

Noise Assessment

Land at Eyhorne Street, Hollingbourne



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Non-Technical Summary

What is Proposed?	A scheme for a seventeen-property residential development is proposed on land adjacent to Eyhorne Street in Hollingbourne, Kent.
What is the Problem?	The development land is adjacent to a train track. As such, the proposed dwellings could be adversely impacted by noise. Distant motorway noise could also have a bearing on the acoustic conditions at the site.
What is the Result?	<p>The assessment has demonstrated that adequate internal noise levels in line with relevant guidance can be achieved with standard construction, but it would be prudent for the future residents to have the option to keep their windows closed.</p> <p>Due to strategic design, external amenity area noise levels are also expected to be comfortably compliant with guidance limits.</p> <p>In essence, some noise would be perceivable but as all levels are compliant with relevant guidance and local policy, future noise conditions are not expected to have a bearing on residential amenity.</p>
What are the Next Steps?	This report should be submitted to the local planning authority to support the planning application.

Report Record

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1.0 Introduction

1.1 A new seventeen-property residential development is proposed on land east of Eyhorne Street in Hollingbourne, Maidstone, Kent. The proposed site is located close to a road and train track and could therefore be exposed to elevated noise.

1.2 In light of the above, and to support the planning application / design process, a noise assessment has been conducted. The findings of this assessment are presented in this report.

What is a Noise Assessment?

1.3 A Noise Assessment will determine if and to what extent existing or future noise sources could affect noise-sensitive receptors, and importantly, if those noise sources could have an adverse impact. If the Noise Assessment finds that the level of risk or impact is unacceptable, mitigation measures will need to be applied to the development.

1.4 The Noise Assessment will consider the prevailing sound environment to determine potential noise sources including traffic, footfall or other noise generating activities, such as mechanical plant, generators etc. The report will provide an impact assessment and give actionable recommendations. Recommendations may include solutions involving changes to design, layout and construction methods, so that the impacts from noise can be reduced to acceptable levels. Often these mitigation measures can be incorporated into standard construction practices. Find out more about how we undertake Noise Assessments including FAQ [here](#).

1.5 Understanding and reducing the impacts ensures that you have a safe and compliant site. When dealing with planning, the National Planning Policy Framework (NPPF) and associated policies require an appropriate noise assessment at the initial planning stage, whilst the ProPG: Planning & Noise Professional Practice Guidance on Planning & Noise New Residential Development May 2017 requires delivery of sustainable development by promoting good health and wellbeing through the effective management of noise.

The Subject Site

Table 1 Site Details	
Address	Land at Eyhorne Street, Hollingbourne, Maidstone, Kent ME17 1UB
Eastings, Northings	583869, 154758
Area	1.19 ha
Local Planning Authority	Maidstone Borough Council

- 1.6 The site is situated east of Eyhorne Street and south of the train track. The area is semi-build up with residential areas to the north and south. The remaining land surrounding the site is either wood or farmland.
- 1.7 The train tracks are elevated via a gradual slope which facilitates a bridge over Eyhorne Street Road. Therefore, the tracks are raised across the length of the proposed development site. The site location is shown below in Figure 1.

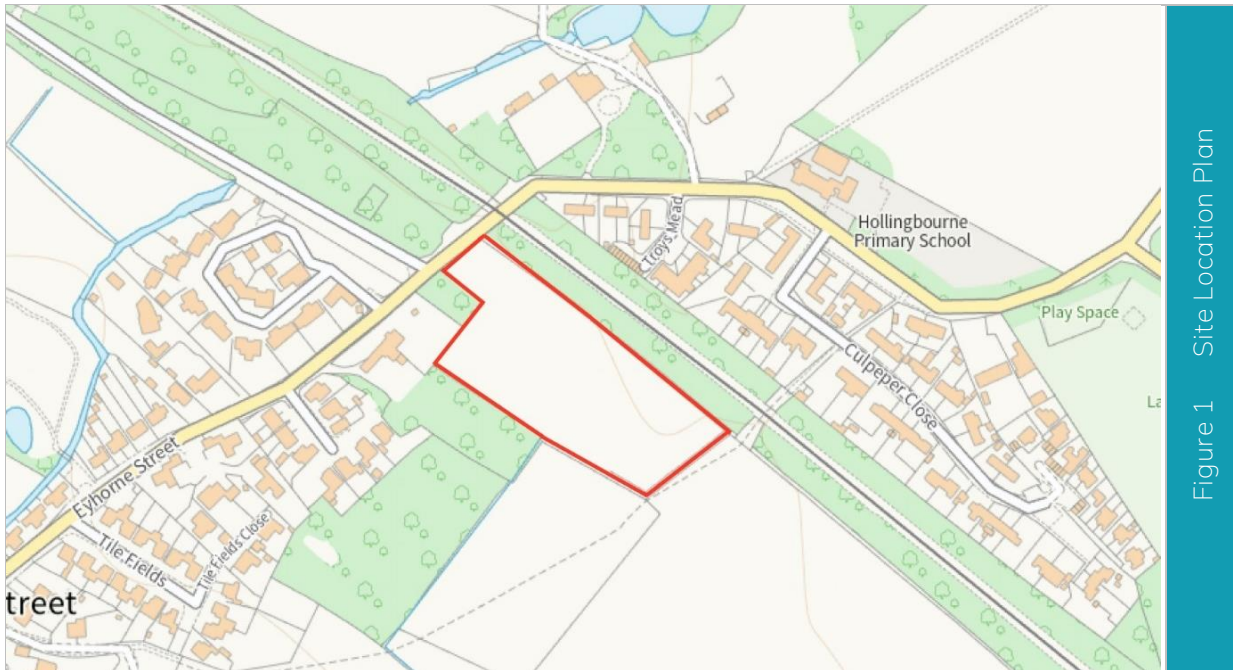


Figure 1 Site Location Plan

The Proposed Development

- 1.8 The proposal involves the construction of 17 new residential properties ranging from 2 to 4 bedrooms in size, along with an access road to the site off Eyhorne Street. For seven of the dwellings, these are noted to be affordable housing and do not include garages.
- 1.9 All the properties are noted to have a dedicated outdoor amenity area in the form of gardens segregated by closed boarded fences. Furthermore, two parking spaces are provided for each property where some spaces are included through the addition of garages.
- 1.10 External parts of the site would comprise communal open space / paths with soft verges and tree planting surrounding the site. Other details include the implementation of visitor parking near the access roads throughout the site with a sustainable drainage area to the southeast inside the site boundary.
- 1.11 The proposed development scheme can be seen below in Figure 2:



Figure 2 Proposed Development Plan



The Objectives

- 1.12 The scope of works adopted in this Noise Assessment will address the following potential issues:
- ▶ Potential for noise from a railway track along the northern edge of the site boundary,
 - ▶ Potential for road traffic noise from Eyhorne Street Road (eastern site boundary) and distant road traffic noise from the M20 (southern site boundary).
- 1.13 The objective of this report is therefore to determine the noise environment and to provide a general indication of the likely impact on noise levels at the development site which may be present.

