Acoustic Associates Sussex Ltd.

Noise Assessment of Proposed Development at 9 Mill Road, Worthing

Site: 9 Mill Road, Worthing
Client: Blythe Properties

Report by: Nick Fry BEng(Hons)
Checked by: Peter Attwood BSc(Hons) MSc MCIOB MIOA MIDiagE

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Acoustic Associates

Sound Insulation Testing - Acoustic Design of Buildings - BS4142 - PPG24 - Schools Acoustics BB93 - Vibration - Expert Witness Testimony - Noise at Work - Air Tightness Testing - Auditorium Acoustics

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Acoustic Associates Sussex Ltd., 8 Highdown House, Shoreham Airport, Shoreham-by-Sea, West Sussex BN43 5PB
Tel: (01273) 455074 Fax: (01273) 455075 e-mail: info@aasussex.co.uk **www.aasussex.co.uk**

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1 Introduction

Acoustic Associates have been appointed by Blythe Properties to undertake a PPG24 assessment of the proposed development at 9 Mill Road, Worthing.

It is understood that planning permission has already been given but there is concern that noise from the neighbouring A259 road will affect the future residents of the site.

For this reason the noise levels measured at the site will be compared with the WHO criterion for day time and night time.

The appropriate acoustic mitigation recommendations have been made in order for the site to meet WHO standards.

Taking into account the above it is considered that the above property will meet WHO standards providing that the acoustic mitigation measures recommended in the report are utilised.

1.1 WHO Noise Criteria

The target internal levels are based on guidelines laid out by the World Health Organisation (WHO) and are as follows:

Room Type	Maximum Internal Level - Leq dB (A)
Living rooms	35 (Daytime only)
Bedrooms	30 (Night)
Room Type	Maximum Internal Level – L(A)max dB (A)
Bedrooms	45 (not more than 10-15 times per Night)

The target internal noise level for a bedroom during the night time corresponds to the threshold of sleep disturbance. Internal noise levels above 30dB (A) are likely to cause sleep disturbance.

The target internal noise level for bedrooms and living rooms during the day time for a reasonable standard is set to 35dB(A). When the internal noise levels exceed 35dB (A) speech intelligibility levels of the occupants will be reduced.

2 Noise Survey Baseline Conditions & Results

A noise survey was carried out between the 16th and 17th of February 2012 in order to measure day and night time noise levels associated with the A259 road.

2.1 Noise Survey Details

2.1.1 Equipment

- Rion NL18 Type 1 Sound Level Meter (Continuous Survey)
- Weatherproof microphone housing
- Castle GA607 Class 1 Acoustic Calibrator
- Microphone Mounting Poles & Tripod

2.1.2 Personnel

Survey carried out by: Nick Fry BEng(Hons)

2.1.3 Weather conditions

Dry, wind: variable direction no greater than 5m/s.

2.1.4 Measurement Positions

The Sound Level Meter was positioned on the first floor with the microphone extending out of the window facing the A259. The microphone was extended 1 metre from the frontal façade and therefore all measurements are façade measurements. The meter was left to run for a 24 hour period in order to determine the day and night time noise levels.

2.1.5 Site/Survey Drawing

The figure below shows the location of the site:

