



ACOUSTIC CONSULTANTS LTD

Proposed Residential Development
The Curlew, Petersfield Road, Havant, PO9

Noise Impact Assessment

Reference: 7063/PP/BL

March 2018



The Curlew, Petersfield Road, Havant, PO9

Noise Impact Assessment

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1. Introduction

Fortitudo Ltd appointed Acoustic Consultants Limited to carry out a site noise monitoring survey to address planning condition 20 for the permitted residential at The Curlew, Petersfield Road, Havant, Hampshire PO9 2HU. The planning reference for the permitted development is APP/17/00369.

The purpose of this assessment is to address the noise climate affecting the proposed development, specifically road traffic noise. The noise impact assessment has been undertaken in accordance to British Standard 8233:2014 (BS8233).

The author of this report is a Member of the Institute of Acoustics with 10 years' experience within the field and as such is considered suitably qualified to undertake a noise impact assessment.

The report is based upon noise level data measured on the development site and reasonable assumptions. This report limits itself to addressing solely on the noise aspects as included in this report and is intended for planning purposes only.



2. The Site

The site is an existing public house with a residential flat/staff accommodation above. The proposal is to demolish the existing building and erect three storey building comprising of 31 apartments.

The site is in a mixed residential and commercial area with residential dwellings to the northwest is Petersfield Road (B2149). To the south is a residential area. To the northeast is a hospital.

The main source of noise affecting the site was from road traffic along the Petersfield Road (B2149).

Figure 1: Site Location Plan





3. Planning and Noise

3.1. Planning Condition 20

The noise related planning condition is condition 20 which state as below

"20. The Building hereby permitted shall not be occupied unless and until details of noise insulation including window glazing details have been submitted to and approved in writing by the Local Planning Authority.

Reason: To ensure that the proposed flats provide an acceptable internal living environment having regard to the location of the development adjacent to Petersfield Road and having due regard to Havant Borough Local Plan (Core Strategy) policies CS16 and M10 Havant Borough Local Plan Allocations 2014 policy DM18 and the *National Planning Policy Framework*."

As the planning condition does not specify any standard or criteria we have used an appropriate standard which is British Standard 8233:2014.

3.2. British Standard 8233:2014

Internal Ambient Noise Levels

British Standard 8233:2014 entitled "Guidance on sound insulation and noise reduction for buildings" came into effect on 28th February 2014.

Section 7.7.2 Table 4 of the British Standard 8233:2014 provides internal ambient noise levels for dwellings from noise sources 'without a specific character'.

The British Standard guideline states that indoor noise levels should not normally exceed those as noted in Table 4 of the British Standard and this is summarised below:

Table 1: British Standard 8233:2014 Internal Noise Criteria

Activity	Location	Daytime (07:00 to 23:00)	Night-time (23:00 to 07:00)
Resting	Living Room	35 dBL _{Aeq,16 hour}	-
Dining	Dining Room/area	40 dBL _{Aeq,16 hour}	-
Sleeping (daytime resting)	Bedroom	35 dBL _{Aeq,16 hour}	30 dBL _{Aeq,8 hour}



It should be noted that BS8233 states that where the development is considered necessary or desirable, the criteria may be relaxed by up to 5 dB.

Maximum Noise Levels

Section 7.7.2 Note 4 of the British Standard 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 British Standard does not provide a definitive criteria for maximum noise levels from individual events ($L_{Amax,F}$).

Section 3.4 of the "Guidelines for Community Noise" published by the World Health Organisation in 1999 (WHO 1999) states *"For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 L_{Amax} more than 10-15 times per night (Vallet & Verbey 1991)"*.

As such maximum noise levels would be considered acceptable if they do not exceed 45 dB $L_{Amax(F)}$ no more than 10 to 15 times during the night-time period.



4. Noise Monitoring

A long term unattended noise survey was conducted between 16:00 hours on the 20th February 2018 and finishing at 16:00 hours on the 21st February 2018. The survey was undertaken in accordance with British Standard 7445.

