SBM SAFETY SOLUTIONS

NOISE ASSESSMENT

13, LABURNUM CLOSE
BLYTHE BRIDGE
STAFFORDSHIRE
ST11 9NF

Planning Ref: SMD/2018/0216

Report by
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Report Date: 12th April 2019
Ref.: Blythe Bridge-BS8233
Site Visited: 5th April 2019
Site Visited by: S.B. Mellor
Signed:



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1.0 INTRODUCTION

At the request of Mr. P. Montford, SBM Safety Solutions Ltd undertook a noise assessment in connection with the proposed development of land off Laburnum Close, Blythe Bridge for 1 x domestic dwelling.

Planning Reference – **SMD/2018/0216**

Transportation and other sources of noise (where applicable) would be examined where they could affect future residents of this development.

This report considers measurements made on site, the requirements of NPPF and current standards such as BS8233:2014, plus other appropriate criteria; and makes recommendations as necessary.

Acoustic terminology is explained in Appendix 1 of this report; The author's qualifications and experience are described in Appendix 2; Views of the site in Appendix 3

and Method for Converting the UK Road Traffic Noise in Appendix 4.

2.0 SITE DESCRIPTION

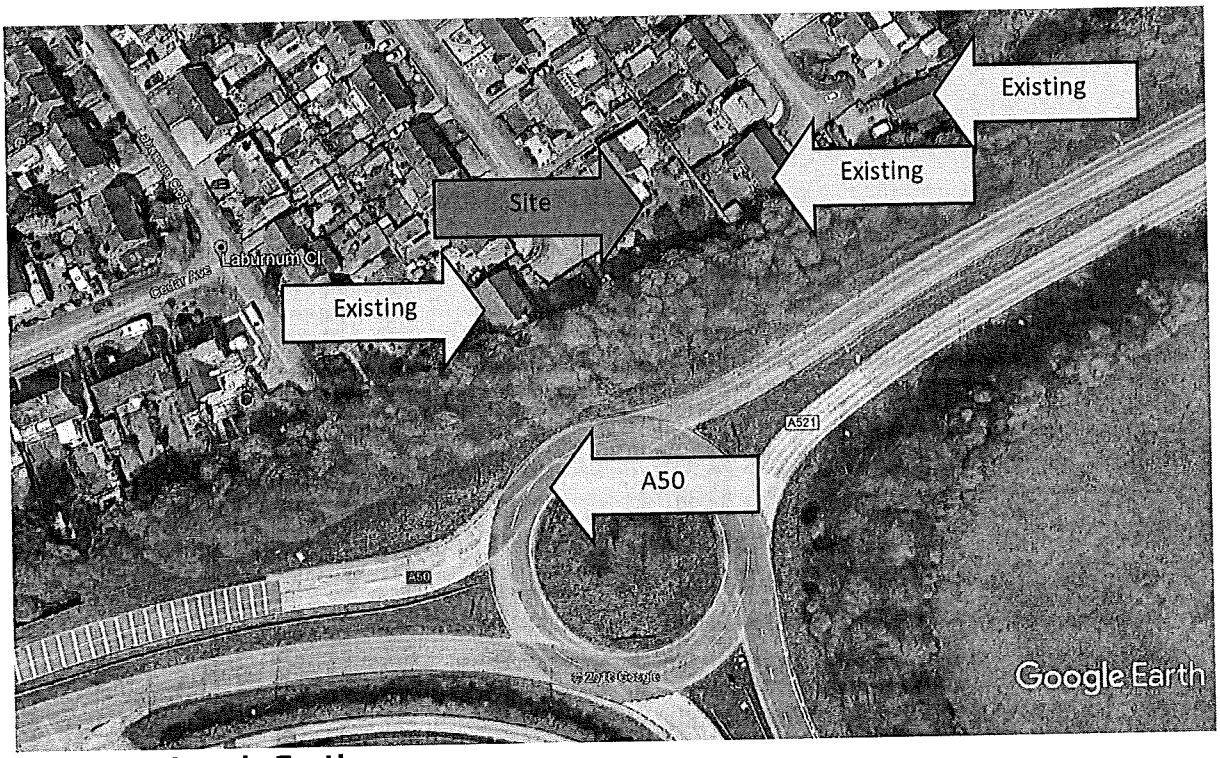
The site lies adjacent to an existing property off Laburnum Close, (S) and adjacent to the A50 carriageway on the outskirts of the village of Blythe Bridge, Staffordshire, ST11 9NF.

This is an existing and well-established residential area.

Apart from the A50 carriageway there are no other significant sources of noise.