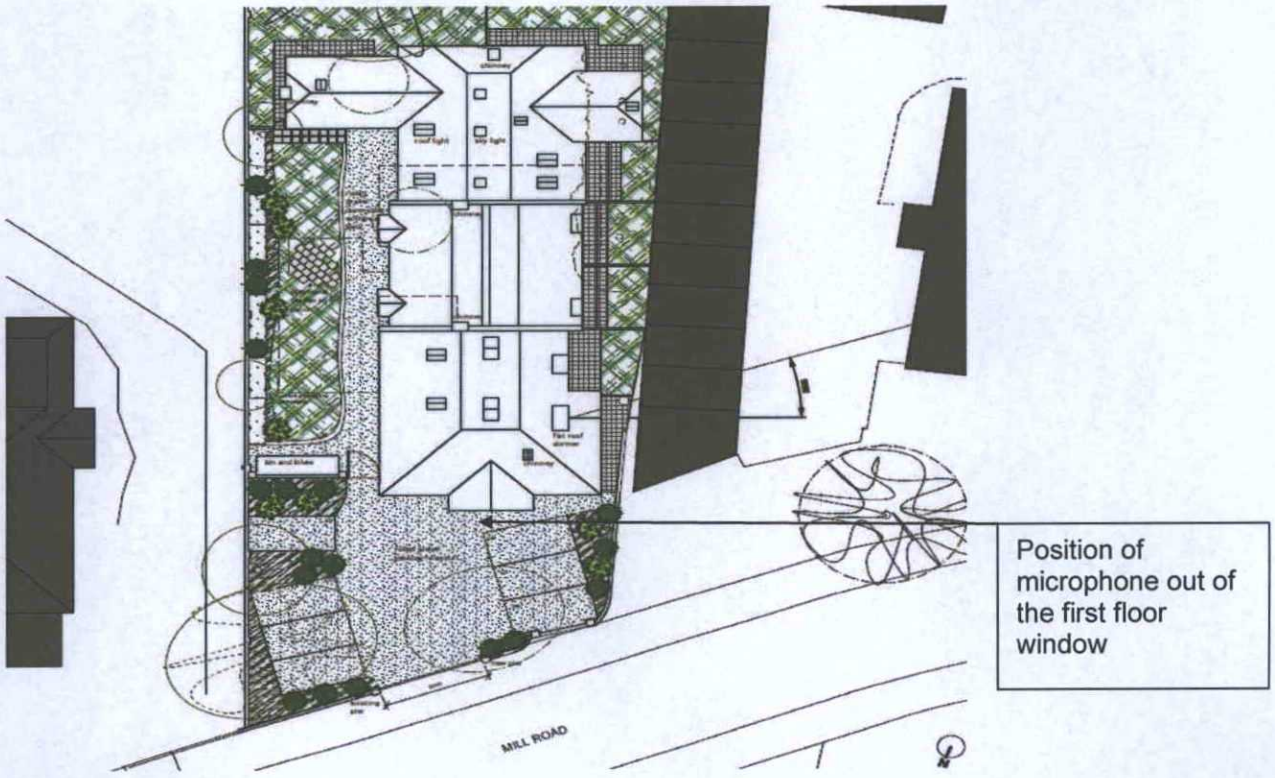

Figure 1: Site Location

2.2 Noise Survey Results (24 Hour Survey)

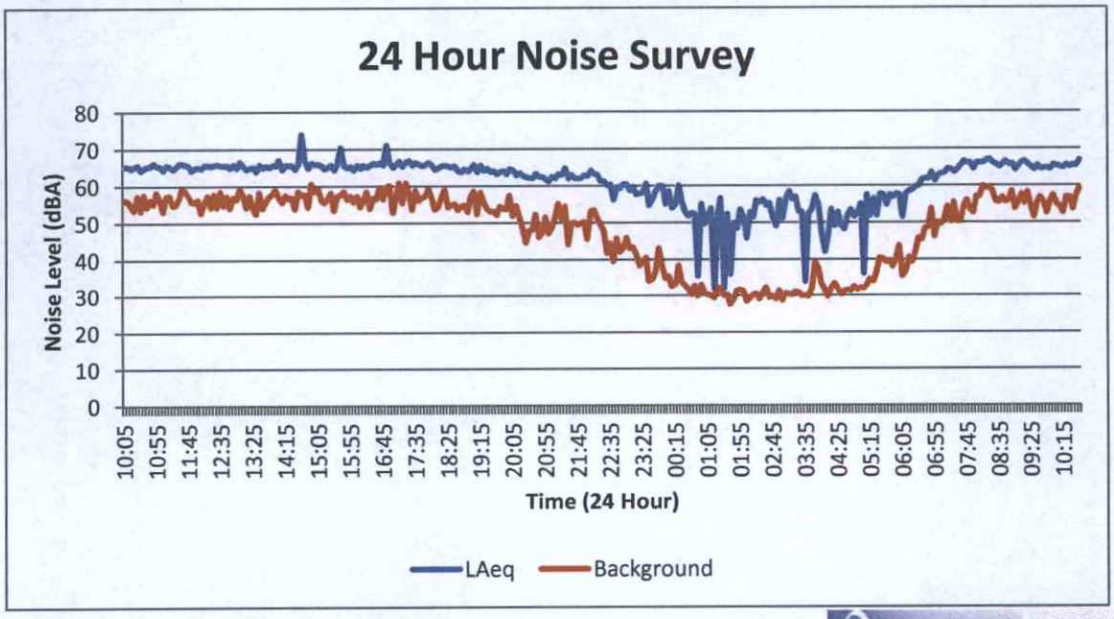

Figure 2: Graph of Survey Results

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The Table below shows the measured day and night time period noise levels. The individual day and night time levels have also been averaged:

Date	*Time Period*	*$L(A)_{eq,T}$ - dB(A)*
02/02/2012	07:00-23:00hrs	65
03/02/2012	23:00-07:00hrs	56

