

Acoustic South East



Reserved Matters Application

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Date: 29/04/2026

Project: J4192

Issue 1

Site: **Land West of Selsfield Road, Ardingly**

Client: **Antler Homes Plc**

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1 Introduction and Executive Summary

Acoustic South East have been appointed to support a reserved matters application being made to Mid Sussex District Council.

Mid Sussex District Council provided outline planning consent for residential dwellings on 8th June 2023 under DM/22/1575. Condition 15 requires a soundproofing scheme to protect residential units from road traffic or other external sound sources.

Standards and guidance referenced for this assessment include:

- BS8233 (Sound insulation and noise reduction for buildings) 2014
- Building Regulations Approved Document O
- ProPG2017 - Professional Practice Guidance on Planning & Noise
- Acoustics Ventilation and Overheating Guidance, 2020.

35 new dwellings are proposed with a reserved matters application. There has been discussion with the client and their design team regarding layout and massing to ensure that where practicable, principles of good acoustic design were capable of being introduced into the final layout. This is discussed in section 2.7 of the reporting.

Noise modelling software was used to provide detailed layered accounts of daytime and night time noise predictions, areas where mitigation measures are likely to be required and also for areas where bedroom windows may be opened during the night to mitigate thermal overheating.

The dominant sound source remains Selsfield Road. However, when there are events taking place at the Ardingly Showground, then inevitably, the showground and the perimeter access road will also contribute to the site soundscape.

Five separate plots were assessed with regards to rigorous calculations which were plots 3,1, 31, 27 and 23 selected on the basis of their exposure to differing sound sources. ie plot 3 for example was exposed only to Selsfield Road, as opposed to plot 27 which would experience showground noise as well as the perimeter access road to the showground (albeit both of these are daytime only sound exposures).

In terms of daytime mitigation measures which are likely to see a configuration above standard thermal double glazing and standard through frame trickle vents, these are likely to be applied to the Eastern Boundary (Selsfield Road Exposure), the Northern Boundary (showground and perimeter access road) and a small area of the Western boundary (See section 3.2). Due to the site massing the plots located within the site are unlikely to require any mitigation measures being applied.

In terms of night time mitigation measures, the only constant sound source occurring during the night time period is that of Selsfield Road which impacts plots 3 to 6 only.

The road traffic noise associated with Selsfield Road will also have an impact on any bedrooms opening windows to mitigate thermal overheating during the night time period. Notwithstanding this, given the first-floor bedrooms overlooking Selsfield Road have a night time noise exposure which exceeds the requirements for a simplified assessment, calculations have been undertaken to determine the potential equivalent opening areas of the window in order that these can be shared with the clients overheating specialists. Bedrooms located on the remainder of the properties and on the rear facades of the roadside properties will be likely to be able to open windows during the night time period.

Garden areas have also been assessed and remain below 55dB $L_{Aeq,16\text{ hour}}$.

Given the information above, sufficient detail has been presented to ensure that future residents remain protected against adverse noise levels and that condition 15 may now be discharged by the local planning authority.

2 Context, Noise Criteria & Noise Assessment Methodology

2.1 Context

Outline planning permission was provided for 35 new build properties by Mid Sussex District Council under consent DM/22/1575 on 8th June 2023.

Specifically, condition 15 which was applied by Environmental Health as technical consultee to the local planning authority which requires a written scheme of soundproofing to ensure that future occupants remain protected against adverse noise levels. For ease of reference, condition 15 is shown below:

15. Soundproofing (Environmental Noise): No development shall take place until a scheme for protecting the residential units from noise generated by road traffic or other external sources, has been submitted to, and approved in writing by, the local planning authority. The scheme shall include an Acoustic Design Statement in line with the recommendations of ProPG: Planning and Noise Professional Practice Guidance on Planning and Noise 2017 and shall ensure that internal and external noise levels are in accordance with BS 8233 2014: Guidance on Sound Insulation and Noise Reduction for Buildings. Noise from individual external events typical to the area shall not exceed 45dB LAmax when measured in bedrooms internally between 23:00 and 07:00 hours post construction unless otherwise agreed in writing with the LPA. Where the internal noise levels will be exceeded by more than 5dB with windows open, then the applicant shall submit details of an alternative means of ventilation with sufficient capacity to ensure the thermal comfort of the occupants with windows closed. Noise levels in gardens and public open spaces shall not exceed 55 dB LAeq 1 hour when measured at any period unless otherwise agreed in writing. All works that form part of the scheme shall be completed before the noise sensitive development is occupied.

The reporting therefore serves to provide the local planning authority a written scheme for protecting future occupants against external sound sources.

2.2 Site Location

The application site is outlined in red below.

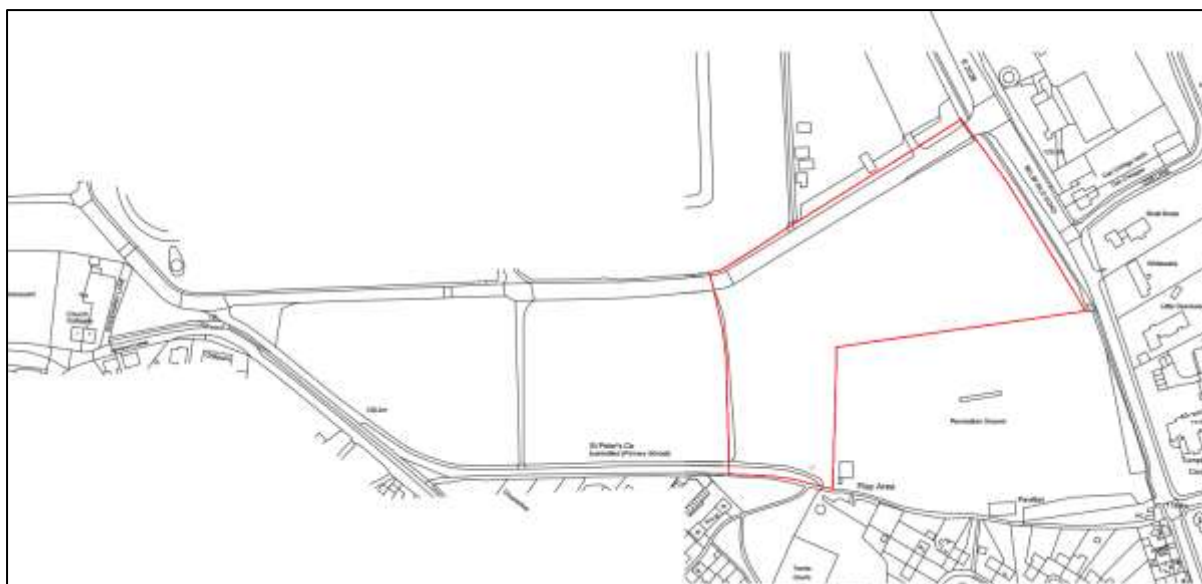


Figure 1. Existing Site

The proposed layout of the building in relation to the remainder of the site can be seen below in Figure 2.



Figure 2. Proposed Layout

2.3 Soundscape

2.3.1 East of Site

Subjectively, to the East of the site, the soundscape is dominated by Selsfield Road, running North to South.

2.3.2 North of Site

The North of the site is delineated by the Southern Showground perimeter road which is lined by trees to the North and South of the road. The site was noted to be very tranquil during the visits made, with dog walkers, walkers and joggers using the site. Dog barking and individuals calling their dogs were noted.

2.3.3 South of site

The South of the site, was also relatively tranquil, however a deliberate visit during a lunch hour for the St Peters Primary School was necessary to determine the noise levels generated by the children playing outside. Again, dog walkers and occasional dog barking was noted.

2.3.4 West of Site

Subjectively, the principal noise source to the West of the site were passing vehicles on Street Lane. In 45 minutes spent monitoring at the Western side of the application site, a number of dog walkers passed, a horse on Street Lane, walkers and 36 vehicles passed. More repetitive dog barking was noted, presumably from a static location further West.

2.3.5 General

The application site is favoured by joggers and dog walkers, the latter of which were noted to park at the highway splay by the South Gate to the Showground, at the North East of the site. Aviation noise was also noted from small aircraft, military helicopters and larger commercial aircraft. At all locations, bird song was noted, although more prominent and noticeable in the quieter areas.

2.4 Previous Acoustic South East Reporting

The outline permission was assessed based on an earlier report dated 27th April 2022, reference J3202.

2.5 Assessment Criteria

The relevant criteria for consideration are included within condition 15 of the decision notice. It is not proposed to present detail on National Planning Policy, as the site has already been granted outline planning consent.

2.5.1 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, typical of that of Selsfield Road.

2.5.2 ProPG2017 – Professional Practice Guidance on Planning & Noise

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.

2.5.3 Building Regulations, 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 $L_{Aeq, 8hour}$
- L_{Amax} events exceed 55dB L_{Amax} more than 10 times a night.

Whilst this is strictly a Building Regulations function, it is relevant to be able to convey to the client whether bedroom windows are likely to be openable during the night time period.

An overheating assessment has been undertaken by NuPlanet on behalf of the client.

2.6 Assessment Methodology

The 2022 Acoustic South East reporting can be seen on the Mid Sussex District Council website in terms of exactly what was measured, the discussion on noise outputs and the creation, calibration and outputs from the noise modelling software. Due to the complexity of the site, it is not proposed to reproduce all of the data here. It is sufficient to state that data from numerous sound sources including the 2019 autumn fair, the Selsfield Road exposure, Street Lane, and the St Peters CoE Primary School were all assessed and used to generate a detailed computer noise model to inform the likely exposure of the 35 proposed properties.

The same worst case noise model inputs have been used, in conjunction with liaison with the client to ensure that good acoustic design has been incorporated into the final design.

2.7 Good Acoustic Design

It is noted that through discussions with the client, a revised layout has been produced which represents good acoustic design. This is especially noticeable when compared to the 2022 reporting. In particular this sees a more structured and linear massing on the Western (Selsfield Road) and northern (perimeter Road) boundaries with a view to protecting the remainder of the site layout from noise ingress.



Figure 3. Comparison of 2022 and 2026 Layouts

3 Noise Modelling

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. IMMI faithfully implements the propagation method of ISO-9613:1996; Acoustics – Attenuation of sound during propagation outdoors. Scaled plans as well as laser measurements on site have been used to ensure that the buildings were representative within the model.

3.1 Noise Model Inputs

Care has been taken to model the site, surrounding buildings and sound sources as accurately as possible. The model defaults to hard ground when considering propagation and this has been left in, as with water logged soft ground during the winter, this will allow less absorption and presents a robust report. Vegetation up to 1.5m has also been added onto the Eastern boundary and the site contoured as accurately as possible.

In terms of the Showground as an area source, and the Perimeter Road, which are capable of operating independently of one another (i.e. exhibitors setting up prior to events). A line source calibrated to 70dB(A) (the worst measured hour) at the survey position LT1 to represent the perimeter road. The show ground was represented by an area source calibrated to 63dB $L_{Aeq,13hour}$ (the period the event took place on Sunday 6th) at the survey position LT1.

The school playground has been calibrated to 64dB $L_{Aeq, 10minutes}$

Selsfield Road has been calibrated as a line source to 63.1dB $L_{Aeq, 16 hour}$ and 54.8dB $L_{Aeq, 8 hour}$ at the LT2 position.

Street Lane has been calibrated as a line source to 57dB $L_{Aeq, 16 hour}$ and 47dB $L_{Aeq, 8 hour}$ at the LT3 position.

Houses and garages have been entered at heights consistent with the architects' plans.

No external boundaries or mitigation measures have been applied.

Five separate properties have been selected due to their close proximity to different sound sources to enable a worst-case assessment and for detailed calculations to be run. These are Plot 3 (Selsfield Road), Plot 1 (Selsfield and Perimeter Road), Plot 31 (Perimeter Road and Showground), Plot 27 (Perimeter and Showground) and Plot 23 (Showground). These are reviewed in turn.

Receptor positions were added to replicate ground floor and first floor windows at 1.5m and 4.5m above ground level on relevant facades to reflect the floorplans of the properties.

No on time corrections have taken place. For example, the school does not have children playing all day long, however it might be reasonable to consider either a worst-case hour or an on-time correction at the receptor location.

