Chartered Building Consultancy

Acoustic South East

Noise Assessment - Road Traffic

Site: **54 Teville Road, Worthing. BN11 1UY**
Client: **Carters Domestic Appliances**

Report by: Simon Barrett BSc (Hons) MSc MIOA

Date: **06/11/2023**
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Constructionline Part of Capita plc

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Issue 1	06/11/2023	Original Issue

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1 Introduction and Executive Summary

Acoustic Associates have been appointed to undertake an acoustic assessment to support a change of use from commercial offices to flats.

Standards and guidance referenced for this assessment include:

- BS8233 (Sound insulation and noise reduction for buildings) 2014
- ProPG Planning and Noise Guidance 2017
- ISO9613 (Attenuation of sound during propagation outdoors) 1996
- National Planning Policy Framework (NPPF) 2021

Adur and Worthing Council have requested a noise survey and assessment relating to how road traffic will affect the property at 54 Teville Road, Worthing, owing to the fact that the area is a DEFRA identified area for excess traffic noise.

A sound level meter was used to ascertain the soundscape to the front of the property. The rear is shielded from road traffic noise by existing buildings along with the fact that there will be no habitable rooms located to the rear according to the proposed room layouts.

Rigorous calculations were applied to ensure that the glazing and/or ventilation proposals are sufficient to protect future occupants

Recommendations have been made in respect of glazing and ventilation to protect the future occupants.

In particular, the lounge area on both first and ground floors cannot rely upon opening windows for background ventilation, but instead will require an appropriate trickle ventilator.

If the mitigation measures discussed in Section 6 are adopted, it is considered that there is no reason to withhold planning consent on the grounds of noise.

2 Context, Noise Criteria & Noise Assessment Methodology

2.1 Context

A planning application seeks a change of use of a property at 54 Teville Road from an office to a pair of residential flats.

The property is slightly set back from the Teville Road terrace and has an exposure to both Teville Road and Victoria Road, a one-way route to Worthing train station.

Adur and Worthing DC's Environmental Health's response to this site in terms of noise is shown below:

> The site is in a DEFRA identified area for excess traffic noise. Therefore we will have to be satisfied that the scheme can be adequately protected against traffic noise
> This will require a noise study to be submitted prior to determination and appropriate measures proposed to deal with noise, i.e. acoustic glazing or similar. The noise report should have regard to the principles contained within the World Health Organisation community noise guidelines and achieve the recommended indoor and outdoor ambient noise levels for dwellings specified in BS8233:2014. Following approval, if appropriate, and completion of the application a test will have to be undertaken to demonstrate that the attenuation measures proposed in the scheme are effective and protect the residential units from noise. This latter bit can be dealt with by condition.
>
> A similar report was recently submitted for No. 56 which might be useful to you to read. It can be found online under reference AWDM/1825/22.

2.2 Consented Floor Plans

The proposed floor plans (DENRA Designs Drawing No. 1967/2) are seen in Figure 1 below:



Figure 1. Proposed Floor Plans

2.3 Site Soundscape

The soundscape is dominated by passing road traffic on Teville Road as well as the 1-way Victoria Road to the East of the site.

2.4 Relevant Assessment Criteria

The requirements of the Local Authority references BS8233:2014 in terms of noise ingress due to road traffic noise.

Whilst not referenced, it will also be relevant to assess Night Time L_{Amax} sound levels for bedrooms as per the criterion set out in ProPG Planning & Noise 2017.

Please note that as this is a change of use, Approved Document O is not applicable in terms of assessing for Overheating. Additionally, the scope of the AVOG assessment also indicates in section 1.13 that it relates to new residential development, which this is not, as it is a conversion with fixed window positions and room orientations which have been consented by the local planning authority.

2.4.1 BS8233:2014

Table 4 values which relate to internal rooms and daytime and night time sound pressure levels have been replicated below in Figure 4.

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 $L_{Aeq,8hour}$

Figure 2. BS8233:2014 - Table 4 Values

2.4.2 ProPG:2017

The following has been copied from the Association of Noise Consultants' (ANC) website:

Over recent years, we have seen the introduction of the Noise Policy Statement for England, as well as substantial changes in national planning policy. But these developments have not been accompanied by detailed technical acoustic advice.

The lack of detailed guidance can lead to inconsistent application of policy, that may in turn result in unsatisfactory development and affect quality of life.

To fill that gap and facilitate efficient and consistent decision-making in the development control process, the Institute of Acoustics, the Association of Noise Consultants and the CIEH have joined to produce a Professional Practice Guidance (ProPG) focussing on noise sensitive development.

The following extract has been taken (Figure 2, Page 13) from the May 2017 ProPG document:

ACTIVITY	LOCATION	07:00 – 23:00 HRS	23:00 – 07:00 HRS
Resting	Living room	35 dB $L_{Aeq,16\,hr}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16\,hr}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16\,hr}$	30 dB $L_{Aeq,8\,hr}$ 45 dB $L_{Amax,F}$ (Note 4)

NOTE 1 The Table provides recommended internal L_{Aeq} target levels for overall noise in the design of a building. These are the sum total of structure-borne and airborne noise sources. Ground-borne noise is assessed separately and is not included as part of these targets, as human response to ground-borne noise varies with many factors such as level, character, timing, occupant expectation and sensitivity.