Table 1: Day Time and Night Time Noise Levels

3 IMMI Model

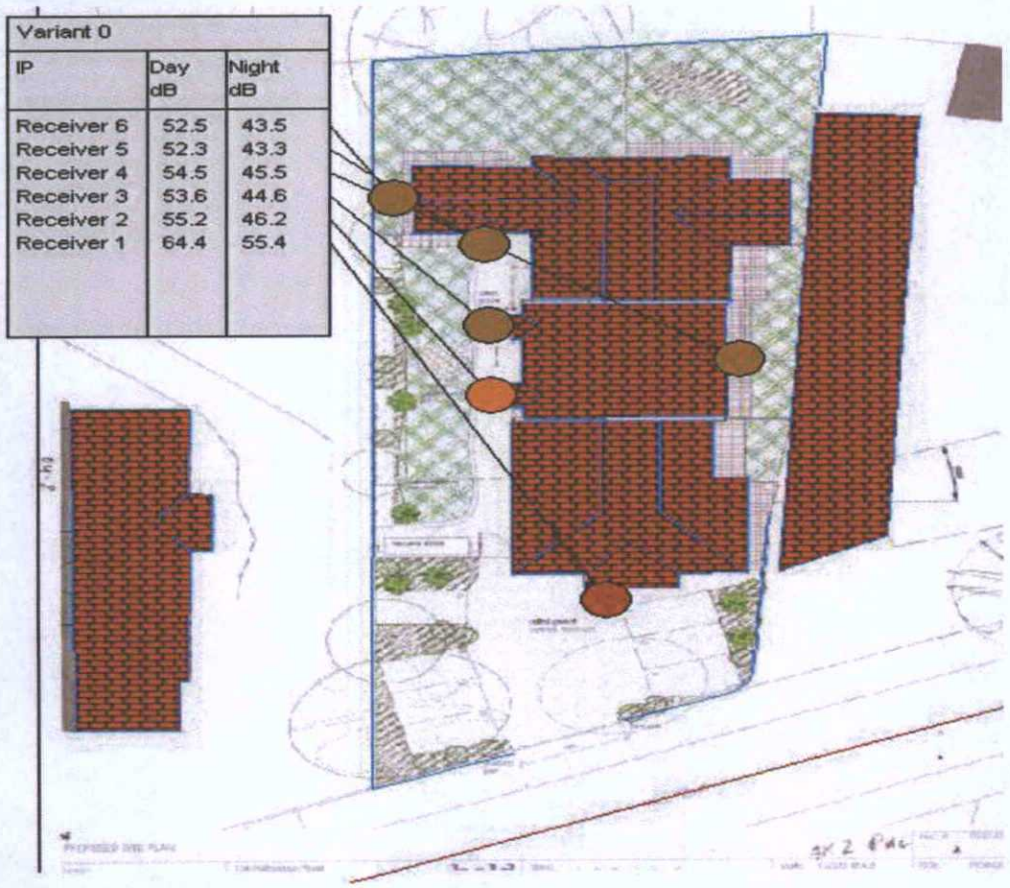

Figure 3: Site Map With Noise Levels at Various Location Around the Building

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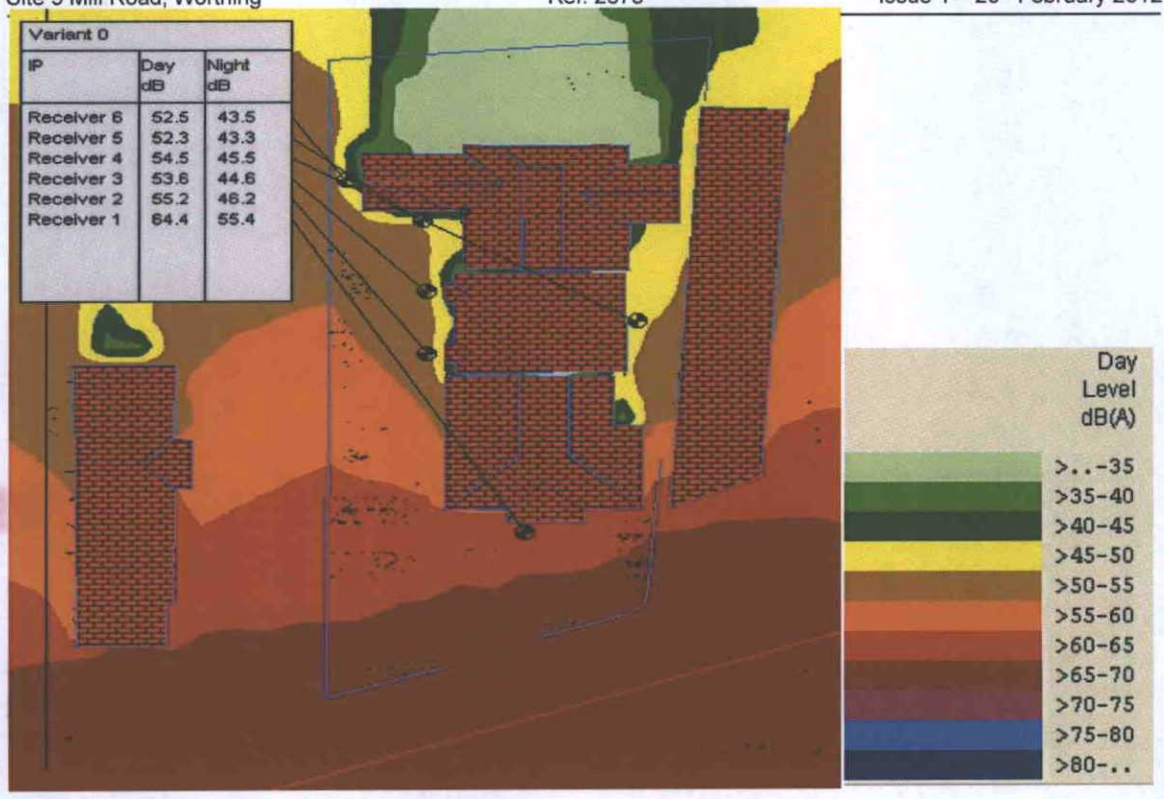

