Environmental Noise Assessment

New flats
St Andrews Yard
Willeys Avenue
Exeter

Client:

Riviera Equity Ltd
Riviera View, Warren Rd
Torquay
TQ2 5TN

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Contents

1 Executive Summary

It is proposed that the St Andrews Yard site off Willeys Avenue, Exeter could be redeveloped for residential use, with a single 3 storey block of 9 apartments. The south west boundary of this triangular site abuts the embankment and railway line.

This report sets out the findings of a weeklong sound survey of the site which shows that the passing of trains does create considerable levels of peak or event noise, quantified by the L_{Amax} noise indices with a mean night time level of 85 dB $L_{Amax,}$ regularly being recorded.

The proposed three storey 9 unit residential block has been designed to maximise the separation of the new building from the railway line.

This report shows that desirable internal sound levels can be achieved if the building façade have a heavy cavity masonry construction, the windows will need to provide a high level of sound insulation (45 dB R_w) and suitable degree of ventilation will need to be moved by a fully attenuated mechanical ventilation system.

In this way internal sound levels can be achieved that will comply with likely requirements of Exeter City Council.

2 Introduction

It is proposed to redevelop St Andrews Yard off Willeys Avenue, next to the railway line in Alphington Exeter, clearing the existing commercial building and constructing a single block of apartments on 3 floors.

The railway line runs on an embankment along the southern boundary of this triangular site approximately 5m above ground level. The track takes passenger trains south to Dawlish, Teignmouth and on to Plymouth as well as a branch line terminating on Marsh Barton Industrial Estate.

This report sets out the findings of an on-site sound survey and shows that internal ambient sound levels, specified in BS8233:2014 can be achieved with suitable glazing, ventilation and façade construction.

3 Sound level criteria

British Standard BS8233 provides guidance for desirable internal ambient noise levels as set out in Table 4 of the Standard namely;

Activity	Location	07,00 to 23,00	23,00 to 07,00
Resting	Living room	35 dB $L_{Aeq,day}$	
Dining	Dining room/area	40 dB $L_{Aeq,day}$	
Sleeping (day time resting)	bedroom	35 dB $L_{Aeq,\ day}$	30 dB $L_{Aeq,night}$

NOTE 4 attached to this Table states;

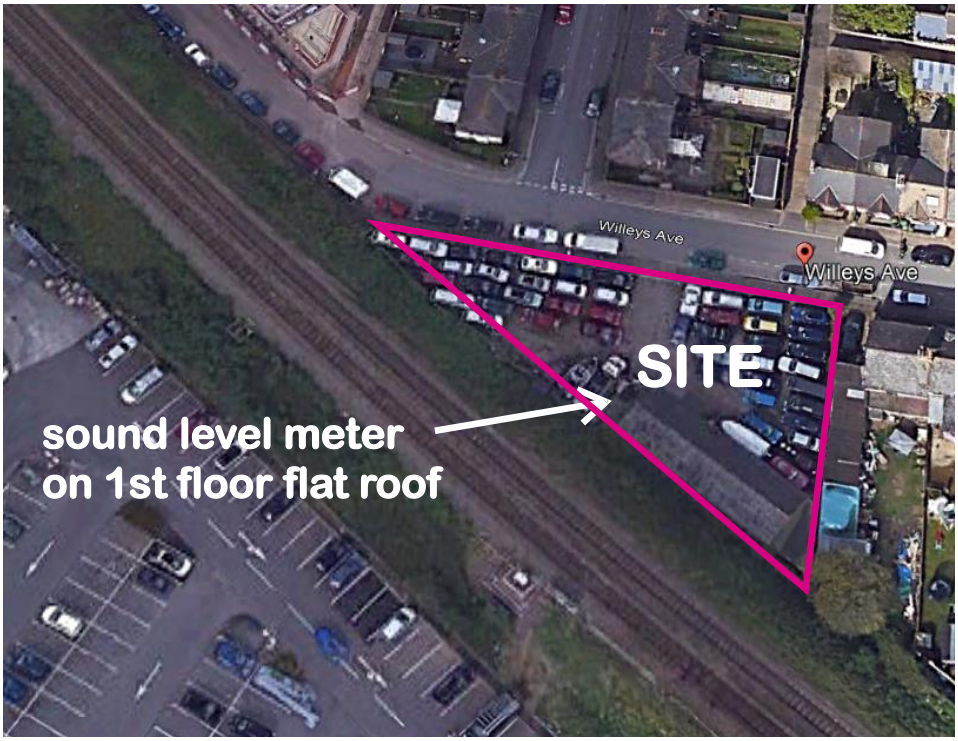
> *"Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$, depending on the character and number of events per night. Sporadic noise events could require separate values.*

