hepworth acoustics

PROPOSED RESIDENTIAL DEVELOPMENT AT LONDON ROAD, STROUD

NOISE ASSESSMENT

On behalf of:

Altus Homes

Report No: P23-308-R01v2
April 2024

PROPOSED RESIDENTIAL DEVELOPMENT AT LONDON ROAD, STROUD

NOISE ASSESSMENT

Report prepared by:
Hepworth Acoustics Ltd
The Wheelhouse
Bond's Mill Estate
Stonehouse
Gloucestershire
GL10 3RF

On behalf of:
Altus Homes

Report prepared by: [redacted] BSc MIOA – Technical Director	[redacted]
Report checked by: [redacted] BSc FIOA – Managing Director	

CONTENTS

1.0 INTRODUCTION

1.1 Hepworth Acoustics was commissioned to carry out a noise assessment relating to a proposed residential development at London Road, Stroud.

1.2 The site is split into two sections, to the northeast and southwest sides of the A419 London Road.

1.3 The site currently comprises a disused car sales forecourt with associated disused sales and servicing buildings.

1.4 The site is located within the side of a valley, and hence the natural land generally slopes from northeast down towards the southwest. However, from previous development the site is also graded with flat areas in parts.

1.5 The main source of noise at the site is London Road traffic noise, however a mainline railway also runs to the southeast, at >140m laterally from the site boundary (but hence slightly further from proposed sensitive development areas). The railway line is broadly at the same level as the central part of the site, with the lower part of the valley in between. The railway line typically carries up to about five passenger trains per hour during the daytime, with only a small number of trains during the early and final parts of the night-time. These is also understood to be some occasional freight activity. Due to the proximity of this part of the railway line to Stroud station, trains pass the site at relatively low speed.

1.6 A plan showing the site location and proposed development layout is provided in Figure 1.

1.7 The various noise indices referred to in this report are described in Appendix I. All noise levels mentioned in the text have been rounded to the nearest decibel, as fractions of decibels are imperceptible.

2.0 NOISE CRITERIA

2.1 The *National Planning Policy Framework* (NPPF), December 2023, states at paragraph 180 that "*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 … noise pollution …*".

2.2 Further, paragraph 191 states that "*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 …*".

2.3 The Noise Policy Statement for England (NPSE) 2010, which is referred to the in NPPF, includes three aims:

i. 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.
ii. 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.
iii. 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.

2.4 However, there is as yet no specific guidance on numerical acoustic assessment/design criteria for proposed new housing developments provided in the NPPF and the accompanying Technical Guidance document, National Planning Practice Guidance 'Noise', not in the NPSE.

ProPG: Planning & Noise

2.5 ProPG: Planning & Noise '*Professional Practice Guidance on Planning & Noise'* 2017 provides "guidance on a recommended approach to the management of noise within the planning system in England", predominantly for proposed new residential developments on land that is exposed to transportation noise.

2.6 It is noted that the guidance has no legal status. It does not constitute an official government code of practice and does not provide an authoritative interpretation of the law or government policy.

2.7 The ProPG recommends a staged approach to assessment. Stage 1 is an initial site noise risk assessment, indicating whether the proposed site is considered to pose a negligible, low, medium or high risk from a noise perspective.

2.8 At low noise levels, the more likely the site is to be acceptable from a noise perspective provided that a good acoustic design process is followed and an ADS (Acoustic Design Statement) confirms how the adverse impacts of noise will be mitigated and minimised in the finished development.

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

2.10 High noise levels indicate that there is an increased risk that development may be refused on noise grounds. This risk may be reduced by following a good acoustic design process that is demonstrated in a detailed ADS.

2.11 Stage 2 of the recommended approach in ProPG is a full assessment to consider good acoustic design. The guidelines of ProPG in terms of suitable acoustic design criteria are broadly consistent with the guidance of BS 8233, and the sound insulation recommendations made later in this report have been designed to achieve the BS 8233 guidelines, as described below. These recommendations are also generally consistent with those set out in the World Health Organisation document *'Guidelines for Community Noise'* 1999.

2.12 The scope of the ProPG is restricted to sites that are exposed predominantly to noise from transportation sources. However, the recommended approach is stated as being suitable where some industrial or commercial noise contributes to the acoustic environment provided that it is "*not dominant*".

BS 8233

2.13 British Standard 8233: 2014 *Guidance on sound insulation and noise reduction for buildings,* which carries the full weight of an adopted British Standard, recommends guidance on design criteria for acceptable noise levels within residential accommodation, as summarised in Table 1.