Report Structure, Limitations & Changes

- 1.14 The report structure generally follows the pollution linkage approach described above. Chapter 2 of the report provides information relating to the identified site-specific sources of noise and sets out the survey methodology. Chapter 3 presents the survey results / discusses the findings, and Chapter 4 details noise model parameters and predictions. Chapter 5 contains a noise design appraisal – a scheme of sound mitigation with comparison against acceptable noise thresholds. Report conclusions are set out in Chapter 6.
- 1.15 There are a lot of technical terms in this report, and definitions are provided in Appendix A. Appendix B details some of the relevant guidance that this assessment is based on, with acoustic criteria/thresholds set out in Appendix C. Extracts of survey data are provided in Appendix D and noise model contours are presented in Appendix E.
- 1.16 This assessment has been undertaken in accordance with our Terms & Conditions. Full details on limitations and reliance are provided in those Terms. Third party information which has been reviewed and used to inform the assessments presented herein, including public records held by various regulatory authorities and environmental database data has been assumed to be true and accurate.



1.17 This assessment has been carried out to determine the potential risks posed to future end users, along with other key receptors, based on the current development. Should revisions in the development proposals result in a change of any assessment parameters detailed in this report, a re-assessment of the risk should be carried out.



2.0 Assessment Methodology

Introduction

- 2.1 This chapter lists the target noise sources identified from a review of Google Earth / Street View, from any client or regulator information and from observations made during deployment of monitoring equipment / site visits. In addition, this section details the methodology for the noise monitoring equipment deployment and survey standards.

Acoustic Criteria

- 2.2 The acoustic survey works were undertaken under the co-ordination of a suitably trained and qualified consultant employed by Lustre Consulting, and with due regard to
- ▶ Local Policy
 - ▶ BS 8233:2014: Guidance on sound insulation and noise reduction for buildings
 - ▶ Professional Practice Guidance & Planning Guidance (ProPG)
- 2.3 The above are discussed in more detail below.

Local Policy

- 2.4 Maidstone Borough Council's (MBC) policy on noise for new residential development is primarily guided by national planning policy, specifically the National Planning Policy Framework (NPPF) and the Noise Policy Statement for England (NPSE), (see Appendix B) which are implemented through the policies in the Maidstone Borough Local Plan
- 2.5 The core of MBC's approach is to ensure that new residential development provides a "good standard of amenity" for future occupants. From our understanding, MBC does not provide specific planning policy guidance as to noise but that adherence to guidance such as ProPG and BS 8233 (both of which are discussed below) would generally be considered to constitute 'good design' in line with local policy requirements.



Professional Practice Guidance on Planning & Noise (ProPG) – New Residential Development

- 2.6 Professional Practice Guidance on Planning & Noise (ProPG) is guidance for new residential development that aims to protect people from noise through encouraging better acoustic design. The guidance has been jointly prepared by the Institute of Acoustics (IOA), Chartered Institute of Environmental Health (CIEH), and the Association of Noise Consultants (ANC).
- 2.7 ProPG draws upon legislation and other guidance and standards such as WHO and BS 8233:2014 (discussed above). In terms of the BS 8233:2014 guidance, ProPG provides supplementary advice with respect to night-time maximum noise levels stating:

“In most circumstances in noise-sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45dB LAmax,F more than 10 times a night. However, where it is not reasonably practicable to achieve this guideline then the judgement of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number, distribution, predictability and regularity of noise events”

BS 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings

- 2.8 BS 8233 ‘Guidance on sound insulation and noise reduction for buildings’ provides guidance on indoor ambient noise levels for various situations.
- 2.9 The relevant guideline limits for dwellings are shown in Table 2.

Table 2 BS 8233 Indoor Ambient Noise Levels for Dwellings			
Activity	Location	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)
Resting	Living room	35 dB LAeq,16h	—
Dining	Dining room/area	40 dB LAeq,16h	—
Sleeping (daytime resting)	Bedroom	35 dB LAeq,16h	30 dB LAeq,8h



2.10 It is important to note that the above guideline noise level limits are applicable to 'anonymous' noise sources such as steady traffic and general distant urban noise.

2.11 In terms of the guideline noise limits, BS 8233 guidance does state that a 5 dB relaxation may be applied where a development is necessary or desirable:

"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."

2.12 In terms of outdoor amenity spaces, BS 8233:2014 offers the following guidance:

"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 50dB LAeq, with an upper guideline value of 55dB LAeq which would be acceptable in noisier environments. However, it is also recognised that these 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."

Baseline Noise Survey

Methodology

2.13 To determine prevailing noise conditions at the proposed site, a long-term (LT) unattended baseline noise survey has been undertaken from around 10:10 am 15th October to 00:35 am 17th October 2024. The microphone was mounted on a tall tripod at about 3.5 m above ground in a free-field position just south of the rail line. This position is considered representative of the nearest façades of the proposed development facing the railway and conservative for the rest of the development.



- 2.14 To further inform the assessment, two attended road traffic noise surveys, NMP1 and NMP2, collected measurement data for a duration of around 22 minutes and 50 minutes respectively. For NMP1, the survey was conducted from 11:27 to 11:45am around 10 m from the centre of Eyhorne Street Road but was aborted due to nearby gardening works. Secondly for NMP2, data collection occurred from 12:21 to 12:35 and from 13:04 to 13:35pm at a distance of around 6m from the centre of Eyhorne Street Road (B2163).
- 2.15 The microphone at the NMP survey positions were set up on a tripod at around 1.5 m high in free-field positions.
- 2.16 All measurements were completed using a Norsonic Nor-140 precision Class I sound level meter (serial no. 1405197). Environmental noise levels were measured throughout the surveys using automated acoustic noise monitoring equipment running in continuous 5-minute samples. Along the broadband noise levels, spectral data was collected, as were audio recordings for any 'events' above 65 dB(A) L_p .
- 2.17 All equipment used for the baseline noise survey had valid calibration certificates at the time of the surveys, which are available upon request. The survey also conformed to the best practice data acquisition methodologies as set out in BS 7445¹. The on-site calibration checks were undertaken using a Norsonic Nor1255 calibrator (serial no. 125525497).
- 2.18 Pre- and post-survey calibration checks were carried out which confirmed that no significant drift had occurred during the survey.
- 2.19 A sample of the graphical survey data is available in Appendix D, with full data available if required upon request.
- 2.20 Figure 3 below shows the locations of the attended noise measurement positions (NMP) and the unattended long term (LT) noise survey:

¹ British Standard 7445 – Description and measurement of environmental noise



Figure 3 Approximate Noise Monitoring Locations

2.21 The photos below show the NMP and LT noise survey measurement positions.



NMP1



NMP2



LT



Meteorological Conditions

2.22 Meteorological conditions during the measurement period were in line with recommendations for environmental noise surveys, with minimal wind (<5m/s) during the survey. An air temperature between 10°C and 20°C was noted during the survey. The cloud cover was moderate during all measurement periods. The meteorological conditions are not expected to affect the measurement results.