NOTE 2 The internal L_{Aeq} target levels shown in the Table are based on the existing guidelines issued by the WHO and assume normal diurnal fluctuations in external noise. In cases where local conditions do not follow a typical diurnal pattern, for example on a road serving a port with high levels of traffic at certain times of the night, an appropriate alternative period, e.g. 1 hour, may be used, but the level should be selected to ensure consistency with the internal L_{Aeq} target levels recommended in the Table.

NOTE 3 These internal L_{Aeq} target levels are based on annual average data and do not have to be achieved in all circumstances. For example, it is normal to exclude occasional events, such as fireworks night or New Year's Eve.

NOTE 4 Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$, depending on the character and number of events per night. Sporadic noise events could require separate values. In most circumstances in noise-sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45dB $L_{Amax,F}$ more than 10 times a night. However, where it is not reasonably practicable to achieve this guideline then the judgement of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number, distribution, predictability and regularity of noise events (see Appendix A).

NOTE 5 Designing the site layout and the dwellings so that the internal target levels can be achieved with open windows in as many properties as possible demonstrates good acoustic design. Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however any façade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the "open" position and, in this scenario, the internal L_{Aeq} target levels should not normally be exceeded, subject to the further advice in Note 7.

NOTE 6 Attention is drawn to the requirements of the Building Regulations.

NOTE 7 Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal L_{Aeq} target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved. The more often internal L_{Aeq} levels start to exceed the internal L_{Aeq} target levels by more than 5 dB, the more that most people are likely to regard them as "unreasonable". Where such exceedances are predicted, applicants should be required to show how the relevant number of rooms affected has been kept to a minimum. Once internal L_{Aeq} levels exceed the target levels by more than 10 dB, they are highly likely to be regarded as "unacceptable" by most people, particularly if such levels occur more than occasionally. Every effort should be made to avoid relevant rooms experiencing "unacceptable" noise levels at all and where such levels are likely to occur frequently, the development should be prevented in its proposed form **(see Section 3.D)**.

Figure 3: ProPG:2017 Criteria

2.5 Methodology

The following methodology was employed:

1. A noise survey was set up at the front of the property to measure the soundscapes affecting the front façade of the property.
2. The data was reviewed against the 1minute resolution consistent with the Planning Noise Advice Document Sussex dated 2021 to ensure robust L_{Amax} event reporting, and subsequent evaluation of the required Sound Reduction Index for rooms.
3. Rigorous calculations were undertaken of the windows to identify what glazing and/or ventilation might be appropriate to protect future occupants.
4. Recommendations were made in respect of the required ventilation and glazing for room types.

3 Measured External Sound Pressure Levels

3.1 General Information

A class 1 sound level meter was used to quantify the external soundscape. Due to the external measurement positions close to the building façade (0.8m), all measurements are considered to be façade and have been adjusted by the subtraction of 3dB to present freefield data hereafter. The measurements were made at the front of the property – no access to the relevant part of the rear of the property (Bedroom window location) was possible, however this is a heavily shielded area of the building.

The sound level meter was calibrated before and after commencing the noise measurements (@94dB with no drift). The meter used a 1-minute resolution, consistent with the approach laid out in the Planning Noise Advice Document Sussex dated 2021. All data is presented in dB, A weighted and Fast time weighted. The survey location can be seen in the figure below:

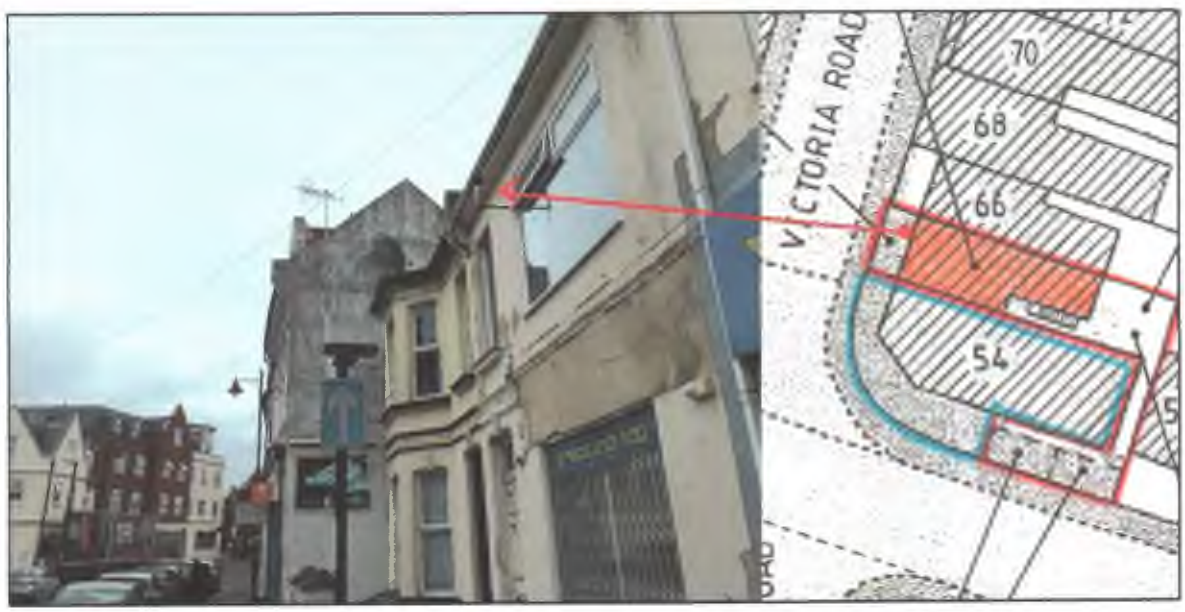


Figure 4. Survey Location

3.2 Survey Base Information

Survey(s) carried out by	Simon Barrett BSc(Hons) MSc MIOA
Equipment Used	Svantek 971 "Moles"
Equipment Used	01dB CAL21 Acoustic Calibrator – Serial No. 50241778
Location	First Floor Window on Monopod (0.8m from façade)
Duration	12th October to 17th October 2023

3.3 Survey Results

Date (2023) 12-17 October	Time Period (Full Periods Only)	Freefield Level $L_{Aeq,16hr/8hr}$ – dB(A)
Day 1	07:00-23:00hrs	61.8
Day 2	07:00-23:00hrs	60.6
Day 3	07:00-23:00hrs	60.1
Day 4	07:00-23:00hrs	60.7
Day 5	07:00-23:00hrs	60.8
Arithmetic Average	**07:00-23:00hrs**	**60.8**
Night 1	23:00-07:00hrs	55.4
Night 2	23:00-07:00hrs	54.1
Night 3	23:00-07:00hrs	53.6
Night 4	23:00-07:00hrs	53.9
Night 5	23:00-07:00hrs	53.2
Arithmetic Average	**23:00-07:00hrs**	**54.0**

Table 1: Un-attended Long-Term Survey Results

4 ProPG Stage 1 Assessment

The ProPG stage one risk assessment does not include a specific location or height which the indicative $L_{Aeq,16hr}$ and $L_{Aeq,8hr}$ should be assessed. The document does however state that a "typical worse case 24 hours" should be assessed. Therefore, Day 1 and Night 1 of the survey results were used for the ProPG Stage 1 Assessment.

Figure 6, below, shows that the levels at the site are in the medium risk category. Therefore, a more in-depth assessment of the soundscape has been conducted to ascertain the mitigation methods needed for the proposed development to meet the relevant noise criteria.

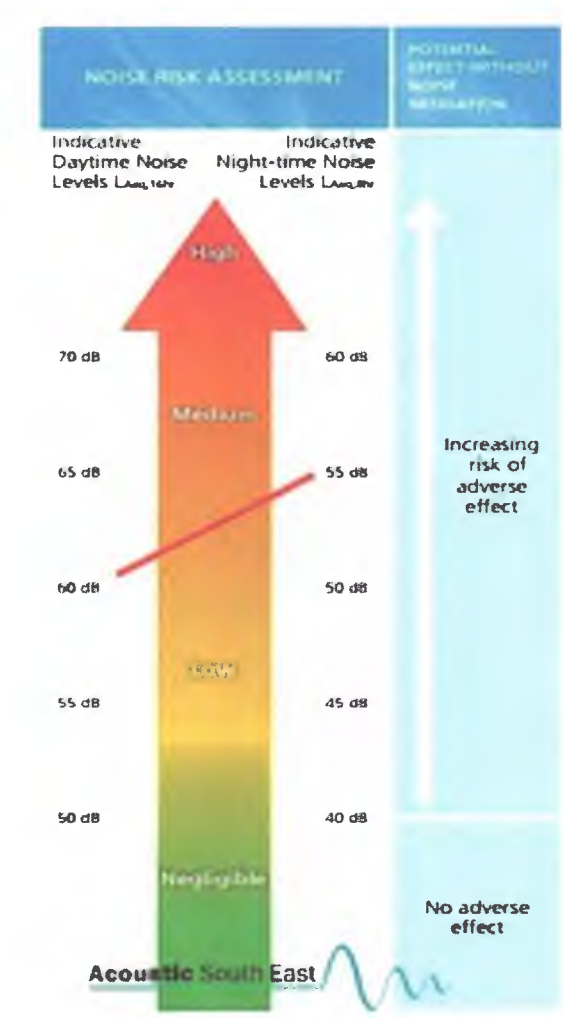


Figure 5: ProPG Stage 1 Assessment

5 Sound Reduction Index (SRI)

To demonstrate that the site is capable of being converted to residential with the future occupants protected against external noise, the worst case (highest external sound pressure levels) have been listed for the most exposed façade.

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 $L_{Aeq'T,}$ and 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 the drivers is highest is applied to ensure that the residents are protected from each criterion.

An assessment has been made below of the Victoria Road façade at first and ground floors.

It is relevant to note that a level of good acoustic design in that the lounges are set on the front façade whilst the bedrooms are protected from the road, by being placed in the middle of the property with their windows protected due to building facades all around.