Table 1 : BS 8233 Recommended Acoustic Design Criteria

Activity	Location	Internal Noise Levels	
		Daytime 0700-2300hrs	Night-time 2300-0700hrs
Resting	Living room	35 dB $L_{Aeq,16hr}$	-
Dining	Dining room / area	40 dB $L_{Aeq,16hr}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hr}$	30 dB $L_{Aeq,8hr}$

2.14 BS 8233 also states that, "*where development is considered necessary or desirable … the internal target levels* [i.e. those in Table 1] *may be relaxed by up to 5dB and reasonable internal conditions still achieved*".

2.15 BS 8233 clarifies that the above guidance relates only to noise without specific character (e.g. such as that which has a distinguishable, discrete and continuous tone, is irregular enough to attract attention, or has strong low-frequency content) and that where such characteristics are present, lower noise limits might be appropriate.

2.16 Further, BS 8233 states that if there is a reliance 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*". Further, it is stated that assessments should be based on a room with "*adequate ventilation provided (e.g. trickle ventilators should be open)*".

2.17 BS 8233 also recognises that regular individual noise events at night can cause sleep disturbance. Peaks of noise from individual events are usually described in terms of L_{Amax} values and these can be highly variable and unpredictable. ProPG states that "*in most circumstances in noise-sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45dB $L_{Amax,F}$ more than 10 times a night*".

2.18 Regarding outdoor living areas, BS 8233 states that "*it is desirable that the external noise level does not exceed 50dB $L_{Aeq,T}$, with an upper guideline value of 55dB L_{Aeq}, which would be acceptable in noisier environments. However, it is recognised 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, 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, developments should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited*."

3.0 NOISE SURVEY

3.1 A survey of prevailing noise levels at the site was undertaken during daytime and night-time periods on Monday 12 February 2024. The noise measurement locations used are identified in Figure 1.

3.2 The scope and methodology for the noise survey was discussed and agreed in advance with the Environmental Protection Manager at Stroud District Council. Part of the reason for this was due to the absence of any suitable and secure location for the deployment of unattended automated noise monitoring equipment, this requiring fully attended noise survey work. This discussion hence served to agree a commensurate scope of noise monitoring for the noise sources affecting the site.

3.3 The survey described below was undertaken on the basis of the agreed approach.

Road Traffic Noise

3.4 A daytime noise survey of London Road traffic noise was undertaken in accordance with the 'Shortened Measurement Procedure' described in the Department of Transport document 'Calculation of Road Traffic Noise' (CRTN), 1988. This procedure involves taking noise measurements in terms of $L_{A10,T}$ over representative time periods within any three consecutive hours between 1000hrs and 1700hrs. By taking the $L_{A10,3hr}$ as the arithmetic mean of the measured $L_{A10,T\ values}$, the $L_{A10,18hr}$ value can then be calculated. The correction to obtain the $L_{A10,18hr}$ value from the $L_{A10,3hr}$ level is -1dB. The $L_{A10,18hr}$ values have then been converted into the equivalent $L_{Aeq,16hr}$ values by applying a correction of -2dB, as set out in paragraph 6.2.2 of BS 8233.

3.5 Hence, daytime noise monitoring was undertaken at Location 1 in sequential 10-minute samples over the period 1150-1450hrs.

3.6 Further to this, supplementary sample noise measurements were undertaken at Locations 2 and 3, during the daytime monitoring at Location 1. The supplementary noise measurements at Locations 2 and 3 were also undertaken in 10-minute samples, and these were concurrent with individual measurement samples at Location 1.

3.7 In broad accordance with the 'Comparative Measurements' technique set out in CRTN, the relationship between noise levels at Location 1 and those at Locations 2 and 3 respectively, was calculated. This was been applied to the overall daytime noise levels at Location to derive overall daytime noise levels at Location 2 and 3.

3.8 The night-time noise survey of London Road traffic noise levels was undertaken based on noise monitoring at Location 1 over the period 0430-0630hrs. The $L_{Aeq,2hr}$ noise level over this period has been established based on experience of surveys of similar types of road to be typically up to 2dB higher than the corresponding $L_{Aeq,8hr}$ noise level for the full night-time period, and hence forms a robust basis for assessment.