3.0 Noise Survey Results

Existing Noise Environment

- 3.1 The main and constant source of noise at the time of the site visits was observed as distant traffic noise from the M20 motorway south of the site and also, but to a less frequent extent, traffic noise from Eyhorne Street. Additionally, intermittent noise from passing trains on the tracks north of the site boundary was also observed during the setup of the LT survey.
- 3.2 Consistent atypical noise from tree surgeon works were observed at NMP1. As such, measurements halted at 11:45am. Similarly, children on break at school lead to a noticeable increase in noise levels at NMP2 survey position leading to the break in measurement before resuming.
- 3.3 The baseline noise level measurement results and derived values are presented below in Table 2 for the day and night-time periods respectively. Table 3 presents the attended noise level data from NMP1 / NMP2 during the daytime.
- 3.4 An overview of the survey results in graphical format is also available in Appendix D, with full data available if required upon request.

Table 3 Summary of Measured Noise Levels at the LT Survey Location

Location	Period	Noise Levels (dB)		
		Ambient, $L_{Aeq}^{[1]}$	Maximum, L_{AFmax}	Background, $L_{A90}^{[4]}$
LT	Daytime (07:00 – 23:00)	53	69 ^[2]	50
	Night-time (23:00 – 07:00)	51	62 ^[3]	44

Notes to Table 3:

[1] Logarithmic average, [2] 90TH percentile of the 5-minute maximum values, [3] Arithmetic average of the 10th highest 5-minute values, [4] Arithmetic average of the 5-minute values

- 3.5 As can be seen from the noise survey results in the above table, the weekday daytime (07:00 – 23:00) and night-time (23:00-7:00) ambient noise levels are both in the region of 51 dB L_{Aeq} respectively. Note that whilst the ambient noise levels for the day and night periods are close to each other, the more typical ambient nighttime noise levels is closer to the mid-40s dB L_{Aeq}

but this is skewed higher by short periods of high noise (which appear to be due to freight and/or track cleaning trains) and a steady increase in noise during the early morning, presumably due to M20 traffic.

- 3.6 The averages for 5-minute maximum noise levels are around 69 dB L_{Amax} during the daytime period and 62 dB L_{Amax} during the night-time period. The representative background daytime and nighttime sound levels are correspondingly 50 and 44 dB(A).
- 3.7 For Table 3, two roadside attended measurements have been conducted at two points along Eyhorne Street Road given the interruption of measurement at NMP1 due to tree surgeon activities.

Table 4 Summary of Measured Noise Levels at the NMP Survey Locations

Location	Period	Noise Levels (dB)		
		Ambient, $L_{Aeq}^{[1]}$	Maximum, $L_{AFmax}^{[2]}$	Background, $L_{A90}^{[2]}$
NMP1	Daytime (22 minutes)	58	74	40
NMP2	Daytime (50 minutes)	60	77	44

Notes to Table 4:

[1] Logarithmic average, [2] Arithmetic average of the 5-minute values

- 3.8 As can be seen above, ambient noise levels measured at NMP1 and NMP2 were in the region of 58 and 60 dB(A) correspondingly. Secondly, maximum noise levels of around 74 and 77 dB can be seen for NMP1 and NMP2 respectively.
- 3.9 NMP1 and NMP2 are measured at different distances central from the road of 10m and 6m respectively, as such, adjusting for line and point source corrections to the ambient and maximum noise levels would see a propagation difference of 2 dB and 4 dB. Taking this into account the two measurement results are virtually identical.
- 3.10 There was no suggestion from the data that the survey equipment had been disturbed, or any erroneous intrusion not related to external noise that was being measured.



4.0 Noise Model Predictions

Noise Model Parameters

- 4.1 Whilst the noise survey data provides a good indication of noise affecting the future properties, there would be a difference due to distance and the screening effect of the hoarding. Therefore, to better evaluate noise propagation across the development, including positions further from the road, a detailed three-dimensional acoustic model of the site and its immediate surroundings has been created, using Datakustik CadnaA noise modelling software (version 2022).
- 4.2 For the noise model calculations, ISO 9613² calculation settings were used along with the following inputs/settings:
- ▶ General ground absorption coefficient of 1 (soft ground) with an absorption of 0 (hard ground) applied to any areas of hardstanding
 - ▶ General building and barrier absorption coefficient of 0.2
 - ▶ Two orders of reflection
 - ▶ Noise level predictions based on spectral data for the 63 Hz to 8 kHz octave bands.
 - ▶ A line source at 1 m above ground was used to represent railway train noise.
 - ▶ Noise contours have been included with a resolution of 0.5 m steps in elevation.
 - ▶ Building heights based on information provided (elevation drawings). Where no information was available, e.g. off-site buildings, a general height of 7.5 m has been used.
- 4.3 The noise model was calibrated to match the relevant noise survey data capture at the long-term survey position.