A computer model has been built to help predict the noise at the bedroom windows from road traffic occurring on Teville Road and Victoria Road. The computer model has been created using the software "Immi" (Wolfel). The survey data and scaled drawings of the proposed development (including topographic information) have been used to complete the noise models. IMMI faithfully implements the calculation method of ISO-9613:1996; Acoustics – Attenuation of sound during propagation outdoors.

The road noise sources have been added to the model along with adding the survey position as a "reception point". The road noise sources were calibrated such that the survey position in the model matches the recorded data. Once calibrated, additional reception points were added for the ground floor at the front façade and the ground & first floors for the rear where the bedroom windows are. The results were then able to be compared with the requirements set out in Section 2 of this report.

The basic, calibrated survey model (daytime hours) can be seen below:

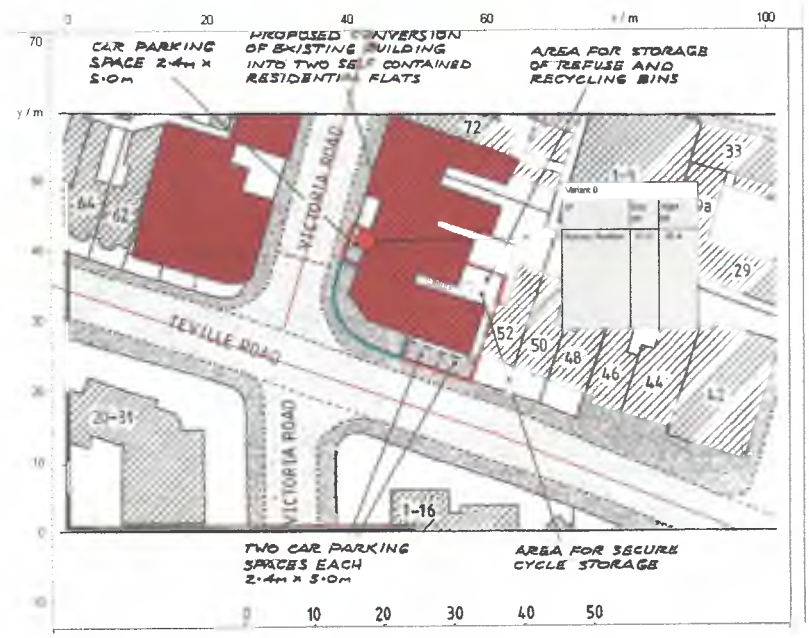


Figure 6: Basic Calibrated Survey Computer Model

5.1 Continuous Noise Levels

The predicted computer model output results can be seen in the table below in terms of daytime and night time continuous daytime noise levels. The table also shows the criteria for continuous ambient noise levels within habitable rooms during daytime and night time and it also shows the SRI required in order to achieve the criteria.

Reception Point	Daytime	Night time	BS8233 Requirement		SRI Required (dB)	
	07:00-23:00	23:00-07:00	Daytime	Night time	Daytime	Night time
	Leq,16hour (dBA)	Leq,8hour (dBA)	Leq,16hour (dBA)	Leq,8hour (dBA)		
1st Floor Lounge	61.8	55.4	35	30	26.8	-
Gnd Floor Lounge	60.8	54.2	35	30	25.8	-
1st Floor Bedroom	42.9	36.8	35	30	7.9	6.8
Gnd Floor Bedroom	42	36	35	30	7	6

Table 2: Computer Model Tabulated Output and SRI Requirements

Please note that the noise contour maps can be found in the appendices of this report.

The required SRI for each of these rooms is typically achievable with standard thermal double glazing when windows are closed. However, when windows are partially open for background ventilation, they will only provide an attenuation of 13dB.

This means that the Lounges in the table above will not be able to rely on opening windows for background ventilation whilst also achieving the BS8233 criterion for internal ambient noise levels during the daytime period.

The bedrooms, however, will be able to open windows for both daytime and night time periods.

For the Lounges, an alternative means of background ventilation will be required.

5.2 Lmax Noise Levels

As well as assessing the continuous noise levels, it is also necessary to assess the Lmax noise levels for bedrooms during the night time hours (23:00 – 07:00hrs).

Now that a computer model has been created, it is possible to view and calculate the difference in sound pressure level between the survey position and the bedroom windows to the rear, based on the output data in Table 2, above.

Using these differences and applying them to the Lmax survey data as well as the attenuation provided by a partially open window (13dB), it is possible to see how many times the Lmax will exceed 45dB within the bedrooms during the night time hours.

It has been calculated that the number of Lmax occurrences exceeding 45dBA within a bedroom during the night will be as per the table on the following page:

Reception Point	Average	Night 1	Night 2	Night 3	Night 4	Night 5	ProPG Compliant?
1st Floor Bedroom	2.6	4	1	1	4	3	Yes
Ground Floor Bedroom	1.8	3	0	1	3	2	Yes

Table 3: No. of Lmax events exceeding 45dBA during the night

6 Mitigation Measures

6.1 Glazing

The most onerous sound reduction required for the front lounges is shown in table 2 to be 27dB (rounded from 26.8dB). This is generally achievable by standard thermal double glazing which typically achieves a sound reduction of 31dB when installed in a frame as part of a cavity masonry façade.

