AVALON TOWN PLANNING

PROPOSED RESIDENTIAL DEVELOPMENT

BARROW BROOK, CLITHEROE

ENVIRONMENTAL NOISE STUDY

R1001-REP01B-JR

27 FEBRUARY 2017

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REPORT DETAILS

Project	Barrow Brook, Clitheroe
Client	Avalon Town Planning 2, Reedley Business Centre Redman Rd, Burnley BB102TY
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Revision	A
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SUMMARY

Red Acoustics Ltd has been commissioned by Avalon Town Planning to provide an assessment of the impact of environmental noise at the proposed development site at Barrow Brook, Clitheroe

An environmental noise survey was carried out to determine the existing noise climate from the A59.The measured noise levels were then used to calibrate a CadnaA 3D noise model to determine facade noise levels based on the proposed conceptual site layout plan provided by Avalon Town Planning.

Typical noise break-in calculations have been undertaken based on the house layouts provided by Avalon Town Planning. The break-in calculations have been used to determine glazing, ventilation and external facade sound insulation specifications. The composite sound insulation specification for the facade of the dwellings is based on achieving the following internal levels: -

- Living Rooms, Dining Rooms and Kitchens 35-40dB $L_{Aeq,16hr}$
- Bedrooms 30dB $L_{Aeq,8hr}$ and 45dB L_{Amax}
- Garden and Patios - up to 55dB $L_{Aeq,16hr}$

Section 6.0 details the recommended glazing and ventilation strategy across the proposed development site as well as locations of close boarded timber fencing. Implementation of the recommended mitigation will ensure the development is adequately protected for environmental noise.

CONTENTS

1.0 INTRODUCTION

Red Acoustics Ltd has been commissioned by Avalon Town Planning to provide an assessment of the impact of environmental noise at the proposed development site at Barrow Brook, Clitheroe.

An environmental noise survey has been undertaken to determine the prevailing noise climate and to assess the impact of nearby road and rail noise sources.

The report outlines the predicted noise levels calculated using CadnaA based on a model calibrated by the environmental noise survey data.

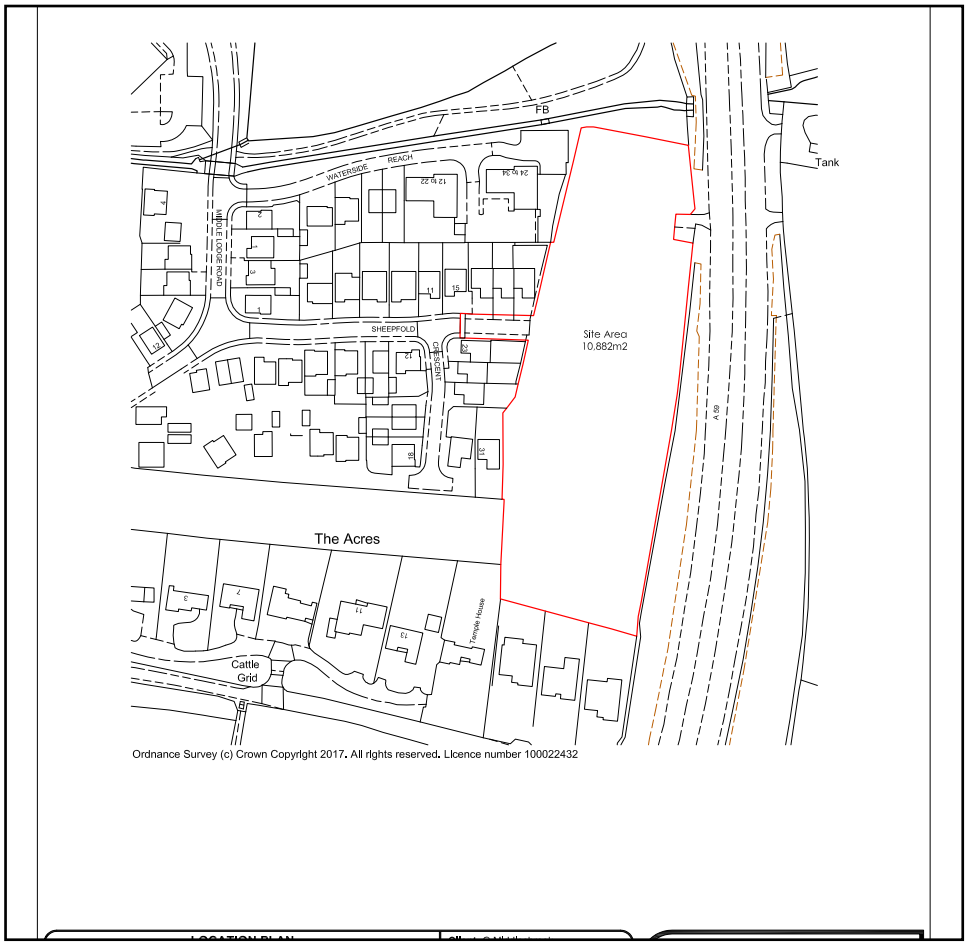
The predicted noise levels across the site have then been used to determine the likely glazing strategy based on the proposed site layout and typical house construction types.

2.0 SITE DESCRIPTION & PROPOSED DEVELOPMENT

The proposed residential development site is located on land off the A59, Barrow Brook, Clitheroe. The major source of environmental noise surrounding the site comes from the A59, which runs the length of the Eastern border.