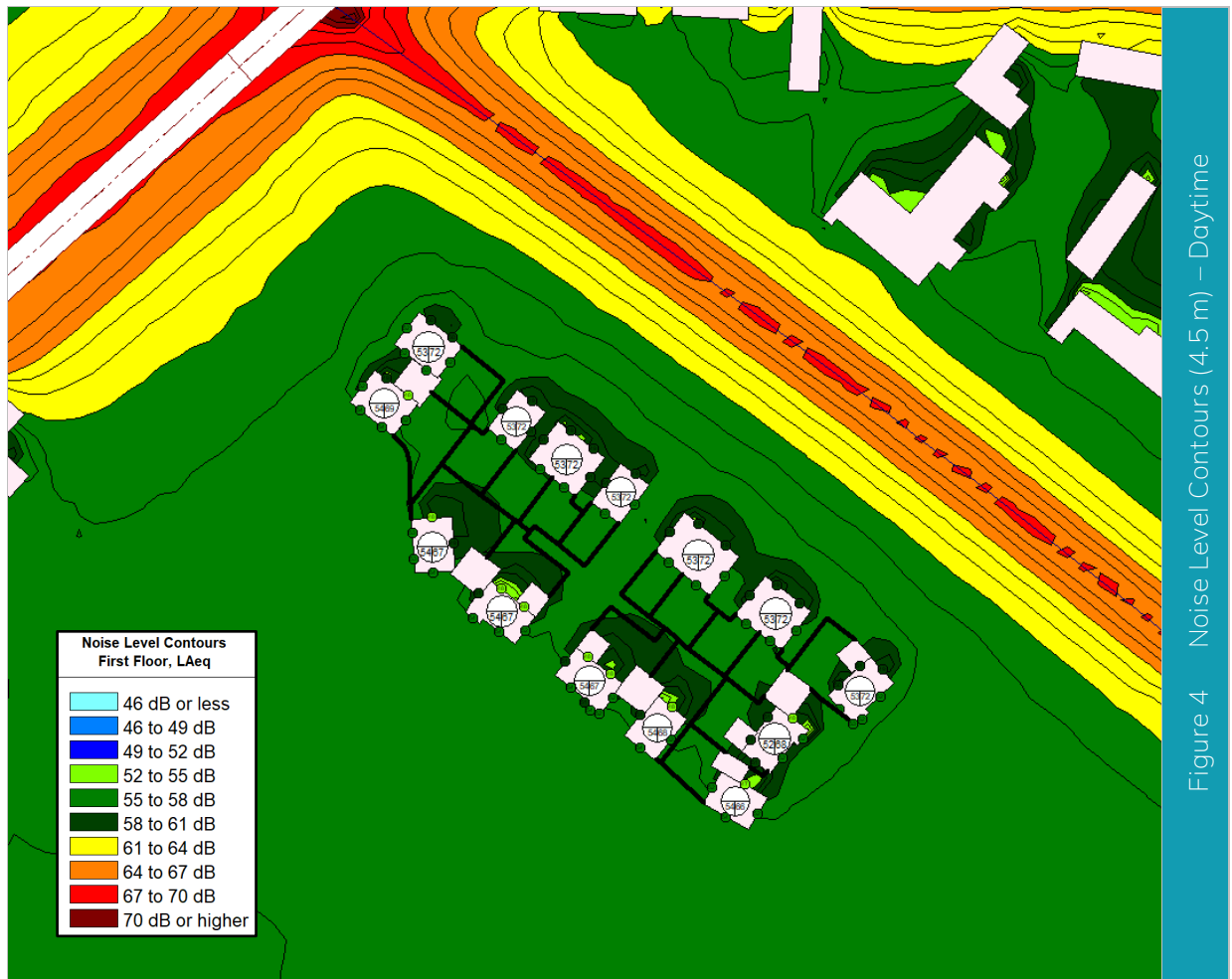
Noise Level Predictions

- 4.4 The noise level predictions with the proposed development in place are shown in Figure 4 below as noise level contours representative of the daytime conditions at first floor level. The

² ISO 9613-2:1996 'Attenuation of sound during propagation outdoors- Part 2: General method of calculation

results also include noise levels at the façade (the circle within the buildings), which show the highest noise levels around the proposed buildings.

4.5 Additional noise level contour figures for both the day and night ambient noise levels (L_{eq}) representative of noise at ground floor (1.5 m) and first-floor height (4.5 m) can be found in Appendix E.



4.6 The above noise level predictions show that worst-case daytime ambient noise levels in the region of 54 dB L_{Aeq} , can be expected at the façade of the proposed dwellings affected by distant M20 traffic noise, Eyhorne Street Road noise and railway noise.

4.7 Given a daytime ambient noise level of 53 dB has been recorded at LT (see Table 3), the noise model shows good correlation with the predicted values measured and can thus be considered reasonably representative of noise levels at the proposed development.



5.0 Acoustic Appraisal

- 5.1 This chapter sets out the minimum acoustic mitigation measures (if needed) which will be required to ensure that the site is compliant with the criteria set out in Section 2 of this report.
- 5.2 The project is still at a relatively early design stage and therefore it is expected that the design will be developed accordingly through the various RIBA stages. This assessment is therefore considered preliminary in this regard.

Building Envelope Assessment

Open Windows

- 5.3 As discussed in the previous section, worst-case daytime noise levels of 54 dB L_{Aeq} are predicted at the first floor of proposed development façades. Considering this and that a slightly open window typically provides around 13 dB sound reduction against external noise, worst-case internal ambient noise levels of around 41 dB(A) could be expected for the day respectively. These noise levels would exceed BS 8233 recommended levels by 6 dB(A).
- 5.4 With respect to nighttime ambient noise levels, as shown in Table 3, levels of around 51 dB L_{Aeq} can be expected (considered worst-case given the proximity to the rail line). Therefore, with a slightly open window, internal ambient noise levels would be around 38 dB(A). Thus, exceeding BS 8233 recommended nighttime noise levels by 8 dB(A).
- 5.5 Where in terms of nighttime maximum noise levels, worst-case outdoor noise of around 62 dB $L_{AF,max}$ is expected (see Table 3) at façades facing the railway. Thus, internal noise of around 49 dB $L_{AF,max}$ would be expected with open windows. This would also exceed the generally accepted noise limits, i.e. the ProPG limit of 45 dB $L_{AF,max}$.
- 5.6 The potential for exceedances of the guidance noise limits highlighted above is a clear indication that future residents would benefit from having the option to keep their windows shut. To facilitate this, alternative means of ventilation, such as (standard) trickle vents, should be provided to all dwellings.



Indoor Noise Levels with Closed Windows

- 5.7 Calculations in line with BS 8233 show that adequate indoor noise conditions can be achieved with standard double glazing and trickle vents. Standard thermal double glazing (e.g. 4/20/4) and trickle vents provide sound insulation of around 30 dB. Based on this, noise levels in the worst affected rooms would be around 24 and 21 dB L_{Aeq} for daytime and nighttime periods respectively. This is well within BS 8233 guideline values.
- 5.8 Regarding maximum nighttime noise levels, with closed window internal conditions of around 32 dB(A) or better can be expected. This is comfortably compliant with the ProPG guideline value of 45 dB $L_{AF,max}$.

Ventilation

- 5.9 Approved Document F (ADF) of the Building Regulations stipulates the requirement for rapid intermittent ventilation for occupants to have the ability to quickly expel fumes in dwellings.
- 5.10 Whilst windows at some of the proposed dwellings would have to remain closed to ensure adequate acoustic conditions, the use of open windows for (rapid) ventilation is considered acceptable as the exceedance would be for a short period only and expected by the occupant.

Noise within External Amenity Areas

- 5.11 Figure 5 below shows the predicted daytime noise levels within external amenity areas for the proposed development. As can be seen, the proposed dwellings have been strategically placed to screen amenity areas from the main noise sources affecting the site (railway and the M20 motorway). As such, noise levels in the gardens would, for large parts, be within lower bound BS 8233 guideline values of 50 dB(A). And where they are not, noise levels are still shown to remain within the upper 55 dB(A) BS 8233 guidance limit for external amenity areas.
- 5.12 Note that the calculations assume good quality fences/walls, as detailed by the thick black lines in Figure 5 below.