4.1. Equipment

Sound Pressure Levels were measured using a Sound Level Meter with a half-inch condenser microphone, using the 'fast' setting. The equipment is checked regularly using a Quality System meeting the requirements of British Standard EN ISO/IEC 17025:2005 and in accordance with British Standard EN 10012:2003 and traceable to the National Standards.

This equipment was checked and calibrated as noted below and the certificates are available for inspect upon request. Table 2 provides the equipment and calibration status.

Table 2: Equipment and Calibration Status

Equipment Description / Manufacturer / Type	Serial number	Date of calibration	Calibration Certification Number
NII XL2 Sound Level Meter	A2A-09705-E0	04/09/2017	15284
NII MA220 Pre-Amp	5332	04/09/2017	15284
NII Microphone Capsule MC230A	A14374	04/09/2017	15284
Calibrator, CEL, Type 284/2	3/02716829	04/09/2017	15283

The measurement system was checked before and after use with the noted calibrator, and 0.2 dB drift was detected.

4.2. Weather Conditions

During the noise survey the weather conditions were dry and a temperature from 2 to 6 degrees Celsius, with little or no wind at the monitoring location. The weather conditions are not expected to have affected the measured data.



4.3. Monitoring Procedure

An unattended long term measurement exercise was undertaken at the location marked on the figure below. At the monitoring location marked on the figure below, the sound level meter was approximately 5 metres above the ground on the flat roof of the existing pub, The Curlew. The monitoring location was in a façade position.