Figure 4: Day Time Ground Floor Noise Map

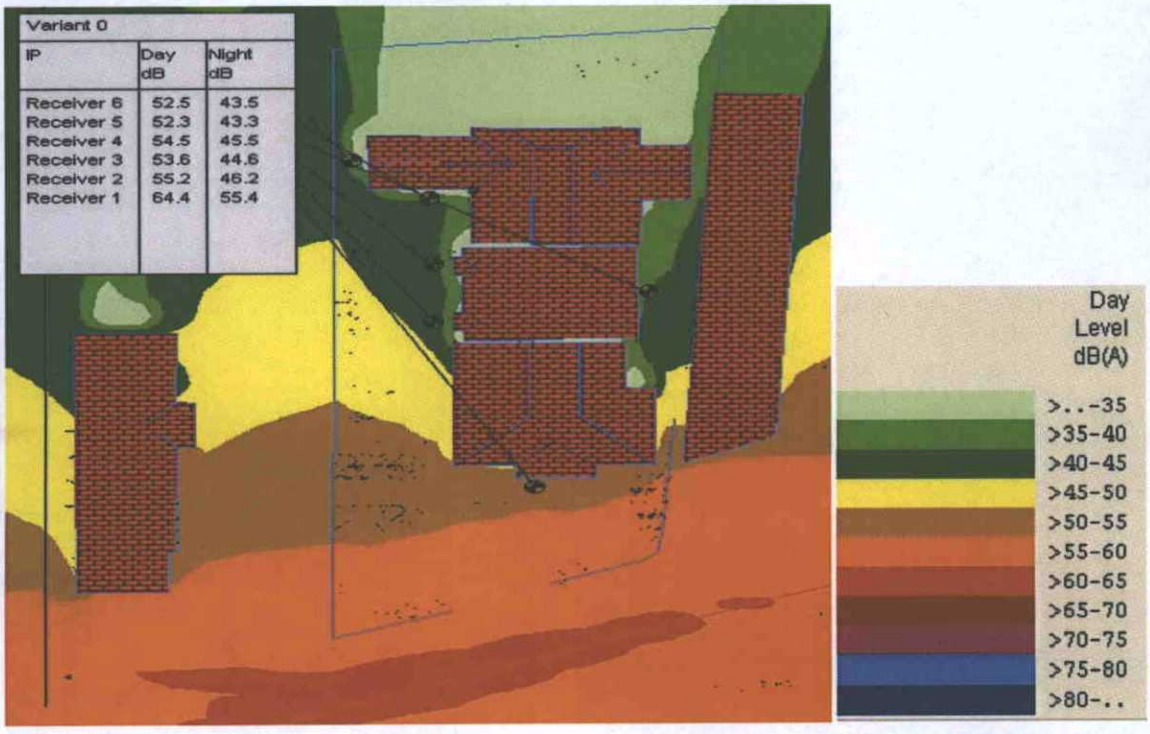

Figure 5: Night Time Ground Floor Noise Map

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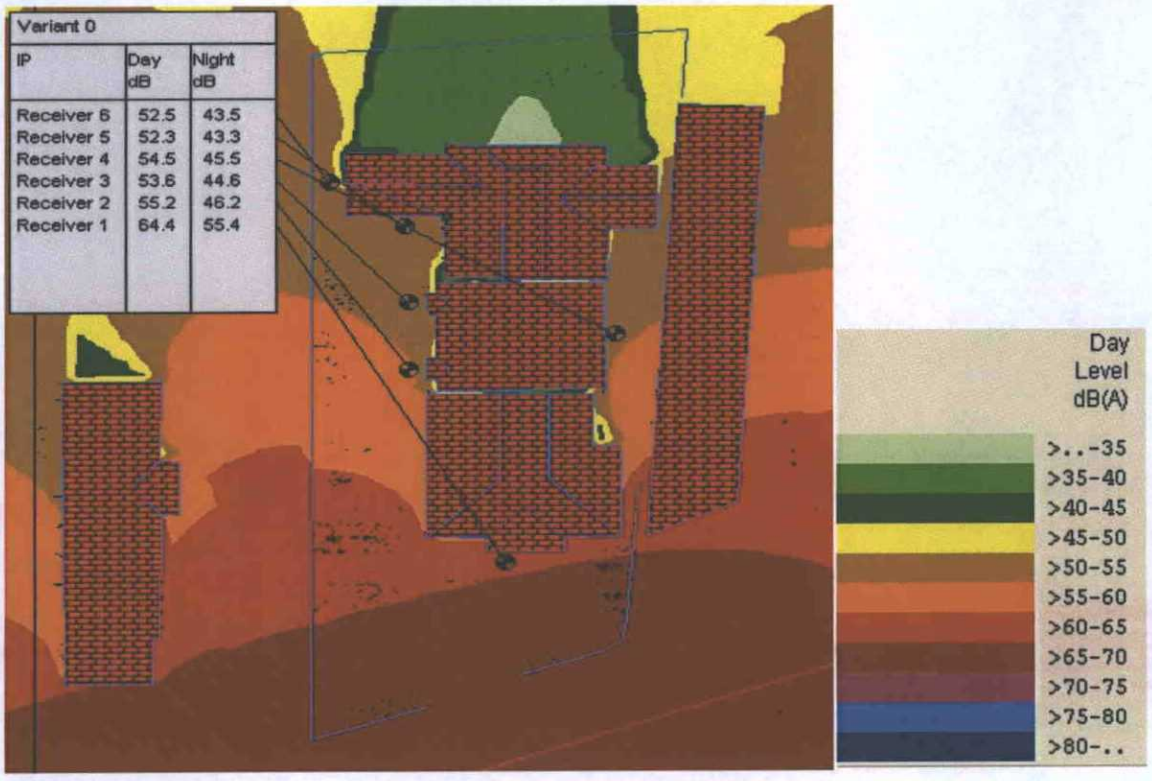