The proposal seeks to introduce 24 two person bungalows and a three storey block of flats containing 9 apartments along with landscape works and associated access arrangements. The dwellings will all be of traditional construction. There are no bedrooms located within the roof space.

Figure 2.1: Proposed Site Location



3.0 ENVIRONMENTAL NOISE SURVEYS

Unattended noise surveys were undertaken to measure existing noise levels from the A59. Measurements were undertaken at MP1 to determine noise levels from the A59.

Figure 3.1: Noise Measurement Position

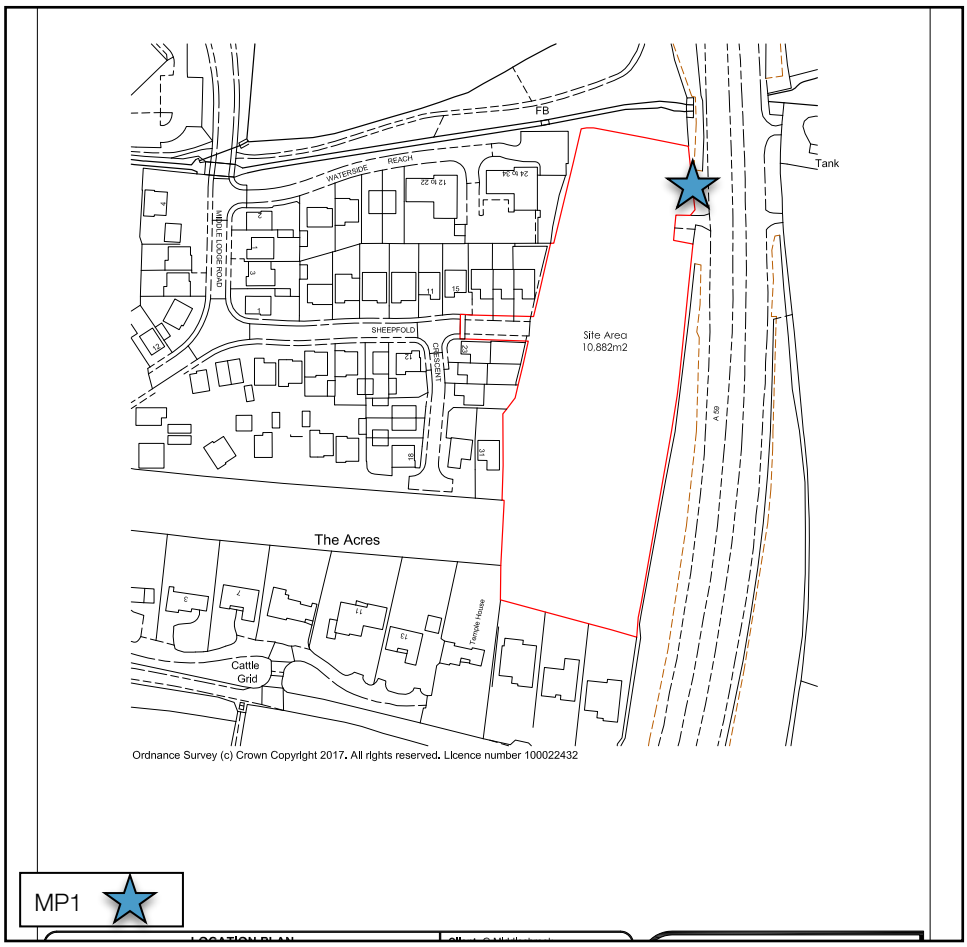
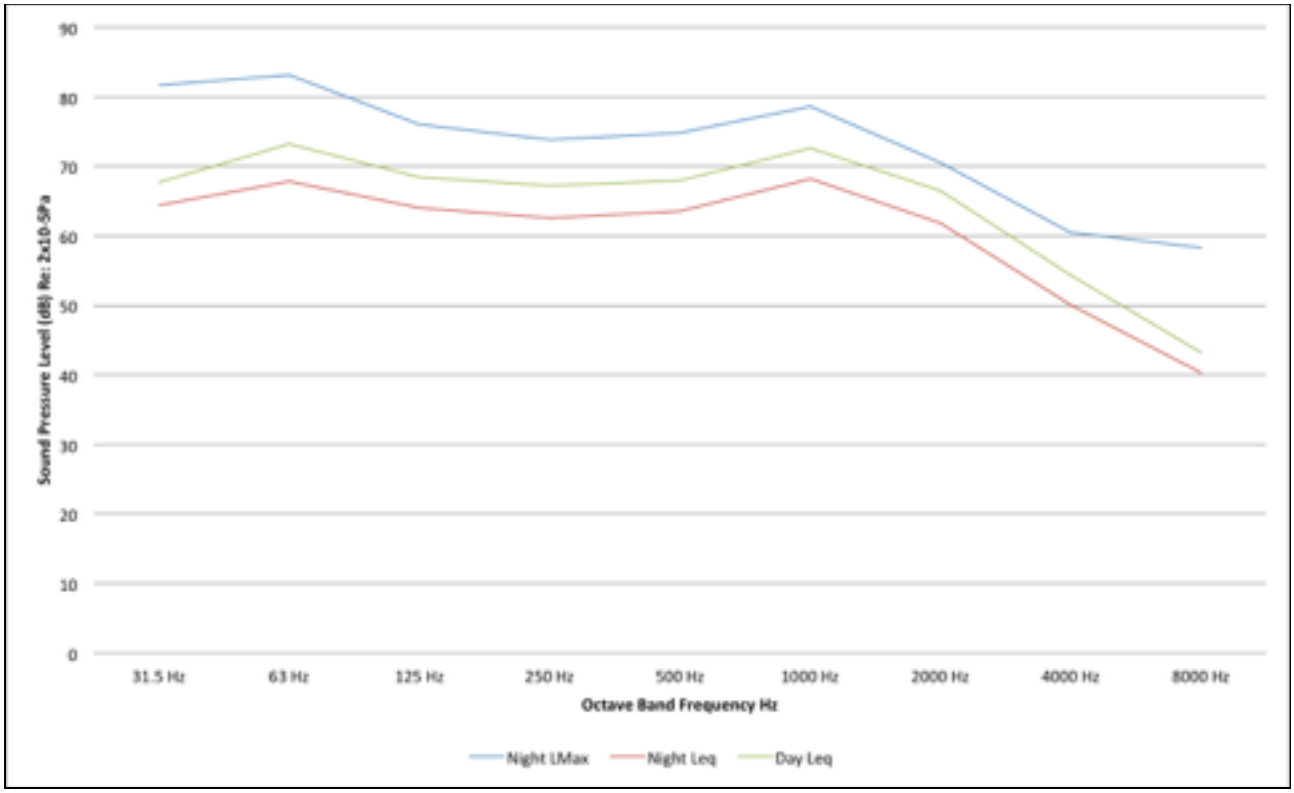


