

REPORT REF: 20655R01aKDmdw

NOISE ASSESSMENT TO SUPPORT PLANNING APPLICATION

16-18 GROSVENOR ROAD, WREXHAM, LL11 1BU





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Executive Summary

Environoise Consulting Limited has been commissioned by Montpellier Estates Limited on behalf of Pendine Care Limited to provide acoustic consultancy to support the planning application for a proposed 34 bed care home located at 16 and 18 Grosvenor Road Wrexham, LL11 1BU.

A 24-hour first floor façade noise survey was undertaken at 16 Grosvenor Road from the 4th October until the 5th October 2015.

When the measured noise levels are assessed in accordance with TAN 11 that the proposed site would fall within Noise Exposure Category (NEC) C and that mitigation measures would be required.

Glazing units with a minimum sound reduction of 34dB R_w and 39dB $D_{n,e,w}$ acoustic trickle ventilation units have been recommended which would result with internal noise level being below guideline levels specified in BS8233:2014 during the daytime and night time.

A 2.4m high close boarded fence has also been recommended to reduce road traffic noise levels in the proposed care home garden to below BS8233 and World Health Organisation (WHO) Guideline Levels of 55dB $L_{Aeq,16\text{ hour}}$ for external amenity.

1 Introduction

- 1.1.1 Environoise Consulting Limited has been commissioned by Montpellier Estates on behalf of Pendine Care to provide acoustic consultancy to support the planning application for a proposed 34 bed care home located at 16 and 18 Grosvenor Road Wrexham, LL11 1BU.

1.2 Site Description

- 1.2.1 The existing site is adjacent to Grosvenor Road in Wrexham and consists of 2 buildings, 16 and 18 Grosvenor Road which are currently vacant offices. The dominant noise source across the proposed site is road traffic from Grosvenor Road, see Figure 1.1.

Figure 1.1: Site Location



1.3 The Development

- 1.3.1 It is intended to demolish 18 Grosvenor Road and to refurbish and extend 16 Grosvenor Road into one complete building. The proposed development is for a 34-bedroom residential care home over 3 floors, 2 gardens and car parking for up to 15 cars, see Figure 1.2..

Figure 1.2: Site Location



2 Criteria

2.1 Technical Advice Note 11 (TAN 11) - Wales

- 2.1.1 Technical Advice Note 11ⁱ (TAN 11) is the current Welsh government guidance on general noise and planning policy. It was produced by the then Department of the Environment [Now Department for Environment Food & Rural Affairs (DEFRA)]ⁱⁱ in October 1997.
- 2.1.2 TAN 11 describes general principles in relation to noise and planning, and provides general guidance on both noise sensitive and noise generative developments, including draft planning conditions dealing with noise. The main detailed guidance provided in TAN 11 is the Noise Exposure Categories for new residential developments.
- 2.1.3 TAN 11 uses four Noise Exposure Categories (A, B, C and D) for assessing the suitability of sites for new residential development. Category A being areas where noise need not be considered as a determining factor in granting permission, and Category D being where planning permission should normally be refused. A table of noise levels is provided for day and night time to assess which category the site falls in to. Different noise criteria are provided for road, rail, aircraft and mixed source noise, with the criteria having been derived from various social surveys for different noise sources.
- 2.1.4 Table 2.1 presents the different noise exposure categories and resultant guidance contained within TAN 11.

Table 2.1: Noise Exposure Categories

NEC Category	TAN 11 Recommended Guidance
A	Noise need not be considered as a determining factor in granting planning permission, although the noise level at the high end of the category should not be regarded as desirable.
B	Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection.
C	Planning permission should not normally be granted. Where it is considered that permission should be given, for example, because there are no alternative quieter sites available, conditions should be imposed to ensure a commensurate level of protection against noise.
D	Planning permission should normally be refused.

- 2.1.5 TAN 11 NEC categories are shown in Table 2.2 for new dwellings exposed to existing noise from road traffic sources.

Table 2.2: TAN 11 Recommended Noise Exposure Categories for Road Noise.