Garden privacy fences have been modelled at 1.8m in height in respect of the all of properties.

The model was run with a 1m grid and 1.5m in height to accurately detail how and where the sound pressure levels on the site change.

3.2 Noise Model Outputs

A number of 2D noise models have been created to show visually the site soundscape and any site-specific constraints. For the daytime and night-time models (Figs. 4 & 5) these show the site and the colour contours and how these change.

For the daytime, a daytime mitigation measures plot has been produced (Fig 7). These use a 21dB figure from the Acoustics Ventilation and Overheating Guidance dated 2020 for the level difference between outside to inside with standard thermal double glazing and standard trickle vents applied. Given the internal sound pressure level to be achieved is 35dB, then a 21dB difference for the daytime would provide for an external noise contour of 56dB $L_{Aeq,16\text{ hour}}$.

For the night time period, the internal sound pressure level to be achieved is less than 30, therefore for a 21dB increase to account for standard mitigation measures, this would be an external noise contour for the night time period (ie 23:00-07:00 hours) of 51dB $L_{Aeq,8\text{ hours}}$. (Fig.8)

To determine the areas where a simplified overheating assessment might be permissible, a night time noise contour of 50dB $L_{Aeq,8\text{ hour}}$ has been created (Fig.9). This, shows areas where an open window with a 10dB reduction (ANC Approved Document O, Noise Guide, version 1.1 2024) will achieve the Building regulations Approved Document O target of 40dB $L_{Aeq,8\text{ hour}}$ internally.

To determine the feasibility of external amenity areas, three noise contours have been applied, with noise levels below 50dB $L_{Aeq,16\text{ hour}}$, 50-55dB $L_{Aeq,16\text{ hour}}$ and above 55dB $L_{Aeq,16\text{ hour}}$ (Fig.6).

It is also recognised that condition 15 contains a specific reference to “where the internal noise levels will be exceeded by more than 5dB with windows open, the applicant shall submit details an alternative means of ventilation with sufficient capacity to ensure the thermal comfort of the occupants with windows closed”. Given that the daytime internal sound pressure level is taken to be 35dB $L_{Aeq,16\text{ hour}}$, a 5dB exceedance would be 40dB internally. With a 13dB for an open window, as per AVOG,2020, this would account for an external sound pressure level of 53dB $L_{Aeq,16\text{ hour}}$. The noise model has therefore been used to show where 53dB $L_{Aeq,16\text{ hour}}$ occurs (Fig.10).

Whilst it is appreciated that the 2D model contours provide a succinct identification of noise concerns, tabulated data with actual decibels are presented in section 5.1.