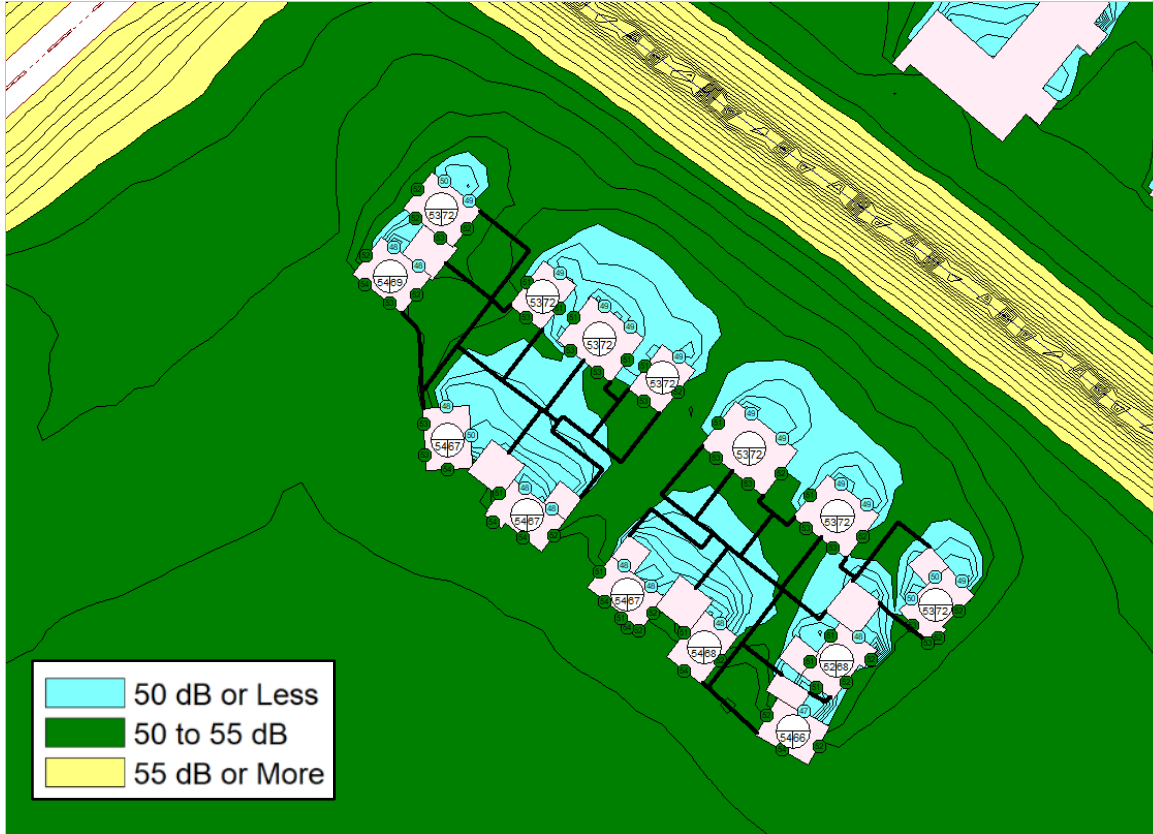


Figure 5 External Amenity Noise Level Contours



6.0 Conclusions & Next Steps

- 6.1 This report has presented the findings of a Noise Assessment, which identified key sources of noise, monitored noise levels, and assessed conditions against Local and British guidance with respect to the site's suitability in terms of noise.
- 6.2 Assessment of the prevailing environmental noise level has been undertaken over what is deemed to have been a representative period. The main noise sources at the proposed site were observed to be road traffic noise from the M20 / Eyhorne Street Road as well as intermittent railway noise.
- 6.3 The assessment has shown that adequate internal noise levels in line with British Standard 8233:2014 and ProPG guidance can be comfortably achieved with standard construction, but it would be prudent for the future residents to have the option to keep their windows closed.
- 6.4 External amenity area noise levels benefit from strategic positioning of the dwellings and are therefore expected to also be comfortably compliant with guidance limits set out in BS 8233:2014.
- 6.5 To summarise, acoustic conditions in line with the Local Planning Authority's requirements and BS 8233 guidance for internal and external amenity can be achieved at the proposed development. As such, future noise conditions are not expected to have a significant bearing on residential amenity.



APPENDIX A: Acoustic Terminology

Parameter	Description
Sound	<p>A sound wave can be viewed as small pressure fluctuations in an elastic medium such as air. When the frequencies of the pressure fluctuations are within the audible range, the human ear responds to sound waves which produces the sensation of hearing.</p> <p>There are two basic characteristics of sound: amplitude and frequency. Amplitude relates to the perceived loudness of a sound whereas the pitch of a sound corresponds to the frequency.</p>
Noise	<p>Noise, a subjective term, is essentially unwanted sound. It is very much dependent on the receptor's perception of the sound.</p>
Decibel (dB)	<p>The sound pressure is measured in Pascals. The human ear responds to a wide range of sound pressures, from 0.00002 to 20 Pascals. Given this wide range of values, it is convenient to express these in a logarithmic scale, the decibel (dB).</p> <p>The decibel is a logarithmic scale representing the measurement unit of sound pressure levels or noise levels relative to the threshold of hearing (20×10^{-6} Pascals).</p> <p>Zero decibel represents the threshold of hearing. The higher the value the louder the sound, with the value around 110 decibel being the level at which hearing becomes uncomfortable. Around 130 decibel is the threshold of pain at which hearing becomes painful.</p>
Frequency (Hz)	<p>The pitch of a sound relates to the frequency, which is expressed in Hertz (Hz). The audible range for human hearing typically ranges from 20 Hz to 20 kHz, but this tends to decrease with age.</p> <p>A pure tone, e.g. as produced by a tuning fork, contains sound of a single frequency (440 Hz). In real life, most sound consists of complex waves containing sound waves of multiple frequencies.</p>
A-weighting	<p>Human hearing is not linear, i.e. the perceived loudness of sound varies with both frequency and amplitude. To better represent the human hearing response, frequency 'weightings' are applied to sound.</p> <p>There are various weighting networks best suited to specific conditions. However, in practice, the A-weighting network has become the generally accepted 'correction' for representing loudness.</p> <p>When a weighting filter has been applied to a value, the weighting type is added to the descriptor, L_{Aeq}, L_{pA}, etc, or just after the decibel, dBA or dB(A)</p>

Parameter	Description
Octave Bands or 1/3-Octave Bands	<p>Whilst single figure values are useful, often spectral data is required for analysis and/or acoustic specification. To represent the frequency content, sound level or acoustic properties are presented in specific frequency bands, also known as octave bands.</p> <p>The frequencies of octave bands have been internationally standardised. For example, the 500 Hz octave band (500 Hz being the centre frequency) has a range from 354 Hz to 707 Hz.</p> <p>Where finer spectral detail is required, 1/3-octave band data can be used. Each octave band is divided into three 1/3-octave bands.</p>
Sound Pressure Level (SPL or L_p)	<p>The sound pressure level is indicative of the sound wave strength and has good correlation with perceived loudness. Sound pressure is expressed in Pascals and, for convenience, is expressed in decibels. A microphone is capable of detecting the sound pressure fluctuations and converting it into an electric signal.</p>
Sound Power Level (SWL or L_w)	<p>The sound power is the overall acoustic energy radiated by a source over a specific period and is expressed in Watts. It is an inherent property of the source and, unlike sound pressure, does not depend on the distance to the source.</p> <p>As sound power values vary greatly, it is convenient to express these as a level in decibels, the sound power level, SWL or L_w (referenced to 10^{-12} Watts).</p>
$L_{Aeq,T}$	<p>The A-weighted equivalent continuous sound level over the period T. Often also referred to as the ambient noise level.</p> <p>This is the sound level that is equivalent to the total average energy of noise recorded over a given period.</p>
L_{Amax}	The A-weighted maximum instantaneous noise level.
L_{A10}	The A-weighted statistical sound level which is exceeded 10% of the given measurement period. In the UK, this level is usually used to describe road traffic noise .
L_{A90}	The A-weighted statistical sound level which is exceeded 90% of the given measurement period. This level is usually synonymous with the background sound level and generally describes the underlying level of sound that is experienced when specific events are not taking place.
R_w	<p>The weighted (w) sound reduction index (R), a single figure rating of the laboratory airborne sound insulation performance of a construction, usually measured across the frequency range 100-3150Hz.</p> <p>The higher the value, the greater the sound insulation, and the more onerous the requirement.</p>

