

Acoustic South East



Planning Application - New Build Residential Development

Report by: Scott Castle BSc (Hons) CEnvH, MCIEH MIOA

Date: 09/03/2026

Project: J3799

Issue 1

Site: **Fontwell Fields, Arundel, West Sussex.**

Client: **Fontwell Fields (West Sussex) Limited**

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Report by: Scott Castle BSc (Hons) CEnvH, MCIEH MIOA

Checked by: Peter Attwood BSc(Hons) MSc MCIOB MIOA

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1 Introduction and Executive Summary

Acoustic South East have been appointed to undertake an acoustic assessment to support a detailed planning application for 56 new dwellings on site, plus a block of 8 residential flats (64 Units in total)

Standards and guidance referenced for this assessment include:

- BS8233 (Sound insulation and noise reduction for buildings) 2014
- National Planning Policy Framework (NPPF), 2024
- Acoustics Ventilation and Overheating Guidance (AVOG), January 2020
- Building Regulations Approved Document O – Overheating
- ProPG2017 - Professional Practice Guidance on Planning & Noise

The site was measured over a number of days and nights with a class 1 sound level meter between 15th to 23rd February 2024. The primary sound source is the A27 to the Eastern and Northern site boundaries.

The application submitted is for detailed planning consent and has sought pre-application advice from the local planning authority. Liaison has also been undertaken with the project management team to ensure that good acoustic design has been worked into the layout and design of the properties (see section 2.6).

The worst-case Sound Reduction Index is 34dB for 2nd floor bedrooms (houses) overlooking the A27. For Kitchen Living Diners (houses) the SRI is 26dB. For the flats in closer proximity the worst-case SRI for the bedrooms is 31dB and for the KLD, 27dB.

Rigorous calculations show that enhanced glazing is required for the bedrooms on the first and second floors of the properties closest to the A27. This is in combination with the use of mechanical Ventilation and Heat Recovery to provide ventilation to the units.

Mechanical ventilation for the properties closest to the A27 was selected by the client to ensure that the results of an overheating assessment by Ecolytik are capable of being achieved with trim cooling applied.

An initial site risk assessment for the site, consistent with the approach in ProPG2017 for the highest received sound pressure levels for those properties on the Eastern facade indicates a low to medium risk. A negligible risk is likely for those properties further from the A27 on the Western boundary which will not likely require any mitigation measures.

External amenity areas for the properties have been assessed and the majority are below 55dB $L_{Aeq,16\text{ hour}}$ satisfying the requirements of both BS8233:2014 and WHO Guidelines for Community Noise dated 1999 and 2018(revised). The exception being plots 47-48 which will require a higher barrier to mitigate roadside noise from the A27.

Given the findings above, planning consent should not be withheld on noise grounds.

2 Context, Noise Criteria & Noise Assessment Methodology

2.1 Context

64 New build dwellings are proposed to be built on Fontwell Fields, as seen below in Figure 1.

Whilst an application was made to Arun District Council previously, the proposed community building has been substituted with a block of 8 flats and the outline proposals have been replaced with a detailed application. Pre-application advice has been obtained from the Council.

2.2 Site Location

The application site is bordered in red in Figure 1 below. To the immediate East is the dual carriageway of the A27 which has Fontwell East roundabout located to the North. To the immediate South is single carriageway Arundel Road. To the West of the site are existing residential properties.



Figure 1. Site Location

2.3 Proposed Site Layout

The proposed site layout is detailed in Figure 2 below.



Figure 2. Block Plan

2.4 Soundscape

The soundscape at the time of setting up and decommissioning the survey was dominated by fast moving road traffic noise from the A27.

2.5 Planning Policy and Assessment Criteria

2.5.1 National Planning Policy Framework Dec 2024

The National Planning Policy Framework (Dec 2024) defines the Government's planning policies for England and how these are expected to be applied. It sets out the Government's requirements for the planning system only to the extent that it is relevant, proportionate and necessary to do so.

The following paragraphs are relevant within NPPF Section 15 (Conserving and enhancing the natural environment) states the following:

Paragraph 187(e) - Preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability, and

Paragraph 198 - Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

- a) mitigate and reduce to a minimum potential adverse impact resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;
- b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and

Paragraph 200– Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.

2.5.2 BS8233:2014 – Guidance on Sound Insulation and Noise Reduction for Buildings

Table 4 of BS8233:2014 provides the following guideline values:

Activity	Location	Time period of day	
		07:00-23:00	23:00-07:00
Resting	Living Rooms	35dB L _{Aeq,16hour}	-
Dining	Dining Room/Area	40dB L _{Aeq,16hour}	-
Sleeping (daytime resting)	Bedroom	35dB L _{Aeq,16hour}	30dB L _{Aeq,8hour}

Table 1. BS8233:2014 Criteria

It is relevant to note that Table 4 criteria in BS8233:2014 relates to continuous and anonymous sound, such as that from the A27 adjacent to the site.

2.5.3 ProPG2017

Planning guidance (ProPG2017) relates to new residential development and airborne transportation noise, which includes exposure to road traffic, railway and aviation noise. Whilst ProPG, 2017 generally mirrors the requirements of BS8233:2014 and the World Health Organisation Guidelines, 1999, it goes further in setting a limit for inside bedrooms for L_{Amax} events and specifically, no more than 10 L_{Amax} events per night time period above 45dB(A).

The internal bedroom L_{Amax} values will be used in accordance with ProPG2017.

2.5.4 Planning Noise Advice Document Sussex, November 2023

A planning noise advice document which all Sussex local authorities have contributed to and signed up to (including Arun District Council) remains relevant. The guidance document has been followed in respect of measurement parameters and report presentation of data

2.5.5 Building Regulations Approved Document O (Overheating)

Whilst a formalised overheating assessment (CIBSE TM59) is outside of the scope, it is possible to carry out a simplified assessment to determine if bedroom windows are capable of being opened during the night time period.

Recently introduced Part O of the building regulation requires an assessment of whether bedroom windows can be opened at night. It is assumed that bedroom windows will be closed if either of the conditions below are met:

- Internal noise level exceeds 40dB $L_{Aeq, 8hour}$
- L_{Amax} events exceed 55dB L_{Amax} more than 10 times a night

2.6 Good Acoustic Design

It is noted from the plan that the development specifically includes a buffer away from the noisier A27 boundary with open land, a play area and a roadway servicing the properties, which deliberately creates a distance buffer between the road and the proposed dwellings. This represents good acoustic design.

It is noted also that through liaison with the designers, the footprint for the block of flats was also moved as far away as possible from the A27. In terms of windows, no windows directly overlook the A27, again representing good acoustic design.

For the flats, the living rooms at both ground and first floors are also placed closest to the roadside, allowing the bedrooms to be set back slightly. Again, this represents good acoustic design.

2.7 Building Regulations Approved Document O - Overheating

An overheating assessment has been carried out by Ecolytik dated February 2026. The report concludes that where there are noise constraints for properties close to the A27, then Mechanical Ventilation and Heat Recovery (MVHR) may be used to provide trim cooling to ensure that overheating does not occur. An extract from the report is presented below.

Table 1. Part O (2021) modelling results summary.					
Iteration	Ventilation strategy	Room type	Applicable number of sample rooms	Sample rooms meeting criteria	% of rooms complying
1	Open windows 24/7	All habitable	76	76	100%
		Bedrooms	44	44	100%
2	Windows open during daytime; Purge fans *	All habitable	45	45	100%
		Bedrooms	27	27	100%
3	Windows open during daytime; MVHR**	All habitable	31	31	100%
		Bedrooms	17	17	100%

Notes:
All habitable rooms are assessed against overheating criteria during occupied hours (determined from CIBSE TM59). Bedrooms have additional night-time specific overheating criteria. Please see section 2.2 and Appendix C of the report for further details.
Iteration 1 is applicable to all dwellings across the site. Iteration 2 is relevant for dwellings not exposed to noise while iteration 3 is applicable for the sample dwellings next to the A27.