Figure 3.2: Unattended Survey Results MP1(A59)

Noise monitoring equipment was set up to monitor noise levels from the A59. $L_{Aeq,t}$ levels from road traffic on the A59 resulted in daytime levels of around 70dB $L_{Aeq,t}$ and night-time levels of around 55 -60dB $L_{Aeq,t}$ with L_{AFmax} levels during the night-time associated with site activity around 75dB

Figure 3.3: Calibration Level MP1



4.0 NOISE MODELLING

CadnaA Modelling

To predict noise levels across the facades of the proposed buildings, CadnaA 3D has been used, which implements the calculation procedure specified within ISO 9613-2[1].

The model has been calibrated using the measured levels presented in Section 3.0. The calibration was undertaken by modelling the existing buildings, proposed buildings and the surroundings using Google Earth imagery and drawn details. The monitoring positions were assigned as receiver positions in the model and the sources of interest i.e. road traffic, rail traffic etc… have been adjusted until the receiver position matched the measured data. The calibrated sources are then used to predict noise propagation to and across the proposed development site.

Appendix B presents the results of the CadnaA modelling.

BS8823:2014 Calculation

Using the results of the 3D noise modelling, break-in calculations have been undertaken to determine suitable glazing and ventilation options to achieve target noise levels internally.

The methodology in Annex G of BS8233:2014 has been used in calculating internal noise levels. The calculation is based on the window being closed and background ventilation being provided by alternative means i.e. window trickle vent or mechanical supply and extract.

The break-in calculation results are presented in Appendix C.

[1] ISO 9613-2:1996 *Acoustics -- Attenuation of sound during propagation outdoors -- Part 2: General method of calculation*

5.0 PLANNING POLICY & DESIGN TARGETS

Planning Policy

National Planning Practice is guided by the National Planning Policy Framework. With regard to Noise the Framework states the following:

Planning policies and decisions should take account of the acoustic environment and consider:

- *whether or not a significant adverse effect is occurring or likely to occur;*
- *whether or not an adverse effect is occurring or likely to occur and;*
- *whether or not a good standard of amenity can be achieved.*

In line with the Explanatory Note of the Noise Policy Statement for England, this would include identifying whether the overall effect of the noise exposure (including the impact during the construction phase wherever applicable) is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation.

The terms 'significant adverse impact' and 'other adverse impacts' are defined in the explanatory notes of the 'Noise Policy Statement for England (NPSE) which states:

There are two established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation. They are:

No Observed Effect Level : This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.

Lowest Observed Adverse Effect Level : This is the level above which adverse effects on health and quality of life can be detected.

Extending these concepts for the purpose of this NPSE leads to the concept of a significant observed adverse effect level.

Significant Observed Adverse Effect Level : This is the level above which significant adverse effects on health and quality of life occur.

These are summarised in Table 5.1 below.

Table 5.1: Explanation of Noise Exposure Hierarchy

Perception	Examples of Outcomes	Increasing Effect Levels	Action
Not noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
		Lowest Observed Adverse Effect Level	
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; closing windows for some of the time because of the noise. Potential for non-awakening sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
		Significant Observed Adverse Effect Level	
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. having to keep windows closed most of the time, avoiding certain activities during periods of intrusion. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

It should be noted that no specific noise limits for NPPG have been defined in Table 5.1 above, however, guidance from other acoustic standards may be employed to determine suitable levels within the overall principal of the National Planning Policy Framework.

Design Targets

The noise design targets for internal habitable spaces and gardens are detailed in Table 5.2. The targets are based on the advice provided in BS8233:2014.

Table 5.2: BS8223:2014 Design Targets

Space	$L_{Aeq,16hr}$ (07:00 - 23:00)	$L_{Aeq,8hr}$ (23:00 - 07:00)	L_{Amax}
Living Room & Kitchen	35dB	-	-
Dining Room & Study	40dB	-	-
Bedroom	35dB	30dB	≤45dB
Garden & Patios	≤55dB	-	-

6.0 RECOMMENDED GLAZING & VENTILATION STRATEGY

Appendix B (Figure B1) presents the recommended glazing and ventilation for the development based on the predictions made using the measured survey data, and based on a 3m high fence running across the northern boundary and down the bordering edge of the A59 for the entire length of the proposed site.