Figure 6: Day Time First Floor Noise Map

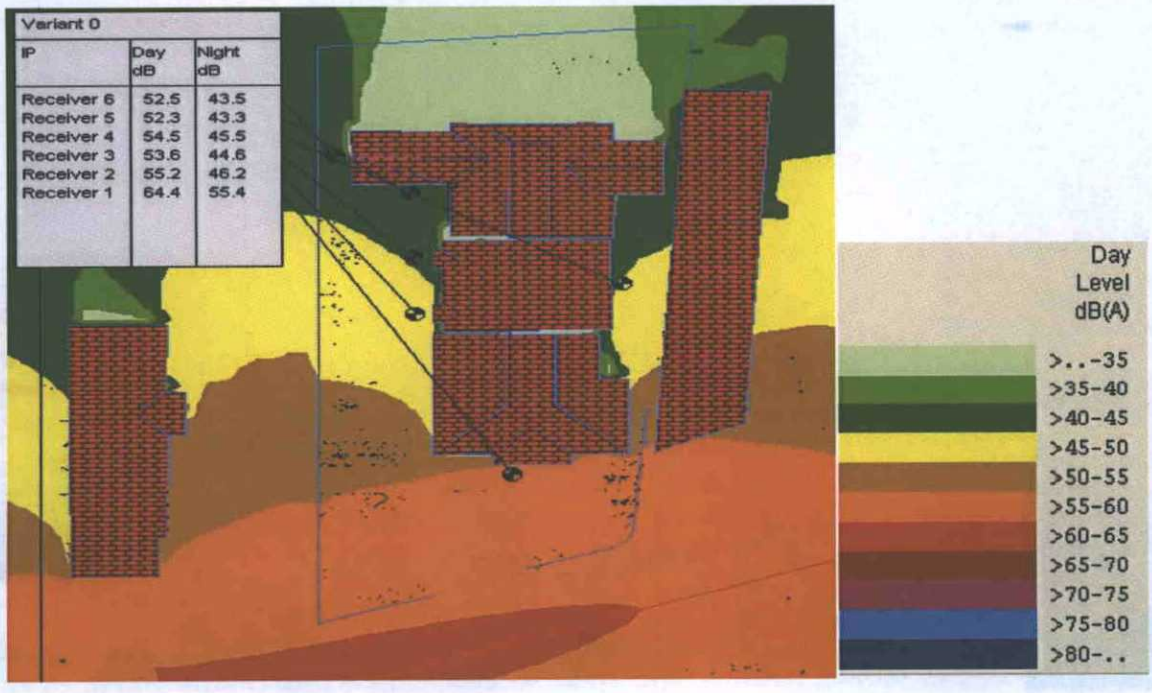

Figure 7: Night Time First Floor Noise Map

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Figure 8: 3-D View

4 Road Noise Mitigation Measures and Amenity Areas

4.1 Noise Criteria

The target internal levels are based on guidelines laid out by the World Health Organisation (WHO) and are as follows:

Room Type	Maximum Internal Level - Leq dB (A)
Living rooms	35 (Daytime only)
Bedrooms	30 (Night)
Room Type	Maximum Internal Level – L(A)max dB (A)
Bedrooms	45 (not more than 10-15 times per Night)

4.2 Glazing

With respect to outside-to-inside attenuation of various transportation noise sources PPG24 (Annex 6, Para. 4) states the following:

"Because the sound insulation of a window (and other components of the building envelope) varies with the frequency (or pitch) of the sound, the overall noise reduction provided by a window will depend, among other factors, on the spectrum of the external noise. Table 1 (below) shows typical reductions in noise levels from common sources which would be expected from

various types of window installations fitted in brick/block walls in a dwelling. The insulation provided by any type of window when partially open will be in the region of 10-15 dB (A)"

Noise Source	Single Glazing	Thermal Double Glazing	Secondary Glazing
Road Traffic	28	33	34
Civil Aircraft	27	32	35
Military Aircraft	29	35	39
Diesel Train	28	32	35
Electric Train	30	36	41

Table 2: Glazing

Normal thermal glazing (4/12/4) will provide $R_{traffic}$ = 25dB(A) and Rw = 31 dB(A):source Pilkington Glass. 4/12/4 glazing when set in a masonry façade, as per the above table, should mean that the façade will attenuate outdoor road noise levels by approximately 33dB(A).

Figure 4 above clearly shows that the front façade and its neighbouring walls fall within the 60-65 dBA noise band during the day time (indicated in red). In order to achieve WHO target internal noise levels thermal glazing of the type 4/12/4 will be required.

The above figures show the other sections of the building that will require noise mitigation works. The building to the left of the development site (looking from the road) provides some screening from road noise and due to this plus distance attenuation, the windows located on the further back sections of the site (receivers 2, 3, 4 & 6) fall into the 50-60 dBA range (indicated by orange and brown). In order to meet WHO target levels these windows will require Single Glazing windows.