* Flow rates: ≥ 70 l/s per bedroom
** Flow rates: KLD, living rooms, bedrooms ≥ 20 l/s, kitchens ≥ 13 l/s, air tempering coil. Please refer to section 4.3 and of the report for further details on the air tempering coil.

Figure 3. Extract from Overheating Report

2.8 Client Proposals

It is proposed that the residential units close to the A27 and additionally the apartment block of flats will each utilise MVHR as a means to ventilate the properties. For the avoidance of doubt, the plots with allocated MVHR are 4-11 and 47-64 inclusive.

2.9 Methodology and Rationale

Noise levels were measured close to source to ensure that the A27 as the primary driver for the soundscape was understood.

Noise modelling software (IMMI) has been used to predict how sound energy is likely to propagate around the site.

IMMI is then capable of being used to identify areas across the site whereby windows are capable of being opened during the daytime and night time periods, and importantly that gardens and external amenity areas are capable of being enjoyed and remain below 55dB

L_{Aeq} , 16 hours.

3 Sound Survey(s)

An unattended sound survey position was used to characterise the site soundscape. This was located on the North Eastern boundary. Attended short term measurements were also taken on the lower southern boundary to determine how the site soundscape differed

The measurement resolution was 1-minute for the Castle “Mirus”, consistent with the Planning and Noise Document, Sussex, dated November 2023 which provides for a robust assessment of L_{Amax} events during the overnight period (23:00-07:00 hours). The microphone was placed in freefield conditions and the sound level meter was placed in a locked peli case with dry cell batteries.

The survey conditions were freefield.



Figure 4. Survey Location (Long Term)

Survey(s) carried out by	George Orton BEng (Hons) MIOA
Equipment Used	Castle GA117 “Mirus” Class 1 Sound Level Meter – Mounted on Monopod
Equipment Used	Castle Acoustic Calibrator – Serial No. 041173
Location	Castle Mirus – 1.8 above ground level
Duration	15 th to 23 rd February 2024

Table 2. Survey Information

4 Results of the Sound Surveys

Continuous sound pressure levels ($L_{Aeq,T}$) are reported herein, however L_{Amax} events and values will be discussed post noise modelling and analysis.

4.1 Unattended Measurements (Freefield Data)

4.1.1 LT1

It is noted that the power source was interrupted for the sound level meter with days 4,5 and 6 noted as not measured. A new battery was applied and the survey left in situ for a number of additional days.

LT1 Logarithmically Averaged Day and Night time Periods (External - Freefield)-dB(A)			
L_{Aeq} , 16 hour - 07:00-23:00		L_{Aeq} , 8 hour 23:00-07:00	
Day 1	Removed	Night 1	Removed
Day 2	65	Night 2	59
Day 3	66	Night 3	59
Day 4	Removed	Night 4	Removed
Day 5	Removed	Night 5	Removed
Day 6	Removed	Night 6	60
Day 7	68	Night 7	60
Day 8	67	Night 8	59
Day 9	66	Night 9	Incomplete
Arithmetic Average	66.4	Arithmetic Average	59.3

Figure 5. Continuously Measured Sound Pressure Levels (Day and Night)

5 Noise Modelling Software (IMMI)

In order to see how noise varies at different positions around the proposed development it is possible to produce a noise contour map. A computer noise model has been completed using the computer package IMMI. Drawings of the area have been used to complete the noise models and the topography of the location recreated. IMMI faithfully implements the propagation method of ISO-9613:1996; Acoustics – Attenuation of sound during propagation outdoors.

The noise modelling software predicts freefield and A weighted dB values.

5.1 Noise Model Inputs

The following inputs were applied

- All houses were entered with ridge heights according to the architects plans.
- The apartment block was entered as a 10.3m building.
- The site was treated as flat.
- Garages were entered as 4.5m above ground level
- All fence lines/barriers were entered as 1.8m above ground level.
- For receptor positions at the worst-case plot windows were entered at 1.5m and 4.5m and 7.5m to replicate ground, first and second floors.
- The A27 was plotted as a line source and calibrated to the highest daytime and night time measurements to represent a worst case and robust report.
- When considering the southern boundary, and comparing the short-term measurements with the longer-term survey and model, it was not necessary to add Arundel Road to the model.