Table 6.1 presents the minimum octave band Sound Reduction Index (SRI) and Element Normalised Level Difference (D_{ne}) values for the various facade elements. Implementation of the suggested glazing and ventilation strategy in the areas outlined will ensure the levels quoted in BS8233:2014 will be achieved.

Table 6.1: Minimum Facade Element Performance Requirements With A 3m Fence Bordering The Northern Boundary And Returning The Length Of The Proposed Site Boundary

Facade Element	Octave Band Performance Data dB							
	31	63	125	250	500	1000	2000	4000
4/12/6 Glazing (SRI)	11	17	19	17	32	37	38	40
Standard Trickle Vent (D_{ne})	27	28	28	31	31	29	34	34
External Wall (R)	45	47	48	44	46	54	63	71

It should be noted the performance of the facade and the resultant internal levels are based on the window remaining closed and background ventilation being supplied by alternative means. Proposed ventilation provision are based on their acoustic performance. Compliance with the requirements of Approved Document F should be checked by others.

Garden noise levels have been predicted and are predominantly <55dB $L_{Aeq,t}$. The introduction of a 3m barrier along the northern boundary and returning down the boundary bordering the A59 for the entirety of the proposed site improves the noise level (See Appendix B Figure B8). BS8233:2014 does highlight that where residential dwellings are located next to transportation noise sources, exceeding the levels of the standard is allowed as long as reasonable attempts to reduce the noise has been undertaken.

A 3m high barrier has a typical performance ranging between 5dB and 15dB. It is advised that to gain any further meaningful reductions a doubling of the barrier height to 6m would be required. We consider this to be impractical and a 3m high barrier to be a reasonable attempt to reduce the noise levels across the site.

7.0 CONCLUSIONS

An assessment to determine the glazing and ventilation specification for the proposed residential dwellings has been undertaken as well as an assessment of the impact within garden and patio areas.

Suitable glazing and ventilation options are presented dependent upon the noise level in each mitigation zone. When plot locations and house types are finalised, break in calculations should be re-checked thus providing a value engineered solution.

Implementation of the recommended glazing and ventilation strategy will ensure that the internal noise levels are controlled to be less than the recommended limits in BS8233:2014.

Garden noise levels have been predicted across the site and depending on plot location are predicted to be <55 dB $L_{Aeq,16hr}$. The introduction of a 3m barrier along the extent of the site is shown to improve garden noise.

APPENDIX A:
NOISE SURVEY DETAILS

Location

Barrow Brook, Clitheroe

Survey Dates

7th February 2017

Weather

Weather during the surveys was cold, dry with wind speeds <5ms^{-1}

Personnel Present During Measurements

Jack Rostron BEng(Hons) AMIOA

Instrumentation

Kit No	Equipment Description	Type Number	Manufacturer	Serial Number	Date of Last Calibration	Calibration Certificate Number	Calibration Due
RED08	Sound Level Meter	SVAN 957 Type 1	SVANTEK	28042	17-Feb-15	17595	16-Feb-17
	Preamplifier	SVAN SV12L	SVANTEK	31144	17-Feb-15	17595	16-Feb-17
	Microphone Capsule	SVAN 7052E	SVANTEK	59416	17-Feb-15	18029	16-Feb-17

Methodology

Before and after the measurements the sound level meters were check calibrated to an accuracy of ±0.3dB using their associated Class 1 Calibrators. No drift in the instruments' sensitivities were noted across any of the survey periods.

Calibration Certificates

Copies of all calibration certificates are kept on file by Red Acoustics Ltd and can be supplied if requested.

APPENDIX B:
DRAWINGS & CADNAA SCREENSHOTS

Figure B1: Proposed Glazing And Ventilation Strategy with 3m Barrier

Figure B2: Predicted Garden Noise Level with 3m Barrier

APPENDIX C:
BS8233:2014 BREAK-IN CALCULATIONS

Assessment of Noise Ingress to BS8233 - Barrow Brook Close, Clitheroe

House Type 1 Bedroom 1

	OCTAVE BAND CENTRE FREQUENCY								
	31.5	63	125	250	500	1000	2000	4000	dBA
Day L_{eq}	59.6	64.4	58.3	58.2	56.9	57.0	48.8	33.2	59.8
Night L_{max}	73.6	74.4	65.9	64.8	63.8	63.0	52.8	39.3	66.0
Night L_{eq}	56.3	59.0	53.9	53.6	52.6	52.6	44.1	28.9	55.4
Day L_{eq} and Source Correction	59.6	64.4	58.3	58.2	56.9	57.0	48.8	33.2	59.8
Night L_{max} and Source Correction	73.6	74.4	65.9	64.8	63.8	63.0	52.8	39.3	66.0
Night L_{eq} and Source Correction	56.3	59.0	53.9	53.6	52.6	52.6	44.1	28.9	55.4
Rev Time (27)	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	
Titon Trimvent (non acoustic)	27.0	28.4	27.9	30.8	30.5	29.0	33.7	33.7	
Typical Masonary Wall Build-up	45	47	48	44	46	54	63	71	
NA									