Noise Source	Time Period	Noise Levels corresponding to the Noise Exposure Categories for New Dwellings $L_{Aeq,T}$ (dB)			
		Noise Exposure Category (NEC)			
		A	B	C	D
Road Traffic	0700-2300	<55	55-63	63-72	>72
	2300-0700	<45	45-57	57-66	>66

- 2.1.6 Proposed sites where individual noise events regularly exceed 82dB $L_{Amax,slow}$ several times in any hour are treated as being in NEC C, regardless of the $L_{Aeq,8hour}$ (except where the $L_{Aeq,8hour}$ already puts the site in NEC D).

2.2 BS8233:2014

- 2.2.1 Internal noise level targets for habitable rooms and external noise level targets for outdoor amenity areas have on guidance from BS8233:2014 'Guidance on sound insulation and noise reduction for buildings'ⁱⁱⁱ and World Health Organisation (WHO) Guidelines for Community Noise, 1999^{iv}.
- 2.2.2 Table 2.3 shows the relevant guidance given in Table 4 of BS8233:2014 and presents "desirable" noise levels to be achieved in habitable spaces during the daytime and night-time period.

Table 2.3: BS8233: 2014 Internal Ambient Noise Level Targets.

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

Maximum Internal Noise Levels

- 2.2.3 The BS8233:2014 standard does not express a numerical limit on transient maximum noise levels in bedrooms. Instead it suggests that a guideline value expressed in terms of SEL or $L_{Amax,fast}$ should be set dependent on number of events per night and the character of the noise.
- 2.2.4 We have therefore used guidance provided in the previous standard, BS8233:1999, as follows:
- For a reasonable standard in bedrooms at night, individual noise events (measured with F time-weighting) should not normally exceed 45dB $L_{Amax,fast}$.*
- 2.2.5 The term 'normally' is not defined in BS8233:1999. However, section 2.3 of this report provides further information regarding the number of excesses allowed for reasonable sleeping conditions.

2.3 World Health Organisation's (WHO) Guidelines

Maximum Internal Noise Levels

- 2.3.1 Maximum noise levels should not typically exceed 45dB $L_{Amax,fast}$ during the night-time (2300 – 0700) on more than 15 occasions, given that World Health Organisation (WHO) Guidelines for Community Noise', 1999 defines 10 to 15 occasions over 45dB $L_{Amax,fast}$ as the number of transient events which may cause sleep disturbance¹.

2.4 Outdoor Amenity Noise Levels

BS8233 and WHO Guidelines

- 2.4.1 BS8233:2014 states that "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 $L_{Aeq,T}$, with an upper guideline value of 55dB $L_{Aeq,T}$ which would be acceptable in noisier environments.". This is in line with recommendations given in the WHO Guidelines for Community Noise

¹ Section 3.3 of World Health Organisation (WHO) Guidelines for Community Noise', 1999.

3 Noise Surveys

3.1 Survey Procedure

- 3.1.1 An unattended 24-hour first floor façade noise survey was undertaken at the proposed development site between Wednesday 4th and Thursday 5th November 2015. Noise levels were measured by placing a microphone fixed to a mast 1.7m out of a first floor window from the first floor window of 16 Grosvenor Road, 4m from the ground and approximately 13m from Grosvenor Road.
- 3.1.2 This monitoring location was agreed² in advance with Ian Jones of Wrexham Environmental Health Department. Figure 3.1 presents the monitoring location and Appendix B provides photographs of the sound level meter at the location.

3.1.3 **Figure 3.1:** Noise Monitoring Location



- 3.1.4 The sound level meter was set to log 'A' weighted ambient ($L_{Aeq,15\text{minute}}$), maximum ($L_{Amax,fast}$) and background (L_{A90}) and associated octave band (L_{eq} , L_{max} , L_{90}) noise levels for contiguous fifteen minute periods.

3.2 Instrumentation

- 3.2.1 Details of the instrumentation used is shown in Table 3.1.

² E-mail conversation 26th October 2015 between Ian Jones, Environmental Health, Wrexham County Borough Council and Kevin Doyle, Environoise Consulting Limited.