Parameter	Description
$D_{nT,w}$	<p>The weighted (w) sound insulation (D), a single figure rating of the in-situ airborne sound insulation performance of a construction. The sound insulation value is standardised (nT) to a reference reverberation time for typical conditions.</p> <p>The higher the value, the greater the sound insulation.</p>
$L'_{nT,w}$	<p>The weighted (w) impact sound pressure level (L), a single figure rating of the in-situ impact sound insulation performance of a construction. The sound insulation value is standardised (nT) to a reference reverberation time for typical conditions.</p> <p>The lower the value, the greater the sound insulation.</p>
C or C_{tr}	<p>These are spectrum adaptation terms for taking into account the effect of different sound spectra. C and C_{tr} are corrections for pink noise and traffic noise respectively and are added to single figure quantities, e.g. $R_w + C_{tr}$</p>
$D_{n,ew}$	<p>The weighted (w) element (e) normalised (n) level difference (D), an indicator of the ability of a small building element (such as a trickle ventilator) to reduce sound in a particular frequency band.</p> <p>The higher the value, the greater the sound reduction, and vice versa.</p>
Reverberation Time (RT60 or T60)	<p>Reverberation time relates to the echoing decay of sound in a room. More specifically, the reverberation time (RT60) is the time it takes for the sound pressure level to drop by 60 dB after excitation. The value is expressed in seconds.</p> <p>In many situations, conditions do not allow for the entire 60 dB decay time to be measured. Where this is the case, a reduced part of the decay can be measured and the results extrapolated; typically these are the T20 or T30.</p> <p>The higher the value, the more reverberant a space is.</p>



APPENDIX B: Planning Policy
Guidance

NATIONAL PLANNING POLICY FRAMEWORK, 2024 (NPPF)

The National Planning Policy Framework (NPPF) includes the following statements relating to noise and the requirement to take it into account in the planning process.

Section 15, paragraph 187 (e) of NPPF states:

- *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.*

Section 15, paragraph 198 of NPPF states:

- *(a) mitigate and reduce to a minimum potential adverse impact 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;*

Paragraph 200 of NPPF further elaborates on the consideration of existing businesses, as follows:

- *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.*

The NPPF does not provide absolute limits on noise that are acceptable or unacceptable in a given situation. It does, however, set out the “need to ensure that developments do not give rise to significant adverse impacts on health and the quality of life”. In addition, the operations of existing businesses are also protected, with reference to ensuring new developments do not have an adverse effect on their operations.

NOISE POLICY STATEMENT FOR ENGLAND, 2010 (NPSE)

The Noise Policy Statement for England (NPSE) applies to all forms of noise including environmental noise, neighbour noise and neighbourhood noise but does not apply to noise in the workplace. The Government recognizes that the effective management of noise requires a coordinated and long-term approach that encompasses many aspects of modern society.

The long-term vision of Government noise policy is set out to promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development. This long-term vision is supported by three aims:

- ▶ avoid significant adverse impacts on health and quality of life;
- ▶ mitigate and minimise adverse impacts on health and quality of life; and
- ▶ where possible, contribute to the improvement of health and quality of life.

The NPSE introduces the concept of NOEL, LOAEL and SOAELs, which are described below:

- ▶ NOEL – No Observed Effect Level – This is the level below which no observable effect can be detected.
- ▶ 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 effects on health and quality of life can be detected.

PLANNING POLICY GUIDANCE – NOISE, 2014

This guidance is provided online within the UK Government Planning System. The guidance expands upon the concepts of Observed Effect Levels and the following table is provided.

Planning Policy Guidance - Noise exposure hierarchy

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

ProPG: PLANNING & NOISE PROFESSIONAL PRACTICE GUIDANCE ON PLANNING & NOISE NEW RESIDENTIAL DEVELOPMENT MAY 2017

The primary goal of ProPG is to assist the delivery of sustainable development by promoting good health and wellbeing through the effective management of noise. It seeks to do that through encouraging a good acoustic design process in and around proposed new residential development having regard to national policy on planning and noise.

ProPG advocates a systematic, proportionate, risk based, 2-stage, approach. The approach encourages early consideration of noise issues, facilitates straightforward accelerated decision making for lower risk sites, and assists proper consideration of noise issues where the acoustic environment is challenging. It is envisaged that following the guidance contained in this document will increase the likelihood of success of planning applications for new residential development, yet it also provides a clear basis for recommending refusal of new housing development on noise grounds where necessary.