Area of SRI 1	5.50	m2		
Area of SRI 2	0.00	m2	Day Leq Src Reduction =	0.0
Area of Glazing	1.00	m2	Lmax Src Reduction =	0
Volume of Room	30.00	m3	Night Leq Src Reduction =	0
Target Internal Noise Levels	35	DAY dB L_{Aeq}	Ext Wall	0
	45	NIGHT dB L_{Amax}		
	30	NIGHT dB L_{Aeq}		
Target NR	40			
Include trickle vent?	y			

Glazing Type	Area of Glazing	Day Leq: Internal Daytime $L_{Aeq,16hr}$	Day Leq: Exceedence over Target		Night Lmax: Internal Night-time L_{Amax}	Night Lmax: Exceedence over Target		Night Leq: Internal Night-time $L_{Aeq,8hr}$	Night Leq: Exceedence over Target		
6-16-8.8 St Gobain	1.00	32.4	0.0	✓	38.7	0.0	✓	28.0	0.0	✓	0.0
10-16-8.8 St Gobain	1.00	32.3	0.0	✓	38.6	0.0	✓	27.9	0.0	✓	0.0
4-12-6	1.00	33.1	0.0	✓	39.6	0.0	✓	28.7	0.0	✓	0.0
10-12-4	1.00	32.6	0.0	✓	38.9	0.0	✓	28.1	0.0	✓	0.0
10-12-6	1.00	32.4	0.0	✓	38.7	0.0	✓	28.0	0.0	✓	0.0
6-12-6.4 PVB	1.00	32.8	0.0	✓	39.2	0.0	✓	28.4	0.0	✓	0.0
Input	1.00	32.2	0.0	✓	38.5	0.0	✓	27.8	0.0	✓	0.0
6.8-16-6.8 Pilkington Insulight	1.00	32.4	0.0	✓	38.7	0.0	✓	28.0	0.0	✓	0.0
10.8-16-6 Pilkington Insulight	1.00	32.3	0.0	✓	38.7	0.0	✓	27.9	0.0	✓	0.0
8-12-8.8 Stadip Silence	1.00	32.3	0.0	✓	38.7	0.0	✓	27.9	0.0	✓	0.0
10-16-16.8 Stadip Silence	1.00	32.2	0.0	✓	38.6	0.0	✓	27.8	0.0	✓	0.0
16.8-16-16.8 Pilkington Insulight	1.00	32.2	0.0	✓	38.5	0.0	✓	27.8	0.0	✓	0.0
Solaglas 4-20-6	1.00	32.6	0.0	✓	39.0	0.0	✓	28.2	0.0	✓	0.0
Solaglas 4-20(arg)-6	1.00	32.7	0.0	✓	39.0	0.0	✓	28.2	0.0	✓	0.0
Velfac 4-15-4 +6	1.00	32.3	0.0	✓	38.6	0.0	✓	27.8	0.0	✓	0.0
Velfac 8-12-8 + 8	1.00	32.2	0.0	✓	38.5	0.0	✓	27.8	0.0	✓	0.0
6-150-4	1.00	32.2	0.0	✓	38.6	0.0	✓	27.8	0.0	✓	0.0
10-200-6	1.00	32.2	0.0	✓	38.5	0.0	✓	27.8	0.0	✓	0.0
6-100-4	1.00	32.3	0.0	✓	38.6	0.0	✓	27.8	0.0	✓	0.0

Assessment of Noise Ingress to BS8233 - Barrow Brook Close, Clitheroe

House Type 1 Bedroom 2

		OCTAVE BAND CENTRE FREQUENCY								
		31.5	63	125	250	500	1000	2000	4000	dBA
	Day L_{eq}	59.6	64.4	58.3	58.2	56.9	57.0	48.8	33.2	59.8
	Night L_{max}	73.6	74.4	65.9	64.8	63.8	63.0	52.8	39.3	66.0
	Night L_{eq}	56.3	59.0	53.9	53.6	52.6	52.6	44.1	28.9	55.4
	Day L_{eq} and Source Correction	59.6	64.4	58.3	58.2	56.9	57.0	48.8	33.2	59.8
RT REF	Night L_{max} and Source Correction	73.6	74.4	65.9	64.8	63.8	63.0	52.8	39.3	66.0
	Night L_{eq} and Source Correction	56.3	59.0	53.9	53.6	52.6	52.6	44.1	28.9	55.4
1	Rev Time (27)	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	
1	Titon Trimvent (non acoustic)	27.0	28.4	27.9	30.8	30.5	29.0	33.7	33.7	
Vent REF	Typical Masonary Wall Build-up	12	19	38	46	51	52	53	53	
	NA									

Area of SRI 1	6.00	m2		
Area of SRI 2	0.00	m2	Day Leq Src Reduction =	0.0
Area of Glazing	1.00	m2	Lmax Src Reduction =	0
Volume of Room	23.00	m3	Night Leq Src Reduction =	0
Target Internal Noise Levels	35	DAY dB L_{Aeq}	Ext Wall	0
	45	NIGHT dB L_{Amax}		
	30	NIGHT dB L_{Aeq}		
Target NR	40			
Include trickle vent?	y			