Table 3.1: Noise Survey Instrumentation Details

Manufacturer	Equipment type	Serial number	Date of Calibration
Rion	NA-52 sound level meter	00654072	9 th October 2015
	NH-25 preamplifier	54117	
	UC-59 Microphone	08333	
	NC-34 calibrator with ½" adaptor	34904967	10 th August 2015

Weather Conditions

- 3.2.2 During the noise monitoring survey weather conditions were mostly dry with average wind speeds remaining below 5m/s throughout the survey period.

Calibration

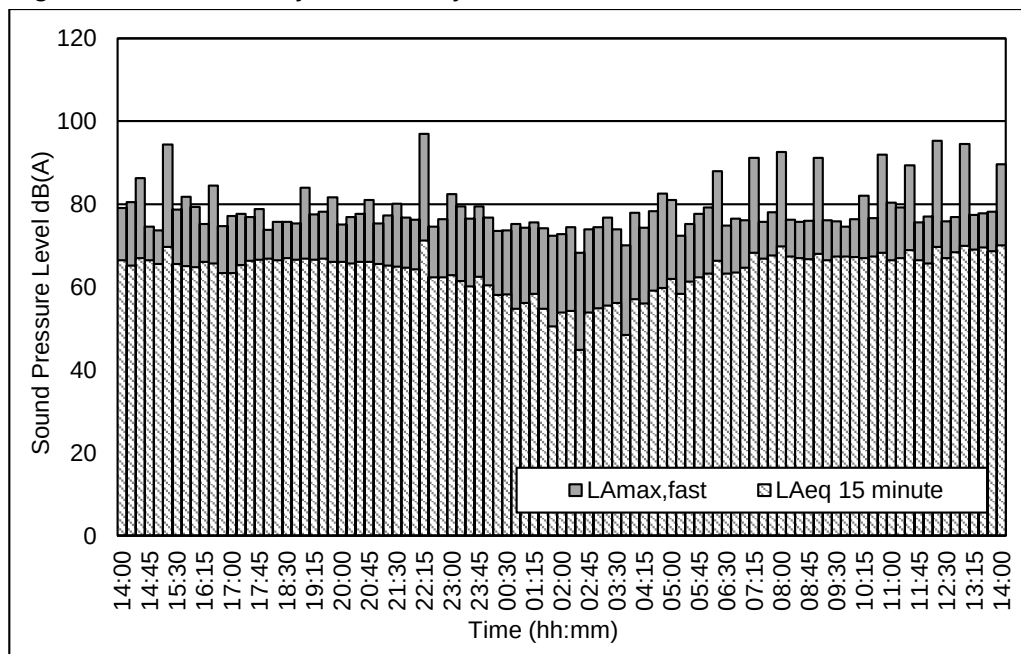
- 3.2.3 The sound level meter was calibrated at the start and end of the noise surveys, there was no recorded drift greater than 0.3dB at 1 kHz. The calibration chain is traceable via to National Standards held at the National Physical Laboratory (NPL).

4 Noise Survey Results

4.1 Ambient Noise Levels

4.1.1 A time history of the measured noise levels from the 24-hour survey is shown in Figure 4.1.

4.1.2 **Figure 4.1:** Noise Survey Time History



4.1.3 The measured noise levels for the daytime and night time period are presented in Table 4.1.

Table 4.1: Measured Ambient Daytime (16-Hour) and Night-Time (8-Hour) Noise Levels.

Time Period	Leq,T at octave band centre frequency (Hz)								LAeq, (T) (dB)
	63	125	250	500	1k	2k	4k	8k	
Daytime (16 Hour)	69	62	61	60	64	61	54	49	67
Night-time (8 Hour)	61	56	57	54	56	53	46	41	60

4.1.4 The highest measured 'regularly' occurring night-time maximum ($L_{Amax,fast}$) noise level determined by the 5th highest measurement is shown in Table 4.2.