The World Health Organisation provides guidance on limiting the magnitude and number of noisy events over night to prevent the loss in the restorative powers of sleep and in their Guidelines for Community Noise (1999) state;

> *"If negative effects on sleep are to be avoided the equivalent sound pressure level should not exceed 30 dBA indoors for continuous noise. If the noise is not continuous, sleep disturbance correlates best with L_{Amax} and effects have been observed at 45 dB or less. For a good night's sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB L_{Amax} more than 10-15 times per night."*

4 Environmental Sound & Vibration Levels

The aerial view below shows the site and its proximity to the railway line which runs along the south west border of the site on an embankment approximately 5m higher than the site.



A site sound survey was carried out from Tuesday 20th August 2018 for 7 days. The site is currently used by a car and parts sales business. Whilst I was on site setting up and collecting the monitoring equipment, there was little activity on the site and the soundscape was dominated by road traffic noise coming chiefly from Alphington Road and by passing trains.

A sound level meter was set up on one of the flat roofs on the western end of the site building as shown in the photograph below;

The meter was calibrated before and after the survey without any adverse variants being observed. Details of the equipment used are given in the table below;

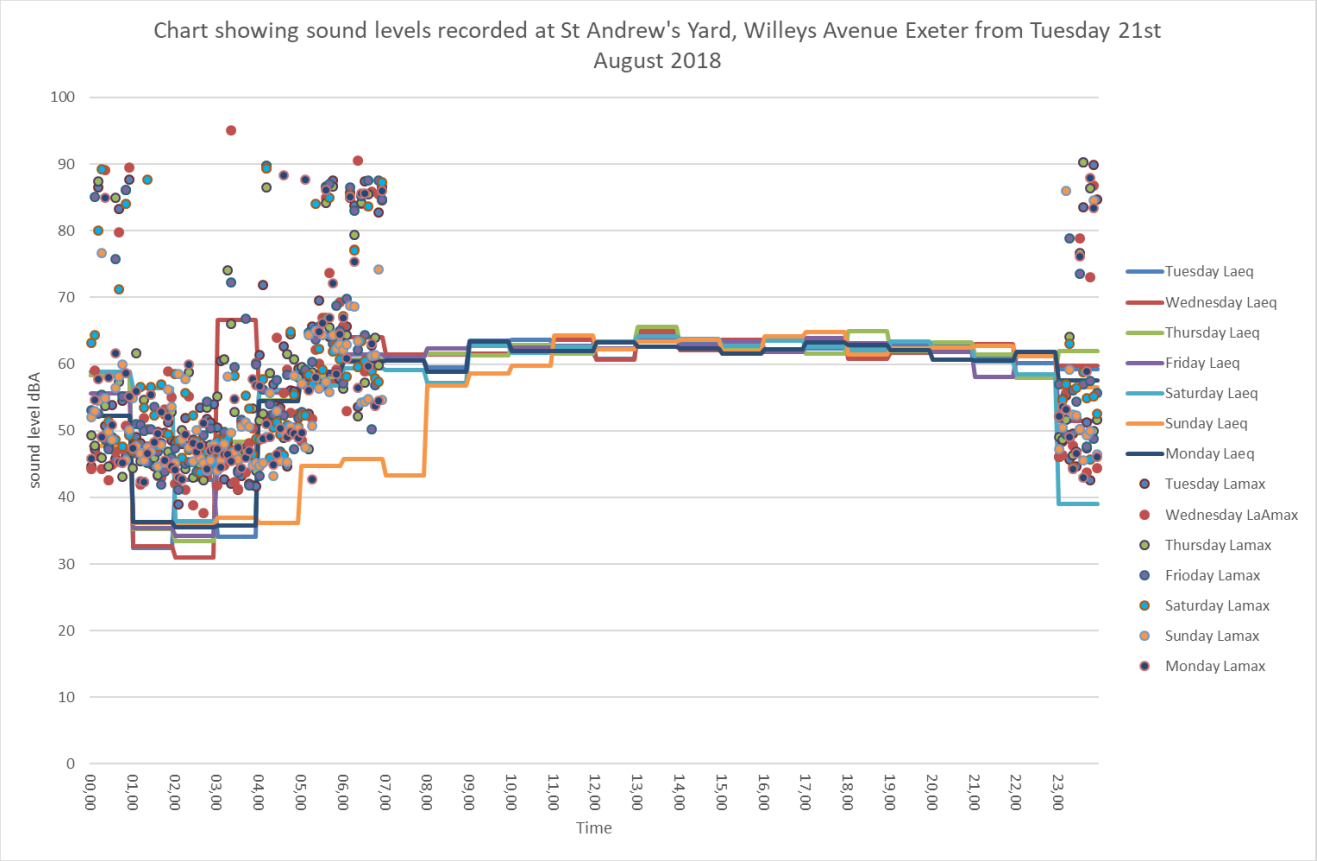
Make	Model	Serial No.	Calibration Cert No.	Re-calibration due
Rion	NL31	00583286	TCRT18/1235	20-3-20
Rion	NC74	34794316	TCRT18/1231	20-3-19

