hepworth acoustics

LAND AT LLAY, NEW ROAD, RHOSROBIN - PROPOSED RESIDENTIAL DEVELOPMENT
NOISE ASSESSMENT

On behalf of:

SG Estates

Report No: P21-297-R01v03
November 2021

LAND AT LLAY, NEW ROAD, RHOSROBIN - PROPOSED RESIDENTIAL DEVELOPMENT NOISE ASSESSMENT

Report prepared by:
Hepworth Acoustics Ltd
21 Little Peter Street
Manchester
M15 4PS

On behalf of:
SG Estates

Report prepared by: James Shaw MIOA – Senior Consultant	[redacted]
Report checked by: Donald Quinn BSc FIOA – Managing Director	[redacted]

CONTENTS

1.0	INTRODUCTION	1
2.0	RAILWAY NOISE SURVEY	2
3.0	ACOUSTIC DESIGN CRITERIA	5
4.0	NOISE MITIGATION SCHEME	7
5.0	SUMMARY AND CONCLUSION	9

FIGURE 1 – SITE LOCATION & NOISE MEASUREMENT POSITION 10

FIGURE 2: PROPOSED SITE LAYOUT & NOISE MITIGATION SCHEME 11

APPENDIX I: NOISE UNITS & INDICES 12

APPENDIX II: NOISE SURVEY RESULTS 14

1.0 INTRODUCTION

1.1 Hepworth Acoustics Ltd was commissioned by SG Estates to carry out an assessment of railway noise for a proposed residential development on land off Llay New Road in Rhosrobin and advise on any necessary noise mitigation measures for the proposed development.

1.2 The location of the development site is shown in Figure 1 and is situated in a primarily residential area.

1.3 Figure 1 shows that the development land is a grassed field to the north side of the Wrexham – Chester railway line. The line is essentially a passenger line with minimal use for freight and runs past the site in a cutting such that the trains pass well below the height of the development land. Only Plots 42, 43, 50 and 51 of the proposed development will be exposed to noise from the train line as the dwellings on Churchlea bound the railway to the majority of the site and this the development land is shielded from the railway by the houses on Churchlea.

1.4 The site is bounded to the west by Llay New Road (B5425) a lightly trafficked road. To the north are open fields and a large cemetery. To the west is open land which will be developed as public open space as part of the scheme.

1.5 We understand that during pre-application consultation with Wrexham County Borough Council the submission of a noise assessment has been requested due to the proximity of a number of plots to the railway line.

1.6 The noise assessment has therefore included:

- Making an inspection of the site;
- Measurement of railway noise levels in the Southern area of the site;
- Assessment of railway noise impact on the proposed development; and
- Recommendation of appropriate noise mitigation measures where necessary.

1.7 The various noise units and 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 RAILWAY NOISE SURVEY

Survey

2.1 A railway noise survey has been carried out at a location 10 metres back from the south-eastern corner of the site boundary. This location is representative of the nearest dwelling to the railway line. The location is indicated in Figure 1.

2.2 The site was not considered to be sufficiently secure for us to be able to install and leave unattended automated noise monitoring instrumentation and therefore an attended noise survey of a sample of individual passing trains was carried out for a representative period of the daytime.

2.3 The survey was carried out on between 10:00 and 12:30 on Thursday 8th July 2021. The noise monitoring was carried out at a microphone height of approximately 1.5 metres above the ground. Calibration checks of the sound level meter were carried out before and after the noise survey with no significant variance in levels observed. Details of the instrumentation used, weather conditions, etc. are stated in Appendix II.

2.4 Based upon timetable information, we understand that the total weekday (07:00-23:00) two-way flow of passing trains is up to 40. During the whole of the night-time period (23:00-07:00) there is typically a total of only seven passing trains. We understand that there may be one or two freight trains per day, but these run according to demand and often do not run, a single freight train passed during the measurement survey.

2.5 The noise levels were measured during the passage of a sample of trains in terms of the 'sound exposure level' (L_{AE}) and the maximum sound pressure level, L_{Amax}. The daytime (07:00-23:00) 16-hour noise exposure value and night-time (23:00-07:00) 8-hour noise exposure value have been calculated from the results as described below.

2.6 The measured sound exposure level (L_{AE}) were between 78 – 86 dB $L_{AE.}$ The measured short-term peaks of noise from passing trains were found to be within the range of 75 – 83 dB L_{Amax}.

2.7 The results of the railway noise survey are detailed in Appendix II and the data has been used in the analysis below.

Railway Noise Exposure Values

2.8 Railway noise is evaluated in terms of the 'equivalent continuous noise level', L_{Aeq}. The daytime and night-time L_{Aeq} values have been calculated from the results of the noise survey using the standard formula:

$L_{Aeq(T)} = L_{AE}$ Average + 10 log N - 10 log T

where: $L_{Aeq(T)} = L_{Aeq}$ over time period T

L_{AE} Average = Average 'Sound Exposure Level'

N = Number of train passes in time period T

T = Time period in seconds

2.9 The daytime and night-time railway noise exposure values are shown in Table 1.

Table 1: Railway noise exposure values (dB) at 5m from boundary

Daytime 07:00-23:00	Night-time 23:00-07:00
51 dB $L_{Aeq,16h}$	47 $L_{Aeq,8h}$

2.10 The values in Table 1 are modest levels of railway noise. This is due to there being a relatively low number of passing trains averaged over the 16-hour daytime period and 8-hour night-time period.