Table 4.2: Highest Regularly Occurring Measured Maximum Noise Level

Measurement Time (hh:mm)	L _{Max,fast} at octave band centre frequency (Hz)								L _{Amax,fast} (dB)
	63	125	250	500	1k	2k	4k	8k	
23:20	75	65	65	66	74	73	73	69	79

5 NEC Assessment

5.1 Ambient Noise Levels

- 5.1.1 The results from the noise survey indicate that that both daytime and night time periods the proposed site would fall within NEC C.
- 5.1.2 TAN 11 states that where a proposed site fall within NEC C 'planning permission should not normally be granted. Where it is considered that permission should be given, for example, because there are no alternative quieter sites available, conditions should be imposed to ensure a commensurate level of protection against noise'.
- 5.1.3 Taking into consideration the advice from TAN 11 mitigation measures would need to be implemented on the building envelope to provide suitable internal noise levels.

5.2 Maximum Noise Levels

- 5.2.1 During the night time period of the noise survey maximum noise levels ranged from 68dB $L_{Amax,fast}$ to 88dB $L_{Amax,fast}$. There were 3 occurrences in excess of 82dB $L_{Amax,fast}$ during the night time period which also means that 82dB $L_{Amax,slow}$ is likely to have been exceeded, which in accordance with TAN 11³ would not automatically place the site within NEC C.

³ TAN 11 specifies an $L_{Amax,Slow}$, however $L_{Amax, fast}$ measurements are approximately 5dB higher

6 Noise Ingress Assessment

Noise Ingress Calculations

- 6.1.1 Noise ingress levels have been calculated using the assessment method given in BS EN 12354-3:2000^v to determine a suitable glazing and ventilation system that would meet the requirements of BS8233.
- 6.1.2 A reverberation time of 0.8 seconds has been used for all habitable rooms. For calculations to be accurate it is assumed that surface finishes will be typical i.e. carpeted floors, upholstered furniture, bed with pillows and curtains.
- 6.1.3 Details of the noise ingress calculations are available in Appendix C.
- 6.1.4 Recommendations given in section 7 are based on the measured noise climate.
- 6.1.5 Room volumes, façade and window areas have been calculated using drawings 1477-F03-001, 1477-F003-002 and 1477-F003-003 Revision A⁴.

⁴ Received from John McGary of Montpellier Estates 21st October 2015

7 External Amenity Assessment

- 7.1.1 Ambient noise levels within the proposed care home garden have been calculated assuming a line source from Grosvenor Road. The ambient noise levels at distances from 15m to 45m have been predicted as representative ambient noise levels with the garden and are presented in Table 7.1.

Table 7.1: Predicted Ambient Noise Levels within Garden Area

Distance (metres)	15m	20m	25m	30m	35m	40m	45m
External Ambient Noise Level [LAeq 16 hour (dB)]	67	65	64	64	63	62	62

- 7.1.2 The noise levels presented in Table 7.1 range between 67dB LAeq,16hour and 62dB LAeq,16hour. The levels would be above 55dB LAeq,16 hour recommended in BS8233 and by WHO and would require mitigation.

8 Recommendations

8.1 Glazing & Ventilation Recommendations

- 8.1.1 To meet recommended internal ambient noise levels given in Table 2.3 and make sure that maximum noise levels do not 'normally' exceed 45dB $L_{A_{Max,fast}}$ we recommend 32dB $R_w + C_{tr}$ glazing, see Table 8.1 and 39dB $D_{n,e,w}$ trickle ventilation units.

Table 8.1: Recommended Glazing to meet Internal Noise Targets.

Room Type	Time Period	Measured External Ambient Noise Level [$L_{Aeq,T}$ (dB)]	Target Internal Noise Level [$L_{Aeq,T}$ (dB)]	Recommended Glazing Performance [$R_w + C_{tr}$ (dB)]
Living Room	Day (07:00-23:00)	67	35	32
	Night (23:00-7:00)	60	-	-
Bedroom	Day (07:00-23:00)	67	35	30
	Night (23:00-7:00)	60	30	32

- 8.1.2 Table 8.2 presents an example glazing system to meet 32dB $R_w + C_{tr}$. However, installed glazing must be based on manufacturer's sound insulation data supplied by the glazier.