3.9 The night-time noise monitoring was undertaken in sequential 2-minute samples. This shorter sampling period was used to provide greater resolution on night-time L_{Amax} 'peak' noise levels. For assessment purposes, to provide a robust interpretation of ProPG guidelines relating to L_{Amax}, the overall night-time L_{Amax} noise level has been determined for assessment purposes as the measured $L_{Amax,5min}$ exceeded no more than 4 times over the 2-hour night-time monitoring period. This is considered a commensurate estimate of the level exceeded no more than 10 times over the full 8-hour night-time, based on a typical distribution of traffic flows over a night-time period.

3.10 The corresponding night-time levels at Locations 2 and 3 have been determined based on the relationship between noise levels at Location 1 and those at Locations 2 and 3 respectively, as described above in relation to the daytime survey.

3.11 Based on the foregoing, the overall daytime and night-time road traffic noise levels for Locations 1 – 3 are summarised in Table 2.

Table 2 : Overall Daytime and Night-time Noise Levels at Locations 1 – 3

Location	Noise Level		
	Daytime (0700-2300hrs)	Night-time (2300-0700hrs)	
	dB $L_{Aeq,16hr}$	dB $L_{Aeq,8hr}$	dB L_{Amax}
1	72	66	83
2	72	66	83
3	70	64	81

3.12 All measured road noise levels are detailed in Appendix II.

Rail Noise

3.13 In addition to above, rail noise levels at the site have been determined based on a number of brief samples of train pass-bys noise measurements, undertaken at Location 4. This included two night-time pass-bys (at 0533hrs and 0632hrs), both of which were eastbound, and six daytime pass-bys (over the period 1232-1455hrs), comprising three eastbound and three westbound trains. The pass-by measurements were of duration 21-28 seconds, corresponding to the periods the train noise was clearly audible over the residual ambient noise.

3.14 All trains passing the site were passenger trains. No freight activity was noted during the noise survey.

3.15 The measured train pass-by noise levels, in terms of the sound event level L_{AE} (i.e. SEL) and also the night-time L_{Amax} 'peak' noise levels, are set out in Table 3.

Table 2 : Overall Daytime and Night-time Noise Levels at Locations 1 – 3

Time	Train Direction	Duration	Noise Level	
			dB L_{AE}	dB L_{Amax}
05:33	Eastbound	25	73	62
06:32	Eastbound	28	72	61
12:32	Eastbound	27	73	63
12:54	Westbound	14	65	62
13:41	Eastbound	24	71	61
13:58	Westbound	26	71	62
14:34	Eastbound	24	71	62
14:54	Westbound	21	69	61
Logarithmic Average >			**71**	

3.16 To provide a robust assessment of train noise at the site, it has been taken that up to six trains may pass in a worst-case daytime hour. Based on the logarithmic average value of L_{AE} for the measured pass-bys, this would correspond to an overall railway noise level of 43dB $L_{Aeq,1hr}$. Even were this to occur over every hour of the daytime, the overall daytime noise level would also be 43dB $L_{Aeq,16hr}$.

3.17 Furthermore, based on a highly cautious assessment that six trains may pass during a full 8-hour night-time, the overall night-time noise level would be 34dB $L_{Aeq,8hr.}$ Typically there will be somewhat fewer night-time trains.

Survey Details

3.18 The noise monitoring was at Location 1 was undertaken using a NTi Audio XL2-TA Class 1 Sound Analyser (serial no. A2A-23512-E1) and at all other locations using a Norsonic 140 Class 1 Integrating Sound Level Meter (serial no. 1406529). Calibration checks were carried out to all equipment using a Norsonic Acoustic Calibrator Type 1251 (serial no. 20804) before and after the survey, and no variation in calibration level was observed.

3.19 Weather conditions during the survey were moderately cold (around 8°C in the daytime and around 4°C at night), dry and clear, with light southerly breeze.

3.20 The measurement microphones at all locations were fitted with a windshield and mounted in 'free-field' conditions. At Locations 1 and 4 the microphone was mounted at about 3m above local ground to ensure a clear line-of-sight over nearby fences/walls. Locations 2 and 3 the microphone was mounted at 1.4m above local ground.

4.0 ASSESSMENT AND MITIGATION OF IMPACTS

4.1 Considering firstly noise from the railway line, the calculated worst-case overall rail noise levels are within the **negligible risk category** of the ProPG guidance for the daytime and night-time period.

4.2 Overall rail noise levels are very low due to a combination of substantial distance and also the relative infrequency of train pass-bys. It is noted that, in fact, the overall noise levels to the southwest area of the site will be a degree higher than the calculated worst-case overall rail noise levels, however this is due to residual road traffic noise levels. Nonetheless, it is anticipated that noise levels will still be at a modest level in that area of the site, due to the screening provided by the proposed development buildings.