The meter was set to record noise parameters over repetitive 5 minute periods.

The weather during the survey was clear and fine with no wind and suitable for repeatable environmental sound measurement[1].

[1] https://espanol.wunderground.com/history/airport/EGTE/2018/8/20/WeeklyHistory.html?req_city=EGTE&req_state=DEV&req_statename=United%20Kingdom&reqdb.zip=00000&reqdb.magic=35&reqdb.wmo=03839

The chart below shows the L_{Aeq} and L_{Amax} sound levels recorded;



The table over page summarises the day and night time L_{Aeq} levels recorded, along with the 10th highest L_{Amax} recorded overnight that usually describes the "regular L_{Amax}" referred to in WHO Guidelines for Community Noise[2] and BS8233[3] as well as the highest individual event for each, as a comparison.

[2] Guidelines for Community Noise 1999
[3] BS8233:2014 Guidance on sound insulation and noise reduction for buildings

Date	Day	Period	Willeys Avenue		
			LAeq,T	10th LAmax	1st LAmax
20/08/2018	Tuesday	day	62		
		night	57	85	90
21/08/2018	Wednesday	day	62		
		night	61	86	95
22/08/2018	Thursday	day	63		
		night	57	85	90
23/08/2018	Friday	day	62		
		night	56	85	90
24/08/2018	Saturday	day	62		
		night	56	80	89
25/08/2018	Sunday	day	62		
		night	43	63	77
26/08/2018	Monday	day	61		
		night	56	85	88
Mean		day	62		
		night	55	81	89

This shows very consistent day time L_{Aeq} levels right across the week (Including the Sunday) at 62 dB L_{Aeq}, there was however greater variation of night time levels (11pm to 7am), Sunday was considerably quieter at 43 dB with week day levels ranging from 56 to 61 dB $L_{Aeq,night}$.

The L_{Amax}, or event levels were similarly less on Sunday nights, and consistent across the other days of week at 85 dB dB $L_{Amax,regular}$.