5.2 Noise Model Outputs

5.2.1 Daytime – $L_{Aeq,16\text{ hour}}$

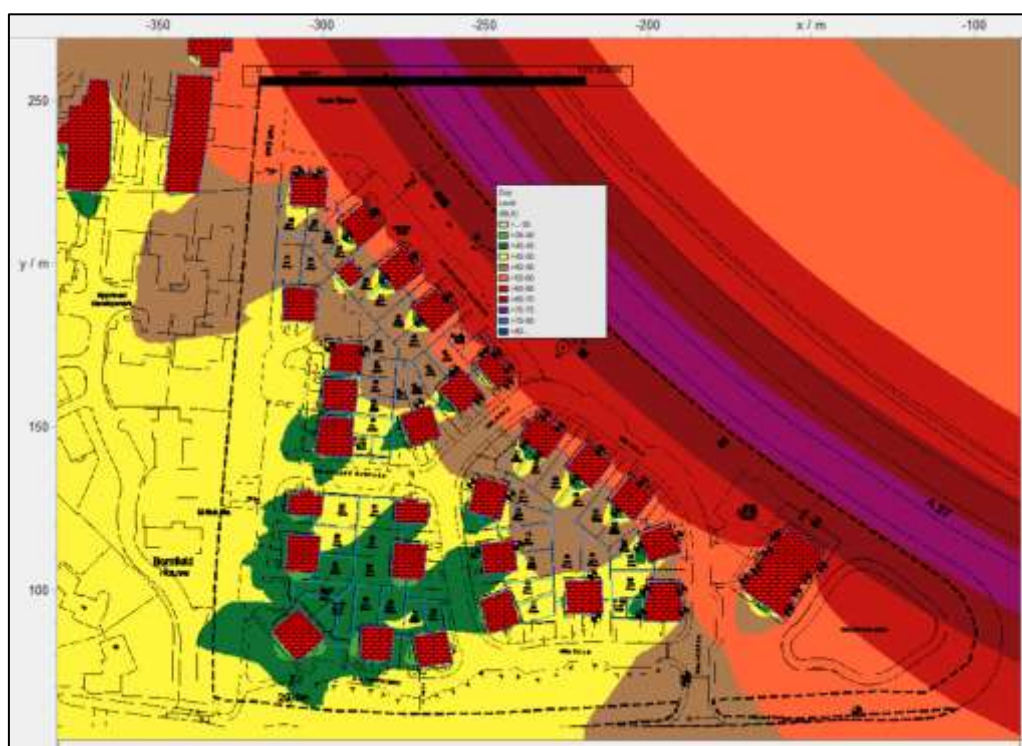


Figure 6. Daytime Noise Modelling Predictions (2D)-IMMI

5.2.2 Night Time- $L_{Aeq,8\text{ hour}}$

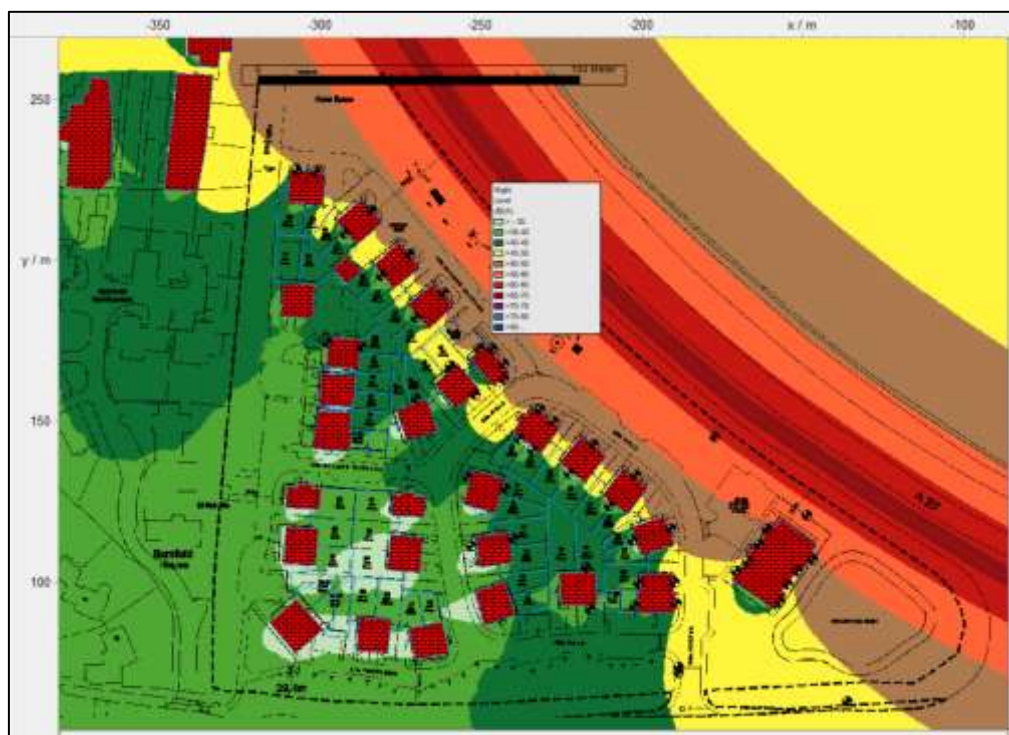


Figure 7. Noise Modelling Predictions (2D)-IMMI

5.2.3 Daytime Mitigation Measures



Figure 8. Daytime Mitigation Measures

5.2.4 Night Time Mitigation Measures



Figure 9. Night Time Mitigation Measures

5.2.5 External Amenity Areas



Figure 10. External Amenity Areas

5.2.6 Building Regulations Approved Document O – 50dB $L_{Aeq,8\text{ hour}}$ Contour



Figure 11. Simplified Assessment for Overheating at Night (50dB $L_{Aeq,8\text{ hour}}$ contour)

5.3 Noise Model Summary

Figures 6 and 7 above show the 2D noise modelling contours for the site with regards to the daytime noise exposure and the night time noise exposure respectively. The colour legends are shown, but as anticipated, the increased exposure is for the properties closer to the A27.

Figures 8 and 9 show where mitigation measures are likely to be required for the development. In using the AVOG guidance and specifically table B2.2 it is apparent that standard thermal double glazing and trickle vents is likely to account for a 21dB difference between outside freefield sound pressure levels and internal reverberant sound pressure levels. Therefore the 2D noise plots have been configured to consider a 56dB daytime plot (made up of 35dB internally and 21dB of attenuation) and 51dB night time plot. Again the results are consistent with the A27 being the dominant sound source at the site.

Figure 10 shows a 2D noise plot across the site which relates to external amenity areas and gardens. The configuration has been set to show levels below 50dB $L_{Aeq, 16 \text{ hour}}$ in green, levels between 50-55dB $L_{Aeq, 16 \text{ hour}}$ in amber and for levels above 55dB $L_{Aeq, 16 \text{ hour}}$, these are in red. This is an easy visual account indicating that the majority of the gardens for the properties achieve below 55dB $L_{Aeq, 16 \text{ hour}}$ and this is consistent with BS8233:2014, ProPG2017 and the World Health Organisation Guidelines for Community Noise dated 1999 (revised 2018).

Figure 11 shows a night time plot for a 50dB $L_{Aeq, 8 \text{ hour}}$ contour and specifically, where noise levels are predicted to be above and below this. The relevance being that for the Building Regulations Approved Document O for overheating, a bedroom may open their window overnight only where the conditions are such that 40dB $L_{Aeq, 8 \text{ hour}}$ is achieved overnight. The coloured configuration is achieved by using 40dB as the relevant inside sound pressure level, then adding 10dB for an open window. As anticipated, those properties close to the A27 are unlikely to be opening bedroom windows to mitigate thermal overheating overnight. This is referred to as a simplified assessment under Approved Document O. It should be noted that there are other L_{Amax} conditions to take into account and the reader is directed to section 2.5.5 above.

6 Discussion

6.1 Calculation of the Sound Reduction Index

By being aware of how the soundscape impacts the proposed properties, a noise modelling approach predicts external sound pressure levels around the building perimeters. Subsequently, the required Sound Reduction Index (SRI) to achieve satisfactory internal sound pressure levels can be calculated.

To present a robust case, the worst-case property (plots 51-52) was selected by identifying receptor positions on the Eastern-most properties closest to the A27. The highest sound pressure levels, typically, the first-floor spaces on each façade have been used to inform the assessment.

There are three drivers which impact the façade sound reduction index or SRI. These are the daytime continuous noise levels measured over 16 hours in $L_{Aeq,T}$, the night time continuous noise levels over 8 hours, also measured in $L_{Aeq,T}$. Thirdly, ProPG2017 requires a consideration of the number of L_{Amax} events which will occur in a bedroom during the night time period. Specifically, ProPG2017 requires no more than ten events exceeding 45dB L_{Amax} measured internally. Whichever of these drivers is highest is applied to ensure that the residents are protected from each criterion.

An assessment has been made below of the worst-case plot (51/52) with all facades at ground and first floor levels.

It is relevant to note that living room and bedroom calculations differ, as whilst living rooms are subject to only the daytime predicted sound pressure levels, bedrooms must consider both daytime and night time continuous sound pressure levels as well as L_{Amax} events during the night to protect sleep.

The daytime SRI is the predicted external freefield sound pressure level minus 35dB as per the Table 4 values in BS8233:2014 and the same for the night time values (albeit minus 30dB).

The L_{Amax} SRI is achieved by using the predicted night time external sound pressure level and comparing this with the measured night time survey noise level. The SRI figure is then adjusted to prevent no more than 10 L_{Amax} events per night inside the bedroom environment above 45dB L_{Amax} . The adjustment process takes account of each of the 5 measured night time periods to ensure that no individual night exceeds 10 events of 45dB L_{Amax} inside the bedroom.

The long-term survey position (LT1) has been used to assess night time data and L_{Amax} considerations. The SRI considerations have been split into bedrooms and living rooms for each façade.

6.1.1 Living Rooms

Living Rooms		
Plot	Predicted Daytime	SRI
1 GF KLD	40.5	5.5
2 FF KLD	43.8	8.8
3 GF Living	54.2	19.2
3 GF Kitchen-diner	40.7	5.7
4/5 GF Kitchen	58.0	23.0
4/5 GF Live dine	42.0	7.0
6/7 GF Kitchen	59.6	24.6
6/7 GF live dine	41.4	6.4
8/9 GF Kitchen	59.5	24.5
8/9 GF live dine	41.3	6.3
10 GF Living	40.6	5.6
10 GF Kitchen	59.1	24.1
11 GF living	59.0	24.0
11 GF KLD	41.4	6.4
47 GF Living 1	59.4	24.4
47 GF living 2	56.5	21.5
48 FF Living	60.7	25.7
48 FF living 2	58.6	23.6
49/50 GF Kitchen	59.6	24.6
49/50 GF Live-dine	41.1	6.1
51/52 GF Kitchen	59.5	24.5
51/52 GF live dine	41.7	6.7
53/54 GF Livedine	41.5	6.5
53/54 GF Kitchen	59.4	24.4
55 GF Kitchen	57.6	22.6
56 GF Kitchen	56.8	21.8

Figure 12. Living Room SRIs

The maximum SRI for the KLD is 26dB.