3.2.1 Daytime

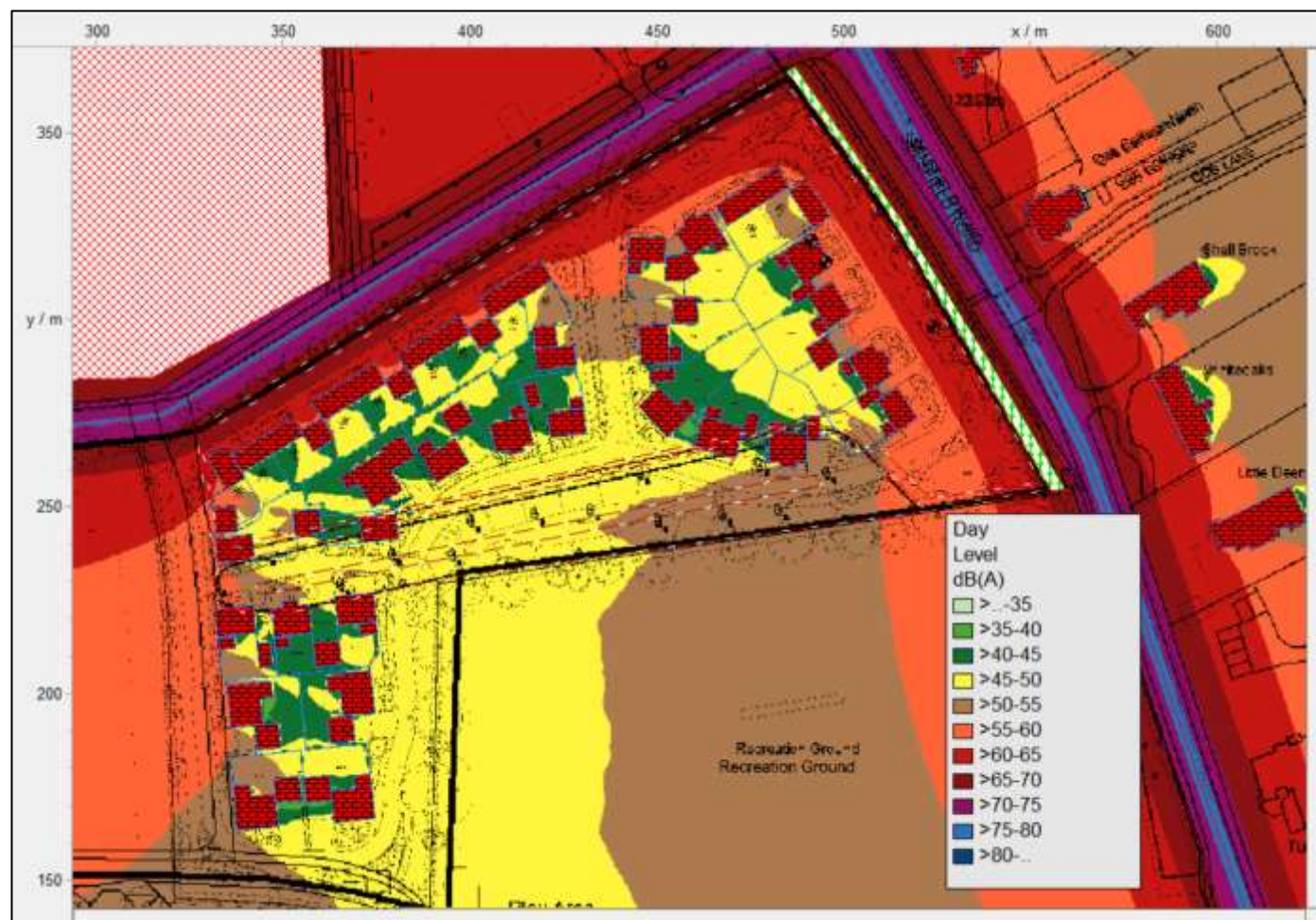


Figure 4, Daytime Noise Contours, L_{Aeq} , 16 hour

3.2.2 Night Time

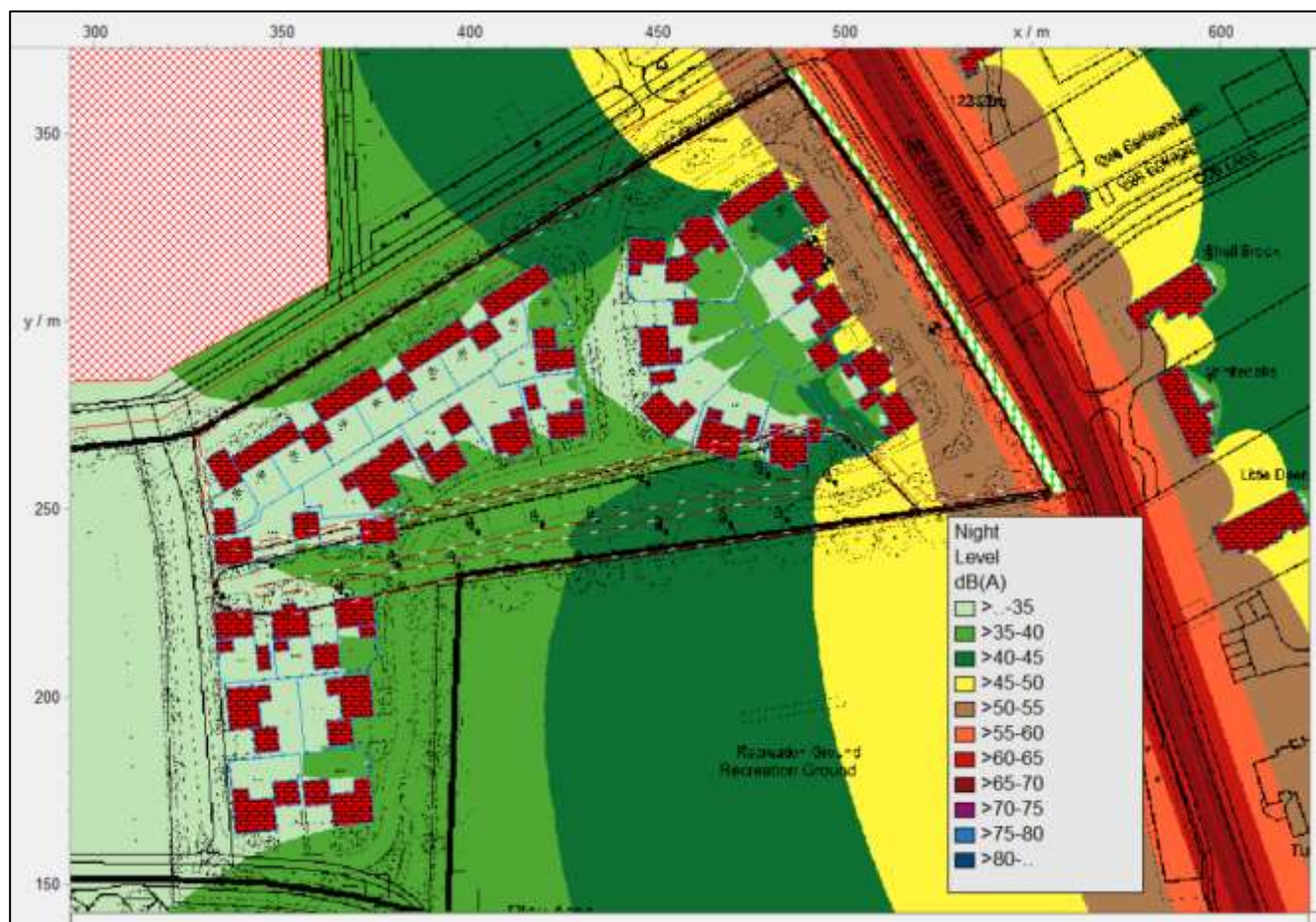


Figure 5. Night Time Noise Contours L_{Aeq} , 8 hour

3.2.3 External Amenity Areas/Garden Areas

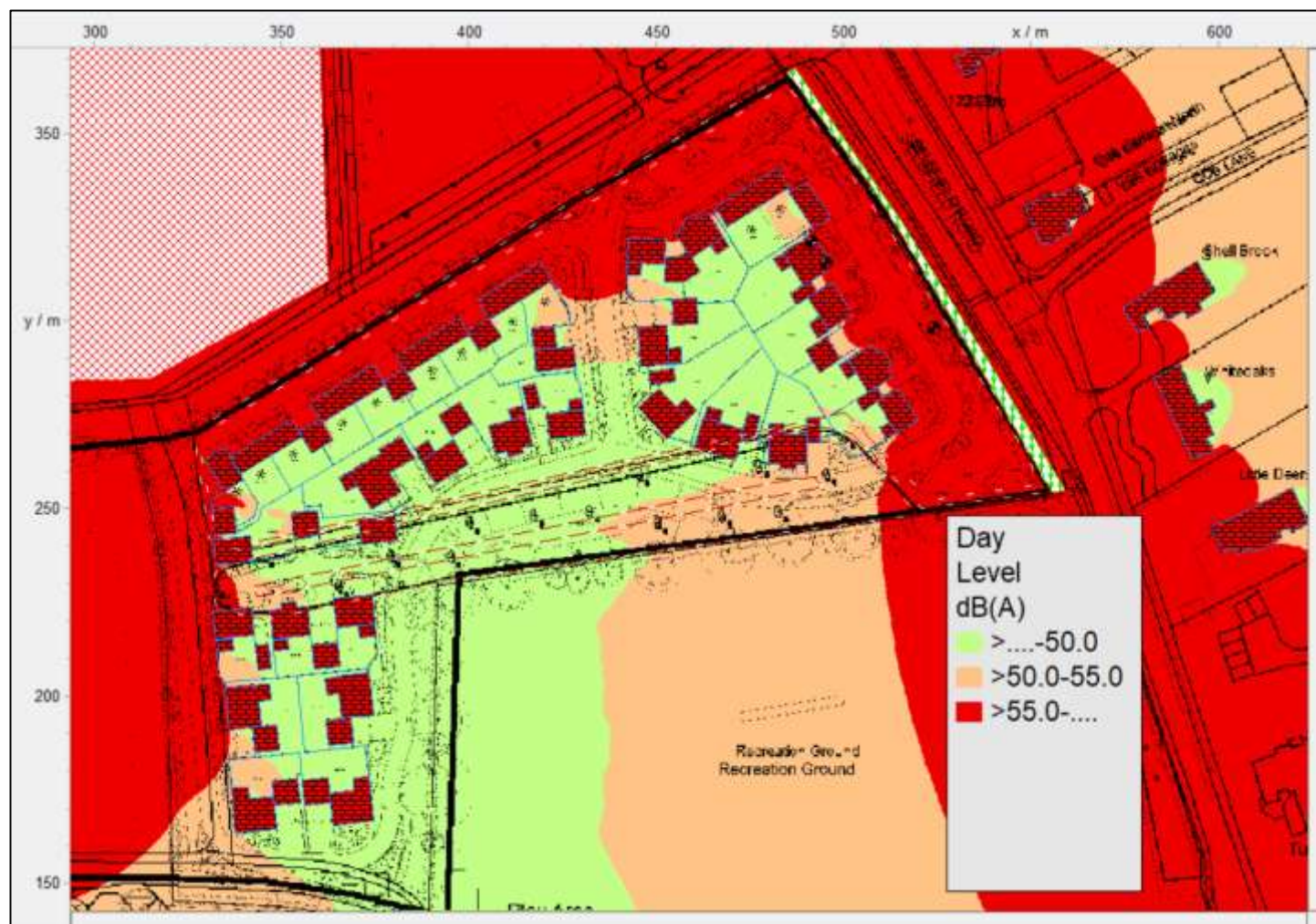


Figure 6. Garden Areas with below 50, 50-55 and 55dB L_{Aeq}

3.2.4 Daytime Mitigation Measures

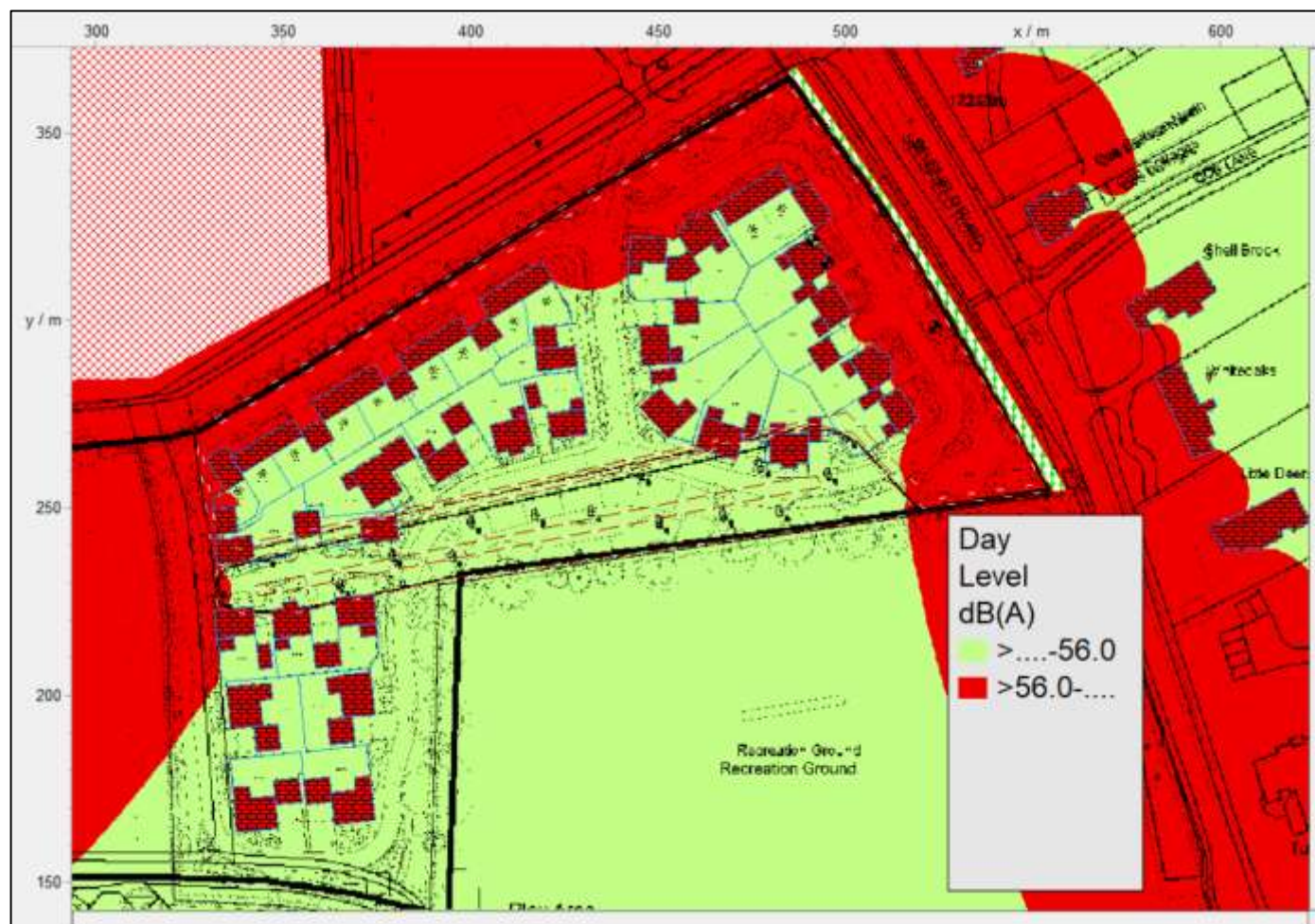


Figure 7. Areas where a Sound Reduction Index is likely to exceed 21dB for the Daytime Period

3.2.5 Night Time Mitigation Measures



Figure 8. Areas where a Sound Reduction Index is likely to exceed 21dB for the Night Time Period

3.2.6 Approved Document O – Simplified Overheating Assessment



Figure 9. 2D Noise Contour Showing Night Time Exceedance of 50dB $L_{Aeq,8 \text{ hour}}$

3.2.7 Open Windows

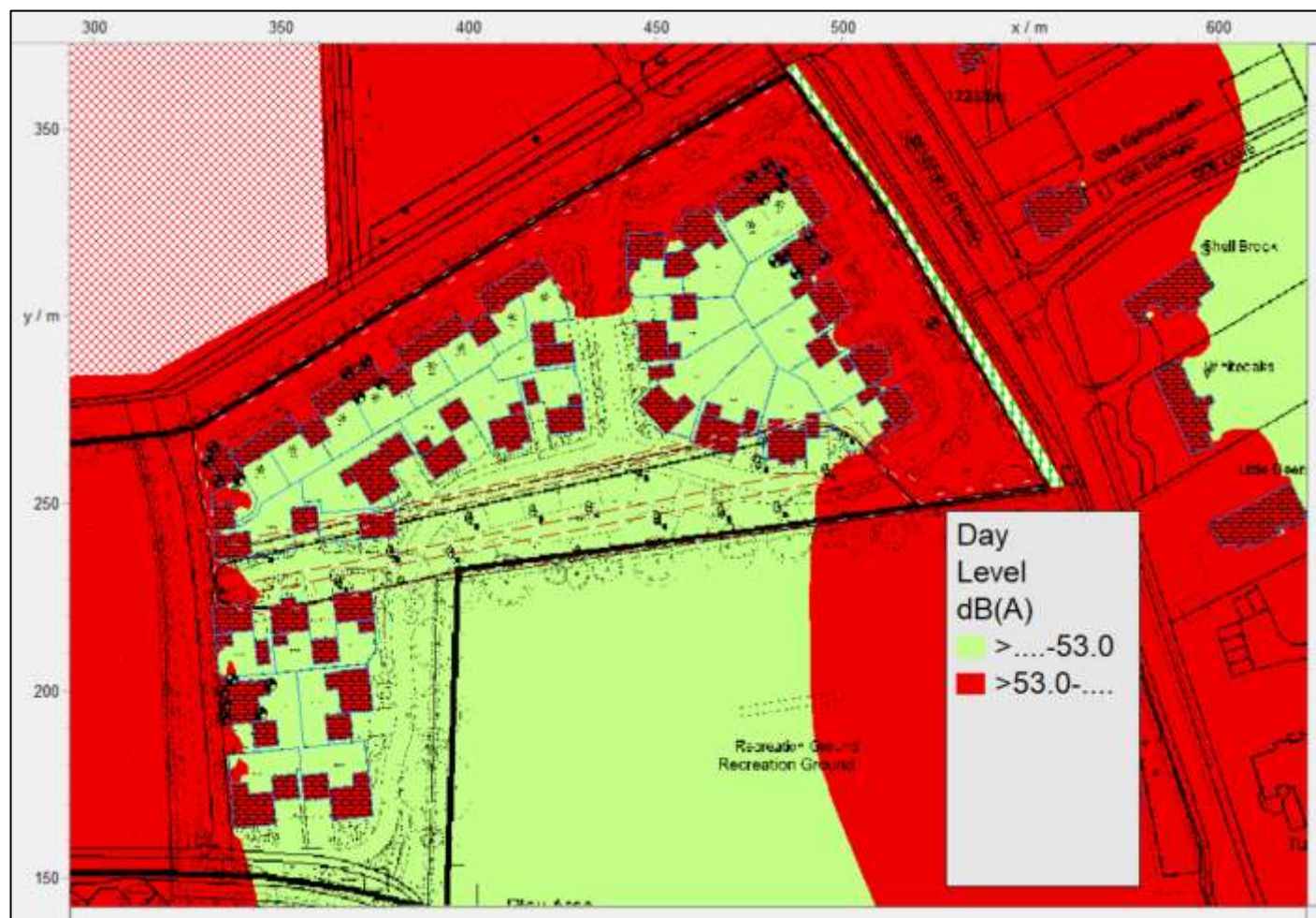


Figure 10. 2D Noise Contour showing Areas likely to exceed internal noise levels by more than 5dB with an Open Window

3.2.8 Outcomes of the Noise Modelling Process

The noise modelling shows as follows:

- The dominant sound sources for the daytime are Selsfield Road to the Eastern boundary, the Perimeter Road on the Northern boundary and the Showground to the North.
- For the night time period, ie 23:00-07:00 hours, Selsfield Road remains the dominant sound source.
- For the daytime period, mitigation measures above standard thermal double glazing and trickle vents are likely for the Selsfield Road, the northern perimeter road and the Western boundary
- In terms of night time and opening of bedroom windows to mitigate thermal overheating, the roadside properties overlooking Selsfield Road will be unlikely to have a simplified assessment undertaken due to the elevated noise levels above 50dB $L_{Aeq,8}$ hour.
- External amenity areas/gardens are shown as below 55dB $L_{Aeq,16}$ hour.
- As per condition 15, the modelling shows that open windows are not likely to be relied upon around the site perimeter, this will be discussed further.

4 Discussion

4.1 Calculation of the Sound Reduction Index (SRI)

By being aware of how the soundscape impacts the proposed property, the Sound Reduction Index (SRI) can be calculated.

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 $L_{Aeq,T}$. Additionally, 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.

As stated, a detailed assessment has been made of 5 separate plots to review their noise exposure. These are plots 3, 1, 31, 27 and 23.

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 6 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 has been used to assess night time data and L_{Amax} considerations. The SRI considerations have been considered for all facades.

It is relevant to note that the predictions are based on the worst-case daytime and night time sound pressure levels being used to ensure that residents remain protected from adverse noise levels.