Figure 2: Monitoring location

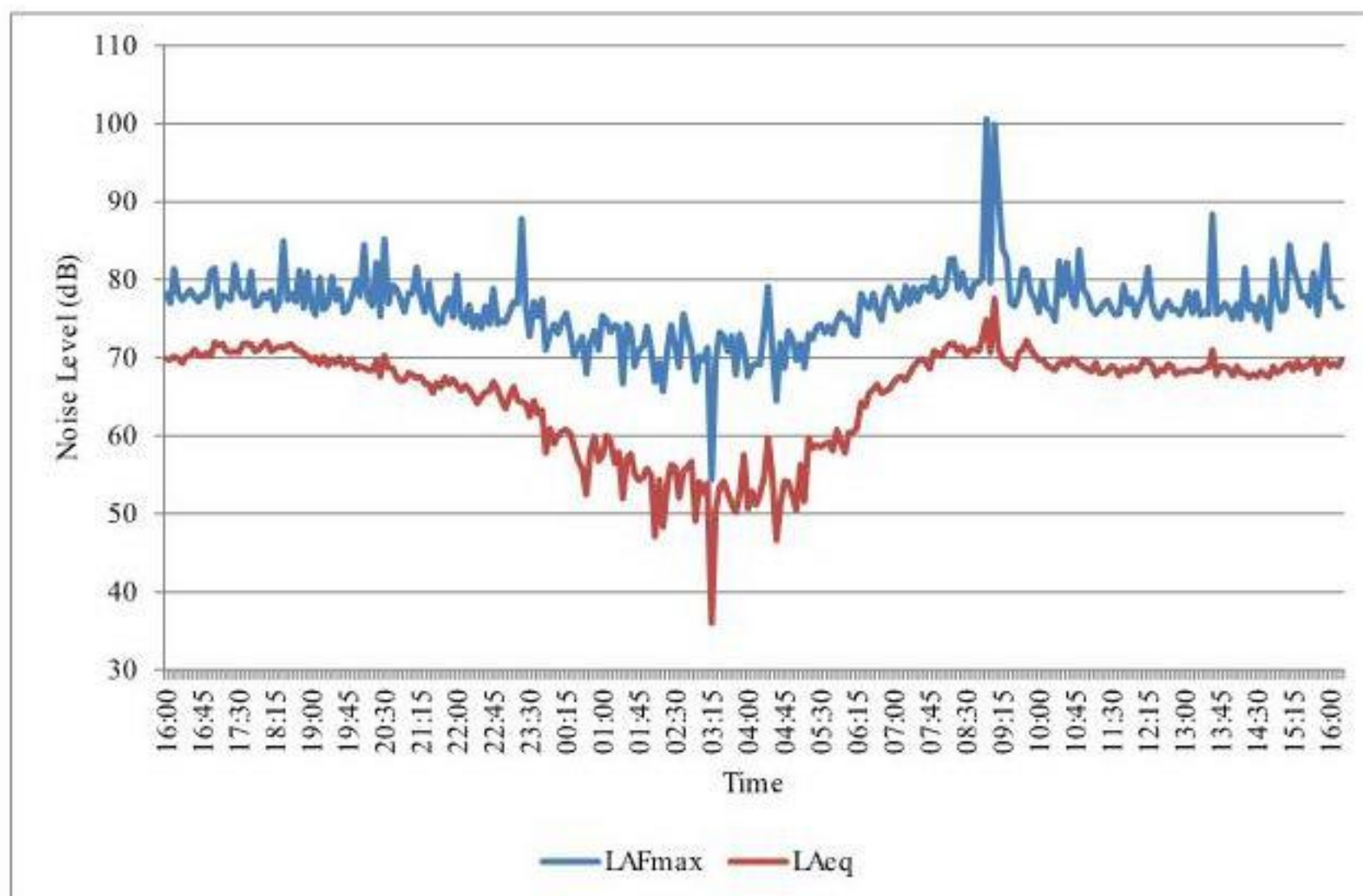




4.4. Measured Noise Levels

The main noise source affecting the monitoring location was the road traffic noise from Petersfield Road (B2149). Chart 1 below provides the measured noise level over the measurement period.

Chart 1: Measured noise levels (façade level)



From the measured data, we have determined the following façade level octave band design 'daytime' and 'night-time' equivalent noise levels, and maximum noise levels at the monitoring location:

Table 3: Measured Octave Band Design Noise Levels (façade level)

Parameter	63	125	250	500	1000	2000	4000	8000	dB(A)
Day $L_{eq}(16hr)$	67	60	58	58	63	61	52	36	66
Night $L_{eq}(8hr)$	56	49	48	48	54	52	44	27	57
Night $L_{max(F)}$	67	57	58	63	70	69	60	42	73



5. Noise Modelling

To determine the noise levels across the proposed development site a noise modelling exercise has been completed in Cadna:A by Datakustik.

5.1. Noise Modelling Methodology

The model allows for the prediction of noise levels to be undertaken for a high number of receiver locations and different noise emission scenarios. The modelling software calculates noise levels based on the inputted noise emission values, source and receiver locations, and primarily distance, barrier and ground attenuation. Calculations are undertaken using the methodology of the Calculation of Road Traffic Noise (CRIN).

The noise emission data and model setting parameters are as given in the table below.

Table 4: Cadna:A Parameters

Parameter	Comments
Topography of the Road	Flat
Topography of the Site	Flat
Building Heights	As per supplied elevations and google earth
Barriers	None
Night-time Receiver locations	Worse case location assumed to be 1.5m, 4.1m and 7m from ground, this is a free-field level
Daytime Receiver Locations	Worse case location assumed to be 1.5m, 4.1m and 7m from ground, this is a free-field level
Reflections	Reflections calculated via the methodology of CRIN and not mirror sources
Ground Absorption	Ground fully reflective

A verification model has been created to ensure the measured and predicted 'daytime' and 'night-time' equivalent noise levels, and maximum noise levels at monitoring location A are comparable. This model is available upon request.

5.2. Noise Modelling Results

To determine the noise levels across the site the proposed building is added into the verification model to determine the noise level at each façade.

The figures below show the predicted equivalent daytime $L_{Aeq(16 \text{ hours})}$ noise level, night-time $L_{Aeq(8 \text{ hours})}$ equivalent noise level and night-time maximum noise level L_{Amax} assessed on the worse case (highest noise level) floors.