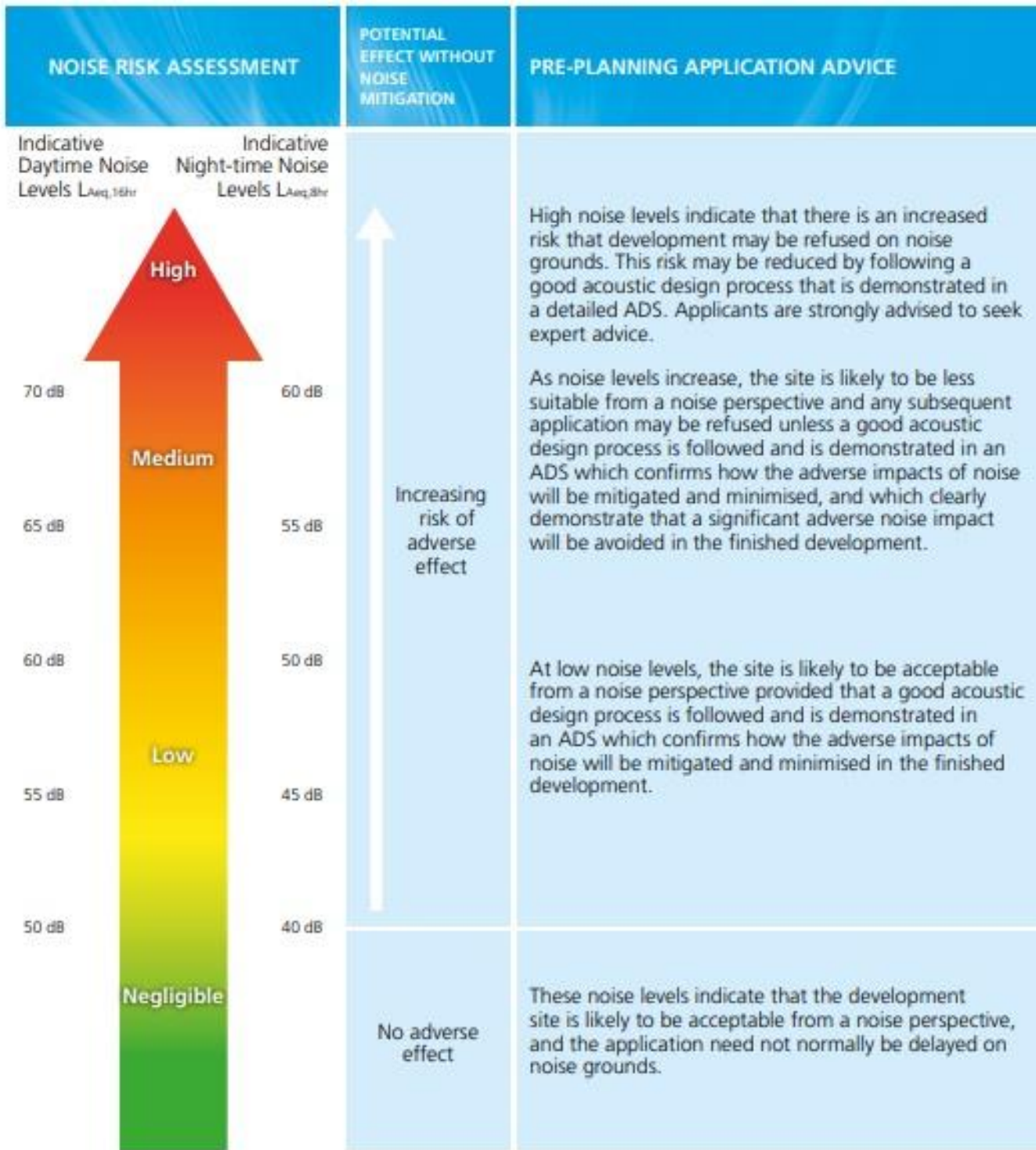
Stage 1: Initial Site Noise Risk Assessment

An initial noise risk assessment of the proposed development site should be conducted by a competent noise practitioner at the earliest opportunity, before any planning application is submitted. The noise risk assessment should provide an indication of the likely risk of adverse effects from noise were no subsequent mitigation to be included as part of the development proposal. It should indicate whether the proposed site is considered to pose a negligible, low, medium or high risk from a noise perspective.

Stage 2: Full Assessment – the four key elements

- ▶ Element 1 – Good Acoustic Design Process Stage 2:
- ▶ Element 2 – Internal Noise Level Guidelines Stage 2:
- ▶ Element 3 – External Amenity Area Noise Assessment Stage 2:
- ▶ Element 4 – Assessment of Other Relevant Issues

Figure: Summary plan for ProPG planning advice





APPENDIX C: Acoustic Criteria

The following British Standards and Building Regulations have been considered and adhered to in this assessment.

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

This standard provides information and guidance on sound insulation and noise reduction for buildings. It deals with the control of external noise and outlines recommendations for occupied rooms.

The following table is taken from the document outlining requirements for internal noise levels in residential accommodation.

Indoor Ambient Noise Levels for Dwellings (BS 8233:2014)

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Room	35dB $L_{Aeq,16Hr}$	-
Dining	Dining Room/Area	40dB $L_{Aeq,16Hr}$	-
Sleeping	Bedroom	35dB $L_{Aeq,16Hr}$	30dB $L_{Aeq,8Hr}$

The noise levels presented are based on existing WHO guideline values. The document further recommends that guideline value may be set in terms of SEL or $L_{Amax,F}$, if systematic individual noise events are happening. The values are depending on the character and number of events per night. Sporadic noise events could require separate values. In this instance a target value of 45 dB L_{Amax} has been established as the average L_{Amax} level not to be exceeded in bedrooms at night.

External Amenity Space

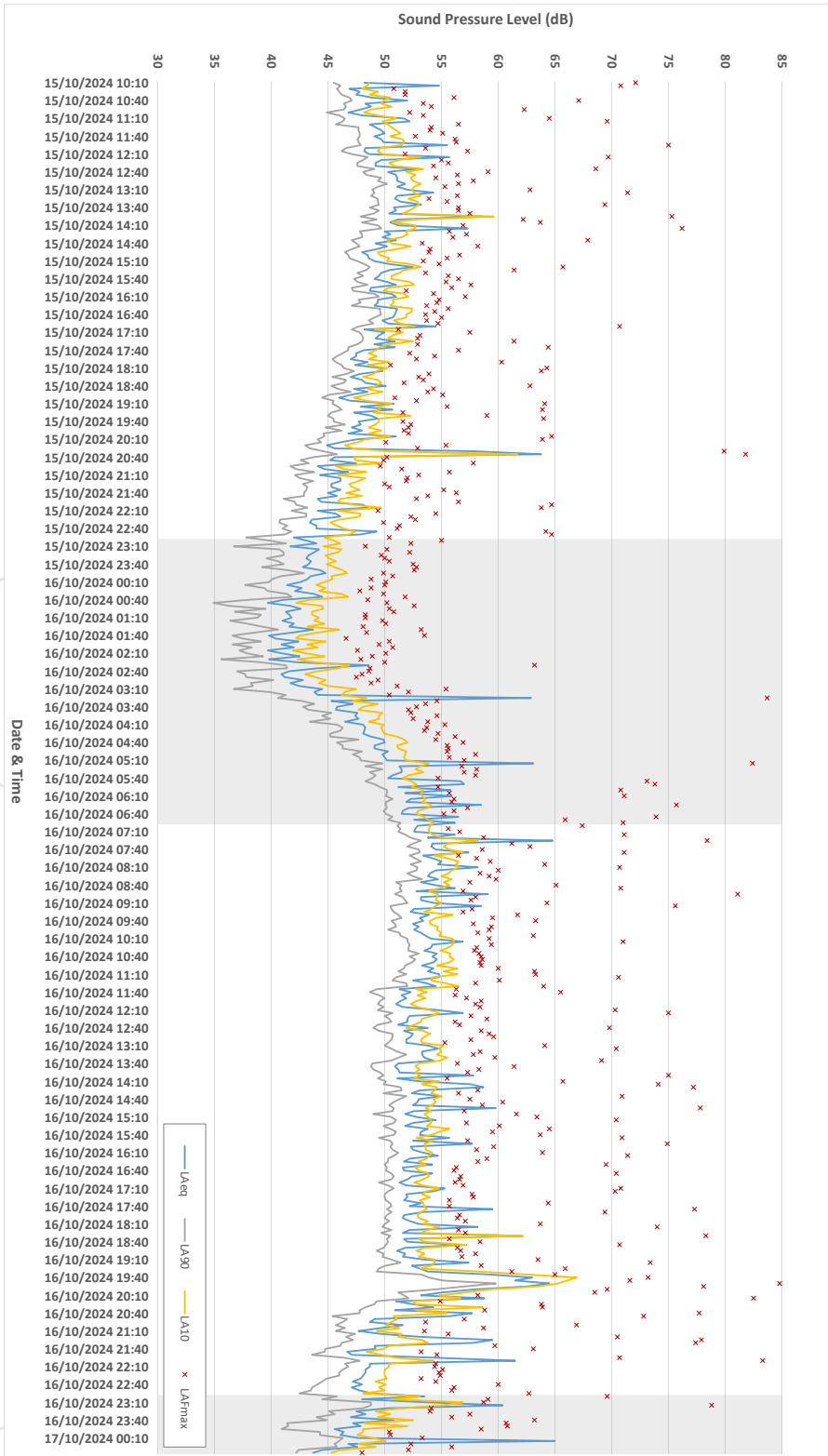
BS 8233:2014 offers the following guidance regarding outdoor amenity space:

“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 50dB LAeq, with an upper guideline value of 55dB LAeq which would be acceptable in noisier environments. However, it is also recognised that these 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.”