4.1.1 Living Rooms

Kitchen/Living/Diners				
Plot Number	Floor	Room Type	Daytime External SPL	SRI Required
3	Ground	GF Study	55	20
3	Ground	GF Sitting	57	22
3	Ground	Rear GF Dinin	44	9
3	Ground	Rear GF KLD	43	8
1	Ground	GF Sitting	60	25
1	Ground	GF Sitting 2	58	23
1	Ground	GF Sitting3	52	17
1	Ground	GF KLD Front	59	24
1	Ground	KLD rear	49	14
31	Ground	Plot 31 GF Kitchen	63	28
31	Ground	Plot 31 GF Sitting	63	28
31	Ground	Plot 31 rear GF sitt	46	11
31	Ground	Plot 31 GF Rear Dine	45	10
27	Ground	Plot 27 GF Sitting	62	27
27	Ground	Plot 27 GF Kitchen	59	24
23	Ground	Plot 23 GF Study	56	21
23	Ground	Plot 23 GF Study(2)	52	17
23	Ground	Plot 23 KLD	55	20
23	Ground	Plot 23 Rear KLD	40	5

Figure 11. Assessment of the Living Rooms/Habitable Rooms Sound Reduction Index(SRI)

4.1.2 Bedrooms

Bedroom SRI							
Plot Number	Floor	Daytime SPL	Night Time SPL	SRI Day	SRI Night	SRI Night L _{Amax}	SRI to Apply
3	Plot 3 Bed 1	59.4	51.8	24.4	21.8	25	25
3	Plot 3 Bed 2	57.8	50.1	22.8	20.1	23	23
3	Plot 3 Rear FF Bed3	49.1	34.0	14.1	4.0	6	14
3	Plot 3 Bedroom 4 FF	48.1	34.1	13.1	4.1	6	13
1	Bed1(2)	60.8	51.7	25.8	21.7	25	26
1	Bed1(1)	61.9	49.4	26.9	19.4	23	27
1	Bed2	61.4	47.7	26.4	17.7	21	26
1	Rear Bed3	52.1	44.2	17.1	14.2	17	17
31	FF Bed 1	64.9	36.3	29.9	6.3	20	30
31	FF Bed 1(2)	48.5	28.9	13.5	-1.1	13	14
31	FF Bed2	65.0	35.9	30.0	5.9	20	30
31	FF Rear Bed3	46.9	31.5	11.9	1.5	15	15
27	FF Bed1	62.8	24.2	27.8	-5.8	8	28
27	FF Bed 2	60.8	24.2	25.8	-5.8	8	26
27	FF Bed 3	49.0	32.8	14.0	2.8	17	17
27	FFBed 1(2)	65.4	34.1	30.4	4.1	18	30
23	FF Bed3	56.1	23.5	21.1	-6.5	7	21
23	FF Bed5	55.9	23.3	20.9	-6.7	7	21
23	Rear Bed 1	43.5	34.0	8.5	4.0	18	18
23	Rear FF Bed2	44.5	31.9	9.5	1.9	16	16
23	SF Bed 4	56.4	24.9	21.4	-5.1	9	21

Figure 12. Assessment of the Living Rooms/Habitable Rooms Sound Reduction Index(SRI)

4.1.3 SRI Outcomes

From Figures 11 and 12 above, it is apparent that the maximum SRI for living rooms is 28dB and for bedrooms, 30dB. These are above the typical 21dB level difference as indicated in Figure 13 below, meaning that either enhanced acoustic vents and/or enhanced glazing will be required to protect future occupants.

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 13. Table B-2 From Acoustics Ventilation and Overheating Guidance, 2020

4.2 Consideration of External Amenity Areas

Both BS8233:2014 and ProPG require no greater than an upper external amenity level of 55dB $L_{Aeq,16 \text{ hour}}$. It is noted that condition 15 also requires no greater than 55dB $L_{Aeq,1 \text{ hour}}$.

It is noted that the model has been run with all sound sources active and simultaneous, ie the showground, school, perimeter road and Selsfield Road and also a worst-case day and night have been calibrated to ensure a robust assessment.

Therefore, the use of the worst-case data means that the 55dB $L_{Aeq,1 \text{ hour}}$ criterion has been achieved.

To reinforce the 2D noise contour plot for external amenity areas, a receptor position located at 1.5m above ground level was placed into each garden to provide a definitive account of the garden exposures. These are presented in Figure 14 below.

Location	Predicted External SPL (Freefield)	Location	Predicted External SPL (Freefield)
Plot 1 Garden	50.9	Plot 19 Garden	46.0
Plot 2 Garden	48.1	Plot 20 Garden	45.1
Plot 3 Garden	44.9	Plot 21 Garden	46.4
Plot 4 Garden	45.6	Plot 22 Garden	51.8
Plot 5 Garden	47.5	Plot 23 Garden	41.1
Plot 6 Garden	50.2	Plot 24 Garden	50.3
Plot 7 Garden	45.5	Plot 25 Garden	41.1
Plot 8 Garden	44.1	Plot 26 Garden	49.8
Plot 9 Garden	43.5	Plot 27 Garden	50.8
Plot 10 Garden	45.7	Plot 28 Garden	44.3
Plot 11 Garden	46.5	Plot 29 Garden	44.5
Plot 12 Garden	48.8	Plot 30 Garden	46.7
Plot 13 Garden	45.1	Plot 31 Garden	44.2
Plot 14 Garden	43.0	Plot 32 Garden	45.0
Plot 15 Garden	45.0	Plot 33 Garden	43.8
Plot 16 Garden	44.6	Plot 34 Garden	48.2
Plot 17 Garden	45.7	Plot 35 Garden	51.4
Plot 18 Garden	42.3		

Figure 14. Assessment of Garden Spaces

4.3 Building Regulations Approved Document O – Overheating

As discussed in section 2.5.3 above, the Approvement Document O considers whether bedroom windows may be opened during the night time period, specifically to mitigate thermal overheating. There are two variables to consider and these include both continuous sound and L_{Amax} events. 10dB is taken as loss of sound energy through an open window for overheating.

The internal sound pressure level $L_{Aeq,8\text{ hour}}$ cannot be above 40dB and there must be no more than 10 events per night above 55dB L_{Amax} inside the bedroom space. Both criteria must be satisfied to allow an openable window.

However, the simplified method may only be carried out where the night time soundscape is below 50dB $L_{Aeq,8\text{ hour}}$. In reviewing Figure 9, it is clear that the first-floor bedrooms overlooking Selsfield Road are likely to exceed 50dB $L_{Aeq,8\text{ hour}}$ and a simplified assessment may not be appropriate.

It is however possible to carry out a prediction of openable areas of the windows overlooking Selsfield Road using the guidance from the Association of Noise Consultants dated November 2024 for overheating. These demonstrate the following and could be considered by the client in association with other methods to control overheating in bedrooms.

It is relevant to observe that whilst the bedrooms overlooking Selsfield Road have an increased night time exposure, those bedrooms located on the rear of the facades are likely to be able to open windows and attention is drawn to Figure 15 below.

Assessment of Bedroom Overheating - Simplified Assessment									
Plot Reference	Bedroom	Area	volume	External SPL	Openable Window $L_{Aeq,8 \text{ hour}}$	Openable Window $L_{A\text{Max}}$	Window Openable to Mitigate Thermal Overheating	DnTw to achieve 40dB $L_{Aeq,8 \text{ hour}}$ Internally	EA for Openable Window (m ²)
Plot 3	Bedroom 1	15.8	37.92	51.8	No	No	No	11.8	0.40
	Bedroom 2	10.3	24.72	50.1	No	No	No	10.1	0.38
	Bedroom 3	10.16	24.384	34	Yes	Yes	Yes		
	Bedroom 4	8.44	20.256	34.1	Yes	Yes	Yes		
Plot 1	Bedroom 1	16.56	39.744	49.4	Yes	No	No	9.4	0.72
	Bedroom 1(2)	16.56	39.744	51.7	No	No	No	11.7	0.43
	Bedroom 2	8.01	19.224	47.7	Yes	Yes	Yes		
	Bedroom 3	7.69	18.456	44.2	Yes	Yes	Yes		
Plot 31	bedroom 1	16.48	39.552	36.3	Yes	Yes	Yes		
	bedroom 1(2)	16.48	39.552	28.9	Yes	Yes	Yes		
	bedroom 2	8.01	19.224	35.9	Yes	Yes	Yes		
	bedroom 3	7.69	18.456	31.5	Yes	Yes	Yes		
Plot 27	Bedroom 1	16.56	39.744	24.2	Yes	Yes	Yes		
	Bedroom 1(2)	16.56	39.744	34.1	Yes	Yes	Yes		
	Bedroom 2	8.01	19.224	24.2	Yes	Yes	Yes		
	Bedroom 3	7.69	18.456	32.8	Yes	Yes	Yes		
Plot 23	Bedroom 1	17.05	40.92	34	Yes	Yes	Yes		
	Bedroom 2	14.07	33.768	31.9	Yes	Yes	Yes		
	Bedroom 3	12.22	29.328	23.5	Yes	Yes	Yes		
	Bedroom 4	14.17	34.008	24.9	Yes	Yes	Yes		
	Bedroom 5	11.63	27.912	23.3	Yes	Yes	Yes		

Figure 15. Approved Document O (Overheating Assessment) of Bedrooms

In terms of context and understanding the amount of openable window in the last column of Figure 15 above, these are presented in m². For comparison, a standard through frame small slot trickle vent is approximately 2500mm². This equates to 0.0025m². Therefore, an openable window in Figure 15 of any less than this will not be practical. The data should be shared with your M+E/overheating consultant.

The calculations show that the bedroom windows for Plot 3 which directly overlook Selsfield Road, will not likely be openable during the night time period to mitigate thermal overheating.

Plot 3 was selected on the basis of its proximity and the results obtained will equally apply to plots 4, 5 and 6 as roadside plots. It is relevant to note that whilst the bedrooms overlooking the road may not be openable, the rear bedrooms, ie plot 3 (bedrooms 3 and 4) would be openable in order to mitigate thermal overheating.

Overheating assessments are not carried out for ground floor windows as these are not openable on safety or security grounds. This report is not a formal/dynamic overheating risk assessment.

4.4 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 and tiled roof
- 35dB $L_{Aeq,16\text{ hour}}$ has been applied as the daytime criteria for a bedroom setting
- The calculations have used passive through wall vents sized for living rooms and bedrooms accordingly.
- It should be noted that when calculating L_{Amax} events for bedrooms, these take into account the requirements of ProPG2017 in that there are no more than 10 events per night
- The full calculations can be seen in Appendix A.

Outcomes of Rigorous Calculations							
Plot	Rooms	External SPL	SRI Required	Window	Vent	Internal SPL	SRI Achieved
Plot 3	Bedroom 1	59.4	25	4\12\4	2x Greenwood 5000	32	27
Plot 3	Bedroom 2	57.8	23	4\12\4	2x Greenwood 5000	31	27
Plot 3	Bedroom 3	49.1	14	4\12\4	2x Greenwood 5000	23	27
Plot 3	Bedroom 4	48.1	13	4\12\4	2x Greenwood 5000	21	27
Plot 3	Sitting Room	57	22	4\12\4	Ryton 9x9 Airliner	28	29
Plot 3	Sitting Room	57	22	4\12\4	2x Greenwood 5000	30	27
Plot 3	Study	55	20	4\12\4	2x Greenwood 5000	28	27
Plot 1	Sitting Room	60	25	4\12\4	Ryton 9x9 Airliner	30	30
Plot 1	Kitchen	59	24	4\12\4	Ryton 9x9 Airliner	29	30
Plot 1	Bedroom 1	62	27	10\12\6	Ryton AAC125HP LookRyt	31	31
Plot 1	Bedroom 2	61	26	4\12\4	Ryton AAC125HP LookRyt	29	32
Plot 31	Sitting Room	63	28	10\12\6	Ryton 9x9 Airliner	31	32
Plot 31	Kitchen	63	28	10\12\6	Ryton 9x9 Airliner	31	32
Plot 31	Bedroom 1	65	30	10\12\6	Ryton AAC125HP LookRyt	33	32
Plot 31	Bedroom 2	65	30	10\12\6	Ryton AAC125HP LookRyt	31	34
Plot 27	Kitchen/Diner	59	24	10\12\4	Ryton 9x9 Airliner	30	29
Plot 27	Sitting Room	62	27	10\12\6	Ryton 9x9 Airliner	31	31
Plot 27	Bedroom 1	65.4	30	10\16\12.8	Ryton AAC125HP LookRyt	33	32
Plot 27	Bedroom 2	60.8	26	10\12\4	Ryton AAC125HP LookRyt	28	33
Plot 27	Bedroom 3	49	17	4\12\4	2x Greenwood 5000	22	27
Plot 23	Study	56	21	4\12\4	2x Greenwood 5000	30	26
Plot 23	Breakfast/KLD	55	20	4\12\4	Ryton 9x9 Airliner	29	26
Plot 23	Bedroom 3	56.1	21	4\12\4	2x Greenwood 5000	29	27
Plot 23	Bedroom 5	56	21	4\12\4	2x Greenwood 5000	29	27

Figure 16. Outcomes of Rigorous Calculations

For the roadside, ie plot 3, the assessment has reported the predicted internal sound pressure levels and the resulting Sound Reduction Index, consistent with the Table 4 requirements from BS8233:2014.