Figure 3: Predicted Daytime Equivalent Noise level $L_{Aeq(16 \text{ hours})}$ at the proposed dwellings

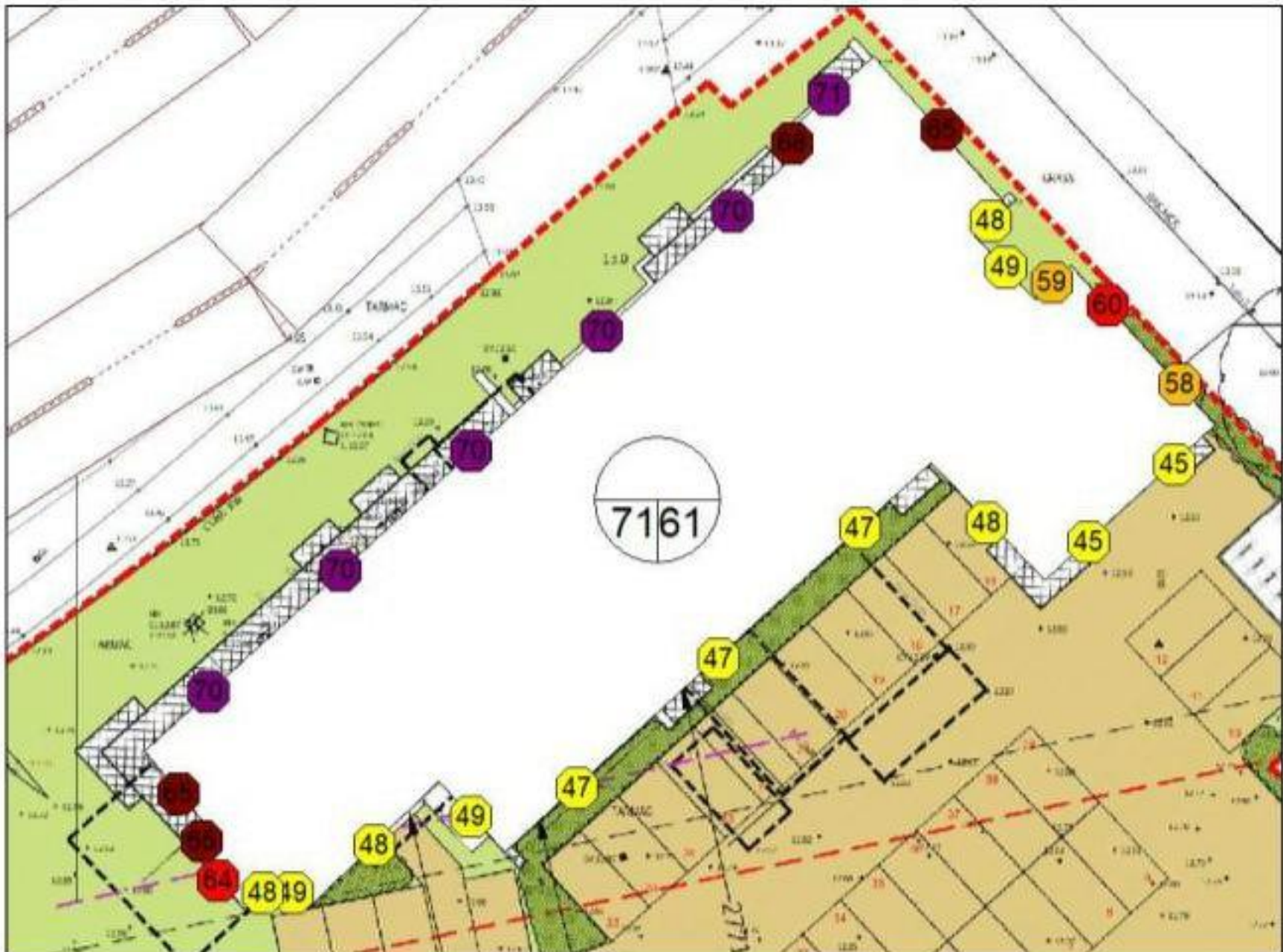


Figure 4: Predicted Night-time Equivalent Noise level $L_{Aeq(8 \text{ hours})}$ at the proposed dwellings



Figure 5: Predicted Night-time Maximum Noise level L_{AFmax} at the proposed dwellings





6. Noise Mitigation Measures

It will be necessary to design the building fabric of the residential properties to control the equivalent noise level and maximum noise levels internally.