If windows are closed and the above glazing is installed, the WHO noise criteria can be achieved for day time and night time periods for these units.

Where the external noise level falls below 50dB(A) during the daytime and 45dB(A) at night, reliance can be placed upon openable windows for rapid ventilation. This applies to some units towards the rear portion of the site.

4.3 Ventilation

Since any partially open windows will give attenuation in the order of 15 dB the internal noise levels of the rooms with windows on the Mill Road façade of the site for day time and night time under open-window conditions will be 50 dB and 41 dB respectively (referring to table 1). These values do not meet the WHO standards and therefore reliance cannot be placed wholly upon open-able windows to achieve rapid ventilation for these units. Therefore, it is recommended that ventilation be provided by means other than that of an open window.

It is our recommendation, therefore, that for those units where the external noise levels is above 50dB(A) daytime or 45dB(A) at night, consideration be given to the use of a mechanical ventilation and heat recovery system (MVHR) or an attenuated powered ventilation system. This means future occupants will have the choice between MHVR/ Powered-System and opening a window to provide ventilation.

5 Conclusion and Comparison with Noise Criteria

A continuous noise survey was carried out in order to determine the noise impact of the A259 road on the future occupants of 9 Mill Road, Worthing. The results have been compared with the WHO criteria and the correct Mitigation measures recommended.

For units where the external traffic noise level is above 50dB(A) daytime or 45dB(A) at night, if glazing is installed as recommended in section 4.2 then the WHO criterion for day and night time internal levels will be achieved provided that the windows remain closed.

It is recommended for these units that an MVHR system or a powered attenuated ventilation system could be installed to provide an alternative to opening a window and causing noise break-in.

Where the external noise level falls below 50dB(A) during the daytime and 45dB(A) at night, reliance can be placed upon openable windows for rapid ventilation. This applies to some units towards the rear portion of the site.