			Day Leq			Night Lmax			Night Leq			
Suitable?	Glazing Type	Area of Glazing	Internal Daytime $L_{Aeq,16hr}$	Exceedence over Target		Internal Night-time L_{Amax}	Exceedence over Target		Internal Night-time $L_{Aeq,8hr}$	Exceedence over Target		
Yes	6-16-8.8 St Gobain	1.00	33.8	0.0	✓	40.4	0.0	✓	29.3	0.0	✓	0.0
Yes	10-16-8.8 St Gobain	1.00	33.7	0.0	✓	40.3	0.0	✓	29.2	0.0	✓	0.0
Yes	4-12-6	1.00	34.5	0.0	✓	41.2	0.0	✓	30.0	0.0	✓	0.0
Yes	10-12-4	1.00	33.9	0.0	✓	40.6	0.0	✓	29.5	0.0	✓	0.0
Yes	10-12-6	1.00	33.8	0.0	✓	40.4	0.0	✓	29.3	0.0	✓	0.0
Yes	6-12-6.4 PVB	1.00	34.1	0.0	✓	40.9	0.0	✓	29.7	0.0	✓	0.0
Yes	Input	1.00	33.6	0.0	✓	40.3	0.0	✓	29.1	0.0	✓	0.0
Yes	6.8-16-6.8 Pilkington Insulight	1.00	33.8	0.0	✓	40.4	0.0	✓	29.3	0.0	✓	0.0
Yes	10.8-16-6 Pilkington Insulight	1.00	33.7	0.0	✓	40.4	0.0	✓	29.2	0.0	✓	0.0
Yes	8-12-8.8 Stadip Silence	1.00	33.7	0.0	✓	40.4	0.0	✓	29.2	0.0	✓	0.0
Yes	10-16-16.8 Stadip Silence	1.00	33.6	0.0	✓	40.3	0.0	✓	29.2	0.0	✓	0.0
Yes	16.8-16-16.8 Pilkington Insulight	1.00	33.6	0.0	✓	40.3	0.0	✓	29.1	0.0	✓	0.0
Yes	Solaglas 4-20-6	1.00	34.0	0.0	✓	40.7	0.0	✓	29.5	0.0	✓	0.0
Yes	Solaglas 4-20(arg)-6	1.00	34.0	0.0	✓	40.7	0.0	✓	29.6	0.0	✓	0.0
Yes	Velfac 4-15-4 +6	1.00	33.6	0.0	✓	40.3	0.0	✓	29.2	0.0	✓	0.0
Yes	Velfac 8-12-8 + 8	1.00	33.6	0.0	✓	40.2	0.0	✓	29.1	0.0	✓	0.0
Yes	6-150-4	1.00	33.6	0.0	✓	40.3	0.0	✓	29.2	0.0	✓	0.0
Yes	10-200-6	1.00	33.6	0.0	✓	40.2	0.0	✓	29.1	0.0	✓	0.0
Yes	6-100-4	1.00	33.6	0.0	✓	40.3	0.0	✓	29.2	0.0	✓	0.0

Assessment of Noise Ingress to BS8233 - Barrow Brook Close, Clitheroe

House Type 1 Living Area

		OCTAVE BAND CENTRE FREQUENCY								
		31.5	63	125	250	500	1000	2000	4000	dBA
	Day L_{eq}	59.6	64.4	58.3	58.2	56.9	57.0	48.8	33.2	59.8
	Night L_{max}	73.6	74.4	65.9	64.8	63.8	63.0	52.8	39.3	66.0
	Night L_{eq}	56.3	59.0	53.9	53.6	52.6	52.6	44.1	28.9	55.4
	Day L_{eq} and Source Correction	59.6	64.4	58.3	58.2	56.9	57.0	48.8	33.2	59.8
RT REF	Night L_{max} and Source Correction	73.6	74.4	65.9	64.8	63.8	63.0	52.8	39.3	66.0
	Night L_{eq} and Source Correction	56.3	59.0	53.9	53.6	52.6	52.6	44.1	28.9	55.4
1	Rev Time (27)	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	
1	Titon Trimvent (non acoustic)	27.0	28.4	27.9	30.8	30.5	29.0	33.7	33.7	
Vent REF	Typical Masonary Wall Build-up	45	47	48	44	46	54	63	71	
	NA									

Area of SRI 1	9.00	m2		
Area of SRI 2	0.00	m2	Day Leq Src Reduction =	0.0
Area of Glazing	3.00	m2	Lmax Src Reduction =	0
Volume of Room	48.00	m3	Night Leq Src Reduction =	0
Target Internal Noise Levels	35	DAY dB L_{Aeq}	Ext Wall	0
	45	NIGHT dB L_{Amax}		
	30	NIGHT dB L_{Aeq}		
Target NR	40			
Include trickle vent?	y			