4.3 'Peak' rail nose levels in terms of L_{Amax} are also modest, and night-time events are infrequent.

4.4 In summary, therefore, it is considered that rail noise does not present any constraint to the proposed development, and no specific mitigation is warranted in with respect to rail noise.

4.5 Considering road traffic noise, it is noted from Table 2 that noise levels at Locations 1 and 2 are essentially the same, as would be expected being the same distance back from the edge of the carriageway to the northeast side of London Road, representative of proposed dwellings to that side. Noise levels at Location 3 are very slightly lower, as would be expected as this location, which is set back at a correspondingly slightly greater distance from the edge of the road on the southwest side, again representative of proposed dwellings.

4.6 To both sides, the road traffic noise levels are within the **medium risk category** of the ProPG guidance at the proposed frontages to London Road, albeit tending towards the high risk category, during the daytime. During the night-time, the road traffic noise levels are within the **high risk category**.

4.7 It is therefore recommended that some noise mitigation measures are required to adequately control London Road traffic noise, and hence secure good acoustic conditions for future occupants of the proposed residential development.

4.8 To control internal noise in habitable rooms to within the BS 8233 / ProPG guideline values will require a suitable specification of acoustically-rated glazing and acoustically-rated ventilation system.

4.9 It is therefore recommended that all habitable rooms to plots adjacent to London Road should be provided with either:

- High-specification acoustic glazing system with acoustic rating not less than 36dB R_w+C_{tr} (which typically may be achieved using a double-glazed unit comprising one 10mm thick standard pane and one 6.4mm thick laminated standard pane on a minimum 12mm air cavity, i.e. 10-12-6.4$_{lam}$), with **no through-wall natural ventilation** openings to London Road (i.e. with ventilation openings on the far/shielded elevation only).

  or

- Very high-specification acoustic glazing system with acoustic rating not less than 39dB R_w+C_{tr} (which typically may be achieved using a double-glazed unit comprising one 12.8mm thick laminated pane and one 8.8mm thick laminated standard pane on a minimum 12mm air cavity, i.e. 12.8-12-8.8$_{lam)}$ with any through-wall ventilators rated at not less than 50dB $D_{n,e,w}$.

4.10 The elevations to which the above recommendations apply are indicated as 'Façade Mitigation Scheme 1' in Figure 1.

4.11 For all other elevations, it is recommended that standard thermal double-glazed, e.g. two 4mm thick standard panes on a minimum 12mm air cavity (i.e. 4-12-4) will suffice in all areas.

4.12 In the majority of those areas (i.e. where Façade Mitigation Scheme 1 does not apply), standard non-acoustic trickle vents will suffice.

4.13 However, in certain areas where there is partial exposure to London Road traffic noise, it is recommended that any through-wall ventilators are rated at not less than 38dB $D_{n,e,w}$. The elevations to which this recommendation applies are indicated as 'Façade Mitigation Scheme 2' in Figure 1.

4.14 It is assumed that the solid sections of the building envelope for all dwellings will be formed with an airborne sound insulation of at least 50 dB R_w+C_{tr}. This is achievable using traditional cavity masonry constructions or with commonplace lightweight options.

4.15 Private rear gardens are all proposed to be located to the opposite side of the houses from the London Road elevations, and hence 'good acoustic design' principles have been employed to maximise control of noise levels these areas. Nonetheless, to ensure best practicable control of noise levels, in line with BS 8233 / ProPG guideline, some supplementary acoustic screening is recommended to the exposed flank side of private rear gardens.

4.16 These acoustic barriers (which can take the visual form of standard timber garden fencing or masonry garden walls) will be at least 1.8m high and should be of overall mass not less than 10kg/m2 and nominal thickness not less than 20mm (e.g. proprietary acoustic fencing or solid masonry wall). The construction should be imperforate with no holes or gaps and should be sealed at the base.

4.17 The lateral extents to which this recommendation applies are indicated as 'Recommended Acoustic Barrier' in Figure 1.

4.18 It is noted that the above recommendations do not take account of the requirement of Approved Document O of the Building Regulations (ADO), as that is not a planning matter. However, in line with ADO provisions it is expected that mechanical or other means of cooling will be necessary in areas closest to London Road, subject to additional assessment.