2.11 The implications of the railway noise exposure values are discussed in the following sections.

Comments on Railway Noise Exposure Levels

2.12 The results of the railway noise survey have been assessed in accordance with the guidance in 'Technical Advice Note (Wales) 11 – Noise', 1997 (TAN 11) and CL-01-15 updates. The TAN 11 Noise Exposure Categories (NECs) for railway noise are shown in Table 5.

2.13 TAN 11 sets out Noise Exposure Categories (NECs) for proposed residential development land that is exposed to different types of noise, and their suitability for residential use. The NECs for land exposed to railway noise (which are 'free field' values) are shown in Table 2.

Table 2: TAN 11 Railway Noise Exposure Categories

	Noise Exposure Category (NEC)			
	A	B	C	D
Daytime (0700-2300 hrs)	<55	55-66	66-74	>74
Night-time (2300-0700 hrs)	<45*	45-59*	59-66	>66

[* sites where noise events regularly exceed 82 dB L_{Amax} several times in any hour at night should be treated as being in Category C]

Category A - Noise need not be considered as a determining factor in granting planning permission.

Category B - Noise should be taken into account and steps taken to ensure an adequate level of protection against noise.

Category C - Planning permission should not normally be granted. Where development is permitted, steps should be taken to ensure a commensurate level of protection against noise.

Category D - Planning permission should normally be refused.

2.14 Thus, the daytime railway noise exposure level at 10 metres from the northern site boundary at this site (shown in Table 1) falls into NEC A of TAN 11.

2.15 The night-time railway noise exposure level falls into NEC B of TAN 11 at the survey location.

2.16 Thus, whilst the railway noise exposure levels are suitable for residential development, the night-time noise levels in NEC B areas need to be taken into account and, where necessary, appropriate noise mitigation measures implemented. The noise mitigation measures also need to take account of short-term peaks of noise from passing trains at night of 75 - 83 dB L_{Amax} .

2.17 Appropriate acoustic design goals for the dwellings are discussed in Section 3.0 and our recommendations for noise mitigation are set out in Section 4.0.

3.0 ACOUSTIC DESIGN CRITERIA

3.1 The most relevant national guidance on appropriate acoustic design goals for residential development is set out in BS 8233: 2014, *Guidance on sound insulation and noise reduction for buildings*, (referred to hereafter as BS 8233) which carries the full weight of an adopted British Standard. The design criteria recommended in BS 8233 for daytime periods (07:00 – 23:00 hours) and night-time periods (23:00 – 07:00 hours) are summarised in Table 3:

Table 3: BS 8233 recommended acoustic design criteria

Activity	Location	07:00 – 23:00	23:00 – 07:00
Resting	Living room	35 dB $L_{Aeq,16h}$	
Dining	Dining room/area	40 dB $L_{Aeq,16h}$	
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16h}$	30 dB $L_{Aeq,8h}$

3.2 BS 8233 also states that, "*where development is considered necessary or desirable … the internal target levels* [i.e. those in Table 6 above] *may be relaxed by up to 5dB and reasonable internal conditions still achieved".*

3.3 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*".

3.4 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 such that for design purposes it is usual to take into account the findings of research described in WHO *Community Noise Guidelines* that states, "for a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB L_{Amax} more than 10-15 times per night".

3.5 Therefore, for the Llay New Road development we recommend the following noise criteria be adopted with windows closed and trickle ventilation provided:

- Daytime noise below 35 dB L_{Aeq} inside living rooms and bedrooms; and
- night-time noise levels not exceeding 30 dB L_{Aeq} and generally not exceeding 45 dB L_{Amax} in bedrooms i.e. not more than 10-15 times per night.

3.6 Meeting the above adopted noise criteria will provide a good standard of protection of residential amenity for future residents of the proposed development.

3.7 For outdoor amenity spaces such as private gardens and patios, BS 8233 states that '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, the standard also recognises that these guideline values are not achievable in all circumstances where development might be desirable, particularly for development sites adjoining the 'strategic transport network'. In such cases (i.e. where noise levels would be above 55 dB L_{Aeq}) BS 8233 states that the development should be designed to minimise noise levels as far as is practicable 'but should not be prohibited'.

3.8 On this basis, our recommendations for noise mitigation are described in Section 4.

4.0 NOISE MITIGATION SCHEME

Gardens

4.1 The daytime railway noise exposure level at 10 metres from the site boundary (i.e. in the rear gardens of the proposed houses) was found to be 51 dB $L_{Aeq,16h}$ which is above the lower limit of 50 dB(A) that is recommended for gardens in BS 8233.