The octave band free-field design equivalent noise levels and maximum noise levels used to determine the internal noise levels within the residential rooms of the development are taken from the measured noise spectra noted in Section 4.4 above.

The internal ambient noise levels have been predicted in accordance with the method of Annex G.2 of British Standard 8233:2014. The predicted internal noise levels are those which would be expected in a typically furnished room having a standardised reverberation time of 0.5 seconds.

The façades (including walls, windows, doors and roof) of the habitable rooms are exposed to noise from road traffic and they will require specific noise mitigation measures.

We advise that building elements, having the sound insulation performances noted below, be incorporated into the design of the façades including the windows, doors, walls and the roof.

6.1. External Wall Construction

The proposed external walls to the development can be of a conventional construction comprising of either masonry or light weight metal/timber frame construction.

- The masonry construction should comprise of at least two skins of 100 millimetre medium density concrete blocks or similar. Between the two skins there will be a cavity of 100 millimetres.
- The timber frame construction should comprise of a twin frame construction with two layers of board each side of the studs (minimum density 20 Kilograms per metre cubed) with a total minimum width of at least 250 millimetres and 50 millimetre of mineral wool insulation within the cavity.

The above constructions are expected to achieve the following minimum sound reduction indices:



Table 5: Required Minimum Sound Reduction Indices of External Walls

Frequency (Hz)	63	125	250	500	1k	2k	4k	8k
SRI (dB)	30	37	40	48	56	67	75	75

Any alternative constructions should achieve the above noted performance.

6.2. Roof Construction

The proposals show a flat roof construction. As such the dwellings could have a roof constructed using 100 mm concrete (230 kilograms per metre squared). Alternatively a light weight roof construction could be used comprising of an external skin of at least 10 Kilograms per metre squared, (i.e. 18 millimetre plywood externally on at least 140 millimetre timber or metal rafters with a 12.5 millimetre plasterboard ceiling density at least 10 Kilograms per metre squared) below and 50 millimetre of mineral wool within the cavity.

The above constructions are expected to achieve the following sound reduction indices:

Table 6: Required Minimum Sound Reduction Indices of Roof

Frequency (Hz)	63	125	250	500	1k	2k	4k	8k
SRI (dB)	14	16	36	48	55	58	48	40

6.3. Windows/Glazed Doors

The following section provides the required sound reduction indices and typical glazing requirements for the habitable rooms of the scheme.

Other constructions may also achieve these levels of sound attenuation. The supplier should provide laboratory test data confirming the sound insulation performance meets the requirements below when tested in accordance with ISO 140-1:1997 or ISO 10140-1:2010.

North West Façade, South East Façade and North East Façade
(Plot 4-9, 15-20, 26-31 excluding plot 10 and 21 Bedroom)

The windows opening into the daytime and night-time habitable rooms on the plot numbers above will require specific noise mitigation measures. The minimum required sound reduction indices of these windows is as follows:



Table 7: Required Minimum Sound Reduction Indices of windows

Octave Band (Hz)	125	250	500	1000	2000	4000
Sound reduction indices (dB)	27	33	39	45	50	58

This equates to a sound reduction rating of 43 dBRw.

Such performance could be achieved with a double glazed unit comprising of 10 millimetre glass, a 12 millimetre void and layer of 8.8 millimetre laminated glass housed in sturdy good quality frames with airtight compression seals.