5.0 SUMMARY AND CONCLUSIONS

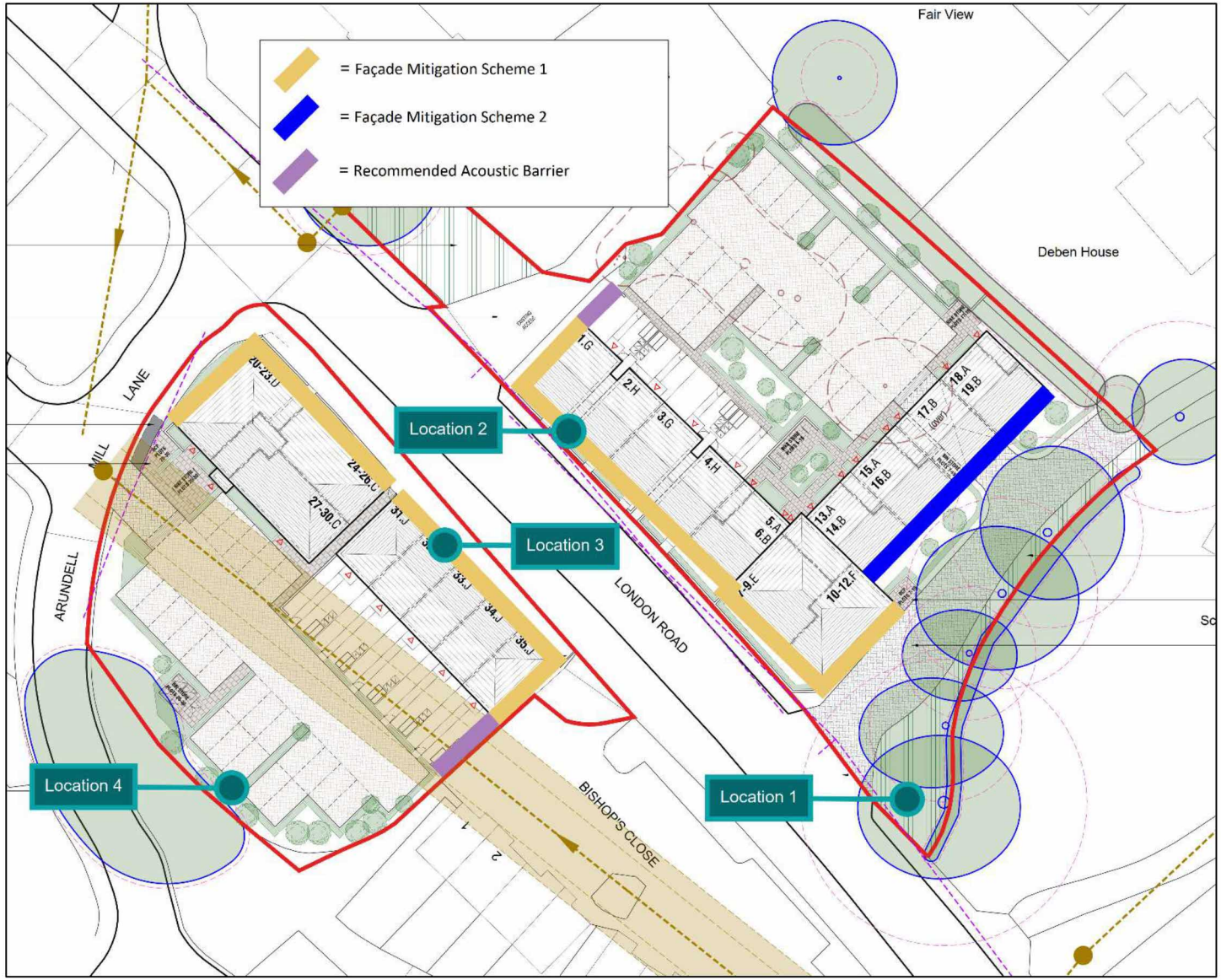
5.1 Hepworth Acoustics has undertaken a noise assessment relating to a proposed residential development at London Road, Stroud.

5.2 A noise survey has been undertaken at the site and the prevailing daytime and night-time road traffic noise levels have been determined.

5.3 Recommendations of appropriate noise mitigation measures have been set out in order to achieve appropriate external and internal noise levels at the new dwellings, in line with relevant British Standard guidelines.

5.4 Noise measurements have also been undertaken of rail noise levels at the site. It has been determined that rail noise presents no constraint to the development and hence no special acoustic mitigation measures are necessary in that regard.