For the remainder of the plots, where possible/practicable, the internal sound pressure levels have sought to achieve 30dB or less, or alternatively the required Sound Reduction Index (SRI) be exceeded by 5dB to account for the fact that the soundscape may not necessarily be continuous and anonymous. This represents good practice albeit it is noted that the model was run with all scenarios operating.

4.5 Open Windows (Condition 15)

As discussed, condition 15 makes reference to open windows.

Whilst windows may be opened for short term purge ventilation (see below), they should not be relied upon for long term background ventilation.

Notwithstanding the above, it is vitally important that all windows are capable of being opened to provide future residents with a connection to the external environment and to allow for purge ventilation, ie the removal of burnt toast smell for example.

5 Recommendations

5.1 Glazing

Whilst Pilkington glass has been used for the assessment, the R_{traffic} or R_w+C_{tr} has been provided below to allow the end builder to compare against other glazing manufacturers. For the avoidance of doubt, the only comparable metric between glazing companies is the R_{traffic} or R_w+C_{tr} value as this allows for a low frequency correction.

As stated, it is a reasonable assumption that Plot 3 calculations will also apply to plots 4-6.

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
Pilkington Double	10\12\6	38	32
Pilkington Double	10\16\12.8	44	39

Figure 17. Glazing Specification

N.B. This is the required R_w+C_{tr} of the frame and glazing together. If the glazing supplier has test results for the glass on its own an R_w+C_{tr} value 2-3dB higher would be required (glazing tested on its own will outperform glazing that is tested within a window frame). Please note R_w+C_{tr} is also referred to as R_{traffic} .

5.2 Ventilation

The assessment has used passive through frame or through wall vents and the sizing is dependent on the room type. The Ryton AAC125HP LookRyt vent used for the bedrooms has an openable area of 8500mm² and has a $D_{new}+C_{tr}$ of 41dB(A)

The Rytons 9x9 Airliner used for the living room space has an openable area of 12800mm² and has a $D_{new}+C_{tr}$ value of 37dB(A).

As with windows, when selecting comparable ventilation options in due course, the only comparable metric is $D_{new}+C_{tr}$ and the vent data MUST be taken from the test data in the OPEN position.

6 Conclusion

35 new dwellings are proposed with a reserved matters application. There has been discussion with the client and their design team regarding layout and massing to ensure that where practicable, principles of good acoustic design were capable of being introduced into the final layout. This is discussed in section 2.7 of the reporting.

Noise modelling software was used to provide detailed layered accounts of daytime and night time noise predictions, areas where mitigation measures are likely to be required and also for areas where bedroom windows may be opened during the night to mitigate thermal overheating.

The dominant sound source remains Selsfield Road, albeit when there are events taking place at the site, then the perimeter road and the showground also contribute to the site soundscape.

Five separate plots were assessed with regards to rigorous calculations which were plots 3,1, 31, 27 and 23 selected on the basis of their exposure to differing sound sources. I.e plot 3 for example was exposed only to Selsfield Road, as opposed to plot 27 which would experience showground noise as well as the perimeter access road to the showground (albeit both of these are daytime only sound exposures).

In terms of daytime mitigation measures which are likely to see a configuration above standard thermal double glazing and standard through frame trickle vents, these are likely to be applied to the Eastern Boundary (Selsfield Road Exposure), the Northern Boundary (showground and perimeter access road) and a small area of the Western boundary (See section 3.2). Due to the site massing the plots located within the site are unlikely to require any mitigation measures being applied.

In terms of night time mitigation measures, the only constant sound source occurring during the night time period is that of Selsfield Road which impacts plots 3 to 6 only.

The road traffic noise associated with Selsfield Road will also have an impact on any bedrooms opening windows to mitigate thermal overheating during the night time period. Notwithstanding this, given the first-floor bedrooms overlooking Selsfield Road have a night time noise exposure which exceeds the requirements for a simplified assessment, calculations have been undertaken to determine the potential equivalent opening areas of the window in order that these can be shared with the clients overheating specialists. Bedrooms located on the remainder of the properties and on the rear facades of the roadside properties will be likely to open windows during the night time period.

Garden areas have also been assessed and remain below 55dB $L_{Aeq,16\text{ hour}}$.

Given the information above, sufficient detail has been presented to ensure that future residents remain protected against adverse noise levels and that condition 15 may now be discharged by the local planning authority.

7 Appendix A- Rigorous Calculations

Non Frequency Dependent Variables			Key for Table Below	
Term	Derivation	Value	R _{wi}	Sound Reduction of Window (Octave)
A _o	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)	17.76	R _{rr}	Sound Reduction Index of Roof/Ceiling (Octave)
S _{wi}	Window Area (m ²)	1.44	A	Equivalent Absorption Area of Rx Room
S _{ew}	External Wall Area (m ²)	16.32	D _{n,e}	Insulation of Trickle Vent (BS EN 20140-10)
S _{rr}	Ceiling Area (m ²)	15.64		
S	Total Area sound enters the room (m ²)	33.4		

Frequency Dependent Variables							
Term	Description	Octave Band Centre Frequency					
		125	250	500	1000	2000	4000
Leq,ff	Free-Field External Noise Level	60.4	56.4	54.4	54.4	51.4	44.4
D _{n,e}	2x Greenwood 5000	36.5	34.3	32.5	29	28	30.5
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	60.4	56.4	54.4	54.4	51.4	44.4
A _o /S . 10 [^] (-D _{n,e} /10)	6.7E-05	0.000111	0.000168	0.000377	0.000475	0.000267
S _{wi} /S . 10 [^] (-R _{wi} /10)	0.000172	0.000431	0.000136	1.36E-05	6.83E-06	1.36E-05
S _{ew} /S . 10 [^] (-R _{ew} /10)	3.88E-05	6.15E-05	1.95E-05	3.08E-06	4.89E-07	1.55E-07
S _{rr} /S . 10 [^] (-R _{rr} /10)	0.000742	0.000186	2.35E-05	2.35E-05	2.35E-05	2.35E-05
10log ₁₀ (S/A)+3	7.823538	6.776184	6.196265	6.196265	6.476552	6.476552
Leq,2	38.30795	32.15415	26.00737	26.79876	24.91213	15.7067
A-Weighting	-16.1	-8.6	-3.2	0	1.2	1
A-Weighted Leq	22.20795	23.55415	22.80737	26.79876	26.11213	16.7067

A-Weighted Level Outside	59
BS8233 Predicted Internal A-Weighted Level	32
Predicted Building Envelope SRI	27

Plot 3 Bedroom 1

BS8233 Calculation can be seen below:

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

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)	17.76	R _{rr}	Sound Reduction Index of Roof/Ceiling (Octave)
S _{wi}	Window Area (m ²)	1.44	A	Equivalent Absorption Area of Rx Room
S _{ew}	External Wall Area (m ²)	16.32	D _{n,e}	Insulation of Trickle Vent (BS EN 20140-10)
S _{rr}	Ceiling Area (m ²)	11.45		
S	Total Area sound enters the room (m ²)	29.21		

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}	2x Greenwood 5000	36.5	34.3	32.5	29	28	30.5
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	60	56	54	54	51	44
A ₀ /S . 10 [^] (-D _{n,e} /10)	7.66E-05	0.000127	0.000193	0.000431	0.000543	0.000305
S _{wi} /S . 10 [^] (-R _{wi} /10)	0.000196	0.000493	0.000156	1.56E-05	7.81E-06	1.56E-05
S _{ew} /S . 10 [^] (-R _{ew} /10)	4.44E-05	7.03E-05	2.22E-05	3.53E-06	5.59E-07	1.77E-07
S _{rr} /S . 10 [^] (-R _{rr} /10)	0.000621	0.000156	1.96E-05	1.96E-05	1.96E-05	1.96E-05
10log ₁₀ (S/A)+3	7.241389	6.194035	5.614116	5.614116	5.894403	5.894403
Leq,2	36.96593	31.47065	25.5281	26.3328	24.45775	15.21596
A-Weighting	-16.1	-8.6	-3.2	0	1.2	1
A-Weighted Leq	20.86593	22.87065	22.3281	26.3328	25.65775	16.21596

A-Weighted Level Outside	58
BS8233 Predicted Internal A-Weighted Level	31
Predicted Building Envelope SRI	27

Plot 3 Bedroom 2

BS8233 Calculation can be seen below:

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

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)	16.32	R _{rr}	Sound Reduction Index of Roof/Ceiling (Octave)
S _{wi}	Window Area (m ²)	2.16	A	Equivalent Absorption Area of Rx Room
S _{ew}	External Wall Area (m ²)	14.16	D _{n,e}	Insulation of Trickle Vent (BS EN 20140-10)
S _{rr}	Ceiling Area (m ²)	10		
S	Total Area sound enters the room (m ²)	26.32		

Frequency Dependent Variables							
Term	Description	Octave Band Centre Frequency					
		125	250	500	1000	2000	4000
Leq,ff	Free-Field External Noise Level	51	47	45	45	42	35
D _{n,e}	2x Greenwood 5000	36.5	34.3	32.5	29	28	30.5
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	51	47	45	45	42	35
A ₀ /S . 10 [^] (-D _{n,e} /10)	8.51E-05	0.000141	0.000214	0.000478	0.000602	0.000339
S _{wi} /S . 10 [^] (-R _{wi} /10)	0.000327	0.000821	0.00026	2.6E-05	1.3E-05	2.6E-05
S _{ew} /S . 10 [^] (-R _{ew} /10)	4.27E-05	6.77E-05	2.14E-05	3.39E-06	5.38E-07	1.7E-07
S _{rr} /S . 10 [^] (-R _{rr} /10)	0.000602	0.000151	1.9E-05	1.9E-05	1.9E-05	1.9E-05
10log ₁₀ (S/A)+3	6.788932	5.741578	5.161659	5.161659	5.441946	5.441946
Leq,2	28.02832	23.4634	17.26819	17.37732	15.46797	6.282828
A-Weighting	-16.1	-8.6	-3.2	0	1.2	1
A-Weighted Leq	11.92832	14.8634	14.06819	17.37732	16.66797	7.282828

A-Weighted Level Outside	49
BS8233 Predicted Internal A-Weighted Level	23
Predicted Building Envelope SRI	27

Plot 3 Bedroom 3

BS8233 Calculation can be seen below:

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

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)	15.84	R _{rr}	Sound Reduction Index of Roof/Ceiling (Octave)
S _{wi}	Window Area (m ²)	2.16	A	Equivalent Absorption Area of Rx Room
S _{ew}	External Wall Area (m ²)	13.68	D _{n,e}	Insulation of Trickle Vent (BS EN 20140-10)
S _{rr}	Ceiling Area (m ²)	8.4		
S	Total Area sound enters the room (m ²)	24.24		