BS8233:2014 provides three different internal sound criteria for ambient noise, 35 dB $L_{Aeq,day}$ for living and bedrooms during the day, 30 dB L_{Aeq} for bedrooms at night and the WHO recommend that event levels are limited to no more than 10 to 15 events per night in excess of 45 dB L_{Amax}.

The table below compares these criteria values against those measured;

	Day	Night	
	dB LAeq	dB LAeq	dB Lamax
BS8233 Criteria	35	30	45
measured Sound Level	62	55	85
insulation required	27	25	40

This shows that the highest sound insulation requirement from the façade is 40 dB, to ensure external events are reduced to no more than 45 dB internally at night.

The implications of this sound insulation requirement on the façade design will be considered later in this report.

5 Assessment of external sound levels

The level of sound incident on the facades of the new dwellings can be estimated using Wolfe IMMI 3-D computer noise modelling software, which implements the calculation procedures set out in ISO 9613-2:1996 (Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation). As well as the amendment contained within ISO/TR 17534-3:2015 (Acoustics - Software for the calculation of sound outdoors - Part 3: Recommendations for quality assured implementation of ISO 9613-2 in software according to ISO 17534-1).

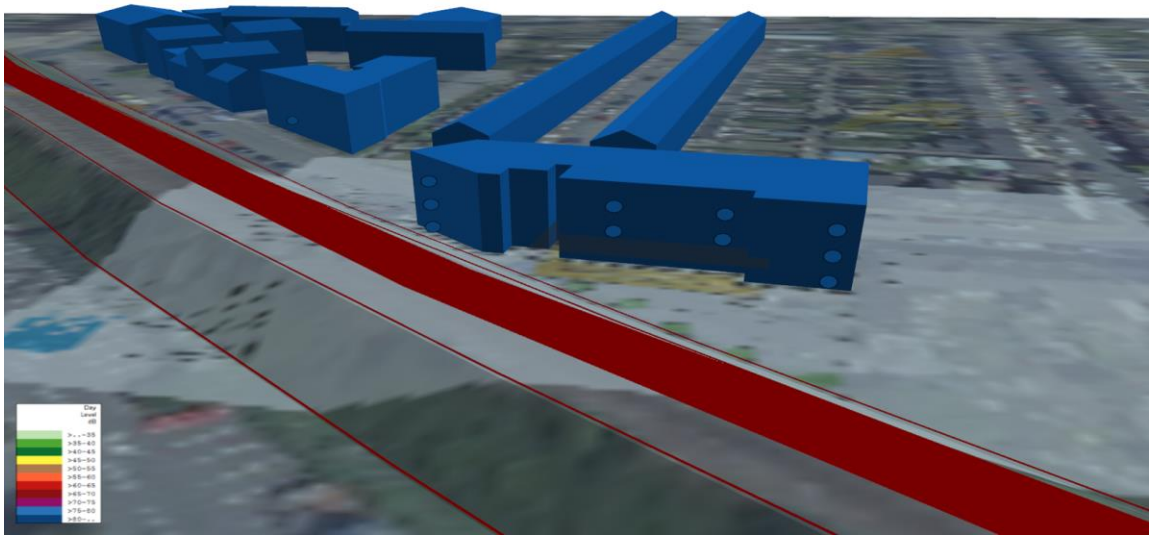
The following modelling assumptions have been relied upon;

- G = 0.0 (hard ground outside the site)
- Air temperature 10° C,
- Humidity 70%,
- Downwind propagation,
- The general arrangement is shown on gjr's drawing No. 553 030 E & 040 D, below, showing a block of 9 No. apartments on three floors, following the building line along Willeys Avenue, to maximise the separation from the railway line.

FIRST FLOOR PLAN
1:100 at A1

SECOND FLOOR PLAN
1:100 at A1

The image below shows the railway track on the embankment running in front of the proposed apartment building;



The acoustic modelling predicts maximum rear façade event levels to be 88 dB $L_{Amax,regular\ night}$.