Table 8.2: Recommended minimum specifications

Minimum glazing performance $\geq R_w$ (dB)	Example glazing specification	Minimum trickle vent performance $\geq D_{n,e,w}$ (dB)	Background Ventilation - Example trickle/ wall vent $\geq D_{n,e,w}$ (dB)
34	10mm pane/ 6mm cavity/ 12mm	39	Passivent Trickle Vent A101dB (Energy Saver) with TVAG4 acoustic material insert in canopy

Internal Noise Levels with Recommended Glazing Specification

- 8.1.3 Table 8.3 shows calculated internal noise levels with the recommended glazing and ventilation strategy meet target requirements.

Table 8.3: Internal Noise Levels with Recommended Glazing Specification

Time Period	Room Type	$L_{Aeq,T}$ (dB)	$L_{A_{max,fast}}$ (dB)
Night-time (23:00-07:00)	Bedroom	29	43
Daytime (07:00 - 23:00)	Living Area	32	-

8.2 Glazing Specification

- 8.2.1 We do not recommend that glazing specifications are reduced with height as the proposed building will be exposed to large areas of road and upper floor apartments will be exposed to more noise sources.
- 8.2.2 Glazing with a larger air or inert gas (e.g. Argon) cavity is acceptable providing both recommended pane thicknesses remain the same. Laminated glazing in place of traditional glazing is acceptable providing it is the same thickness. The glazing performance should be constant across the overall assembly, so the framing should be of similar or greater performance than the glazing recommended. The performance of the glazing units will depend on quality of framing and good contact with window seals.

8.3 Ventilation specification

- 8.3.1 The ventilation opening and free area of the proposed glazing unit should be checked by a mechanical services engineer before installation. Should the equivalent open area be insufficient to meet the minimum background ventilation requirements of Part F of the Building Regulations, it may be necessary to provide more than one unit per habitable room. In this case, the level of performance required for each glazing unit will need to be increased and a further review would be required.

8.4 External Amenity

- 8.4.1 As detailed in section 2.4, guidance given in BS8233 and the WHO Guidelines for Community Noise states that it is desirable for the steady state noise levels in external amenity spaces (such as gardens, balconies or outdoor living areas) to be less than 50dB $L_{Aeq,16\text{hour}}$ to prevent moderate annoyance with 55dB $L_{Aeq,16\text{hour}}$ regarded as an upper limit in order to prevent serious annoyance for occupants.
- 8.4.2 Figure 8.1 presents the location of 2.4m high close boarded fence which would put the majority of the garden area situated to the north of the proposed care home to 55 $L_{Aeq,16\text{ hour}}$ or below.

Figure 8.1: Location of Close Boarded Fence.



- 8.4.3 The sound insulation performance of the recommended barrier is determined largely by the effective height as it is diffraction over the top which limits performance.
- 8.4.4 Suitable barrier construction would be a close boarded timber fence with a surface mass of $\geq 15\text{kg/m}^2$. The fencing should be free from gaps in the fence itself and also between the fence and the ground.
- 8.4.5 Ambient noise levels in the garden with the recommended barrier in place are presented in Table 8.4.

Table 8.4: Predicted Ambient Noise Levels within Garden Area with Mitigation

Distance (metres)	15m	20m	25m	30m	35m	40m	45m
External Ambient Noise Level [LAeq 16 hour (dB)]	55	55	55	55	54	53	53

- 8.4.6 The noise levels presented in Table 8.4 range between 55dB LAeq,16hour and 53dB LAeq,16hour. The levels would be below 55dB LAeq,16 hour recommended in BS8233 and by WHO and would be suitable for outdoor relax purposes.