There are existing properties located at a similar distance to the A50 carriageway (see figure 1 below – source Google Earth).

Figure 1



Source – Google Earth

The A50 is a relatively busy road at times, featuring all types of vehicles – agricultural, public transport, HGV's, private cars and motorbikes at a maximum of 70mph – although the site is adjacent to a roundabout where vehicles naturally slow or stop.

The dominant and principal source of noise is from road traffic which can fluctuate.

3.0 ASSESSMENT CRITERIA

3.1 Staffordshire Moorlands District Council / High Peak Borough Council

The proposed methodology for this site was discussed and agreed with Denis Colgan, Pollution Officer (Specialist) with Staffordshire Moorlands District Council / High Peak Borough Council.

It was agreed that the procedure from the Department of Transport document 'Calculation of Road Traffic Noise' was suitable to measure road traffic noise on the A50.

3.2 NPPF (National Planning Policy Framework)

When considering applications for new residential development adjacent to existing noise sources, the relevant document is now NPPF. "National Planning Policy Framework". Section 123 of NPPF specifies:

Planning policies and decisions should aim to:

- *avoid noise from giving rise to significant adverse impacts[27] on health and quality of life as a result of new development;*
- *mitigate and reduce to a minimum other adverse impacts[27] on health and quality of life arising from noise from new development, including through the use of conditions;*
- *recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established;[28] and*
- *identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.*

27 See Explanatory Note to the Noise Policy Statement for England (Department for the Environment, Food and Rural Affairs).
28 Subject to the provisions of the Environmental Protection Act 1990 and other relevant law.

The national Planning Practice Guidance (PPG) web-based resource was launched by the Department for Communities and Local Government (DCLG) on 6 March 2014 to support the National Planning Policy Framework and make it more accessible. The overall aim of the guidance, tying in with the principles of the NPPF and the Explanatory Note of the Noise Policy Statement for England, is to identify whether the overall effect of noise exposure is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation.

A summary of the effects of noise exposure associated

with both noise generating developments and noise sensitive developments is presented within the PPG:

Table 1

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

The NPPF, NSPE and PPG:Noise do not, however, present absolute noise level criteria which define SOAEL, LOAEL and NOEL which is applicable to all sources of noise in all

situations. Therefore, within the context of the proposed development, national planning policy and appropriate guidance documents including the 'World Health Organisation Community Noise Guidelines' (1999) and 'BS 8233 – Guidance on Sound Insulation and Noise Reduction for Buildings (2014), which presents the noise level criteria used as a basis for this assessment.

The PPG:Noise also states that neither the NPSE nor the NPPF (which reflects the Noise Policy Statement) expects noise to be considered in isolation, separately from the economic, social and other environmental dimensions of the proposed development.

3.3 ProPG Professional Practice Guidance on Planning & Noise (May 2017) – excerpts are reproduced below

The Professional Practice Guidance on Planning and Noise (ProPG) has been produced to provide practitioners with guidance on a recommended approach to the management of noise within the planning system in England.

The scope of ProPG is restricted to the consideration of new residential development that will be exposed predominantly to airborne noise from transport sources.

New apartments, flats and houses are the most common type of new residential development; however, the guidance can also be applied to other types of residential developments such as residential institutions, care homes etc.

The two sequential stages of the overall approach are:

Stage 1 – an initial noise risk assessment of the proposed development site; and

Stage 2 – a systematic consideration of four key elements.

The overall Stage 1 approach is considered to support wider Government planning and noise policy and guidance at the date of publication of this document, including the NPPF, NPSE and PPG-Noise.

The noise risk assessment may be based on measurement or prediction (or a combination) as appropriate and should aim to describe noise levels over a "typical worst case" 24-hour day either now or in the foreseeable future.

The four key elements to be undertaken in parallel during Stage 2 of the recommended approach are:

- **Element 1 – demonstrating a "Good Acoustic Design Process";**
- **Element 2 – observing internal "Noise Level Guidelines";**
- **Element 3 – undertaking an "External Amenity Area Noise Assessment"; and;**
- **Element 4 – consideration of "Other Relevant Issues".**

The approach is underpinned by the preparation and delivery of an "Acoustic Design Statement" (ADS). An ADS for a site assessed as high risk should be more detailed than for a site assessed as low risk. An ADS should not be necessary for a site assessed as negligible risk. The choice of recommendation is as follows: "grant without conditions", "grant with conditions", "avoid" or "prevent".

The recommended ProPG internal noise level guidelines are described in Figure 2. These guidelines reflect and

extend current practice contained in BS8233:2014.