			Day Leq			Night Lmax			Night Leq			
Suitable?	Glazing Type	Area of Glazing	Internal Daytime $L_{Aeq,16hr}$	Exceedence over Target		Internal Night-time L_{Amax}	Exceedence over Target		Internal Night-time $L_{Aeq,8hr}$	Exceedence over Target		
Yes	6-16-8.8 St Gobain	3.00	30.7	0.0	✓	37.1	0.0	✓	26.3	0.0	✓	0.0
Yes	10-16-8.8 St Gobain	3.00	30.4	0.0	✓	36.8	0.0	✓	26.0	0.0	✓	0.0
Yes	4-12-6	3.00	32.5	0.0	✓	39.2	0.0	✓	28.1	0.0	✓	0.0
Yes	10-12-4	3.00	31.2	0.0	✓	37.7	0.0	✓	26.7	0.0	✓	0.0
Yes	10-12-6	3.00	30.8	0.0	✓	37.2	0.0	✓	26.3	0.0	✓	0.0
Yes	6-12-6.4 PVB	3.00	31.8	0.0	✓	38.4	0.0	✓	27.3	0.0	✓	0.0
Yes	Input	3.00	30.3	0.0	✓	36.6	0.0	✓	25.8	0.0	✓	0.0
Yes	6.8-16-6.8 Pilkington Insulight	3.00	30.7	0.0	✓	37.2	0.0	✓	26.3	0.0	✓	0.0
Yes	10.8-16-6 Pilkington Insulight	3.00	30.5	0.0	✓	37.0	0.0	✓	26.1	0.0	✓	0.0
Yes	8-12-8.8 Stadip Silence	3.00	30.6	0.0	✓	37.0	0.0	✓	26.1	0.0	✓	0.0
Yes	10-16-16.8 Stadip Silence	3.00	30.3	0.0	✓	36.6	0.0	✓	25.9	0.0	✓	0.0
Yes	16.8-16-16.8 Pilkington Insulight	3.00	30.3	0.0	✓	36.6	0.0	✓	25.8	0.0	✓	0.0
Yes	Solaglas 4-20-6	3.00	31.3	0.0	✓	37.8	0.0	✓	26.9	0.0	✓	0.0
Yes	Solaglas 4-20(arg)-6	3.00	31.5	0.0	✓	37.9	0.0	✓	27.0	0.0	✓	0.0
Yes	Velfac 4-15-4 +6	3.00	30.4	0.0	✓	36.8	0.0	✓	25.9	0.0	✓	0.0
Yes	Velfac 8-12-8 + 8	3.00	30.2	0.0	✓	36.6	0.0	✓	25.8	0.0	✓	0.0
Yes	6-150-4	3.00	30.3	0.0	✓	36.7	0.0	✓	25.9	0.0	✓	0.0
Yes	10-200-6	3.00	30.2	0.0	✓	36.5	0.0	✓	25.8	0.0	✓	0.0
Yes	6-100-4	3.00	30.3	0.0	✓	36.8	0.0	✓	25.9	0.0	✓	0.0

Assessment of Noise Ingress to BS8233 - Barrow Brook Close, Clitheroe

House Type 1 Bedroom 1

	OCTAVE BAND CENTRE FREQUENCY								
	31.5	63	125	250	500	1000	2000	4000	dBA
Day L_{eq}	59.6	64.4	58.3	58.2	56.9	57.0	48.8	33.2	59.8
Night L_{max}	73.6	74.4	65.9	64.8	63.8	63.0	52.8	39.3	66.0
Night L_{eq}	56.3	59.0	53.9	53.6	52.6	52.6	44.1	28.9	55.4
Day L_{eq} and Source Correction	59.6	64.4	58.3	58.2	56.9	57.0	48.8	33.2	59.8
Night L_{max} and Source Correction	73.6	74.4	65.9	64.8	63.8	63.0	52.8	39.3	66.0
Night L_{eq} and Source Correction	56.3	59.0	53.9	53.6	52.6	52.6	44.1	28.9	55.4
Rev Time (27)	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	
Titon Trimvent (non acoustic)	27.0	28.4	27.9	30.8	30.5	29.0	33.7	33.7	
Typical Masonary Wall Build-up	45	47	48	44	46	54	63	71	
NA									

Area of SRI 1	6.00	m2		
Area of SRI 2	0.00	m2	Day Leq Src Reduction =	0.0
Area of Glazing	1.00	m2	Lmax Src Reduction =	0
Volume of Room	22.00	m3	Night Leq Src Reduction =	0
Target Internal Noise Levels	35	DAY dB L_{Aeq}	Ext Wall	0
	45	NIGHT dB L_{Amax}		
	30	NIGHT dB L_{Aeq}		
Target NR	40			
Include trickle vent?	y			

		Day Leq			Night Lmax			Night Leq			
Glazing Type	**Area of Glazing**	**Internal Daytime $L_{Aeq,16hr}$**	**Exceedence over Target**		**Internal Night-time L_{Amax}**	**Exceedence over Target**		**Internal Night-time $L_{Aeq,8hr}$**	**Exceedence over Target**		
6-16-8.8 St Gobain	1.00	33.7	0.0	✓	40.1	0.0	✓	29.3	0.0	✓	0.0
10-16-8.8 St Gobain	1.00	33.6	0.0	✓	39.9	0.0	✓	29.2	0.0	✓	0.0
4-12-6	1.00	34.5	0.0	✓	40.9	0.0	✓	30.0	0.0	✓	0.0
10-12-4	1.00	33.9	0.0	✓	40.3	0.0	✓	29.5	0.0	✓	0.0
10-12-6	1.00	33.7	0.0	✓	40.1	0.0	✓	29.3	0.0	✓	0.0
6-12-6.4 PVB	1.00	34.1	0.0	✓	40.6	0.0	✓	29.7	0.0	✓	0.0
Input	1.00	33.6	0.0	✓	39.9	0.0	✓	29.2	0.0	✓	0.0
6.8-16-6.8 Pilkington Insulight	1.00	33.7	0.0	✓	40.1	0.0	✓	29.3	0.0	✓	0.0
10.8-16-6 Pilkington Insulight	1.00	33.7	0.0	✓	40.0	0.0	✓	29.2	0.0	✓	0.0
8-12-8.8 Stadip Silence	1.00	33.7	0.0	✓	40.0	0.0	✓	29.3	0.0	✓	0.0
10-16-16.8 Stadip Silence	1.00	33.6	0.0	✓	39.9	0.0	✓	29.2	0.0	✓	0.0
16.8-16-16.8 Pilkington Insulight	1.00	33.6	0.0	✓	39.9	0.0	✓	29.2	0.0	✓	0.0
Solaglas 4-20-6	1.00	34.0	0.0	✓	40.3	0.0	✓	29.5	0.0	✓	0.0
Solaglas 4-20(arg)-6	1.00	34.0	0.0	✓	40.4	0.0	✓	29.6	0.0	✓	0.0
Velfac 4-15-4 +6	1.00	33.6	0.0	✓	39.9	0.0	✓	29.2	0.0	✓	0.0
Velfac 8-12-8 + 8	1.00	33.6	0.0	✓	39.9	0.0	✓	29.2	0.0	✓	0.0
6-150-4	1.00	33.6	0.0	✓	39.9	0.0	✓	29.2	0.0	✓	0.0
10-200-6	1.00	33.6	0.0	✓	39.9	0.0	✓	29.1	0.0	✓	0.0
6-100-4	1.00	33.6	0.0	✓	39.9	0.0	✓	29.2	0.0	✓	0.0