Plot 10 and 21 Bedroom

The windows opening into the plot 10 and 21 night-time habitable rooms on the plot numbers above will require specific noise mitigation measures. The minimum required sound reduction indices of these windows is as follows:

Table 8: Required Minimum Sound Reduction Indices of windows

Octave Band (Hz)	125	250	500	1000	2000	4000
Sound reduction indices (dB)	20	19	29	38	36	45

This equates to a sound reduction rating of 33 dBRw.

Such performance could be achieved with a double glazed unit comprising of 6 millimetre glass, a 12 millimetre void and a 6 millimetre layer of glazing housed in sturdy good quality frames with airtight compression seals.

South East Façade (Plot 1-3, 10-14 and 21-25) (Except 10-21 Bedroom)

The predicted noise level on the south east façade habitable rooms are low enough to ventilated naturally and as such do not require any mitigation measure in their design.



6.4. Ventilation Provisions

North West Façade, South East Façade and North East Façade
(Plot 4-9, 15-20, 26-31 including 10 and 21 Bedroom)

The habitable rooms of the development will need to be ventilated via attenuated means. This could comprise of in wall vents, roof vents or window fitted acoustic trickle vents.

The vents will need to achieve the following element normalised level difference ($D_{n,e}$) in the open position.

Table 8: Ventilation Octave Band Element Normalised Level Difference $D_{n,e}$

Frequency (Hz)	125	250	500	1k	2k	4k
$D_{n,e}$, dB	37	37	36	47	49	55

This would equate to a weighted element normalised level difference ($D_{n,e,w}$) in the open position of 47 dB. The supplier should provide test data confirming that the above Weighted Element Normalised Level Difference $D_{n,e,w}$ is achievable with the vent in the open position.

The prediction is based on one vent within the night-time rooms and two vents within the daytime rooms.

South East Façade (Plot 1-3, 10-14 and 21-25) (Except 10-21 Bedroom)

The predicted noise level on the south east façade habitable rooms are low enough to ventilated naturally and as such do not require any mitigation measure in their design.

6.5. Effect of Mitigation Measures

With the noted building fabric construction, and ventilation provisions, the predicted internal noise levels within plot 9 living room exceeds the criteria of British Standard 8233:2014 of 35 dB $L_{Aeq(16\text{ hour})}$ in the daytime rooms by 2 decibel. BS8233 states that where the development is considered necessary or desirable, the criteria may be relaxed by up to 5 dB.

In all other rooms the predicted internal noise levels achieved the criteria of British Standard 8233:2014 of 35 dB $L_{Aeq(16\text{ hour})}$ in the daytime rooms; and 30 dB $L_{Aeq(8\text{ hour})}$, 45 dB $L_{Amax(fast)}$ within the night-time rooms.



We are of the opinion that the mitigation measures mentioned above are sufficient and external noise will be suitably controlled when assessed to the relevant standards.

The calculation for the living room of plot 9 is shown below.

Reverberation Time Calculation									
Room Dimensions			Room Volume		0.16*Volume				
Room Height (m)	2.6		57.2		9.152				
Length (m)	5								
Width (m)	4.4		22						
Frequency	63	125	250	500	1000	2000	4000	8000	T _{ref}
Reverberation Time	1.27	1.27	1.48	1.43	1.22	0.68	0.52	0.50	1.1

Free Field Level at Façade									
Octave Band	63	125	250	500	1000	2000	4000	8000	dBA
Day, L _{eq} (6 hour)	72	65	63	63	68	66	57	41	71
Night L _{eq} (6 hour)	59	52	51	51	57	55	47	30	60
Night-time L _{max} (hour)	70	60	61	66	73	72	63	45	76