Frequency Dependent Variables							
Term	Description	Octave Band Centre Frequency					
		125	250	500	1000	2000	4000
Leq,ff	Free-Field External Noise Level	50	46	44	44	41	34
D _{n,e}	2x Greenwood 5000	36.5	34.3	32.5	29	28	30.5
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	50	46	44	44	41	34
A ₀ /S . 10 [^] (-D _{n,e} /10)	9.24E-05	0.000153	0.000232	0.000519	0.000654	0.000368
S _{wi} /S . 10 [^] (-R _{wi} /10)	0.000355	0.000891	0.000282	2.82E-05	1.41E-05	2.82E-05
S _{ew} /S . 10 [^] (-R _{ew} /10)	4.48E-05	7.1E-05	2.25E-05	3.56E-06	5.64E-07	1.78E-07
S _{rr} /S . 10 [^] (-R _{rr} /10)	0.000549	0.000138	1.74E-05	1.74E-05	1.74E-05	1.74E-05
10log ₁₀ (S/A)+3	6.431399	5.384046	4.804126	4.804126	5.084414	5.084414
Leq,2	26.60655	22.36483	16.23618	16.35117	14.44695	5.248148
A-Weighting	-16.1	-8.6	-3.2	0	1.2	1
A-Weighted Leq	10.50655	13.76483	13.03618	16.35117	15.64695	6.248148

A-Weighted Level Outside	48
BS8233 Predicted Internal A-Weighted Level	21
Predicted Building Envelope SRI	27

Plot 3 Bedroom 4

BS8233 Calculation can be seen below:

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

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	R _{rr}	Sound Reduction Index of Roof/Ceiling (Octave)
S _{wi}	Window Area (m ²)	2.7	A	Equivalent Absorption Area of Rx Room
S _{ew}	External Wall Area (m ²)	15.3	D _{n,e}	Insulation of Trickle Vent (BS EN 20140-10)
S _{rr}	Ceiling Area (m ²)	0.00001		
S	Total Area sound enters the room (m ²)	18.00001		

Frequency Dependent Variables							
Term	Description	Octave Band Centre Frequency					
		125	250	500	1000	2000	4000
Leq,ff	Free-Field External Noise Level	59	55	53	53	50	43
D _{n,e}	2x Greenwood 5000	36.5	34.3	32.5	29	28	30.5
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	59	55	53	53	50	43
A ₀ /S . 10 [^] (-D _{n,e} /10)	0.000124	0.000206	0.000312	0.000699	0.00088	0.000495
S _{wi} /S . 10 [^] (-R _{wi} /10)	0.000597	0.0015	0.000474	4.74E-05	2.38E-05	4.74E-05
S _{ew} /S . 10 [^] (-R _{ew} /10)	6.75E-05	0.000107	3.38E-05	5.36E-06	8.5E-07	2.69E-07
S _{rr} /S . 10 [^] (-R _{rr} /10)	8.8E-10	2.21E-10	2.78E-11	2.78E-11	2.78E-11	2.78E-11
10log ₁₀ (S/A)+3	5.138801	4.091447	3.511528	3.511528	3.791815	3.791815
Leq,2	33.10986	31.67642	25.6528	25.27486	23.35887	14.13855
A-Weighting	-16.1	-8.6	-3.2	0	1.2	1
A-Weighted Leq	17.00986	23.07642	22.4528	25.27486	24.55887	15.13855

A-Weighted Level Outside	57
BS8233 Predicted Internal A-Weighted Level	30
Predicted Building Envelope SRI	27

Plot 3 Sitting Room

BS8233 Calculation can be seen below:

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

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)	12.96	R _{rr}	Sound Reduction Index of Roof/Ceiling (Octave)
S _{wi}	Window Area (m ²)	2.7	A	Equivalent Absorption Area of Rx Room
S _{ew}	External Wall Area (m ²)	10.26	D _{n,e}	Insulation of Trickle Vent (BS EN 20140-10)
S _{rr}	Ceiling Area (m ²)	0.00001		
S	Total Area sound enters the room (m ²)	12.96001		

Frequency Dependent Variables							
Term	Description	Octave Band Centre Frequency					
		125	250	500	1000	2000	4000
Leq,ff	Free-Field External Noise Level	57	53	51	51	48	41
D _{n,e}	2x Greenwood 5000	36.5	34.3	32.5	29	28	30.5
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	57	53	51	51	48	41
A ₀ /S . 10 [^] (-D _{n,e} /10)	0.000173	0.000287	0.000434	0.000971	0.001223	0.000688
S _{wi} /S . 10 [^] (-R _{wi} /10)	0.000829	0.002083	0.000659	6.59E-05	3.3E-05	6.59E-05
S _{ew} /S . 10 [^] (-R _{ew} /10)	6.29E-05	9.97E-05	3.15E-05	5E-06	7.92E-07	2.5E-07
S _{rr} /S . 10 [^] (-R _{rr} /10)	1.22E-09	3.07E-10	3.87E-11	3.87E-11	3.87E-11	3.87E-11
10log ₁₀ (S/A)+3	3.712127	2.664773	2.084854	2.084854	2.365141	2.365141
Leq,2	30.98569	29.59117	23.5934	23.26465	21.35753	12.13784
A-Weighting	-16.1	-8.6	-3.2	0	1.2	1
A-Weighted Leq	14.88569	20.99117	20.3934	23.26465	22.55753	13.13784

A-Weighted Level Outside	55
BS8233 Predicted Internal A-Weighted Level	28
Predicted Building Envelope SRI	27

Plot 3 Study

BS8233 Calculation can be seen below:

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

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)	33.36	R _{rr}	Sound Reduction Index of Roof/Ceiling (Octave)
S _{wi}	Window Area (m ²)	2.16	A	Equivalent Absorption Area of Rx Room
S _{ew}	External Wall Area (m ²)	31.2	D _{n,e}	Insulation of Trickle Vent (BS EN 20140-10)
S _{rr}	Ceiling Area (m ²)	0.00001		
S	Total Area sound enters the room (m ²)	33.36001		

Frequency Dependent Variables							
Term	Description	Octave Band Centre Frequency					
		125	250	500	1000	2000	4000
Leq,ff	Free-Field External Noise Level	62	58	56	56	53	46
D _{n,e}	Ryton 9x9 Airliner (38dB Open)	36	29	31	39	44	52
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	62	58	56	56	53	46
A ₀ /S . 10 [^] (-D _{n,e} /10)	7.53E-05	0.000377	0.000238	3.77E-05	1.19E-05	1.89E-06
S _{wi} /S . 10 [^] (-R _{wi} /10)	0.000258	0.000647	0.000205	2.05E-05	1.03E-05	2.05E-05
S _{ew} /S . 10 [^] (-R _{ew} /10)	7.43E-05	0.000118	3.72E-05	5.9E-06	9.35E-07	2.96E-07
S _{rr} /S . 10 [^] (-R _{rr} /10)	4.75E-10	1.19E-10	1.5E-11	1.5E-11	1.5E-11	1.5E-11
10log ₁₀ (S/A)+3	7.818335	6.770981	6.191062	6.191062	6.471349	6.471349
Leq,2	35.91805	35.34992	29.00431	20.26058	13.11326	6.024389
A-Weighting	-16.1	-8.6	-3.2	0	1.2	1
A-Weighted Leq	19.81805	26.74992	25.80431	20.26058	14.31326	7.024389

A-Weighted Level Outside	60
BS8233 Predicted Internal A-Weighted Level	30
Predicted Building Envelope SRI	30

Plot 1 Sitting

BS8233 Calculation can be seen below:

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

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)	7.44	R _{rr}	Sound Reduction Index of Roof/Ceiling (Octave)
S _{wi}	Window Area (m ²)	2.16	A	Equivalent Absorption Area of Rx Room
S _{ew}	External Wall Area (m ²)	5.28	D _{n,e}	Insulation of Trickle Vent (BS EN 20140-10)
S _{rr}	Ceiling Area (m ²)	0.00001		
S	Total Area sound enters the room (m ²)	7.44001		

Frequency Dependent Variables							
Term	Description	Octave Band Centre Frequency					
		125	250	500	1000	2000	4000
Leq,ff	Free-Field External Noise Level	61	57	55	55	52	45
D _{n,e}	Ryton 9x9 Airliner (38dB Open)	36	29	31	39	44	52
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	61	57	55	55	52	45	
A ₀ /S . 10 [^] (-D _{n,e} /10)	0.000338	0.001692	0.001068	0.000169	5.35E-05	8.48E-06	
S _{wi} /S . 10 [^] (-R _{wi} /10)	0.001156	0.002903	0.000918	9.18E-05	4.6E-05	9.18E-05	
S _{ew} /S . 10 [^] (-R _{ew} /10)	5.64E-05	8.93E-05	2.83E-05	4.48E-06	7.1E-07	2.24E-07	
S _{rr} /S . 10 [^] (-R _{rr} /10)	2.13E-09	5.35E-10	6.74E-11	6.74E-11	6.74E-11	6.74E-11	
10log ₁₀ (S/A)+3	1.301808	0.254455	-0.32546	-0.32546	-0.04518	-0.04518	
Leq,2	34.20453	33.96124	27.71508	18.91511	11.96487	4.977046	
A-Weighting	-16.1	-8.6	-3.2	0	1.2	1	
A-Weighted Leq	18.10453	25.36124	24.51508	18.91511	13.16487	5.977046	

A-Weighted Level Outside	59
BS8233 Predicted Internal A-Weighted Level	29
Predicted Building Envelope SRI	30

Plot 1 Kitchen

BS8233 Calculation can be seen below:

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

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)	30.72	R _{rr}	Sound Reduction Index of Roof/Ceiling (Octave)
S _{wi}	Window Area (m ²)	3.6	A	Equivalent Absorption Area of Rx Room
S _{ew}	External Wall Area (m ²)	27.12	D _{n,e}	Insulation of Trickle Vent (BS EN 20140-10)
S _{rr}	Ceiling Area (m ²)	16.6		
S	Total Area sound enters the room (m ²)	47.32		

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}	Rytons AAC125HP Look Ryt	42	37	34	43	57	64
R _{wi}	10_12_6	26	27	34	40	38	46
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)	1.33E-05	4.22E-05	8.41E-05	1.06E-05	4.22E-07	8.41E-08
S _{wi} /S . 10 [^] (-R _{wi} /10)	0.000191	0.000152	3.03E-05	7.61E-06	1.21E-05	1.91E-06
S _{ew} /S . 10 [^] (-R _{ew} /10)	4.55E-05	7.22E-05	2.28E-05	3.62E-06	5.73E-07	1.81E-07
S _{rr} /S . 10 [^] (-R _{rr} /10)	0.000556	0.00014	1.76E-05	1.76E-05	1.76E-05	1.76E-05
10log ₁₀ (S/A)+3	9.336521	8.289167	7.709248	7.709248	7.989535	7.989535
Leq,2	42.39956	34.37196	27.60741	21.6639	17.85158	8.946999
A-Weighting	-16.1	-8.6	-3.2	0	1.2	1
A-Weighted Leq	26.29956	25.77196	24.40741	21.6639	19.05158	9.946999

A-Weighted Level Outside	62
BS8233 Predicted Internal A-Weighted Level	31
Predicted Building Envelope SRI	31

Plot 1 Bedroom1

BS8233 Calculation can be seen below:

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

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)	7.68	R _{rr}	Sound Reduction Index of Roof/Ceiling (Octave)
S _{wi}	Window Area (m ²)	1.44	A	Equivalent Absorption Area of Rx Room
S _{ew}	External Wall Area (m ²)	6.24	D _{n,e}	Insulation of Trickle Vent (BS EN 20140-10)
S _{rr}	Ceiling Area (m ²)	8.01		
S	Total Area sound enters the room (m ²)	15.69		

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}	Ryttons AAC125HP Look Ryt	42	37	34	43	57	64
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	63	59	57	57	54	47
A ₀ /S . 10 [^] (-D _{n,e} /10)	4.02E-05	0.000127	0.000254	3.19E-05	1.27E-06	2.54E-07
S _{wi} /S . 10 [^] (-R _{wi} /10)	0.000365	0.000918	0.00029	2.9E-05	1.45E-05	2.9E-05
S _{ew} /S . 10 [^] (-R _{ew} /10)	3.16E-05	5.01E-05	1.58E-05	2.51E-06	3.98E-07	1.26E-07
S _{rr} /S . 10 [^] (-R _{rr} /10)	0.000809	0.000203	2.56E-05	2.56E-05	2.56E-05	2.56E-05
10log ₁₀ (S/A)+3	4.542303	3.494949	2.91503	2.91503	3.195317	3.195317
Leq,2	38.49851	33.62856	27.58941	19.41194	13.40725	7.598054
A-Weighting	-16.1	-8.6	-3.2	0	1.2	1
A-Weighted Leq	22.39851	25.02856	24.38941	19.41194	14.60725	8.598054