When looking for a glazing product for this property, the metric to be applied is R_w+C_{tr} and is often referred to as $R_{traffic}$.
It is imperative to note that the glazing performance is of the glass when mounted within its frame. If glazing specifications are found where the performance is for the glass alone, then a penalty of 2dB should be applied, as glazing within a frame performs lower than glass alone.

6.2 Ventilation

From Section 5 above, it is noted that whilst the bedrooms are sufficiently shielded from the road such that they can utilise open windows whilst also achieving internal ambient noise levels, this is not true of the windows at the front of the property that serve the lounges.

An alternative means of providing ventilation will be required for the lounges.

Commercially available passive ventilators are capable of providing air flow with good levels of attenuation against sound.

Through wall ventilators have been selected with high areas of opening to provide maximum ventilation rates for future tenants. As stated, these have used 12800mm^2 for living room areas and 9800mm^2 for bedrooms which exceed the requirements of Approved Document F for ventilation.

The future occupants are also able to exercise control over whether they wish to open windows and it is relevant to note that there are not any criteria applied for short term purge ventilation such as removing odours of burnt toast for example.

When selecting ventilation units, the performance specification must be with the unit OPEN and not closed.

Should the client choose mechanical extract ventilation, then any mechanical extract ventilation would have to be carefully specified (a mechanical noise level of 24-26dB $L_{Aeq,T}$ or less) to ensure that it does not add to the internal soundscape and that future occupants do not switch the system off resulting in poor air quality.

In considering MEV/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.

6.3 Confirmation of Mitigation Measures

A BS8233 "Rigorous Calculation" has been carried out for the most onerous exposed façade (1st Floor Lounge).
The calculation has utilised the area of the wall and the area of the glazing to create the composite building façade. The Leq sound pressure level of the loudest daytime period (61.8dBA) as used in the ProPG assessment and computer model has been entered into this calculation. The glazing type and ventilator type have both been entered into the model.

The outcome showed that a typical trickle vent and a standard thermal double-glazing unit with the specification of 4mm glass, 12mm cavity, 4mm glass would enable the building façade to provide a sound reduction of 28dB, meaning an internal daytime ambient noise level of Leq,16hr= 34dBA.

This satisfies the requirements of BS8233 from a noise point of view.

The rigorous calculation was then altered from a ventilation point of view to utilise a vent that supplies an equivalent area of 12,800mm^2. This is a Rytons 9x9 unit, which supplies a D,ne,w performance of 38dB when open. With this alternative ventilator in place the sound reduction of the building envelope was also 28dB, again satisfying the requirements of BS8233.

These BS8233 rigorous calculations can be found within Appendix B of this report.

7 Conclusion

A noise survey has been carried out at 54 Teville Road, Worthing.

A sound level meter was used to ascertain the soundscape to the front of the property. The dominant soundscape impacting the site is road traffic on both Teville Road and Victoria Road.

A computer model was created to show the effect of the road noise at the bedroom window positions to the rear of the property given the large amount of shielding provided by the building and adjacent buildings.

BS8233 "Rigorous Calculations" were applied to ensure that the glazing and/or ventilation proposals are sufficient to protect future occupants.

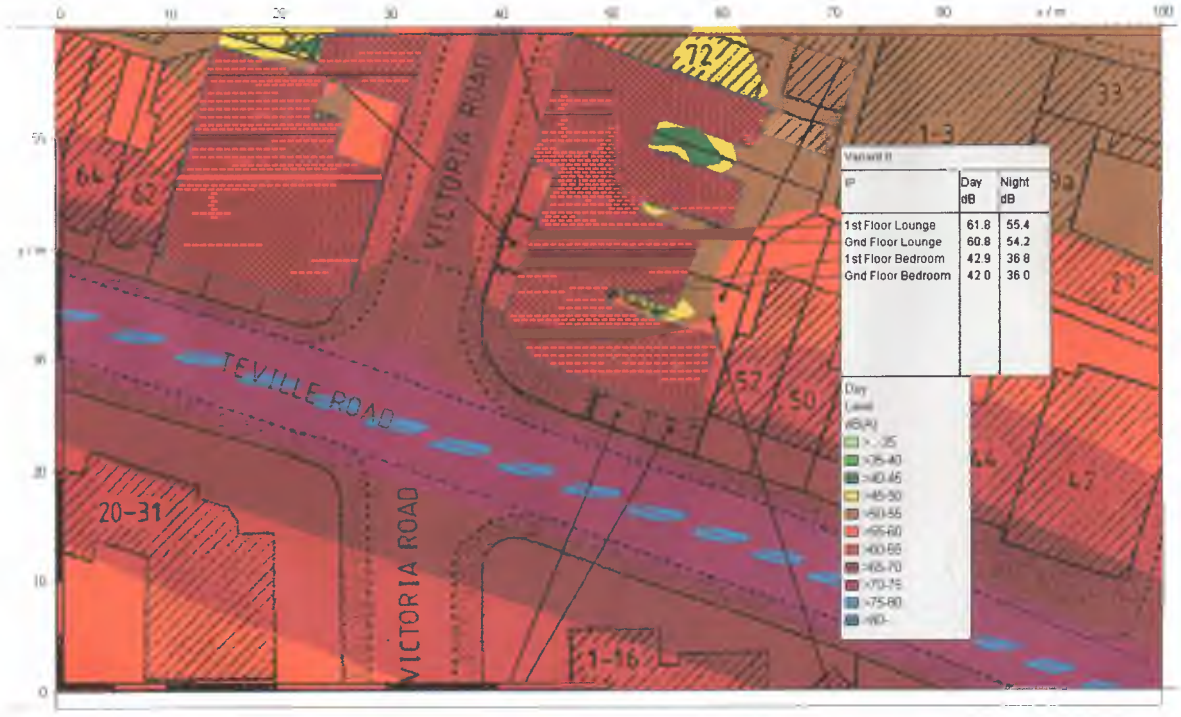
Recommendations have been made in respect of glazing and ventilation to protect the future occupants.