6.1.2 Bedrooms

Bedroom SRI Assessment						
Plot	Predicted Day	Predicted Night	SRI Day	SRI Night	SRI L _{Amax}	SRI to be Applied
1 GF Bedroom 1	53.8	45.8	18.8	15.8	25	25
2 FF Bedroom	54.7	46.7	19.7	16.7	26	26
3 FF Bed 2	55.3	47.3	20.3	17.3	27	27
3 FF Bed 1	43.9	35.9	8.9	5.9	16	16
4/5 FF Bed 2	59.2	51.2	24.2	21.2	31	31
4/5 FF Bed 1	43.6	35.6	8.6	5.6	16	16
6/7 FF Bed 2	42.8	34.8	7.8	4.8	15	15
6/7 FF Bed 3	60.9	52.9	25.9	22.9	33	33
6/7 SF Bed 1	62.2	54.2	27.2	24.2	34	34
8/9 FF Bed 3	60.8	52.8	25.8	22.8	33	33
8/9 SF Bed 1	62.1	54.1	27.1	24.1	34	34
8/9 FF Bed 2	42.3	34.3	7.3	4.3	15	15
10 FF Bed 2	42.5	34.5	7.5	4.5	15	15
10 FF Bed 1	60.2	52.2	25.2	22.2	33	33
11 FF Bed 1	42.5	34.5	7.5	4.5	15	15
11 FF Bed2/Bed 3	60.2	52.2	25.2	22.2	33	33
47 GF Bed1	56.8	48.8	21.8	18.8	29	29
47 GF Bed 2	59.4	51.4	24.4	21.4	32	32
48 FF Bed1	58.0	50.0	23.0	20.0	30	30
48 FF Bed 2	60.6	52.6	25.6	22.6	33	33
49/50 FF Bed 3	60.9	52.9	25.9	22.9	33	33
49/50 SF Bed 1	62.2	54.2	27.2	24.2	34	34
49/50 FF Bed 2	43.6	35.6	8.6	5.6	15	15
51/52 FF Bed 3	60.8	52.8	25.8	22.8	33	33
51/52 SF Bed1	62.1	54.1	27.1	24.1	34	34
51/52 FF Bed 2	43.0	35.0	8.0	5.0	15	15
53/54 FF Bed 3	60.6	52.6	25.6	22.6	32	32
53/54 FF Bed2	43.3	35.3	8.3	5.3	15	15
53/54 SF Bed 1	61.9	53.9	26.9	23.9	34	34
55 FF Bed 3	58.8	50.8	23.8	20.8	30	30
56 FF Bed 3	57.9	49.9	22.9	19.9	30	30

Figure 13. Bedroom SRIs

The maximum SRI for the Bedrooms is 34dB.

6.1.3 Flats

Kitchen/Living/Diners Flats		
Room	Predicted Daytime	SRI
57 Ground KLD	59.5	24.5
58 Ground KLD	56.1	21.1
59 Ground KLD	59.4	24.4
60 Ground KLD	55.9	20.9
61 First KLD	61.7	26.7
62 First KLD	57.2	22.2
63 First KLD	61.6	26.6
64 First KLD	57.0	22.0

Figure 14. Flat KLD SRI

The maximum SRI for the KLD is 27dB

Bedroom Assessment for Flats						
Room	Predicted Daytime	Predicted Night time	SRI Day	SRI Night	SRI LAmax	SRI to be Applied
57 Ground BED	57.0	49.0	22.0	19.0	29	29
58 Ground BED	54.1	46.1	19.1	16.1	26	26
59 Ground BED	54.9	46.9	19.9	16.9	27	27
60 Ground BED	56.0	48.0	21.0	18.0	28	28
61 First BED	58.4	50.4	23.4	20.4	31	31
62 First BED	55.0	47.0	20.0	17.0	27	27
63 First BED	56.0	48.0	21.0	18.0	28	28
64 First BED	57.3	49.3	22.3	19.3	29	29

Figure 15. Flats - Bedrooms SRI

The maximum SRI for the Bedrooms is 31dB.

6.1.4 SRI Summary

The maximum SRI for the KLD for the houses is 26dB.

The maximum SRI for the Bedrooms for the houses is 34dB.

The maximum SRI for the KLD within the flats is 27dB.

The maximum SRI for the Bedrooms within the flats is 31dB.

The above values are capable of being compared against the AVOG Table B.2 (replicated below) to show where and why enhanced glazing and/or ventilation is likely. As previously stated, this is driven by proximity to the A27.

Table B-2 Potential level differences associated with different ventilation Systems from ADF

Ventilation System from ADF	Cont. equiv. (L_{Aeq}) or events (L_{Amax})	Level Difference, external free field level – Internal reverberant level, dB	
		Typical windows and vent	Higher acoustic performance windows and vent
1, 2	L_{Aeq}	21	31
	L_{Amax}	22	35
3 (with trickle vent)	L_{Aeq}	23	33
	L_{Amax}	24	38
4 (no trickle vent)	L_{Aeq}	27	38
	L_{Amax}	31	45

Figure 16. Table B2 of Acoustics Ventilation and Overheating Guidance (AVOG), Jan 2020

6.2 Consideration of External Amenity Areas

From Figure 10 above, replicated below it is apparent that most gardens achieve below the requirements of BS8233:2014. The exception is for plots 47 and 48 which are flats and have the garden areas closer to the road. The situation is remedied using a 2.4m fence line to further reduce the garden soundscape, see figures 17 and 18 below.

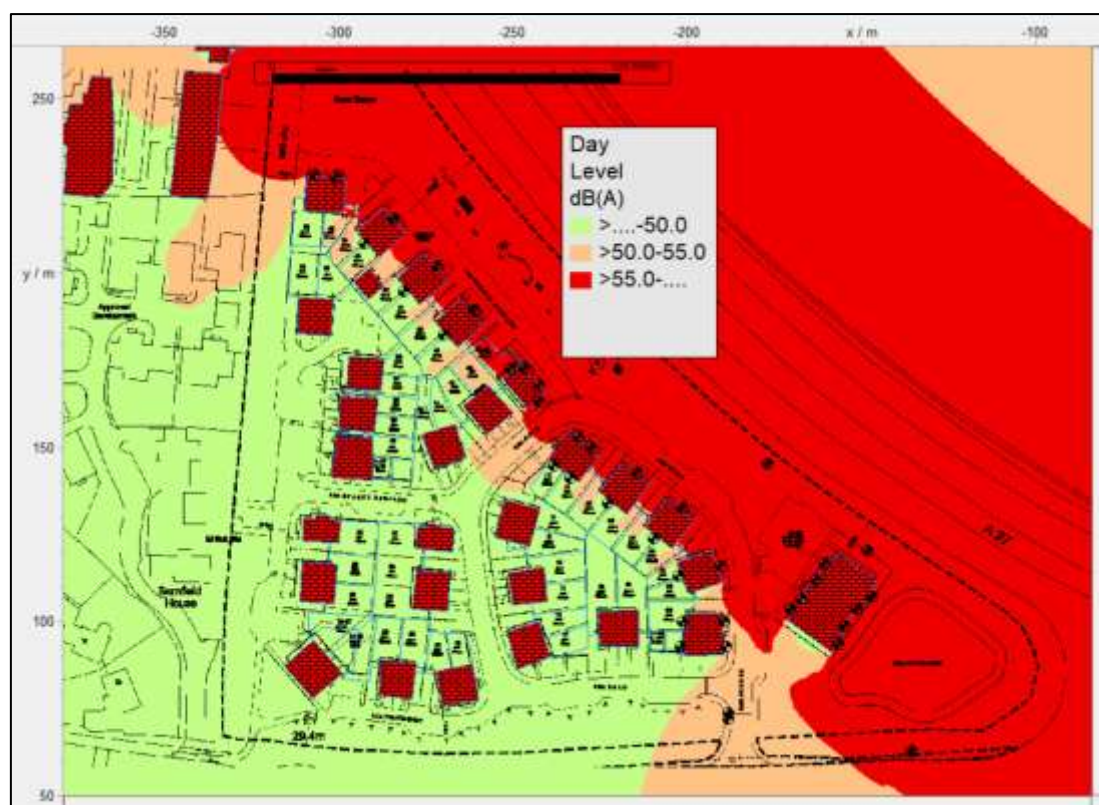


Figure 17. Garden Assessment (1.8m Barriers Applied Throughout)