A-Weighted Level Outside	61
BS8233 Predicted Internal A-Weighted Level	29
Predicted Building Envelope SRI	32

Plot 1 Bedroom2

BS8233 Calculation can be seen below:

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

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)	21.12	R _{rr}	Sound Reduction Index of Roof/Ceiling (Octave)
S _{wi}	Window Area (m ²)	2.16	A	Equivalent Absorption Area of Rx Room
S _{ew}	External Wall Area (m ²)	18.96	D _{n,e}	Insulation of Trickle Vent (BS EN 20140-10)
S _{rr}	Ceiling Area (m ²)	0.0001		
S	Total Area sound enters the room (m ²)	21.1201		

Frequency Dependent Variables							
Term	Description	Octave Band Centre Frequency					
		125	250	500	1000	2000	4000
Leq,ff	Free-Field External Noise Level	65	61	59	59	56	49
D _{n,e}	Ryton 9x9 Airliner (38dB Open)	36	29	31	39	44	52
R _{wi}	10_12_6	26	27	34	40	38	46
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	65	61	59	59	56	49
A ₀ /S . 10 [^] (-D _{n,e} /10)	0.000119	0.000596	0.000376	5.96E-05	1.88E-05	2.99E-06
S _{wi} /S . 10 [^] (-R _{wi} /10)	0.000257	0.000204	4.07E-05	1.02E-05	1.62E-05	2.57E-06
S _{ew} /S . 10 [^] (-R _{ew} /10)	7.13E-05	0.000113	3.57E-05	5.66E-06	8.98E-07	2.84E-07
S _{rr} /S . 10 [^] (-R _{rr} /10)	7.5E-09	1.88E-09	2.37E-10	2.37E-10	2.37E-10	2.37E-10
10log ₁₀ (S/A)+3	5.833033	4.785679	4.20576	4.20576	4.486047	4.486047
Leq,2	37.33753	35.39114	29.76247	21.98521	16.04385	1.150591
A-Weighting	-16.1	-8.6	-3.2	0	1.2	1
A-Weighted Leq	21.23753	26.79114	26.56247	21.98521	17.24385	2.150591

A-Weighted Level Outside	63
BS8233 Predicted Internal A-Weighted Level	31
Predicted Building Envelope SRI	32

Plot 31 Sitting Room

BS8233 Calculation can be seen below:

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

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)	7.68	R _{rr}	Sound Reduction Index of Roof/Ceiling (Octave)
S _{wi}	Window Area (m ²)	2.16	A	Equivalent Absorption Area of Rx Room
S _{ew}	External Wall Area (m ²)	5.52	D _{n,e}	Insulation of Trickle Vent (BS EN 20140-10)
S _{rr}	Ceiling Area (m ²)	0.0001		
S	Total Area sound enters the room (m ²)	7.6801		

Frequency Dependent Variables							
Term	Description	Octave Band Centre Frequency					
		125	250	500	1000	2000	4000
Leq,ff	Free-Field External Noise Level	65	61	59	59	56	49
D _{n,e}	Ryton 9x9 Airliner (38dB Open)	36	29	31	39	44	52
R _{wi}	10_12_6	26	27	34	40	38	46
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	65	61	59	59	56	49
A ₀ /S . 10 [^] (-D _{n,e} /10)	0.000327	0.001639	0.001034	0.000164	5.18E-05	8.22E-06
S _{wi} /S . 10 [^] (-R _{wi} /10)	0.000706	0.000561	0.000112	2.81E-05	4.46E-05	7.06E-06
S _{ew} /S . 10 [^] (-R _{ew} /10)	5.71E-05	9.05E-05	2.86E-05	4.53E-06	7.19E-07	2.27E-07
S _{rr} /S . 10 [^] (-R _{rr} /10)	2.06E-08	5.18E-09	6.53E-10	6.53E-10	6.53E-10	6.53E-10
10log ₁₀ (S/A)+3	1.439742	0.392388	-0.18753	-0.18753	0.092756	0.092756
Leq,2	36.81654	34.99236	29.51229	21.74788	15.9663	0.998317
A-Weighting	-16.1	-8.6	-3.2	0	1.2	1
A-Weighted Leq	20.71654	26.39236	26.31229	21.74788	17.1663	1.998317

A-Weighted Level Outside	63
BS8233 Predicted Internal A-Weighted Level	31
Predicted Building Envelope SRI	32

Plot 31 Kitchen

BS8233 Calculation can be seen below:

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

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)	18.48	R _{rr}	Sound Reduction Index of Roof/Ceiling (Octave)
S _{wi}	Window Area (m ²)	1.44	A	Equivalent Absorption Area of Rx Room
S _{ew}	External Wall Area (m ²)	17.04	D _{n,e}	Insulation of Trickle Vent (BS EN 20140-10)
S _{rr}	Ceiling Area (m ²)	16.56		
S	Total Area sound enters the room (m ²)	35.04		

Frequency Dependent Variables							
Term	Description	Octave Band Centre Frequency					
		125	250	500	1000	2000	4000
Leq,ff	Free-Field External Noise Level	67	63	61	61	58	51
D _{n,e}	Ryttons AAC125HP Look Ryt	42	37	34	43	57	64
R _{wi}	10_12_6	26	27	34	40	38	46
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	67	63	61	61	58	51
A ₀ /S . 10 [^] (-D _{n,e} /10)	1.8E-05	5.69E-05	0.000114	1.43E-05	5.69E-07	1.14E-07
S _{wi} /S . 10 [^] (-R _{wi} /10)	0.000103	8.2E-05	1.64E-05	4.11E-06	6.51E-06	1.03E-06
S _{ew} /S . 10 [^] (-R _{ew} /10)	3.86E-05	6.12E-05	1.94E-05	3.07E-06	4.86E-07	1.54E-07
S _{rr} /S . 10 [^] (-R _{rr} /10)	0.000749	0.000188	2.37E-05	2.37E-05	2.37E-05	2.37E-05
10log ₁₀ (S/A)+3	8.031714	6.984361	6.404441	6.404441	6.684728	6.684728
Leq,2	44.61682	35.87612	29.78545	23.9527	19.63396	11.66168
A-Weighting	-16.1	-8.6	-3.2	0	1.2	1
A-Weighted Leq	28.51682	27.27612	26.58545	23.9527	20.83396	12.66168

A-Weighted Level Outside	65
BS8233 Predicted Internal A-Weighted Level	33
Predicted Building Envelope SRI	32

Plot 31 Bedroom 1

BS8233 Calculation can be seen below:

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

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)	7.68	R _{rr}	Sound Reduction Index of Roof/Ceiling (Octave)
S _{wi}	Window Area (m ²)	1.44	A	Equivalent Absorption Area of Rx Room
S _{ew}	External Wall Area (m ²)	6.24	D _{n,e}	Insulation of Trickle Vent (BS EN 20140-10)
S _{rr}	Ceiling Area (m ²)	8.01		
S	Total Area sound enters the room (m ²)	15.69		

Frequency Dependent Variables							
Term	Description	Octave Band Centre Frequency					
		125	250	500	1000	2000	4000
Leq,ff	Free-Field External Noise Level	67	63	61	61	58	51
D _{n,e}	Rytons AAC125HP Look Ryt	42	37	34	43	57	64
R _{wi}	10_12_6	26	27	34	40	38	46
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	67	63	61	61	58	51
A ₀ /S . 10 [^] (-D _{n,e} /10)	4.02E-05	0.000127	0.000254	3.19E-05	1.27E-06	2.54E-07
S _{wi} /S . 10 [^] (-R _{wi} /10)	0.000231	0.000183	3.65E-05	9.18E-06	1.45E-05	2.31E-06
S _{ew} /S . 10 [^] (-R _{ew} /10)	3.16E-05	5.01E-05	1.58E-05	2.51E-06	3.98E-07	1.26E-07
S _{rr} /S . 10 [^] (-R _{rr} /10)	0.000809	0.000203	2.56E-05	2.56E-05	2.56E-05	2.56E-05
10log ₁₀ (S/A)+3	4.542303	3.494949	2.91503	2.91503	3.195317	3.195317
Leq,2	42.00122	34.00464	29.12235	22.31714	17.40725	8.708772
A-Weighting	-16.1	-8.6	-3.2	0	1.2	1
A-Weighted Leq	25.90122	25.40464	25.92235	22.31714	18.60725	9.708772

A-Weighted Level Outside	65
BS8233 Predicted Internal A-Weighted Level	31
Predicted Building Envelope SRI	34

Plot 31 Bedroom 2

BS8233 Calculation can be seen below:

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

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)	25.68	R _{rr}	Sound Reduction Index of Roof/Ceiling (Octave)
S _{wi}	Window Area (m ²)	6.15	A	Equivalent Absorption Area of Rx Room
S _{ew}	External Wall Area (m ²)	19.53	D _{n,e}	Insulation of Trickle Vent (BS EN 20140-10)
S _{rr}	Ceiling Area (m ²)	0.00001		
S	Total Area sound enters the room (m ²)	25.68001		

Frequency Dependent Variables							
Term	Description	Octave Band Centre Frequency					
		125	250	500	1000	2000	4000
Leq,ff	Free-Field External Noise Level	61	57	55	55	52	45
D _{n,e}	Ryton 9x9 Airliner (38dB Open)	36	29	31	39	44	52
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	61	57	55	55	52	45
A ₀ /S . 10 [^] (-D _{n,e} /10)	9.78E-05	0.00049	0.000309	4.9E-05	1.55E-05	2.46E-06
S _{wi} /S . 10 [^] (-R _{wi} /10)	0.000757	0.001511	0.00012	2.39E-05	1.2E-05	9.53E-06
S _{ew} /S . 10 [^] (-R _{ew} /10)	6.04E-05	9.57E-05	3.03E-05	4.8E-06	7.61E-07	2.4E-07
S _{rr} /S . 10 [^] (-R _{rr} /10)	6.17E-10	1.55E-10	1.95E-11	1.95E-11	1.95E-11	1.95E-11
10log ₁₀ (S/A)+3	6.682025	5.634672	5.054752	5.054752	5.335039	5.335039
Leq,2	37.29883	35.85072	26.67876	18.96291	11.84766	1.209878
A-Weighting	-16.1	-8.6	-3.2	0	1.2	1
A-Weighted Leq	21.19883	27.25072	23.47876	18.96291	13.04766	2.209878

A-Weighted Level Outside	59
BS8233 Predicted Internal A-Weighted Level	30
Predicted Building Envelope SRI	29

Plot 27 Kitchen Diner

BS8233 Calculation can be seen below:

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

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)	30.96	R _{rr}	Sound Reduction Index of Roof/Ceiling (Octave)
S _{wi}	Window Area (m ²)	4.86	A	Equivalent Absorption Area of Rx Room
S _{ew}	External Wall Area (m ²)	26.1	D _{n,e}	Insulation of Trickle Vent (BS EN 20140-10)
S _{rr}	Ceiling Area (m ²)	0.00001		
S	Total Area sound enters the room (m ²)	30.96001		

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}	Ryton 9x9 Airliner (38dB Open)	36	29	31	39	44	52
R _{wi}	10_12_6	26	27	34	40	38	46
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)	8.11E-05	0.000407	0.000257	4.07E-05	1.29E-05	2.04E-06
S _{wi} /S . 10 [^] (-R _{wi} /10)	0.000394	0.000313	6.25E-05	1.57E-05	2.49E-05	3.94E-06
S _{ew} /S . 10 [^] (-R _{ew} /10)	6.7E-05	0.000106	3.36E-05	5.32E-06	8.43E-07	2.67E-07
S _{rr} /S . 10 [^] (-R _{rr} /10)	5.12E-10	1.29E-10	1.62E-11	1.62E-11	1.62E-11	1.62E-11
10log ₁₀ (S/A)+3	7.494084	6.446731	5.866811	5.866811	6.147098	6.147098
Leq,2	38.83732	35.61637	29.33989	21.76824	17.01082	2.104269
A-Weighting	-16.1	-8.6	-3.2	0	1.2	1
A-Weighted Leq	22.73732	27.01637	26.13989	21.76824	18.21082	3.104269