Figure 2

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 $L_{AFmax,F}$ (Note to 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 $L_{AFmax,F}$, 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 $L_{AFmax,F}$ 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).**

It should be noted that the acoustic performance of the building envelope will be reduced in the event windows are opened for ventilation or cooling purposes, typically reducing the insulation to no more than 10 to 15 dB(A). Most residents value the ability to open windows at will, for a variety of reasons.

"The acoustic environment of external amenity areas that are an intrinsic part of the overall design should always be assessed and noise levels should ideally not be above the range 50 – 55 dB LAeq,16hr."

ProPG Stage 1

For an initial assessment the following table can be referred for indications of suitability:

Table 2

Level Day	Level Night	Risk	Conclusion
Below 50 dB(A) day	Below 40 dB(A) at night	Negligible Risk	Site is likely to be acceptable
Between 50 and 60-65 dB(A) day	Between 40 and 50-55 dB(A) night	Low Risk	Likely to be acceptable provided that Good Acoustic Design (GAD) is followed
Between 60-65 and 70 dB(A) day	Between 50-55 and 60 dB(A) night	Medium Risk	Likely to be less suitable and application may be refused unless ADS demonstrates GAD, how adverse effects will be mitigated, and significant adverse effects avoided
Above 70 dB(A) day	Above 60 dB(A) night	High Risk	Increased risk of refusal, which may be reduced by demonstrating GAD in a detailed ADS, expert advice recommended

3.4 British Standard 8233:2014 (Guidance on Sound Insulation and Noise Reduction for Buildings)

The latest version of BS.8233 "Guidance on Sound Insulation and Noise Reduction for Buildings", was published in February 2014. BS 8233:2014 adopts guideline external noise values provided in WHO for external amenity areas such as gardens and patios. The Standard states that it is "desirable" that the external noise does not exceed 50 dB $L_{Aeq,T}$ with an upper guideline value of 55 dB $L_{Aeq,\ T}$. Where design standards cannot be achieved for traditional amenity spaces (e.g. gardens and

patios) then the *'lowest practical levels'* should be achieved.

An extract of the "Design Range" of BS.8233's Table 4 for indoor noise levels (with Notes 4 & 7) appears below and it should also be noted that the assessment period is for the whole of the day (16 hours) or night (8 hours).

Table 4 **Indoor ambient noise levels for dwellings**

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq,16hour}$	—
Dining	Dining room/area	40 dB $L_{Aeq,16hour}$	—
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

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 LAmax,P depending on the character and number of events per night. Sporadic noise events could require separate values.

NOTE 7 Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved.

"For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB LAeq,T , with an upper guideline value of 55 dB LAeq,T. which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable."

3.5 WHO "Guidelines for Community Noise"

These guidelines entitled "Guidance for Community

Noise"; were approved by the World Health Organisation and consider guideline values for annoyance in the community. These have been set at 50 or 55 dBA, representing daytime levels below which a majority of the adult population will be protected from becoming moderately or seriously annoyed, respectively. An extract of "*Table 4.1 from Section 4.4*" appears below:

Table 4.1: Guideline values for community noise in specific environments (Extract).

Specific environment	Critical health effect(s)	LAeq [dB]	Time base [hours]	LAmax, fast [dB]
Outdoor living area	Serious annoyance, daytime and evening Moderate annoyance, daytime and evening	55 50	16 16	- -
Dwelling, indoors Inside bedrooms	Speech intelligibility and moderate annoyance, daytime and evening Sleep disturbance, night-time	35 30	16 8	 45
Outside bedrooms	Sleep disturbance, window open (outdoor values)	45	8	60

The guidelines also suggest that; "*At night, sound pressure levels at the outside façades of the living spaces should not exceed 45 dB LAeq and 60 dB LAmax, so that people may sleep with bedroom windows open. These*

values have been obtained by assuming that the noise reduction from outside to inside with the window partly open is 15 dB." LAeq for daytime is for 16 h and for night time 8h. BS8223 is based on the WHO Guidelines and as can be seen has similar values.