The level of sound break-in, to the houses, can be estimated using the procedures set out in BS8233[4] and enabled in a handy calculator provided by BRE[5].

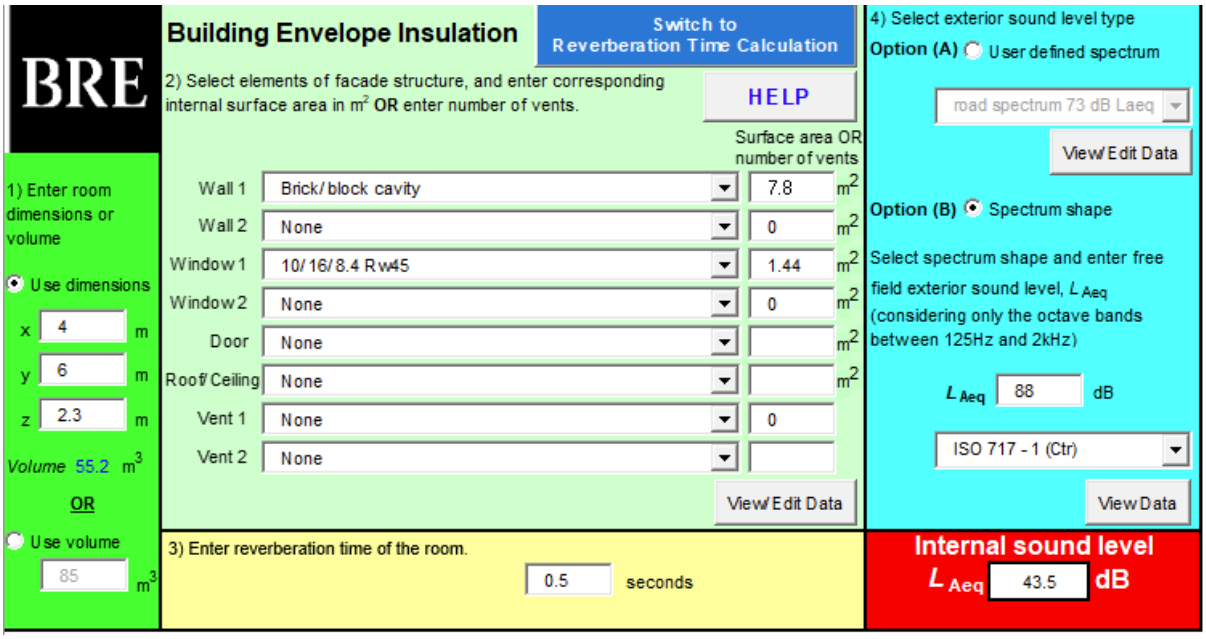
The constructions for the external walls will be;

External rendered walls with
100mm dense concrete block
50mm Unventilated cavity with
50mm Celotex FR5000 with
100mm dense concrete block with dot and dab plaster board finish
Estimated sound insulation > 60 dB R_w

UPVC window double glazed units consisting 10mm low e glass 16mm air gap 8.4 mm acoustic laminate glass
Estimated sound insulation > 45 dB R_w

Background sound insulation to be provided by an acoustic (sound attenuating) filtered air supply units[6] offering at least 56 dB D_{new}.

The image below shows the estimated external sound break-in to a typical bedroom (which will have a single 1200mm x 1200mm window 1.44 m^2 in a wall of 7.8m^2);



[4] BS8233: 2014 Guidance on sound insulation and noise reduction for buildings Annex C
[5] Building Research Establishment
[6] Such as Titon Sonair http://www.titon.co.uk/media/product/ventilator-systems/download/mechanical-supply-ventilation/Sonair/Sonair.pdf or equivalent

This shows that with high performance double glazing (offering at least 45 dB R'_w) along with a attenuated mechanical air supply unit (offering at least 56 dB D_{new} attenuation) system, internal event sound levels can be limited to less than 45 dB L_{Amax}.