4.2 Therefore, in order to achieve railway noise levels of below 50 dB $L_{Aeq,16hr}$, we recommend that a 1.8m high proprietary acoustic fence is installed for the gardens of plots 43, 51 and part of plot 42 as indicated in blue on Figure 2.

4.3 The acoustic fencing must be imperforate (i.e. have no holes or gaps), have a surface mass no less than 10 kg/m^2 and be at least 20mm thick. Gates, where necessary, in the fencing would be acceptable as long as they are built to the same standard as the acoustic fencing.

4.4 Suppliers of proprietary acoustic fences include Jacksons Fencing (jacksons-fencing.co.uk), Guardian Fencing (guardianfencing.com) and Ransford's (ransfords.co.uk).

4.5 All other dwellings/gardens will be further away from the railway and/or shielded from railway noise by the houses themselves and so noise levels will be lower and below 50 dB $L_{Aeq,16hr}$.

Sound Insulation of Dwellings

4.6 Windows of standard well-sealed thermal double glazing (4mm glass – 4mm glass) have a typical sound reduction performance of 25 dB $R_w + C_{tr}$. Therefore, where railway noise levels exceed 60 dB $L_{Aeq,16h}$ during the daytime and/or 55 dB $L_{Aeq,8h}$ at night, and/or 70 dB L_{Amax} for more than 10 times a night, higher specification glazing will be necessary.

4.7 Based on the noise survey results, standard thermal double glazing (4mm glass – 4mm glass) will be adequate for living rooms and bedrooms for all dwellings on the site.,

4.8 However, due to short-term peaks of noise from passing trains at night, it would be necessary to install specialist acoustic vents instead of standard window frame trickle vents in the bedrooms of a small number of plots. The relevant dwellings/elevations are indicated in Figure 2.

4.9 Various types of acoustic vents are commercially available. However, in terms of acoustic performance, we would recommend types such as the Greenwood EAR42W 3-part slot system,

comprising humidity sensitive indoor unit, acoustic sleeve, and outdoor acoustic canopy or wall mounted Ryton AAC125HP units, both of which have a good acoustic performance rating of at least 40 dB $D_{n,e,w}$.

4.10 For dwellings that are further away from the railway and/or screened from the railway by other houses, standard double glazing and standard non-acoustic trickle vents will be adequate.

5.0 SUMMARY AND CONCLUSION

5.1 The potential impact of railway noise has been assessed for the proposed residential development at Llay New Road in Rhosrobin.

5.2 The assessment has included the measurement railway noise at an appropriate location on the site and calculation of the daytime and night-time railway noise exposure levels.

5.3 Railway noise levels are fairly modest, however to achieve 50 dB $L_{Aeq,16hr}$ in all garden fencing has been recommended for the gardens of a small number of plots. In addition as a result of the elevated peaks of noise during the passage of trains at night, we consider that some modest sound insulation measures are warranted for the most exposed dwellings in order to meet the adopted acoustic design criteria.

5.4 An appropriate sound insulation scheme for the development has been described in this report.

Key:
Not to scale
Noise Measurement Location
North
hepworthacoustics
Title: Figure 1: Site Location & Noise Measurement Position
Project: P21-297


Key:
Not to scale
Acoustic Ventillation for Bedrooms
1.8m Acoustic Barrier
North
hepworthacoustics
Title: Figure 2: Proposed Site Layout & Noise Mitigation Scheme
Project: P21-297
POND
Wild Life Area
Mitigation Land
PLAY EQUIPPED AREA
POS 1
POS 2
POS 3
POS 4
POS 5
POS 6
POS 7
POS 8
POS 9
POS11
POS 12
POS 13
6.5m wide Spine Road No. 3
6.5m wide Shared Surface Road No. 6
5.5m Access Collector Road No. 1
4.8m wide Shared surface Road No. 4
4.8m wide Shared surface Road No. 2
LLAY NEW ROAD (FFORDD NEWYDD)

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.

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.

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.

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 usually used as a measure of 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.

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 SEL value can be used to calculate the actual L_{Aeq} value for a given time period if the number of noise events is known.

Appendix II: Noise Survey Results

Date(s):	Thursday 8th July 2020
Equipment:	Brüel & Kjær 2250 'Type 1' sound analyser (serial no. 3011706) with tripod and calibrator
Weather:	Dry, warm 20°C and calm, clear skies turning to overcast during latter part of survey.

All levels in dB(A)

Location 1: Railway Noise Survey

Time	Direction	Measured Noise Levels (dB)		Comments
		L_{Amax}	SEL	
10:12	North	81.4	80.1	Light Passenger
10:48	South	77.6	82.4	
10:53	South	75.8	79.4	
11:05	North	82.6	88.2	Freight Train
11:48	South	81.9	86.4	Light Passenger
11:54	North	75.4	77.8	
12:11	South	80.3	83.2	
12:32	North	80.8	82.7	