In particular, the lounge area on both first and ground floors cannot rely upon opening windows for background ventilation, but instead will require an appropriate trickle ventilator.

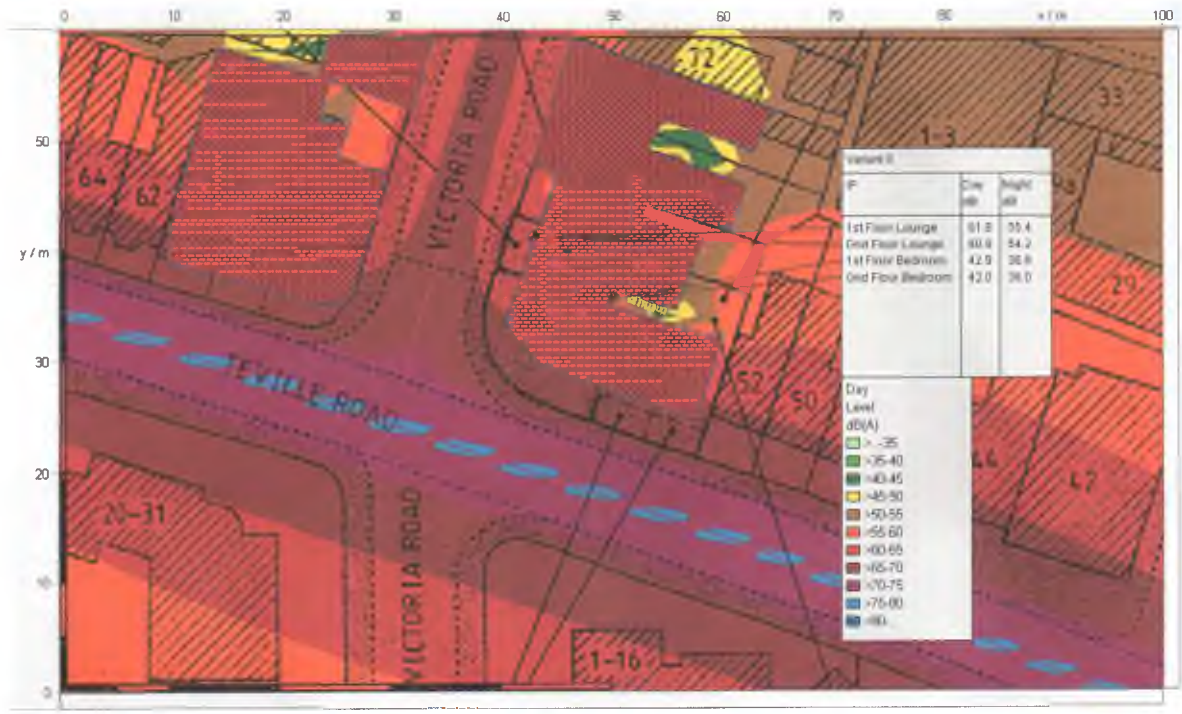
If the mitigation measures discussed in Section 6 are adopted, it is considered that there is no reason to withhold planning consent on the grounds of noise.