A-Weighted Level Outside	62
BS8233 Predicted Internal A-Weighted Level	31
Predicted Building Envelope SRI	31

Plot 27 Sitting Room

BS8233 Calculation can be seen below:

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

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)	14.64	R _{rr}	Sound Reduction Index of Roof/Ceiling (Octave)
S _{wi}	Window Area (m ²)	1.44	A	Equivalent Absorption Area of Rx Room
S _{ew}	External Wall Area (m ²)	13.2	D _{n,e}	Insulation of Trickle Vent (BS EN 20140-10)
S _{rr}	Ceiling Area (m ²)	8.01		
S	Total Area sound enters the room (m ²)	22.65		

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}	Rytons AAC125HP Look Ryt	42	37	34	43	57	64
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)	2.79E-05	8.81E-05	0.000176	2.21E-05	8.81E-07	1.76E-07
S _{wi} /S . 10 [^] (-R _{wi} /10)	0.000201	0.000401	3.19E-05	6.36E-06	3.19E-06	2.53E-06
S _{ew} /S . 10 [^] (-R _{ew} /10)	4.63E-05	7.34E-05	2.32E-05	3.68E-06	5.83E-07	1.84E-07
S _{rr} /S . 10 [^] (-R _{rr} /10)	0.00056	0.000141	1.77E-05	1.77E-05	1.77E-05	1.77E-05
10log ₁₀ (S/A)+3	6.136755	5.089402	4.509482	4.509482	4.789769	4.789769
Leq,2	38.35715	32.56133	25.46368	18.48929	12.28724	4.931639
A-Weighting	-16.1	-8.6	-3.2	0	1.2	1
A-Weighted Leq	22.25715	23.96133	22.26368	18.48929	13.48724	5.931639

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

Plot 27 Bedroom 2

BS8233 Calculation can be seen below:

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

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)	11.52	R _{rr}	Sound Reduction Index of Roof/Ceiling (Octave)
S _{wi}	Window Area (m ²)	1.44	A	Equivalent Absorption Area of Rx Room
S _{ew}	External Wall Area (m ²)	10.08	D _{n,e}	Insulation of Trickle Vent (BS EN 20140-10)
S _{rr}	Ceiling Area (m ²)	7.7		
S	Total Area sound enters the room (m ²)	19.22		

Frequency Dependent Variables							
Term	Description	Octave Band Centre Frequency					
		125	250	500	1000	2000	4000
Leq,ff	Free-Field External Noise Level	51	47	45	45	42	35
D _{n,e}	2x Greenwood 5000	36.5	34.3	32.5	29	28	30.5
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	51	47	45	45	42	35
A ₀ /S . 10 [^] (-D _{n,e} /10)	0.000116	0.000193	0.000293	0.000655	0.000825	0.000464
S _{wi} /S . 10 [^] (-R _{wi} /10)	0.000298	0.000749	0.000237	2.37E-05	1.19E-05	2.37E-05
S _{ew} /S . 10 [^] (-R _{ew} /10)	4.17E-05	6.6E-05	2.09E-05	3.31E-06	5.24E-07	1.66E-07
S _{rr} /S . 10 [^] (-R _{rr} /10)	0.000635	0.000159	2.01E-05	2.01E-05	2.01E-05	2.01E-05
10log ₁₀ (S/A)+3	5.423607	4.376253	3.796334	3.796334	4.076621	4.076621
Leq,2	26.80326	22.05084	16.35861	17.26025	15.40685	6.132241
A-Weighting	-16.1	-8.6	-3.2	0	1.2	1
A-Weighted Leq	10.70326	13.45084	13.15861	17.26025	16.60685	7.132241

A-Weighted Level Outside	49
BS8233 Predicted Internal A-Weighted Level	22
Predicted Building Envelope SRI	27

Plot 27 Bedroom 3

BS8233 Calculation can be seen below:

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

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)	17.76	R _{rr}	Sound Reduction Index of Roof/Ceiling (Octave)
S _{wi}	Window Area (m ²)	4.14	A	Equivalent Absorption Area of Rx Room
S _{ew}	External Wall Area (m ²)	13.62	D _{n,e}	Insulation of Trickle Vent (BS EN 20140-10)
S _{rr}	Ceiling Area (m ²)	0.0001		
S	Total Area sound enters the room (m ²)	17.7601		

Frequency Dependent Variables							
Term	Description	Octave Band Centre Frequency					
		125	250	500	1000	2000	4000
Leq,ff	Free-Field External Noise Level	58	54	52	52	49	42
D _{n,e}	2x Greenwood 5000	36.5	34.3	32.5	29	28	30.5
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	58	54	52	52	49	42
A ₀ /S . 10 [^] (-D _{n,e} /10)	0.000126	0.000209	0.000317	0.000709	0.000892	0.000502
S _{wi} /S . 10 [^] (-R _{wi} /10)	0.000928	0.002331	0.000737	7.37E-05	3.69E-05	7.37E-05
S _{ew} /S . 10 [^] (-R _{ew} /10)	6.09E-05	9.65E-05	3.05E-05	4.84E-06	7.67E-07	2.43E-07
S _{rr} /S . 10 [^] (-R _{rr} /10)	8.92E-09	2.24E-09	2.82E-10	2.82E-10	2.82E-10	2.82E-10
10log ₁₀ (S/A)+3	5.080527	4.033174	3.453254	3.453254	3.733541	3.733541
Leq,2	33.55325	32.24397	25.80479	24.41523	22.41885	13.33615
A-Weighting	-16.1	-8.6	-3.2	0	1.2	1
A-Weighted Leq	17.45325	23.64397	22.60479	24.41523	23.61885	14.33615

A-Weighted Level Outside	56
BS8233 Predicted Internal A-Weighted Level	30
Predicted Building Envelope SRI	26

Plot 23 Study

BS8233 Calculation can be seen below:

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

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)	58.32	R _{rr}	Sound Reduction Index of Roof/Ceiling (Octave)
S _{wi}	Window Area (m ²)	8.28	A	Equivalent Absorption Area of Rx Room
S _{ew}	External Wall Area (m ²)	50.04	D _{n,e}	Insulation of Trickle Vent (BS EN 20140-10)
S _{rr}	Ceiling Area (m ²)	0.0001		
S	Total Area sound enters the room (m ²)	58.3201		

Frequency Dependent Variables							
Term	Description	Octave Band Centre Frequency					
		125	250	500	1000	2000	4000
Leq,ff	Free-Field External Noise Level	57	53	51	51	48	41
D _{n,e}	Ryton 9x9 Airliner (38dB Open)	36	29	31	39	44	52
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	57	53	51	51	48	41
A ₀ /S . 10 [^] (-D _{n,e} /10)	4.31E-05	0.000216	0.000136	2.16E-05	6.83E-06	1.08E-06
S _{wi} /S . 10 [^] (-R _{wi} /10)	0.000565	0.00142	0.000449	4.49E-05	2.25E-05	4.49E-05
S _{ew} /S . 10 [^] (-R _{ew} /10)	6.82E-05	0.000108	3.42E-05	5.41E-06	8.58E-07	2.71E-07
S _{rr} /S . 10 [^] (-R _{rr} /10)	2.72E-09	6.83E-10	8.59E-11	8.59E-11	8.59E-11	8.59E-11
10log ₁₀ (S/A)+3	10.24426	9.196902	8.616983	8.616983	8.89727	8.89727
Leq,2	35.54656	34.61146	27.53617	18.18408	11.69531	6.548365
A-Weighting	-16.1	-8.6	-3.2	0	1.2	1
A-Weighted Leq	19.44656	26.01146	24.33617	18.18408	12.89531	7.548365

A-Weighted Level Outside	55
BS8233 Predicted Internal A-Weighted Level	29
Predicted Building Envelope SRI	26

Plot 23 Breakfast/KLD

BS8233 Calculation can be seen below:

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

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)	21.12	R _{rr}	Sound Reduction Index of Roof/Ceiling (Octave)
S _{wi}	Window Area (m ²)	2.16	A	Equivalent Absorption Area of Rx Room
S _{ew}	External Wall Area (m ²)	18.96	D _{n,e}	Insulation of Trickle Vent (BS EN 20140-10)
S _{rr}	Ceiling Area (m ²)	0.0001		
S	Total Area sound enters the room (m ²)	21.1201		

Frequency Dependent Variables							
Term	Description	Octave Band Centre Frequency					
		125	250	500	1000	2000	4000
Leq,ff	Free-Field External Noise Level	58	54	52	52	49	42
D _{n,e}	2x Greenwood 5000	36.5	34.3	32.5	29	28	30.5
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	58	54	52	52	49	42
A ₀ /S . 10 [^] (-D _{n,e} /10)	0.000106	0.000176	0.000266	0.000596	0.00075	0.000422
S _{wi} /S . 10 [^] (-R _{wi} /10)	0.000407	0.001023	0.000323	3.23E-05	1.62E-05	3.23E-05
S _{ew} /S . 10 [^] (-R _{ew} /10)	7.13E-05	0.000113	3.57E-05	5.66E-06	8.98E-07	2.84E-07
S _{rr} /S . 10 [^] (-R _{rr} /10)	7.5E-09	1.88E-09	2.37E-10	2.37E-10	2.37E-10	2.37E-10
10log ₁₀ (S/A)+3	5.833033	4.785679	4.20576	4.20576	4.486047	4.486047
Leq,2	31.50065	29.96388	24.16742	24.22724	22.33698	13.06251
A-Weighting	-16.1	-8.6	-3.2	0	1.2	1
A-Weighted Leq	15.40065	21.36388	20.96742	24.22724	23.53698	14.06251

A-Weighted Level Outside	56
BS8233 Predicted Internal A-Weighted Level	29
Predicted Building Envelope SRI	27

Plot 23 Bedroom 3

BS8233 Calculation can be seen below:

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

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)	21.6	R _{rr}	Sound Reduction Index of Roof/Ceiling (Octave)
S _{wi}	Window Area (m ²)	2.16	A	Equivalent Absorption Area of Rx Room
S _{ew}	External Wall Area (m ²)	19.44	D _{n,e}	Insulation of Trickle Vent (BS EN 20140-10)
S _{rr}	Ceiling Area (m ²)	0.0001		
S	Total Area sound enters the room (m ²)	21.6001		

Frequency Dependent Variables							
Term	Description	Octave Band Centre Frequency					
		125	250	500	1000	2000	4000
Leq,ff	Free-Field External Noise Level	58	54	52	52	49	42
D _{n,e}	2x Greenwood 5000	36.5	34.3	32.5	29	28	30.5
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	58	54	52	52	49	42
A ₀ /S . 10 [^] (-D _{n,e} /10)	0.000104	0.000172	0.00026	0.000583	0.000734	0.000413
S _{wi} /S . 10 [^] (-R _{wi} /10)	0.000398	0.001	0.000316	3.16E-05	1.58E-05	3.16E-05
S _{ew} /S . 10 [^] (-R _{ew} /10)	7.15E-05	0.000113	3.58E-05	5.68E-06	9E-07	2.85E-07
S _{rr} /S . 10 [^] (-R _{rr} /10)	7.34E-09	1.84E-09	2.32E-10	2.32E-10	2.32E-10	2.32E-10
10log ₁₀ (S/A)+3	5.930631	4.883277	4.303358	4.303358	4.583645	4.583645
Leq,2	31.51404	29.97334	24.1737	24.22822	22.33711	13.06257
A-Weighting	-16.1	-8.6	-3.2	0	1.2	1
A-Weighted Leq	15.41404	21.37334	20.9737	24.22822	23.53711	14.06257

A-Weighted Level Outside	56
BS8233 Predicted Internal A-Weighted Level	29
Predicted Building Envelope SRI	27

Plot 23 Bedroom 5

BS8233 Calculation can be seen below:

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