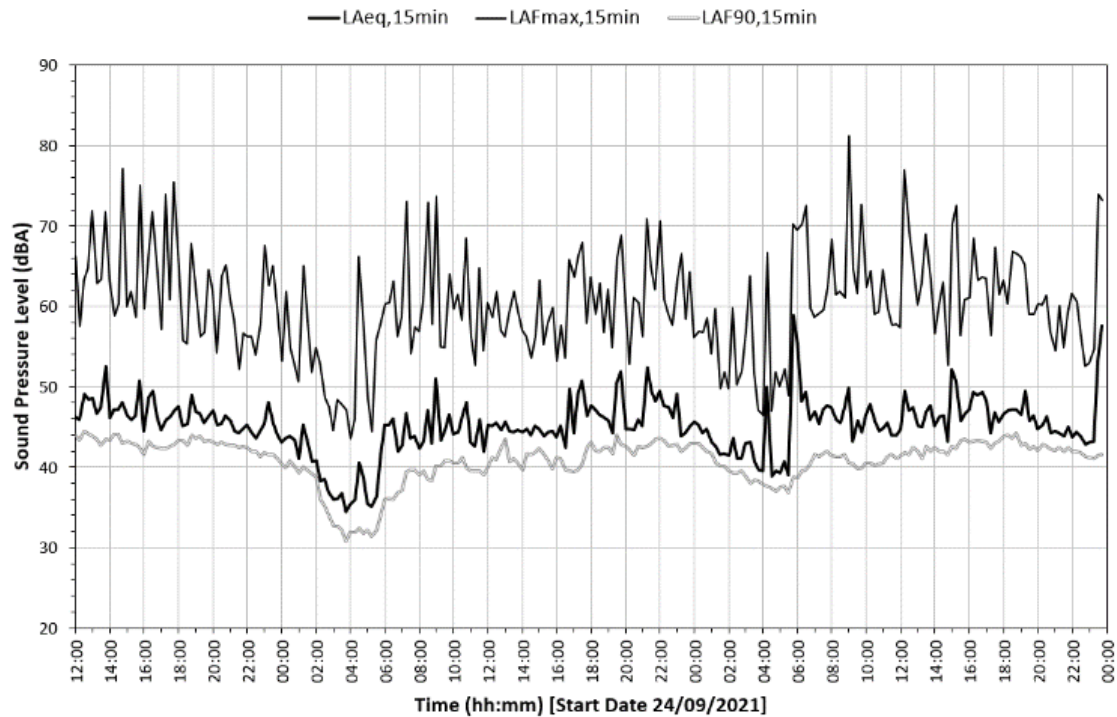


Figure 6. The 60-hour noise survey data subset at location L1, showing L_{Aeq} , L_{AFmax} and L_{AF90} data for consecutive 15-minute measurement periods (data plotted at measurement period start times). This data is used for analysis.

Table 3 shows the results obtained at the long-term survey location L1, including the mean ambient noise level and minimum recorded $L_{AF90,15min}$; as well as the 40th percentile of the background level $L_{AF90,15min}$, which we will adopt as the 'representative background sound level' (see Appendix B for histograms of $L_{AF90,15min}$ data). Table 3 also reports the night-time maximum noise level in terms of the L_{AFmax} level that is exceeded approximately 10 times per night.

Table 4 presents the short-term measurement obtained at location S1.

Location	Period, T	Mean $L_{Aeq,T}$ [dB]	Minimum $L_{AF90,15min}$ [dB]	40 th percentile of $L_{AF90,15min}$ data [dB]	L_{AFmax} level exceeded 10 times per night [dB]
L1	Day 16 hours (07:00-23:00)	49	37	42	n/a
L1	Night 8 hours (23:00-07:00)	46	31	38	64

Table 3. Noise levels obtained at location L1. Mean, background and maximum noise parameters are reported.

Location	Date	Approx. time	Period, T	Mean $L_{Aeq,T}$ [dB]
S1	28 th September 2021	15:00 – 15:15	15 min	54

Table 4. Short term noise survey at location S1, with mean level reported.