Building Façade Construction									
External Element		63	125	250	500	1000	2000	4000	8000
SF X V75 / SFSA C75 (open)	D _{un}	30	37	37	36.1	46.9	49.2	55.2	61.3
	Number of	2							
		0.001538462	0.000306963	0.000306963	0.000377648	3.14114E-05	1.84964E-05	4.64608E-06	1.14048E-06
10/12/44.1		25	27	33	39	45	50	58	60
	Area	8							
		0.001948017	0.001227854	0.000308423	7.74723E-05	1.94602E-05	6.15385E-06	9.75319E-07	6.15385E-07
Masonry / Blockwork : Cavity brickwork with ties		30	37	40	48	56	67	75	75
	Area	5							
		0.000384615	7.67409E-05	3.84615E-05	6.09574E-06	9.6611E-07	7.67409E-08	1.21626E-08	1.21626E-08
	Area								
		0	0	0	0	0	0	0	0

Calculations to BS EN 12354									
	63	125	250	500	1000	2000	4000	8000	
Sum	0.00386909	0.001611558	0.000653848	0.000461216	5.18376E-05	2.4727E-05	5.63356E-06	1.76802E-06	
10log sum	-24.1239073	-27.92754053	-31.8452328	-33.3609601	-42.8535483	-46.0682922	-52.4921699	-57.5251172	
10log S/A	2.56755645	2.567556448	3.229053551	3.080892214	2.403205355	-0.11993115	-1.35597412	-1.45478495	
correction factor +3	3	3	3	3	3	3	3	3	
Octave Band	63	125	250	500	1000	2000	4000	8000	dBA
Day, L _{eq} (6 hour)	53.0	42.7	37.2	35.5	31.0	22.9	6.5	-15.3	36.9
Night L _{eq} (6 hour)	40.4	29.6	25.4	23.7	19.5	11.8	-3.8	-26.0	25.1
Night-time L _{max} (hour)	51.4	37.6	35.4	38.7	35.5	28.8	12.2	-11.0	39.7



7. Limitations

The report limits itself to addressing solely on the road traffic noise aspects as included in this report. We provide advice only in relation to noise and acoustics. It is recommended that appropriate expert advice is sought on all the ramifications (e.g. CDM, structural, condensation, fire, legal, etc.) associated with any proposals in this report or as advised and concerning the appointment.

The report has been prepared in good faith, with all reasonable skill and care, based on information provided or available at the time of its preparation and within the scope of work agreement with the Client. We disclaim any responsibility to the Client and others in respect of any matters outside the scope of the above.

The report is provided for the sole use of the named Client and is confidential to them and their professional advisors. No responsibility is accepted to other parties.

It should be noted that noise predictions are based on the current information as we understand it and on the performances noted in this report. Any modification to these parameters can alter the predicted level. All predictions are in any event subject to a degree of tolerance of normally plus or minus three decibels. If this tolerance is not acceptable, then it would be necessary to consider further measures.



8. Summary and Conclusions

Fortitudo Ltd appointed Acoustic Consultants Limited to carry out a site noise monitoring survey to address planning condition 20 for the permitted residential at The Curlew, Petersfield Road, Havant, Hampshire PO9 2HU. The planning reference for the permitted development is APP/17/00369.

The purpose of this assessment is to address the noise climate affecting the proposed development, specifically road traffic noise. The noise impact assessment has been undertaken in accordance to British Standard 8233:2014 (BS8233).

With the noted building fabric construction, and suitable ventilation provisions, the predicted internal noise levels within plot 9 living room exceeds the criteria of British Standard 8233:2014 of 35 dB $L_{Aeq (16 \text{ hour})}$ in the daytime rooms by 2 decibel. BS8233 states that where the development is considered necessary or desirable, the criteria may be relaxed by up to 5 dB.

In all other rooms the predicted internal noise levels achieved the criteria of British Standard 8233:2014 of 35 dB $L_{Aeq (16 \text{ hour})}$ in the daytime rooms; and 30 dB $L_{Aeq (8 \text{ hour})}$, 45 dB $L_{Amax(fast)}$ within the night-time rooms.

We are of the opinion that the mitigation measures mentioned above are sufficient and external noise will be suitably controlled when assessed to the relevant standards. As such we would consider that external noise is suitably controlled and achieve the requirements planning condition 20.



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