9 Conclusions

- 9.1.1 An assessment of the suitability in terms of noise for the proposed 34 bed care home at 16 to 18 Grosvenor Road, Wrexham has been undertaken.
- 9.1.2 The results from the 24-hour noise survey indicated that the proposed care home would fall within NEC C during the daytime and night-time.
- 9.1.3 TAN 11 states that where a proposed site fall within NEC C 'planning permission should not normally be granted. Where it is considered that permission should be given, for example, because there are no alternative quieter sites available, conditions should be imposed to ensure a commensurate level of protection against noise'.
- 9.1.4 Mitigation measures in the form of glazing and acoustic trickle ventilation units with a sound reduction of 34dB R_w and 39dB $D_{n,e,w}$ respectively have been recommended to meet guideline levels specified in BS8233.
- 9.1.5 A 2.4m close boarded fence has also been recommended to reduce noise levels in the proposed garden to below those recommended for external amenity in BS8233 and by the WHO.
- 9.1.6 As such, we consider with that implementation of the recommended mitigation, noise impacts would not present a constraint to the granting of planning permission for the proposed care home.

References

ⁱ Planning Guidance (Wales), Technical Advice Note 11, Noise - October 1997

ⁱⁱ Department for Environment Food & Rural Affairs (DEFRA)

ⁱⁱⁱ British Standard 8233:2014 'Guidance on Sound Insulation and noise reduction for buildings.

^{iv} World Health Organisation (WHO) Guidelines; 'Community and Noise'1999.

^vBS EN 12354-3:2000 Building acoustics. Estimation of acoustic performance in buildings from the performance of elements. Airborne sound insulation against outdoor sound.

Appendix A: Acoustic Terms

Between the quietest audible sound and the loudest tolerable sound there is a million to one ratio in sound pressure (measured in Pascal, Pa). Because of this wide range a noise level scale based on logarithms is used in noise measurement called the decibel (dB) scale. Audibility of sound covers a range of approximately 0 to 140 dB.

The human ear system does not respond uniformly to sound across the detectable frequency range and consequently instrumentation used to measure noise is weighted to represent the performance of the ear. This is known as the 'A weighting' and annotated as dB (A). Table A1 lists the sound pressure level in dB (A) for common situations.

Table A1: Noise levels for common situations.

Typical noise level dB(A)	Example
0	Threshold of hearing
30	Rural area at night, still air
40	Public library, refrigerator humming at 2m
50	Quiet office, no machinery, Boiling kettle at 0.5m
60	Normal conversation
70	Telephone ringing at 2m, Vacuum cleaner at 3m
80	General factory noise level, heavy goods vehicle from pavement
90	Powered lawn motor, operators ear
100	Pneumatic drill at 5m
120	Discotheque – 1m in front of loudspeaker
140	Threshold of pain

The noise levels at a measurement point are rarely steady, even in rural areas, and vary over a range dependent upon the effects of local noise sources. Close to a busy motorway, the noise levels may vary over a range of 5 dB(A), whereas in a suburban area this may increase up to 40 dB(A) and more due to the multitude of noise sources in such areas (cars, dogs, aircraft etc.) and their variable operation. Furthermore, the range of night-time noise levels will often be smaller and the levels significantly reduced compared with daytime levels. When considering environmental noise, it is necessary to consider how to quantify the existing noise (the ambient noise) to account for these second to second variations.

Human subjects are generally only capable of noticing changes in steady levels of no less than 3 dB(A). It is generally accepted that a change of 10 dB(A) in an overall, steady noise level is perceived to the human ear as a doubling (or halving) of the noise level. (These findings do not necessarily apply to transient or non-steady noise sources such as changes in noise due to change in road traffic flow, or intermittent noise sources). The equivalent continuous A-weighted sound pressure level, L_{Aeq} , is the single number that represents the average sound energy measured over that period. The L_{Aeq} is the sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period. It is commonly used to express the energy value from individual sources that vary in level over their operational cycle.