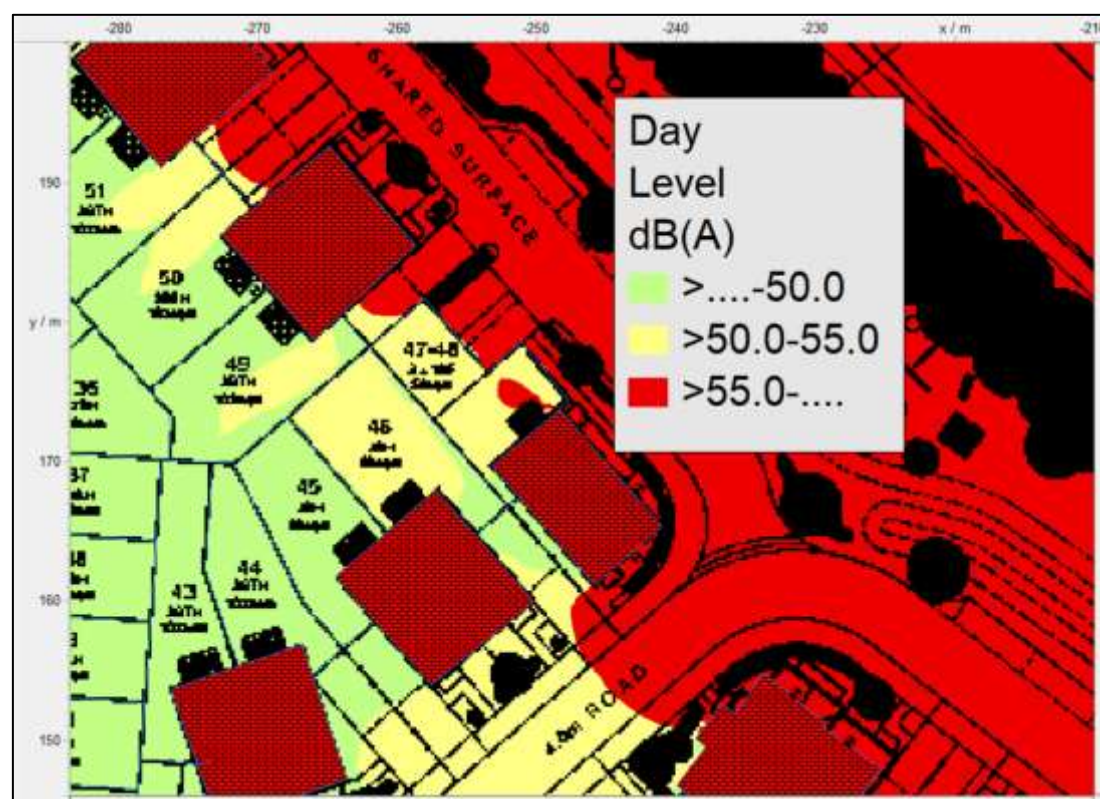


Figure 18. Plots 47-48 Garden with a 2.4m Barrier

6.3 Simplified Overheating Assessment (Approved Document O)

Recently introduced Part O of the building regulation requires an assessment of whether bedroom windows can be opened at night. It is assumed that bedroom windows will be closed if either of the conditions below are met:

- Internal noise level exceeds 40dB $L_{Aeq, 8\text{hour}}$
- L_{Amax} events exceed 55dB L_{Amax} more than 10 times a night.

The assessment concerns only bedroom windows for the night time period.

As seen from Figure 11 above, properties in close proximity to the A27 are unlikely to be able to open windows to mitigate thermal overheating at night. Therefore, the formalised assessment (Ecolytik) dictates that these properties will be fitted with MVHR and trim cooling.

6.4 ProPG2017 Initial Site Risk Assessment

In line with the requirements of ProPG2017, an initial site risk assessment has been undertaken which requires that the worst case/typical 24 hours are represented. The highest daytime and night time data from LT1 were used to populate the noise model, the maximum received sound pressure levels of 62dB for the daytime period ($L_{Aeq,16\text{ hour}}$) and 54dB for the night time period ($L_{Aeq,8\text{ hour}}$).

The assessment details a low to medium impact for the front façade and a negligible impact for the rear of the site footprint.

Accordingly, the grant of planning consent should not be withheld on noise grounds.

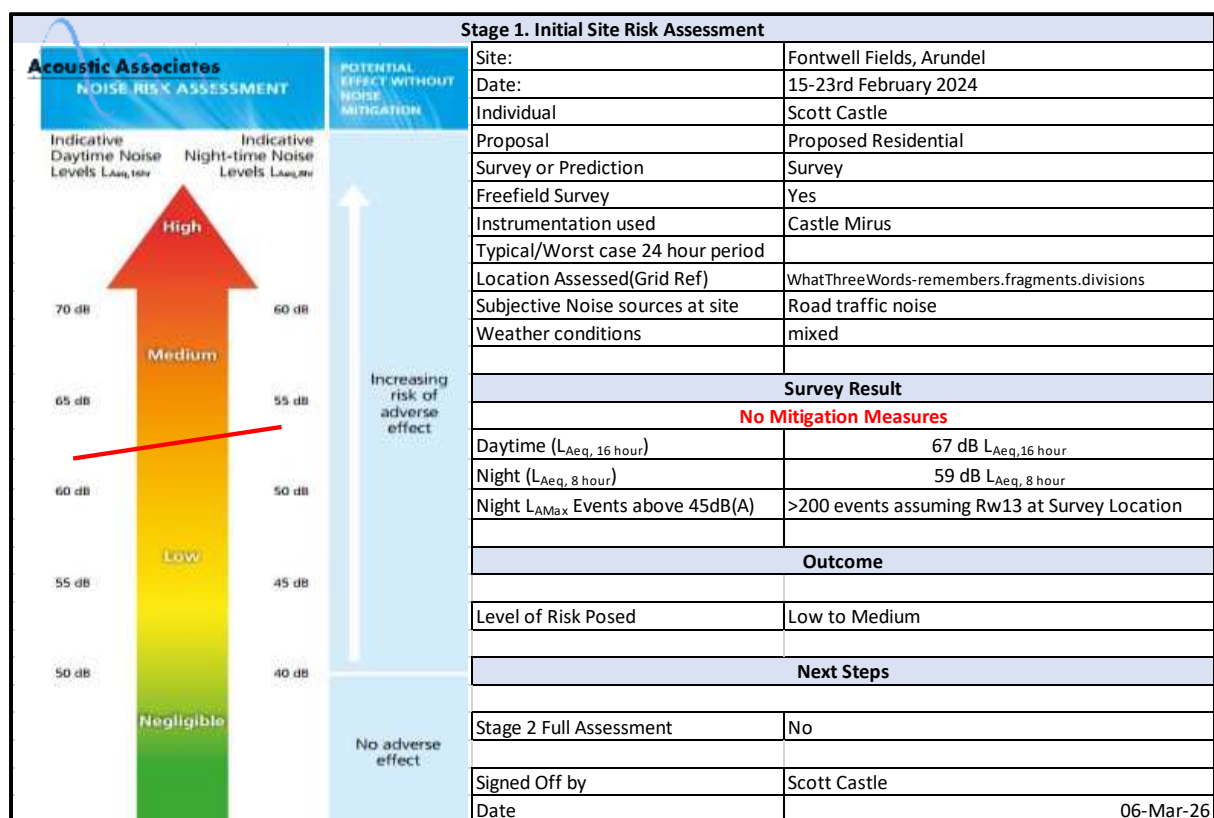


Figure 19. ProPG 2017 Initial Site Risk Assessment

6.5 Rigorous Calculations

Rigorous calculations, as per Annex G2 of BS8233:2014 consider the worst-case measured external (freefield levels) sound pressure level, but rather than using a simplistic external to internal sound pressure level subtraction, the Sound Reduction Index (SRI) is achieved using ratios of window sizes, facades, glazing specification as well as the proposed ventilation considerations. The rigorous calculations have taken account of the following:

- The worst case highest daytime sound pressure levels have been used.
- All rigorous calculations use freefield data.
- The calculations have assumed a masonry cavity wall with inner leaf blockwork.
- The roof has been applied as a pitched roof with tile exterior, with mineral wool and internal plasterboard.
- For the second-floor dormers, these have been modelled separately and attention is drawn to Appendix B for the build ups.
- 35dB $L_{Aeq,16\text{ hour}}$ has been applied as the daytime criteria for a Kitchen/Lounge/Diner
- Calculations have been made for both kitchen living diners as well as the higher specification bedroom spaces.
- The plots examined for rigorous calculations included those with the highest SRI requirements and were as follows Flat 61, Plot 54 (second and first floors), plots 49/50.
- The rigorous calculations undertaken applied MVHR.
- In terms of glazing, this used both Pilkington and Velfac specifications.