Appendix A – Noise Contour Maps

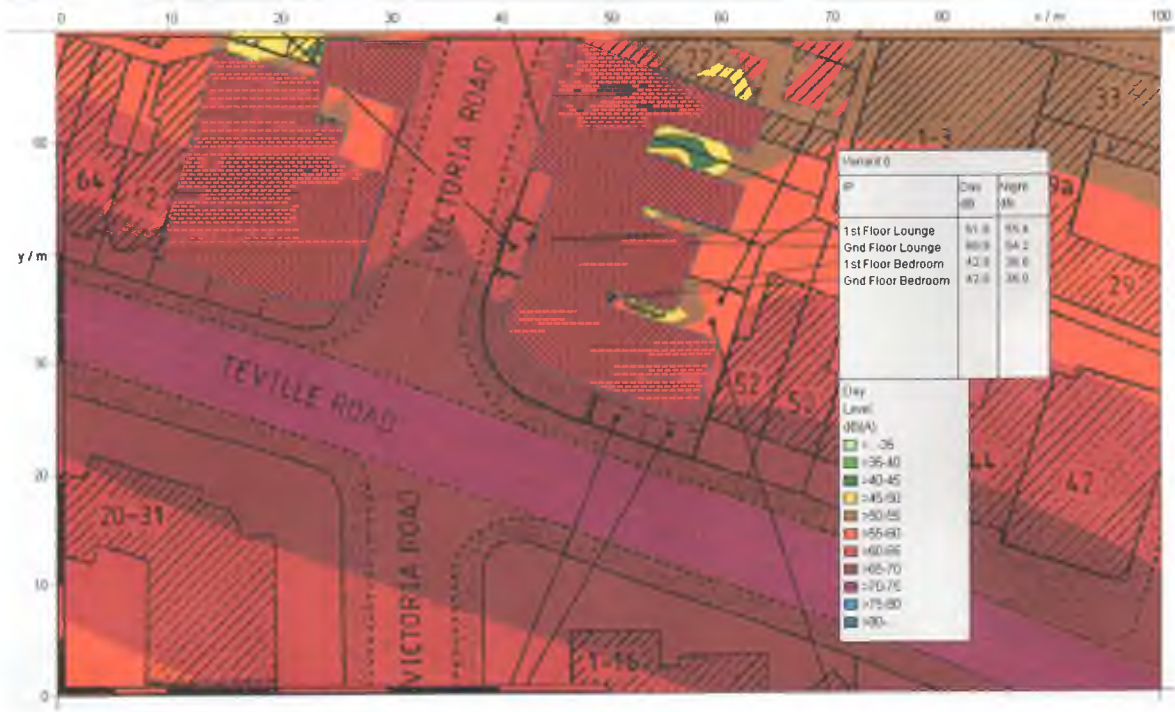
Ground Floor Day



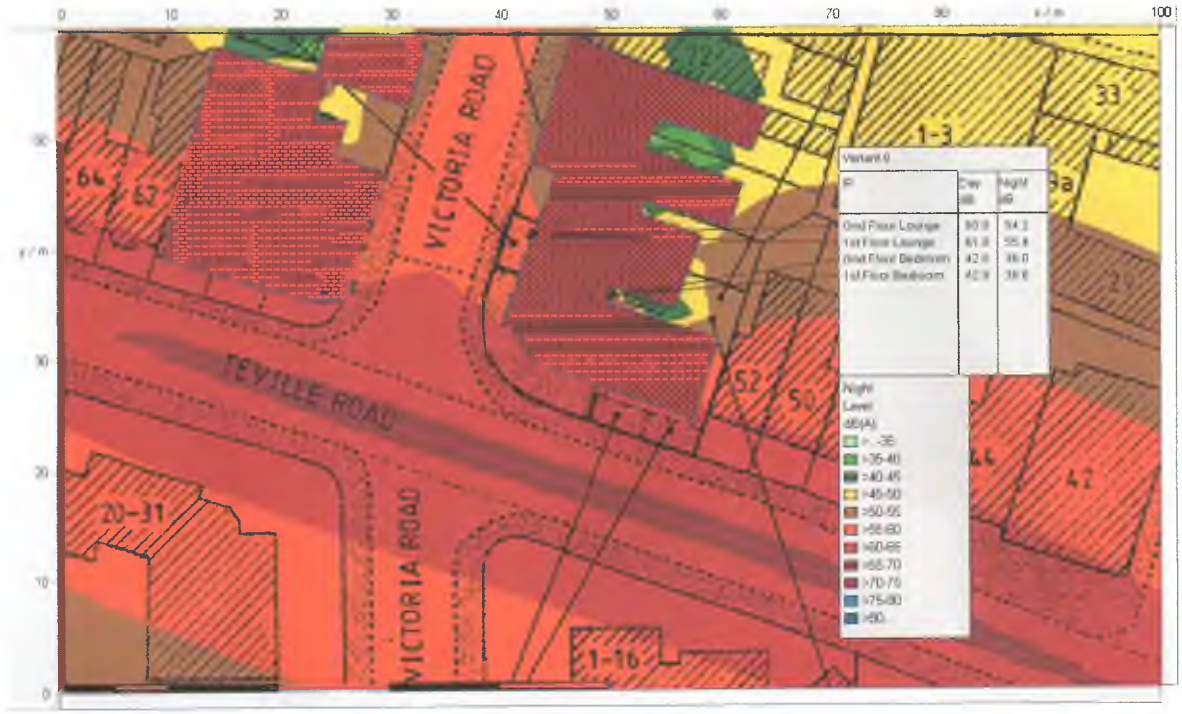
Ground Floor Night



1st Floor Day



1st Floor Night



Appendix B – BS8233 Rigorous Calculations

Typical Trickle Vent

Non Frequency Dependent Variables		
Term	Derivation	Value
Ao	Given in BS EN 20140-10 = 10 (m^2)	10
Sf	Total Facade Area (m^2)	10.6
Swi	Window Area (m^2)	5.26
Sew	External Wall Area (m^2)	5.4
Srr	Ceiling Area (m^2)	0.001
S	Total Area sound enters the room (m^2)	10.6

Key for Table Below	
Rwi	Sound Reduction of Window (Octave)
Rew	Sound Reduction Index of External Wall (Octave)
Rrr	Sound Reduction Index of Roof/Ceiling (Octave)
A	Equivalent Absorbtion Area of Rx Room
Dn,e	Insulation of Trickle Vent (BS EN 20140-10)