5.0 SITE SUITABILITY

5.1 Noise Levels and Ventilation Strategy

The mean noise levels measured during the long-term noise survey (as outlined in Table 3) were 49 dB ($L_{Aeq, 16hr}$ day) and 46 dB ($L_{Aeq, 8hr}$ night) – these are considered representative of noise levels at the majority of facades over the Brunel Walk site. Noise levels may be slightly elevated at the easternmost façade with direct line of sight to Kirkton Road due to occasional passing of local vehicles on Kirkton Road. This is not expected to be more than 5 dB above the mean $L_{Aeq,T}$ (as supported by the S1 measurement) and there are no bedrooms on the façade in question, therefore noise levels at the bedroom windows of block D are expected to be within acceptable levels of <55 dB ($L_{Aeq, 16hr}$ day) and <50 dB ($L_{Aeq, 8hr}$ night). In reference to the ProPG risk category, outlined in Figure 2, noise levels are in the ‘Low – Negligible’ risk category. Ambient noise levels at the site are low, and the site is suitable for residential use.

AVO Level 1 Assessment

With respect to ventilation strategy and the proposed use of opening windows to mitigate overheating (i.e. higher ventilation rates than is provided by the proposed MVHR normal background ventilation); Figure 3 summarised the AVO Guide risk categories indicating that, again, the site is in the ‘Low-Negligible’ risk category. As such, it is considered that that opening windows for overheating control is acceptable with no additional mitigation measures proposed.

Approved Document O Assessment

To avoid residents needing to significantly compromise their acoustic comfort by opening windows for overheating control, the noise levels recorded have been compared with the levels presented in Approved Document O (ADO), despite the ADO levels not being defined as absolute upper limits for acceptable internal noise levels.

From the noise survey, the mean night-time external noise level was 46 dB $L_{Aeq, 8hr}$ and the L_{AFmax} level exceeded 10 times per night was 64 dB L_{AFmax} (both free-field levels). According to the AVO Guide, ‘partially’ open windows have an outside-to-inside level difference of about 13 dB. With windows ‘fully’ open, under ADO maximum overheating conditions, the level difference will be lower.

We understand from the M&E Engineers that, to meet overheating requirements at night, the likely required maximum opening angle of the side hung bedroom windows will be no more than 30 degrees when ‘fully open’. We estimate that the outside-to-inside level difference under these conditions will be no more than 9 dB. The resulting expected internal noise levels for the ‘partially open’ and ‘fully open’ situations *inside* the bedroom is shown in Table 5.

Criteria (at night)	Typical external noise level (dBA)	Indoor level if windows partially open (dBA)	Indoor level if windows fully open (dBA)	ADO indoor noise level at which windows are likely to be closed (dBA)
Representative ambient mean noise level ($L_{Aeq, 8hr}$)	46	33	37	40
Representative maximum noise level (10 times per night) (L_{AFmax})	64	51	55	55

Table 5. Comparison between expected external noise levels, indoor levels (windows open), and ADO assumption.

It is seen from Table 5 that the expected indoor noise levels are lower than the ADO guide values, with the case of maximum predicted levels being equal to the ADO guide value.

It should be appreciated that precise future noise levels at each specific façade cannot be predicted with absolute certainty, and clearly some exceedance of the target values may occasionally occur. However, the expected internal noise environment with bedroom windows open is in line with the general goals of ADO and suggests that the ventilation and overheating strategy proposed for the scheme (MVHR with opening windows for peak ventilation/overheating) is appropriate.

BS8233 and façade/glazing performance

To deliver BS 8233 internal day and night noise levels (with windows closed and normal background ventilation provided by MVHR), an outside-to-inside level difference of about 20 dB would be adequate. This is not an onerous requirement, and typical fabric constructions and glazing elements (windows and balcony doors) will provide this comfortably. To be conservative, it is recommended that the windows are selected with a weighted sound reduction rating of at least 33 dB R_w (and/or 28 dB R_w+C_{tr}), and balcony doors at least 30 dB R_w (and/or 25 dB R_w+C_{tr}), which are readily provided by typical double glazed (or triple glazed) products.

5.2 Internal Sound Insulation

As a minimum, the scheme must deliver the internal sound insulation performance standards stated in Approved Document E of the Building Regulations ('Part E').

For information, as the scheme includes concrete floors, and appropriate lightweight gypsum blockwork walls, the performance delivered is likely to be at least '+5 dB' better than Part E standards between flats.