Outcomes of Rigorous Calculations							
Plot	Rooms	External SPL	SRI Required	Window	Vent	Internal SPL	SRI Achieved
Flat 61	KLD	62	27	4\12\4	None-MVHR	35	27
Flat 61	Bed	58	31	10\12\4	None-MVHR	26	33
Plot 53/54	Bedroom 1 (Second Floor)	62	34	4\12\8.8	None-MVHR	27	35
Plot 53/54	Bedroom 3 First Floor	61	32	10\12\4	None-MVHR	28	33
Plot 49/50	Bedroom 1 (Second Floor)	62	34	4\12\8.8	None-MVHR	27	35
Plot 49/50	Bedroom 3 First Floor	61	33	10\12\4	None-MVHR	28	33

Figure 20. Rigorous Calculations

7 Recommendations

7.1 Glazing

The assessment demonstrates that there are areas within the development footprint which require enhanced glazing as well as other properties which are more distant from the roadside which will likely warrant standard thermal double glazing.

Whilst Pilkington and Velfac has been used within the calculations, should alternative glazing providers be sought, then the only metric for relevant comparison is that of R_{traffic} or sometimes referred to as $R_w + C_{tr}$ which includes a low frequency correction. The R_{traffic} values are as follows and are A weighted:

Sound Insulation Performance of Window Units			
Brand	Window Specification	R_w	R_{traffic}
Pilkington Double	4\12\4	31	25
Pilkington Double	10\12\4	36	29
Velfac	4\12\8.1	38	33

Figure 21. R_{traffic} of Glazing Values

7.2 Ventilation

The rigorous calculations undertaken considered the worst-case residential units and applied MVHR. It is noted that this is only proposed for plots 4-11 and 47-64.

In considering MVHR, the client should be aware of design criteria listed in the Acoustics, Ventilation and Overheating Guide dated Jan 2020 in 3.3.1:

“Evidence [20] indicates that “a more prudent limit for mechanical services noise around 24 – 26 dB(A) is likely to be required to prevent an adverse reaction from most occupants while falling asleep”. The selection of MVHR units should therefore be as quiet as possible when placed into the residential demise.

It will be important that the Clients M+E Consultant/ventilation engineer is able to advise on any Approved Document F (building regulations) requirements that impact on the proposed ventilation strategy.

7.3 Fencing/Barriers

The model applied a standard 1.8m privacy fence for the majority of the site. The exception being plots 47 and 48 which warranted a higher 2.4m fence as the gardens are closer to the A27. The barrier for the garden section between plots 47 and 48 must have a mass of no less than 12-15kg/m².

7.4 Workmanship – Dormer Cheeks

Some of the properties were noted to have second floor windows which are dormer windows. Being located in the roof void, these do not benefit from the same protection as a masonry cavity wall as the walls are effectively replaced by the roofing construction. Caution should be applied to ensure that the workmanship for the roof area and dormer cheeks is of the highest quality and includes a resilient clip. The full build up is presented in Appendix B.

8 Conclusion

The site was measured over a number of days and nights with a class 1 sound level meter between 15th to 23rd February 2024. The primary sound source is the A27 to the Eastern and Northern site boundaries.

The application submitted is for detailed planning consent and has sought pre-application advice from the local planning authority. Liaison has also been undertaken with the project management team to ensure that good acoustic design has been worked into the layout and design of the properties (see section 2.6).

The worst-case Sound Reduction Index is 34dB for 2nd floor bedrooms (houses) overlooking the A27. For Kitchen Living Diners (houses) the SRI is 26dB. For the flats in closer proximity the worst-case SRI for the bedrooms is 31dB and for the KLD, 27dB.

Rigorous calculations show that enhanced glazing is required for the bedrooms on the first and second floors of the properties closest to the A27. This is in combination with the use of mechanical Ventilation and Heat Recovery to provide ventilation to the units.

Mechanical ventilation for the properties closest to the A27 was selected by the client to ensure that the results of an overheating assessment by Ecolytik are capable of being achieved with trim cooling applied.

An initial site risk assessment for the site, consistent with the approach in ProPG2017 for the highest received sound pressure levels for those properties on the Eastern facade indicates a low to medium risk. A negligible risk is likely for those properties further from the A27 on the Western boundary which will not likely require any mitigation measures.

External amenity areas for the properties have been assessed and the majority are below 55dB $L_{Aeq,16\text{ hour}}$ satisfying the requirements of both BS8233:2014 and WHO Guidelines for Community Noise dated 1999 and 2018(revised). The exception being plots 47-48 which will require a higher barrier to mitigate roadside noise from the A27.

Given the findings above, planning consent should not be withheld on noise grounds.

9 Appendix A – Rigorous Calculations (Worked Examples)

Non Frequency Dependent Variables			Key for Table Below	
Term	Derivation	Value	R _{wi}	Sound Reduction of Window (Octave)
A ₀	Given in BS EN 20140-10 = 10 (m ²)	10	R _{ew}	Sound Reduction Index of External Wall (Octave)
S _f	Total Facade Area (m ²)	24	R _{rr}	Sound Reduction Index of Roof/Ceiling (Octave)
S _{wi}	Window Area (m ²)	5.67	A	Equivalent Absorption Area of Rx Room
S _{ew}	External Wall Area (m ²)	18.33	D _{n,e}	Insulation of Trickle Vent (BS EN 20140-10)
S _{rr}	Ceiling Area (m ²)	23.2		
S	Total Area sound enters the room (m ²)	47.2		

Frequency Dependent Variables							
Term	Description	Octave Band Centre Frequency					
		125	250	500	1000	2000	4000
Leq,ff	Free-Field External Noise Level	64	60	58	58	55	48
D _{n,e}	No Vent	100	100	100	100	100	100
R _{wi}	4 12 4	24	20	25	35	38	35
R _{ew}	Cavity Masonry (Brick Cavity with Insulation lightweight block)	41	39	44	52	60	65
R _{rr}	Tile on Felt, Pitched Roof, 100mm mineral wool on plasterboard ceiling	28	34	43	43	43	43
A	Equivalent Absorption Area of Room (Copied from BS8233)	11.00	14.00	16.00	16.00	15.00	15.00

BS8233 Calculation Details						
Term From Equation Below	Octave Band Centre Frequency					
	125	250	500	1000	2000	4000
Leq,ff	64	60	58	58	55	48
A ₀ /S . 10 [^] (-D _{n,e} /10)	2.12E-11	2.12E-11	2.12E-11	2.12E-11	2.12E-11	2.12E-11
S _{wi} /S . 10 [^] (-R _{wi} /10)	0.000478	0.001201	0.00038	3.8E-05	1.9E-05	3.8E-05
S _{ew} /S . 10 [^] (-R _{ew} /10)	3.08E-05	4.89E-05	1.55E-05	2.45E-06	3.88E-07	1.23E-07
S _{rr} /S . 10 [^] (-R _{rr} /10)	0.000779	0.000196	2.46E-05	2.46E-05	2.46E-05	2.46E-05
10log ₁₀ (S/A)+3	9.325493	8.27814	7.69822	7.69822	7.978507	7.978507
Leq,2	44.42498	39.87935	31.93041	23.83219	19.41914	13.9543
A-Weighting	-16.1	-8.6	-3.2	0	1.2	1
A-Weighted Leq	28.32498	31.27935	28.73041	23.83219	20.61914	14.9543

A-Weighted Level Outside	62
BS8233 Predicted Internal A-Weighted Level	35
Predicted Building Envelope SRI	27