Assessment of Noise Ingress to BS8233 - Barrow Brook Close, Clitheroe

House Type 1 Living Area

	OCTAVE BAND CENTRE FREQUENCY								
	31.5	63	125	250	500	1000	2000	4000	dBA
Day L_{eq}	54.2	56.4	47.4	45.7	42.8	43.5	37.4	24.5	46.7
Night L_{max}	68.2	66.4	55.0	52.3	49.7	49.5	41.4	30.6	52.9
Night L_{eq}	50.9	51.0	43.0	41.1	38.5	39.1	32.7	20.2	42.2
Day L_{eq} and Source Correction	54.2	56.4	47.4	45.7	42.8	43.5	37.4	24.5	46.7
Night L_{max} and Source Correction	68.2	66.4	55.0	52.3	49.7	49.5	41.4	30.6	52.9
Night L_{eq} and Source Correction	50.9	51.0	43.0	41.1	38.5	39.1	32.7	20.2	42.2
Rev Time (27)	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	
Titon Trimvent (non acoustic)	27.0	28.4	27.9	30.8	30.5	29.0	33.7	33.7	
Typical Masonary Wall Build-up	45	47	48	44	46	54	63	71	
NA									

Area of SRI 1	6.00	m2		
Area of SRI 2	0.00	m2	Day Leq Src Reduction =	0.0
Area of Glazing	2.00	m2	Lmax Src Reduction =	0
Volume of Room	22.00	m3	Night Leq Src Reduction =	0
Target Internal Noise Levels	35	DAY dB L_{Aeq}	Ext Wall	0
	45	NIGHT dB L_{Amax}		
	30	NIGHT dB L_{Aeq}		
Target NR	40			
Include trickle vent?	y			

		Day Leq			Night Lmax			Night Leq			
Glazing Type	**Area of Glazing**	**Internal Daytime $L_{Aeq,16hr}$**	**Exceedence over Target**		**Internal Night-time L_{Amax}**	**Exceedence over Target**		**Internal Night-time $L_{Aeq,8hr}$**	**Exceedence over Target**		
6-16-8.8 St Gobain	2.00	20.8	0.0	✓	27.4	0.0	✓	16.3	0.0	✓	0.0
10-16-8.8 St Gobain	2.00	20.6	0.0	✓	27.1	0.0	✓	16.1	0.0	✓	0.0
4-12-6	2.00	22.5	0.0	✓	29.4	0.0	✓	18.0	0.0	✓	0.0
10-12-4	2.00	21.2	0.0	✓	28.0	0.0	✓	16.7	0.0	✓	0.0
10-12-6	2.00	20.9	0.0	✓	27.5	0.0	✓	16.4	0.0	✓	0.0
6-12-6.4 PVB	2.00	21.9	0.0	✓	28.9	0.0	✓	17.3	0.0	✓	0.0
Input	2.00	20.5	0.0	✓	27.0	0.0	✓	16.0	0.0	✓	0.0
6.8-16-6.8 Pilkington Insulight	2.00	20.9	0.0	✓	27.6	0.0	✓	16.4	0.0	✓	0.0
10.8-16-6 Pilkington Insulight	2.00	20.7	0.0	✓	27.3	0.0	✓	16.2	0.0	✓	0.0
8-12-8.8 Stadip Silence	2.00	20.7	0.0	✓	27.3	0.0	✓	16.2	0.0	✓	0.0
10-16-16.8 Stadip Silence	2.00	20.5	0.0	✓	27.0	0.0	✓	16.0	0.0	✓	0.0
16.8-16-16.8 Pilkington Insulight	2.00	20.5	0.0	✓	27.0	0.0	✓	16.0	0.0	✓	0.0
Solaglas 4-20-6	2.00	21.4	0.0	✓	28.0	0.0	✓	16.9	0.0	✓	0.0
Solaglas 4-20(arg)-6	2.00	21.4	0.0	✓	28.0	0.0	✓	16.9	0.0	✓	0.0
Velfac 4-15-4 +6	2.00	20.6	0.0	✓	27.2	0.0	✓	16.1	0.0	✓	0.0
Velfac 8-12-8 + 8	2.00	20.4	0.0	✓	26.9	0.0	✓	16.0	0.0	✓	0.0
6-150-4	2.00	20.5	0.0	✓	27.1	0.0	✓	16.0	0.0	✓	0.0
10-200-6	2.00	20.4	0.0	✓	26.9	0.0	✓	15.9	0.0	✓	0.0
6-100-4	2.00	20.6	0.0	✓	27.3	0.0	✓	16.1	0.0	✓	0.0