If the above acoustic mitigation recommendations are followed then the WHO criterion for internal noise levels during day and night time periods should be achieved for the whole development.

6 Glossary of Terms

- **Specific noise level,** *L*Aeq,*Tr*
  The equivalent continuous A-weighted sound pressure level at the assessment position produced by the specific noise source over a given reference time interval.

- **Ambient noise**
  Totally encompassing sound in a given situation at a given time usually composed of sound from many sources near and far.

- **Background noise level,** *L*A90,*T*
  The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90 % of a given time interval, *T*, measured using time weighting, *F*, and quoted to the nearest whole number of decibels

7 Appendix 1

Measured Noise Levels from 9 Mill Road, Worthing

Time	Leq	Lmax
10:05	65.4	72.9
10:10	65.4	71.3
10:15	64.9	70.8
10:20	65.4	71.9
10:25	65.8	71.5
10:30	64.4	71.3
10:35	65.1	74.2
10:40	65.4	72.7
10:45	65.5	73.6
10:50	66.3	72.8
10:55	65.6	71.3
11:00	65.4	73
11:05	64.6	70.7
11:10	65.8	73.2
11:15	65.4	70.9
11:20	64.8	72.2
11:25	65.4	73.2
11:30	66.2	72.1
11:35	66.2	73.3
11:40	65.9	72.3
11:45	65.7	71.2
11:50	64.4	71.4
11:55	65.1	71.9
12:00	65.2	73.6
12:05	65	71.6
12:10	65.8	72
12:15	65.8	72.9
12:20	65.6	72.3
12:25	65.9	71.6
12:30	66.1	74.1
12:35	65.8	71.6
12:40	65.7	72.7
12:45	65.8	73.9
12:50	65.1	72
12:55	66	72.1

13:00	65.1	71.9
13:05	66.6	73.1
13:10	65.6	72.2
13:15	64.8	73.2
13:20	65.1	70.7
13:25	65.3	72.2
13:30	64.1	71.5
13:35	65.9	72.9
13:40	65.1	71.8
13:45	65.6	72.6
13:50	65.3	71.8
13:55	65.8	72.3
14:00	65.7	73.1
14:05	67.2	82.1
14:10	64.7	71.3
14:15	65.9	72.1
14:20	65.8	72.8
14:25	65.8	72.2
14:30	64.8	72.9
14:35	66.2	74.1
14:40	74.2	95
14:45	67	78.1
14:50	65.1	71.4
14:55	66.4	71.4
15:00	66.1	74.8
15:05	66.1	72.7
15:10	65.8	71.9
15:15	64.9	72.1
15:20	65.2	71.2
15:25	65.9	71.5
15:30	64.6	70.8
15:35	66.3	73.2
15:40	70.6	88.2
15:45	65.6	71.7
15:50	65.2	71.7
15:55	65.4	72.7
16:00	64.6	70.5
16:05	65.8	71.7
16:10	65	71.6
16:15	65.8	72.3
16:20	65.3	72.3
16:25	65.8	72
16:30	66.3	75.3
16:35	66.1	75.3

16:40	66.5	72.1
16:45	65.9	71.3
16:50	71.1	91.1
16:55	66.4	71.6
17:00	65.3	72.2
17:05	66.1	71.4
17:10	66.8	72.2
17:15	65.5	72.7
17:20	66.6	73.8
17:25	67	81.7
17:30	65.8	73
17:35	66.5	74
17:40	66.1	72.8
17:45	65.6	72.6
17:50	66	72.7
17:55	66.5	72.4
18:00	65.8	71.9
18:05	64.7	72.2
18:10	65	77.1
18:15	65.6	71.5
18:20	65.7	71.8
18:25	65.5	73.1
18:30	65.3	72.2
18:35	65.5	75.7
18:40	64.2	71.3
18:45	64	71.2
18:50	64.8	71.5
18:55	64.1	74.1
19:00	64.9	73.2
19:05	65.9	72.9
19:10	64	77.8
19:15	65.7	72.8
19:20	64.3	71.3
19:25	64.9	73.2
19:30	64	71.2
19:35	64.2	73.1
19:40	63.4	70.3
19:45	64	72.4
19:50	64.2	71.8
19:55	63.4	71.7
20:00	64.8	72.8
20:05	64.5	71.6
20:10	63	70.8
20:15	63.7	72.3