Appendix B: Photographs of SLM at Location

Figure B1: SLM from inside building



Figure B2: SLM from outside building



Figure B3: SLM from outside building



Figure B4: SLM from outside building



Appendix C: Noise Ingress Calculations

Figure C1: Noise Ingress Calculation - Bedroom

ENVIRONOISE		Leq - Bedroom							
Project	16-18 Grosnevor Road								
Client	Montpellier Estates								
Room	Bedroom	TYPE	BEDROOM						
Enter Facade Correction	0 dB	Notes: ☒ Bedroom ☐ Living Area							
Receiving Room									
Height of room	1.0 m								
Width of room	1.0 m								
Length of room	1.0 m								
Volume of room	30.0 m ³								
Element									
Area 1 - Glazing	0.0 m ²	10/12/6 Double Glazing							
Area 2 - Glazing & TV	1.7 m ²	10/12/6 Double Glazing and Passivent Trickle Vent A101dB (Energy Sa							
Area 3 - Non Glazed	5.0 m ²	Brick/Block Cavity Wall							
Area 4 - Non Glazed	0.0 m ²	No data							
Angle of incidence	0 deg								
Frequency Hz	63	125	250	500	1000	2000	4000	8000	
Reverberation time (sec)	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	
Absorption (sabines)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	
Frequency Hz	63	125	250	500	1000	2000	4000	8000	dB(A)
External dB	61	56	57	54	56	53	46	41	60
External Freefield									
External Freefield Leq dB	61	56	57	54	56	53	46	41	60
Additional Correction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
10log(cos(angle))	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
SRI Ref	Area								
17	0.0 m ²	22	26	27	34	40	38	46	48
Glazing and Trickle Vent	1.7 m ²	15	19	25	32	39	37	42	42
55	5.0 m ²	38	41	45	45	54	58	61	64
0	0.0 m ²	0	0	0	0	0	0	0	0
Combined SRI		21	25	31	38	44	43	47	48
Criterion (NR at 1kHz)		59	48	40	34	30	27	25	23
Additional SRI Required		0.0	0.0	0.0	0.0	0.0	0.0	0.0	To Meet NR30
Internal Leq dB		46	38	32	23	18	17	5	0
Internal Lfmax dB		60	46	40	35	36	37	32	28
									29 dB(A)
									43 dB(A)

Figure C2: Noise Ingress Calculation – Living Area

ENVIRONOISE		Leq - Lounge								
Project	16-18 Grosnevor Road									
Client	Montpellier Estates									
Room	Lounge	TYPE	LIVING AREA							
Enter Facade Correction	0 dB	Notes: ☐ Bedroom ☒ Living Area								
Receiving Room										
Height of room	1.0 m									
Width of room	1.0 m									
Length of room	1.0 m									
Volume of room	96.0 m ³									
Element										
Area 1 - Glazing	0.0 m ²	10/12/6 Double Glazing								
Area 2 - Glazing & TV	3.4 m ²	10/12/6 Double Glazing and Passivent Trickle Vent A101dB (Energy Sa								
Area 3 - Non Glazed	18.0 m ²	Brick/Block Cavity Wall								
Area 4 - Non Glazed	0.0 m ²	No data								
Angle of incidence	0 deg									
Frequency Hz	63	125	250	500	1000	2000	4000	8000		
Reverberation time (sec)	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80		
Absorption (sabines)	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3		
Frequency Hz	63	125	250	500	1000	2000	4000	8000	dB(A)	
External dB	69	62	61	60	64	61	54	49	67	
External Freefield										
External Freefield Leq dB	69	62	61	60	64	61	54	49	67	
Additional Correction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
10log(cos(angle))	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
SRI Ref	Area									
17	0.0 m ²	22	26	27	34	40	38	46	48	10/12/6 Double Glazing
Glazing and Trickle Vent	3.4 m ²	17	21	26	33	39	38	43	43	
55	18.0 m ²	38	41	45	45	54	58	61	64	Brick/Block Cavity Wall
0	0.0 m ²	0	0	0	0	0	0	0	0	No data
Combined SRI		25	29	34	40	47	45	51	51	
Criterion (NR at 1kHz)		59	48	40	34	30	27	25	23	
Additional SRI Required		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	To Meet NR30
Internal Leq dB		50	40	34	27	24	22	10	4	32 dB(A)