5.3 External Amenity

The day time noise levels in external amenity areas of the site, represented by balcony space and external surrounding grounds, are predicted to be typically about 50 dBA, which represents good BS 8233 amenity space conditions. The easternmost end of the site may have day time levels of up to 55 dBA, which is still considered acceptable in urban environments.

6.0 PLANT NOISE ASSESSMENT

Plant Noise Limits

Haringey Council plant noise limits determination methodology was described in Section 3.3 above; stating that new plant shall not increase the existing background noise level. This is essentially specifying that plant noise limits are set at 10 dB below existing background noise levels.

In selecting a background level, we note that 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 of L_{A90} data.

Based on past experience, a reasonable approach to defining an overall representative value is to consider the 40th percentile value of the $L_{AF90,15min}$ data periods, which accounts for potentially unrepresentative high values and untypical events, while usually representing values near the median of the remaining 'valid' distribution. That said, visual interrogation of the statistical distributions is also useful, taking a view on the most appropriate value. The statistical distributions of our noise survey $L_{A90,15min}$ data is shown in Appendix B. From this assessment, it is considered that adopting the 40th percentile is reasonable, and these values were noted above in Table 3 (results of the noise surveys).

Adopting these values as representative background sound levels (as per BS 4142), Table 6 notes our proposed plant noise limits, such that the total plant noise specific level 1 m from the façade of the nearest noise sensitive receiver (NSR) shall be 10 dB below the representative background. The nearest NSRs are generally the top floor windows to flats on Turner Avenue, and the nearest dwellings on Kirkton Road. At night, we propose that the plant noise specific level limit is set to 30 dBA, as this represents an extremely low and onerous level, particularly in an urban context such as this.

Period	Adopted Representative Background Sound Level [dBA]	Plant noise specific sound level limit at the nearest NSR, $L_{Aeq,15min}$ [dBA]
Day (07:00-23:00)	42	32
Night (23:00-07:00)	38	30*

Table 6. Representative background sound level and proposed plant noise emission limit, as at surrounding NSRs. *Proposed night-time limit (see text).

Plant Noise Assessment

The M&E strategy uses 2 no. ASHPs located within an acoustic enclosure which provides attenuation (including to the top face as well as sides), on the roof of each of the four flat Blocks (A-D). The acoustic enclosure locations are shown on the site plan in Figure 1 as the white squares on the roofs of the proposed flat blocks.

We have assessed that to meet the plant noise limits in Table 6, the sound power emitted from each of the ASHP acoustic enclosures (assuming equal installations), would need to be limited to no more than 58 dBA sound power.

We understand that the ASHP units selected, when at 100% duty, emit a sound power of between 77 and 80 dBA depending on the precise unit used and its heating/cooling mode. Furthermore, the typical peak load usage will be provided by operating the two units simultaneously at part load, running at no more than 50-60% of maximum output.

To be conservative, if we assume the worst case of two units each of 80 dBA sound power, running simultaneously at 100% duty, then that would imply a maximum of 83 dBA sound power internal to each acoustic enclosure. Thus our 58 dBA emission limit is met if the enclosure can provide 25 dB insertion loss.

We understand from the M&E Engineers, that the enclosure specified from specialist suppliers will provide an insertion loss of 27 dB. As such, noise limits are expected to be met. Furthermore, with the units running at 50-60% duty in the worst case, the actual noise emissions are likely to be at least 5 dB lower than assumed above.

In conclusion, the plant noise mitigation appears acceptable.

7.0 SUMMARY

Max Fordham LLP Acoustics Team have provided a Noise Impact Assessment for the proposed Brunel Walk residential development. Max Fordham LLP Acoustics Team is a corporate member of the Association of Noise Consultants (ANC).

An unattended noise survey was undertaken on site between the Friday 24th and Tuesday 28th of September 2021 to determine typical mean ambient (L_{Aeq}) and background (L_{A90}) sound levels in the vicinity of Brunel Walk.

Based on survey measurements, our proposed adopted representative background sound levels (as per BS 4142 methodology) were determined as 42 dBA (day) and 38 dBA (night). Haringey Council generally requires that plant noise is limited to a level 10 dB below background (although this is taken on a case by case basis). It is proposed that plant noise limits of 32 dBA (day) and 30 dBA (night) are applied – the night time level being only 8 dB below background but still representing a very low level.