Plot 61 (Living)

BS8233 Calculation can be seen below:

$$L_{eq,2} = L_{eq,ff} + 10 \log_{10} \left(\frac{A_0}{S} 10^{\frac{-D_{n,e}}{10}} + \frac{S_{wi}}{S} 10^{\frac{-R_{wi}}{10}} + \frac{S_{ew}}{S} 10^{\frac{-R_{ew}}{10}} + \frac{S_{rr}}{S} 10^{\frac{-R_{rr}}{10}} \right) + 10 \log_{10} \left(\frac{S}{A} \right) + 3$$

Non Frequency Dependent Variables			Key for Table Below	
Term	Derivation	Value	R _{wi}	Sound Reduction of Window (Octave)
A ₀	Given in BS EN 20140-10 = 10 (m ²)	10	R _{ew}	Sound Reduction Index of External Wall (Octave)
S _r	Total Facade Area (m ²)	6.72	R _{rr}	Sound Reduction Index of Roof/Ceiling (Octave)
S _{wi}	Window Area (m ²)	2.34	A	Equivalent Absorption Area of Rx Room
S _{ew}	External Wall Area (m ²)	4.38	D _{n,e}	Insulation of Trickle Vent (BS EN 20140-10)
S _{rr}	Ceiling Area (m ²)	12.7		
S	Total Area sound enters the room (m ²)	19.42		

Frequency Dependent Variables							
Term	Description	Octave Band Centre Frequency					
		125	250	500	1000	2000	4000
Leq,ff	Free-Field External Noise Level	60	56	54	54	51	44
D _{n,e}	No Vent	100	100	100	100	100	100
R _{wi}	10_12_4	25	22	33	40	43	44
R _{ew}	Cavity Masonry (Brick Cavity with Insulation lightweight block)	41	39	44	52	60	65
R _{rr}	Tile on Felt, Pitched Roof, 100mm mineral wool on plasterboard ceiling	28	34	43	43	43	43
A	Equivalent Absorption Area of Room (Copied from BS8233)	11.00	14.00	16.00	16.00	15.00	15.00

BS8233 Calculation Details						
Term From Equation Below	Octave Band Centre Frequency					
	125	250	500	1000	2000	4000
Leq,ff	60	56	54	54	51	44
A ₀ /S . 10 [^] (-D _{n,e} /10)	5.15E-11	5.15E-11	5.15E-11	5.15E-11	5.15E-11	5.15E-11
S _{wi} /S . 10 [^] (-R _{wi} /10)	0.000381	0.00076	6.04E-05	1.2E-05	6.04E-06	4.8E-06
S _{ew} /S . 10 [^] (-R _{ew} /10)	1.79E-05	2.84E-05	8.98E-06	1.42E-06	2.26E-07	7.13E-08
S _{rr} /S . 10 [^] (-R _{rr} /10)	0.001036	0.00026	3.28E-05	3.28E-05	3.28E-05	3.28E-05
10log ₁₀ (S/A)+3	5.468565	4.421212	3.841292	3.841292	4.12158	4.12158
Leq,2	37.03834	30.62901	17.93347	14.49226	11.03673	3.878564
A-Weighting	-16.1	-8.6	-3.2	0	1.2	1
A-Weighted Leq	20.93834	22.02901	14.73347	14.49226	12.23673	4.878564

A-Weighted Level Outside	58
BS8233 Predicted Internal A-Weighted Level	26
Predicted Building Envelope SRI	33

Plot 61 (Bedroom)

BS8233 Calculation can be seen below:

$$L_{eq,2} = L_{eq,ff} + 10 \log_{10} \left(\frac{A_0}{S} 10^{\frac{-D_{n,e}}{10}} + \frac{S_{wi}}{S} 10^{\frac{-R_{wi}}{10}} + \frac{S_{ew}}{S} 10^{\frac{-R_{ew}}{10}} + \frac{S_{rr}}{S} 10^{\frac{-R_{rr}}{10}} \right) + 10 \log_{10} \left(\frac{S}{A} \right) + 3$$

Non Frequency Dependent Variables			Key for Table Below	
Term	Derivation	Value	R _{wi}	Sound Reduction of Window (Octave)
A ₀	Given in BS EN 20140-10 = 10 (m ²)	10	R _{ew}	Sound Reduction Index of External Wall (Octave)
S _r	Total Facade Area (m ²)	18.96	R _{rr}	Sound Reduction Index of Roof/Ceiling (Octave)
S _{wi}	Window Area (m ²)	3.78	A	Equivalent Absorption Area of Rx Room
S _{ew}	External Wall Area (m ²)	15.18	D _{n,e}	Insulation of Trickle Vent (BS EN 20140-10)
S _{rr}	Ceiling Area (m ²)	0		
S	Total Area sound enters the room (m ²)	18.96		

Frequency Dependent Variables							
Term	Description	Octave Band Centre Frequency					
		125	250	500	1000	2000	4000
Leq,ff	Free-Field External Noise Level	63	59	57	57	54	47
D _{n,e}	No Vent	100	100	100	100	100	100
R _{wi}	10_12_4	25	22	33	40	43	44
R _{ew}	Cavity Masonry (Brick Cavity with Insulation lightweight block)	41	39	44	52	60	65
R _{rr}	Tile on Felt, Pitched Roof, 100mm mineral wool on plasterboard ceiling	28	34	43	43	43	43
A	Equivalent Absorption Area of Room (Copied from BS8233)	11.00	14.00	16.00	16.00	15.00	15.00

BS8233 Calculation Details						
Term From Equation Below	Octave Band Centre Frequency					
	125	250	500	1000	2000	4000
Leq,ff	63	59	57	57	54	47
A ₀ /S . 10 [^] (-D _{n,e} /10)	5.27E-11	5.27E-11	5.27E-11	5.27E-11	5.27E-11	5.27E-11
S _{wi} /S . 10 [^] (-R _{wi} /10)	0.00063	0.001258	9.99E-05	1.99E-05	9.99E-06	7.94E-06
S _{ew} /S . 10 [^] (-R _{ew} /10)	6.36E-05	0.000101	3.19E-05	5.05E-06	8.01E-07	2.53E-07
S _{rr} /S . 10 [^] (-R _{rr} /10)	0	0	0	0	0	0
10log ₁₀ (S/A)+3	5.364456	4.317103	3.737184	3.737184	4.017471	4.017471
Leq,2	36.77837	34.64839	21.93614	14.71457	8.348776	0.150406
A-Weighting	-16.1	-8.6	-3.2	0	1.2	1
A-Weighted Leq	20.67837	26.04839	18.73614	14.71457	9.548776	1.150406

A-Weighted Level Outside	61
BS8233 Predicted Internal A-Weighted Level	28
Predicted Building Envelope SRI	33

Plot 54 (First Floor Bed)

BS8233 Calculation can be seen below:

$$L_{eq,2} = L_{eq,ff} + 10 \log_{10} \left(\frac{A_0}{S} 10^{\frac{-D_{n,e}}{10}} + \frac{S_{wi}}{S} 10^{\frac{-R_{wi}}{10}} + \frac{S_{ew}}{S} 10^{\frac{-R_{ew}}{10}} + \frac{S_{rr}}{S} 10^{\frac{-R_{rr}}{10}} \right) + 10 \log_{10} \left(\frac{S}{A} \right) + 3$$

Non Frequency Dependent Variables			Key for Table Below	
Term	Derivation	Value	R _{wi}	Sound Reduction of Window (Octave)
A ₀	Given in BS EN 20140-10 = 10 (m ²)	10	R _{ew}	Sound Reduction Index of External Wall (Octave)
S _f	Total Facade Area (m ²)	18.72	R _{rr}	Sound Reduction Index of Roof/Ceiling (Octave)
S _{wi}	Window Area (m ²)	3.78	A	Equivalent Absorption Area of Rx Room
S _{ew}	External Wall Area (m ²)	14.94	D _{n,e}	Insulation of Trickle Vent (BS EN 20140-10)
S _{rr}	Ceiling Area (m ²)	0		
S	Total Area sound enters the room (m ²)	18.72		