20:20	62.9	72
20:25	62.5	71.3
20:30	62.4	71.5
20:35	62.3	72.5
20:40	63.5	74.1
20:45	62.6	70.9
20:50	62.6	71.7
20:55	62	70.8
21:00	61.3	72.7
21:05	62.7	71.4
21:10	62.2	70.3
21:15	63.3	72.4
21:20	63.1	71.5
21:25	64.9	74.8
21:30	62.2	71.2
21:35	63.2	73.5
21:40	62.1	70.4
21:45	62.1	69.8
21:50	62.3	71.9
21:55	63	72
22:00	62.8	72
22:05	64.3	72
22:10	63.3	70.9
22:15	63.2	73.3
22:20	61.4	70.5
22:25	61.4	69.6
22:30	60.2	73.5
22:35	60.5	71.4
22:40	56.3	70
22:45	59.7	71.7
22:50	59.3	71.2
22:55	60.5	73
23:00	60.5	70.8
23:05	58.8	70.7
23:10	59.9	70.9
23:15	57.8	72.1
23:20	58	71.3
23:25	58.2	69.4
23:30	60.7	72.7
23:35	54.8	68.1
23:40	56.5	69.9
23:45	58.6	70.7
23:50	60	73.4
23:55	60	75.8

00:00	55.2	70.3
00:05	58.7	70.5
00:10	54.2	69.9
00:15	55	70.7
00:20	60.2	73.1
00:25	55.7	70.1
00:30	53.2	69.4
00:35	51.9	69.1
00:40	52.7	68.7
00:45	52.5	68.1
00:50	35.7	52.4
00:55	55.2	71.3
01:00	49.7	68.2
01:05	51.9	69.5
01:10	54	68.8
01:15	31.8	37.1
01:20	52.6	70.5
01:25	56.7	70.7
01:30	32	37.2
01:35	52.5	68.4
01:40	36.2	50
01:45	50	68.9
01:50	48.5	67.5
01:55	53.6	70.6
02:00	51.5	69
02:05	45.9	62.9
02:10	53	69.9
02:15	51.6	69.4
02:20	56	70.8
02:25	55.6	71.2
02:30	56.3	71.6
02:35	54.7	70.7
02:40	55.4	69.5
02:45	51.7	68.2
02:50	49	67.5
02:55	56.1	72
03:00	51.2	70.1
03:05	56.7	71.8
03:10	58.4	72.7
03:15	56.5	72
03:20	57.1	71.6
03:25	53.1	68.9
03:30	53	69.8
03:35	34	42.2

03:40	52.4	69.5
03:45	53.8	72.5
03:50	57.3	72.2
03:55	55.1	70
04:00	47.2	57.2
04:05	42.3	52.2
04:10	46.7	65.6
04:15	53.7	72
04:20	49.2	64.1
04:25	53	68.5
04:30	49.3	68.3
04:35	48.3	67.2
04:40	52.3	70.1
04:45	53.5	69.3
04:50	51.7	70.7
04:55	52.8	68.7
05:00	55.2	69.9
05:05	36.3	43.7
05:10	57.6	71.8
05:15	51.9	68
05:20	56.6	73.1
05:25	51.9	68.1
05:30	57.8	71.3
05:35	57.7	72.1
05:40	54.9	68.5
05:45	57.6	72.8
05:50	57	70.2
05:55	57.8	69.4
06:00	57.6	68.2
06:05	51.6	67.7
06:10	57.9	71.2
06:15	58.5	74
06:20	59	71.4
06:25	59.8	70.9
06:30	60	72.2
06:35	61.7	77.6
06:40	62	71.8
06:45	61.9	70.8
06:50	63.7	72.3
06:55	61.4	71.1
07:00	62.9	71.1
07:05	63.3	73.6
07:10	63.6	71.4
07:15	64.7	72.5

07:20	64.5	75.2
07:25	63.8	70.6
07:30	64.5	73.1
07:35	65.6	74.5
07:40	66.6	72.4
07:45	66.3	72.7
07:50	66.2	74.5
07:55	64.7	71.7
08:00	66.3	72.6
08:05	66.3	74.5
08:10	66.4	73.8
08:15	67	74
08:20	67.2	73.1
08:25	66.3	73.9
08:30	65.8	73.3
08:35	65.3	75.7
08:40	66	74
08:45	66.6	74.7
08:50	65.9	72.9
08:55	66.1	72.3
09:00	64.4	72
09:05	65.6	72.1
09:10	66.4	73.8
09:15	66.6	81.9
09:20	66	73.8
09:25	65.2	71.4
09:30	64.5	70.9
09:35	65.6	74.1
09:40	64.8	72.4
09:45	64.8	72.7
09:50	64.9	71.9
09:55	64.6	71.5
10:00	65.7	76.7
10:05	65.5	72.7
10:10	65.2	72.1
10:15	65	71.7
10:20	65.7	72.5
10:25	65.3	72.5
10:30	65.7	73.1
10:35	65.5	73.4
10:40	66.9	76.5