Site suitability has been considered. Acoustic ratings of the glazing elements (i.e. windows and doors) have been recommended to deliver required BS 8233:2014 internal noise levels (with windows closed and normal background ventilation provided by MVHR).

Due to generally low ambient noise levels (the long term survey returning 49 dBA $L_{Aeq,16hr}$ and 46 dBA $L_{Aeq,8hr}$), opening windows for increased ventilation and overheating mitigation is considered acceptable. With respect to ProPG and AVO Guide assessments, the site is considered in the 'Low – Negligible' risk category.

An assessment with respect to the recently introduced Building Regulations Approved Document O *Overheating*, shows that the scheme is expected to be in line with the noise expectations mentioned in Approved Document O.

Outdoor amenity spaces, such as the surrounding grounds and balconies, will typically have mean day time ambient noise levels of ≤ 55 dBA, and as such are considered appropriate conditions in an urban context under BS 8233 methodology.

It is understood that each of the four blocks will have 2 no. ASHPs on the roof, housed in acoustic enclosures. An assessment indicates that the combined noise from these units at full duty will meet the proposed plant noise limits at the surrounding existing residential properties.

In conclusion, the site is considered appropriate for residential use, and represents a low impact with respect to noise emissions.

8.0 APPENDICES

8.1 Appendix A – Noise Survey Equipment Details

The equipment summarised in the table below has been calibrated by a UKAS accredited laboratory in accordance with the laboratory requirements of the United Kingdom Accreditation Service (UKAS) on the dates indicated.

Item	Make	Type	Serial no.	Calibration Intervals	Last Calibrated	Next Due Calibration	Calibration Certificate Number
Class 1 sound level meter	Norsonic	118	31419	2 years	30/01/20	30/01/22	U33913 U33914
Microphone preamplifier	Norsonic	1206	30457	2 years	30/01/20	30/01/22	U33913 U33914
Microphone	Norsonic	1225	271043	2 years	30/01/20	30/01/22	33912
Calibrator	Norsonic	1251	30895	1 year	16/02/21	16/02/22	U37083

Table A1. Calibration details of noise survey equipment.