Frequency Dependent Variables							
		Octave Band Centre Frequency					
Term	Description	125	250	500	1000	2000	4000
Leq,ff	Free-Field External Noise Level	63.7	59.7	57.7	57.7	54.7	47.7
Dn,e	Typical Trickle Vent	34	34	34	34	34	34
Rwi	4_12_4	24	20	25	35	38	35
Rew	Cavity Masonry (Brick Cavity with Insulation lightweight block)	41	39	44	52	60	65
Rrr	Flat timber joist roof, asphalt on boarding, 12mm plasterboard ceiling, thermal insuation	45	45	45	45	45	45
A	Equivalent Absorbtion Area of Room (Copied from BS8233)	11.00	14.00	16.00	16.00	15.00	15.00

BS8233 Calculation Details						
	Octave Band Centre Frequency					
Term From Equation Below	125	250	500	1000	2000	4000
Leq,ff	63.7	59.7	57.7	57.7	54.7	47.7
Ao/S . 10^(-Dn,e/10)	0.0003756	0.000376	0.000376	0.000375573	0.000375573	0.000375573
Swi/S . 10^(-Rwi/10)	0.0019755	0.004962	0.001569	0.000156921	7.86466E-05	0.000156921
Sew/S . 10^(-Rew/10)	4.047E-05	6.41E-05	2.03E-05	3.21431E-06	5.09434E-07	1.61097E-07
Srr/S . 10^(-Rrr/10)	2.983E-09	2.98E-09	2.98E-09	2.98328E-09	2.98328E-09	2.98328E-09
10log10(S/A)+3	2.8391318	1.791778	1.211859	1.211858826	1.492146062	1.492146062
Leq,2	40.325935	38.8173	31.84562	26.20116177	22.76969938	16.45662615
A-Weighting	-16.1	-8.6	-3.2	0	1.2	1
A-Weighted Leq	**24.225935**	**30.2173**	**28.64562**	**26.20116177**	**23.96969938**	**17.45662615**

A-Weigted Level Outside	62
BS8233 Predicted Internal A-Weigted Level	34
Prediced Building Envelope SRI	27

BS8233 Calculation can be seen below:

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

Acoustic Trickle Vent with EA of 12800mm²

Non Frequency Dependent Variables		
Term	Derivation	Value
Ao	Given in BS EN 20140-10 = 10 (m^2)	10
Sf	Total Facade Area (m^2)	10.6
Swi	Window Area (m^2)	5.26
Sew	External Wall Area (m^2)	5.4
Srr	Ceiling Area (m^2)	0.001
S	Total Area sound enters the room (m^2)	10.6

Key for Table Below	
Rwi	Sound Reduction of Window (Octave)
Rew	Sound Reduction Index of External Wall (Octave)
Rrr	Sound Reduction Index of Roof/Ceiling (Octave)
A	Equivalent Absorbtion Area of Rx Room
Dn,e	Insulation of Trickle Vent (BS EN 20140-10)

Frequency Dependent Variables							
		Octave Band Centre Frequency					
Term	Description	125	250	500	1000	2000	4000
Leq,ff	Free-Field External Noise Level	63.7	59.7	57.7	57.7	54.7	47.7
Dn,e	Ryton 9x9 Airliner (38dB Open)	36	29	31	39	44	52
Rwi	4_12_4	24	20	25	35	38	35
Rew	Cavity Masonry (Brick Cavity with Insulation lightweight block)	41	39	44	52	60	65
Rrr	Flat timber joist roof, asphalt on boarding, 12mm plasterboard ceiling, thermal insuation	45	45	45	45	45	45
A	Equivalent Absorbtion Area of Room (Copied from BS8233)	11.00	14.00	16.00	16.00	15.00	15.00

BS8233 Calculation Details						
	Octave Band Centre Frequency					
Term From Equation Below	125	250	500	1000	2000	4000
Leq,ff	63.7	59.7	57.7	57.7	54.7	47.7
Ao/S . 10^(-Dn,e/10)	0.000237	0.001188	0.000749	0.000118767	3.75573E-05	5.95243E-06
Swi/S . 10^(-Rwi/10)	0.0019755	0.004962	0.001569	0.000156921	7.86466E-05	0.000156921
Sew/S . 10^(-Rew/10)	4.047E-05	6.41E-05	2.03E-05	3.21431E-06	5.09434E-07	1.61097E-07
Srr/S . 10^(-Rrr/10)	2.983E-09	2.98E-09	2.98E-09	2.98328E-09	2.98328E-09	2.98328E-09
10log10(S/A)+3	2.8391318	1.791778	1.211859	1.211858826	1.492146062	1.492146062
Leq,2	40.066651	39.42554	32.60189	23.36641269	16.86346059	11.31500992
A-Weighting	-16.1	-8.6	-3.2	0	1.2	1
A-Weighted Leq	**23.966651**	**30.82554**	**29.40189**	**23.36641269**	**18.06346059**	**12.31500992**

A-Weigted Level Outside	62
BS8233 Predicted Internal A-Weigted Level	34
Prediced Building Envelope SRI	28

BS8233 Calculation can be seen below:

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