Figure 1: Site Plan



Appendix I: Noise Units & Indices

Sound and the decibel

A sound wave is a small fluctuation of atmospheric pressure. The human ear responds to these variations in pressure, producing the sensation of hearing. The ear can detect a very wide range of pressure variations. In order to cope with this wide range of pressure variations, a logarithmic scale is used to convert the values into manageable numbers. Although it might seem unusual to use a logarithmic scale to measure a physical phenomenon, it has been found that human hearing also responds to sound in an approximately logarithmic fashion. The dB (decibel) is the logarithmic unit used to describe sound (or noise) levels. The usual range of sound pressure levels is from 0 dB (threshold of hearing) to 120dB (threshold of pain).

Due to the logarithmic nature of decibels, when two noises of the same level are combined together, the total noise level is (under normal circumstances) 3 dB(A) higher than each of the individual noise levels e.g. 60 dB(A) plus 60 dB(A) = 63 dB(A). In terms of perceived 'loudness', a 3 dB(A) variation in noise level is a relatively small (but nevertheless just noticeable) change. An increase in noise level of 10 dB(A) generally corresponds to a doubling of perceived loudness. Likewise, a reduction in noise level of 10 dB(A) generally corresponds to a halving of perceived loudness.

Frequency and Hertz (Hz)

As well as the loudness of a sound, the frequency content of a sound is also very important. Frequency is a measure of the rate of fluctuation of a sound wave. The unit used is cycles per second, or hertz (Hz). Sometimes large frequency values are written as kilohertz (kHz), where 1 kHz = 1000 Hz.

Young people with normal hearing can hear frequencies in the range 20 Hz to 20 kHz. However, the upper frequency limit gradually reduces as a person gets older.

The ear is not equally sensitive to sound at all frequencies. It is less sensitive to sound at low and very high frequencies, compared with the frequencies in between. Therefore, when measuring a sound made up of different frequencies, it is often useful to 'weight' each frequency appropriately, so that the measurement correlates better with what a person would actually hear. This is usually achieved by using an electronic filter called the 'A' weighting, which is built into sound level meters. Noise levels measured using the 'A' weighting are denoted dB(A) or dBA.

Glossary of Terms

When a noise level is constant and does not fluctuate, it can be described adequately by measuring the dB(A) level. However, when the noise level varies with time, the measured dB(A) level will vary as well. In this case it is therefore not possible to represent the noise climate with a simple dB(A) value. In order to describe noise where the level is continuously varying, a number of other indices can be used. The indices used in this report are described below.

L_{Aeq} This is the A–weighted 'equivalent continuous noise level' which is an average of the total sound energy measured over a specified time period. In other words, L_{Aeq} is the level of a continuous noise which has the same total (A–weighted) energy as the real fluctuating noise, measured over the same time period. It is increasingly being used as the preferred parameter for all forms of environmental noise.

L_{Amax} This is the maximum A-weighted noise level that was recorded during the monitoring period.

L_{A10} This is the A-weighted noise level exceeded for 10% of the time period. L_{A10} is used as a measure of road traffic noise.

L_{A90} This is the A-weighted noise level exceeded for 90% of the time period. L_{A90} is used as a measure of background noise.

L_{AE} (or SEL) This is the A-weighted 'Sound Exposure Level' which is used for measuring discrete noise events. Essentially it is a measure of the sound energy of the whole noise event normalised to a period of 1 second. The L_{AE} value can be used to calculate the actual $L_{Aeq,T}$ value for a given time period if the number of noise events is known.

Appendix II: Road Traffic Noise Survey Results

Daytime Road Traffic Noise Measurements – Locations 1 – 3

Location	Time	Noise Level			
		dB L_{Aeq}	dB L_{Amax}	dB L_{A10}	dB L_{A90}
1	11:50	72	81	76	60
	12:00	72	83	76	62
	12:10	72	81	75	59
	12:20	72	82	75	63
	12:30	72	83	76	62
	12:40	71	81	74	60
	12:50	72	83	75	59
	13:00	73	92	76	63
	13:10	72	80	76	62
	13:20	72	83	76	62
	13:30	73	96	75	61
	13:40	72	81	75	64
	13:50	72	83	76	64
	14:00	72	80	76	63
	14:10	81	108	76	60
	14:20	71	81	75	59
	14:30	72	82	76	61
	14:40	71	82	75	61
2	12:20	72	80	75	64
	14:20	71	81	74	61
3	12:00	71	79	74	62
	14:00	71	77	73	63

Night-time Road Traffic Noise Measurements – Location 1