Frequency Dependent Variables							
Term	Description	Octave Band Centre Frequency					
		125	250	500	1000	2000	4000
Leq,ff	Free-Field External Noise Level	63	59	57	57	54	47
D _{n,e}	No Vent	100	100	100	100	100	100
R _{wi}	10_12_4	25	22	33	40	43	44
R _{ew}	Cavity Masonry (Brick Cavity with Insulation lightweight block)	41	39	44	52	60	65
R _{rr}	Tile on Felt, Pitched Roof, 100mm mineral wool on plasterboard ceiling	28	34	43	43	43	43
A	Equivalent Absorption Area of Room (Copied from BS8233)	11.00	14.00	16.00	16.00	15.00	15.00

BS8233 Calculation Details							
Term From Equation Below	Octave Band Centre Frequency						
	125	250	500	1000	2000	4000	
Leq,ff	63	59	57	57	54	47	
A ₀ /S . 10 [^] (-D _{n,e} /10)	5.34E-11	5.34E-11	5.34E-11	5.34E-11	5.34E-11	5.34E-11	
S _{wi} /S . 10 [^] (-R _{wi} /10)	0.000639	0.001274	0.000101	2.02E-05	1.01E-05	8.04E-06	
S _{ew} /S . 10 [^] (-R _{ew} /10)	6.34E-05	0.0001	3.18E-05	5.04E-06	7.98E-07	2.52E-07	
S _{rr} /S . 10 [^] (-R _{rr} /10)	0	0	0	0	0	0	
10log ₁₀ (S/A)+3	5.309132	4.261778	3.681859	3.681859	3.962146	3.962146	
Leq,2	36.77207	34.64329	21.9195	14.70067	8.343679	0.148283	
A-Weighting	-16.1	-8.6	-3.2	0	1.2	1	
A-Weighted Leq	20.67207	26.04329	18.7195	14.70067	9.543679	1.148283	

A-Weighted Level Outside	61
BS8233 Predicted Internal A-Weighted Level	28
Predicted Building Envelope SRI	33

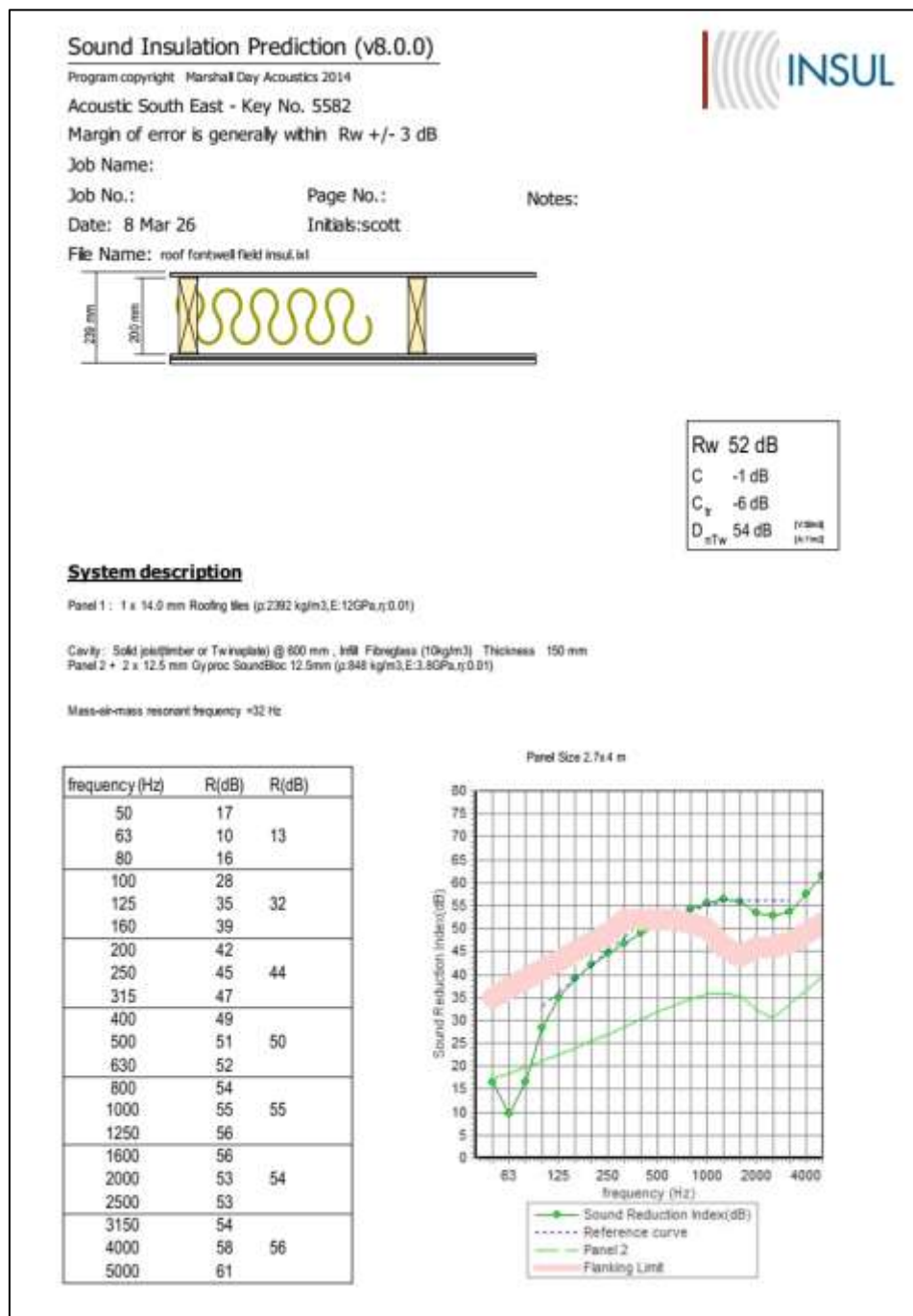
Plot 49/50 (First Floor Bed)

BS8233 Calculation can be seen below:

$$L_{eq,2} = L_{eq,ff} + 10 \log_{10} \left(\frac{A_0}{S} 10^{\frac{-D_{n,e}}{10}} + \frac{S_{wi}}{S} 10^{\frac{-R_{wi}}{10}} + \frac{S_{ew}}{S} 10^{\frac{-R_{ew}}{10}} + \frac{S_{rr}}{S} 10^{\frac{-R_{rr}}{10}} \right) + 10 \log_{10} \left(\frac{S}{A} \right) + 3$$

10 Appendix B – Roof and Dormer Window Build Up

10.1 Roof Build Up



10.2 Dormer Cheeks

Sound Insulation Prediction (v8.0.0)

Program copyright Marshall Day Acoustics 2014

Acoustic South East - Key No. 5582

Margin of error is generally within $R_w \pm 3$ dB

Job Name:

Job No.:

Page No.:

Notes:

Date: 8 Mar 26

Initials:scott

File Name: insul



R_w	48 dB
C	-3 dB
C_{tr}	-10 dB
D_{nTw}	50 dB
	[V: 50m ³] [A: 11m ²]

System description

Panel 1: 1 x 12.0 mm Plywood (ρ :560 kg/m³, E:4.4GPa, η :0.01)

Cavity: Resilient clip or channel @ 600 mm, Infill Fibreglass (10kg/m³) Thickness: 150 mm
Panel 2 + 1 x 15.0 mm Gyproc SoundBloc 15mm (ρ :840 kg/m³, E:3.1GPa, η :0.01)

Mass-air-mass resonant frequency =56 Hz

frequency(Hz)	R(dB)	R(dB)
50	13	
63	6	9
80	11	
100	20	
125	27	23
160	33	
200	38	
250	42	40
315	44	
400	47	
500	49	49
630	52	
800	53	
1000	55	54
1250	55	
1600	54	
2000	49	48
2500	46	
3150	49	
4000	53	52
5000	57	

Panel Size 2.7x4 m