8.2 Appendix B – Background Sound Level Histograms

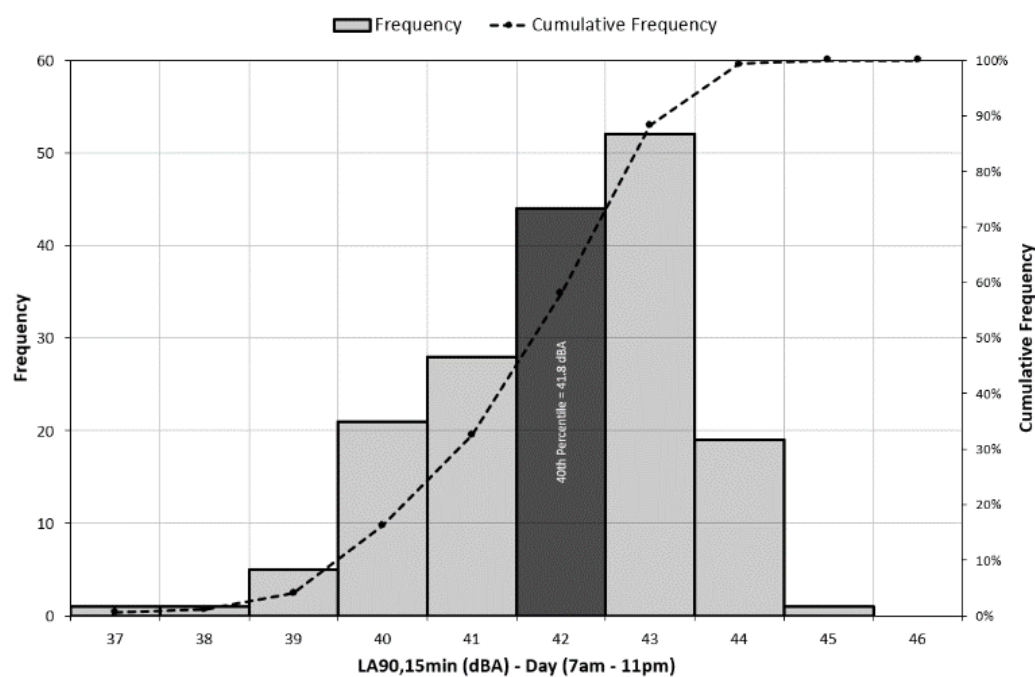


Figure A1. Long-term survey daytime background levels $L_{A90,15min}$

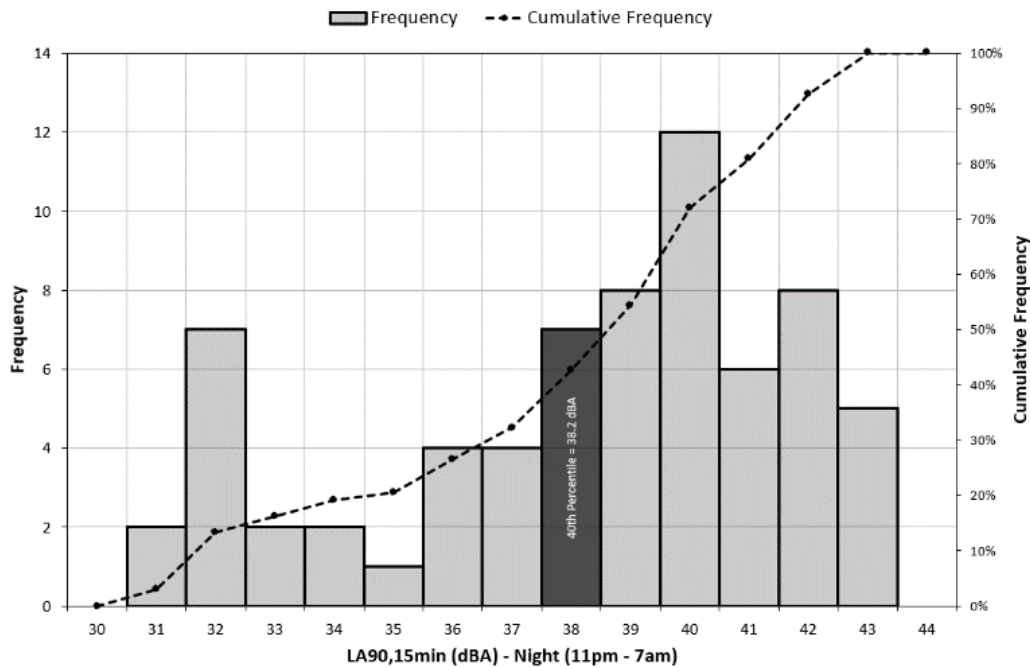


Figure A2. Long-term survey night time background levels $L_{A90,15min}$

8.3 Appendix C – Glossary of Acoustic Terminology

SOUND POWER LEVEL (SWL), L_w (dB)

The rate of total sound energy radiated by a sound source, measured on a logarithmic scale, with unit decibel dB. This units can also be A-weighted, as for A-weighted sound pressure level.

SOUND PRESSURE LEVEL (SPL), L (dB)

The sound level measured on a logarithmic scale, with unit decibel dB. This scale is linearly weighted, as opposed to A-weighted (see below). 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 125ms.

PERCENTILE NOISE LEVELS $L_{A1,T}$, $L_{A10,T}$, $L_{A90,T}$ (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. $L_{A90,T}$ is the level that is exceeded for 90% of the measurement period, and is usually used to represent the ambient background sound level.

BACKGROUND NOISE, $L_{A90,T}$ (dBA)

The value of the A-weighted sound pressure level that is exceeded for 90% of any given time interval, T. This value is generally adopted as representing the background noise level of a given environment. If not specified, usually assumed to mean $L_{AF90,T}$, i.e. determined with a 'fast' (F) sound level meter time constant of 125ms.

SOUND REDUCTION INDEX, R (decibels, 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 (decibels, 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 TERMS, C AND C_{tr} (dB). These are the values to be added to $D_{nT,w}$ to take account of the characteristics of a particular sound spectra. C corresponds to pink noise spectra and C_{tr} corresponds to typical urban traffic noise spectra. Typically used in context of residential sound insulation, $D_{nT,w}+C_{tr}$.