APPENDIX D: Noise Survey Data

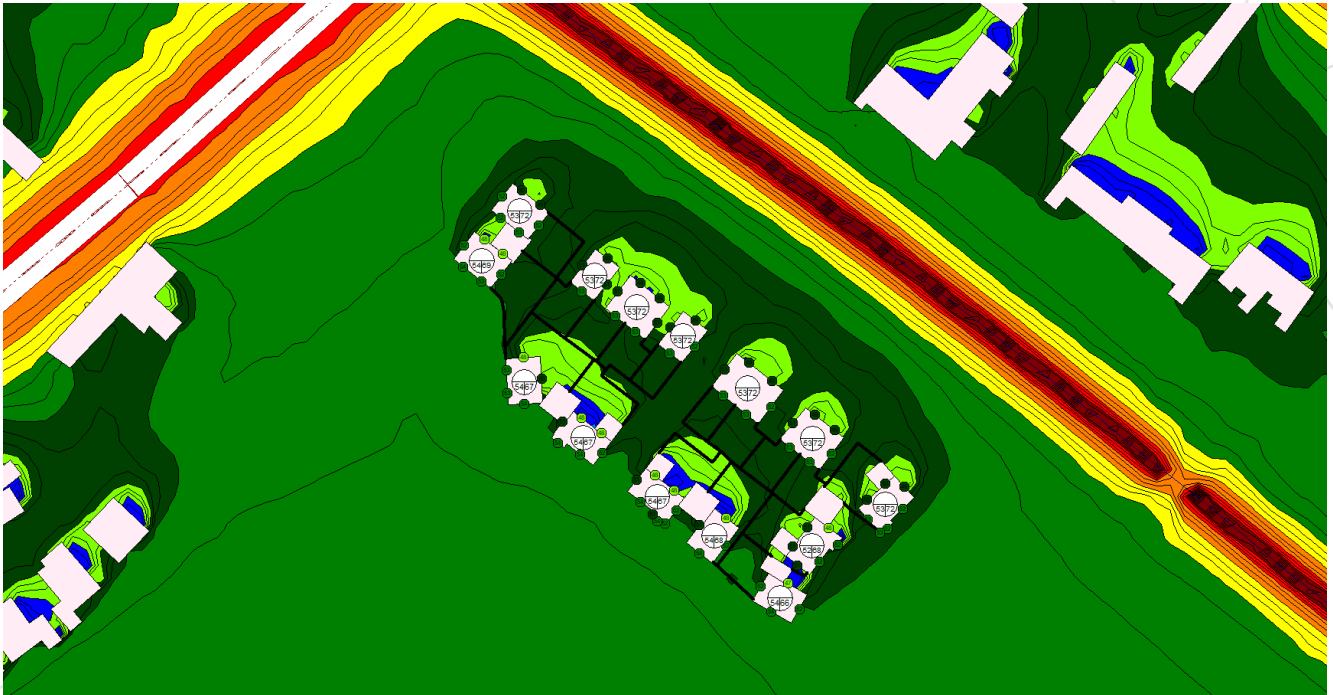
Long Term Noise Survey



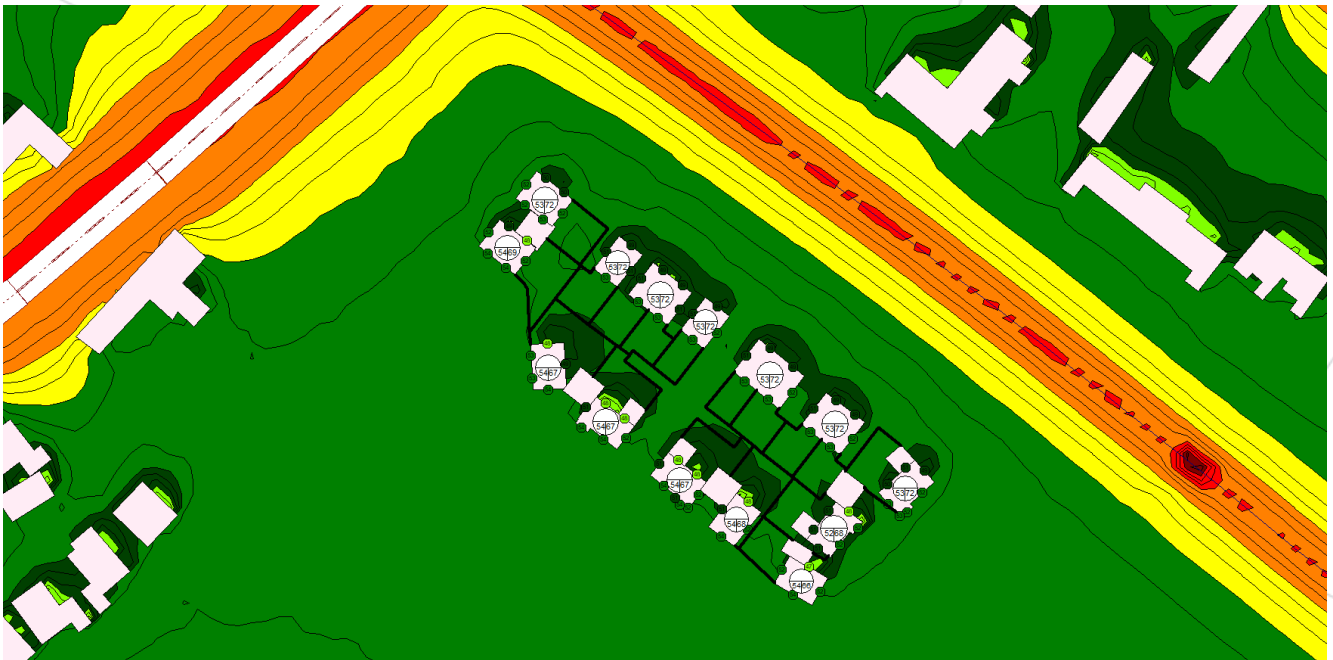


APPENDIX E: Noise Model Contours

Daytime Noise Contours (Ground Floor – 1.5m)



Daytime Noise Contours (First Floor – 4.5m)





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