4.0 NOISE LEVEL INFORMATION

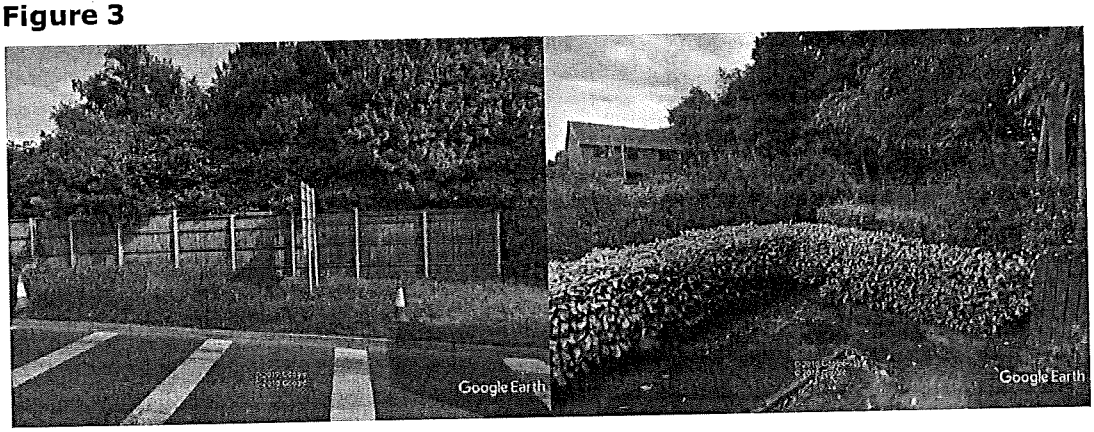
4.1 Existing Noise Climate

Methodology

The site was visited on Friday 5th April 2019 noise monitoring instrumentation was positioned in the rear garden of an existing property – the location for the proposed development. The purpose was to measure road traffic noise from the A50 which could potentially affect future residents.

All properties located at a similar distance adjacent to the A50 are screened by an earth embankment which obscures the line of sight from gardens and ground floor rooms and may provide partial screening for first floor rooms.

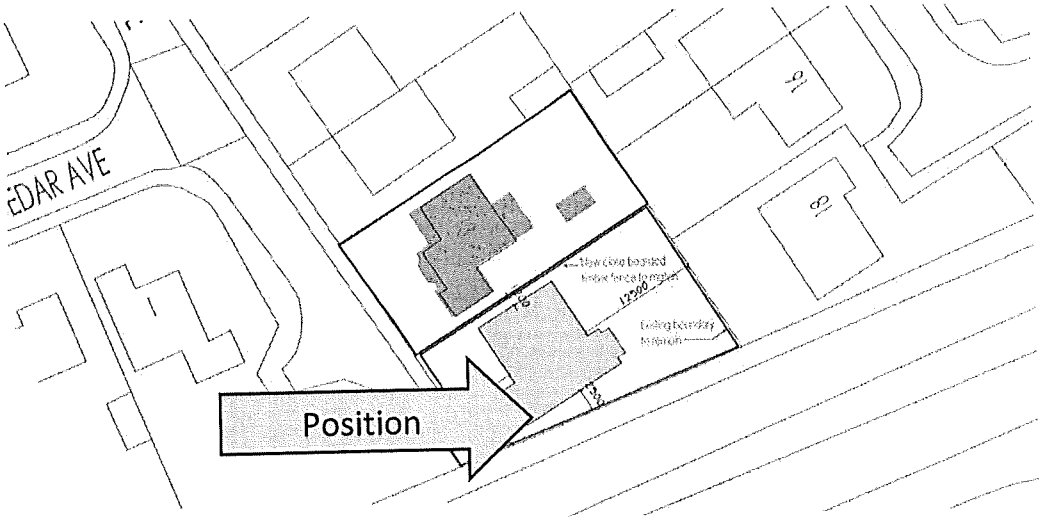
Figure 3



Earth embankment and fencing (in sections) and existing property

The monitoring position was located at approximately 32m from the edge of the carriageway (the position of the nearest façade of the proposed dwelling) – Figure 4.

Figure 4



Grid reference position 1 – SJ96315 4058

The monitoring position was situated under free-field conditions.

The weather was dry, cool and overcast with a wind speed of up to 0.5m/s (SE) measured on an electronic anemometer. The temperature ranged between 6-7 degrees Celsius.

It is not considered that the weather conditions would have influenced the results.

The sound level meter used (with "outdoor kit") plus on-site calibrator can be found in Table 3 below. The meter calibrated correctly before and after the measurements; all instrumentation had been laboratory calibrated within the preceding 2 years.

Table 3

Instrument	Type	Serial No.	Calibration Cert. No.	Date of Due Calibration
Svan 977A	Sound Level Meter	69280	New - test date 23/02/2018	23/02/2020
ACO 7052E	Microphone	70160	New - test date 23/02/2018	23/02/2020
Svan SV12L	Preamp	71675	New - test date 23/02/2018	23/02/2020
Cirrus 511E	Calibrator	39816	Cirrus 248531	25/04/2019

4.2 Results and Calculations (Road Noise)

Period measurements are shown below in Tables 4 and 5.

Table 4 - Monitoring Position 1 Road Noise

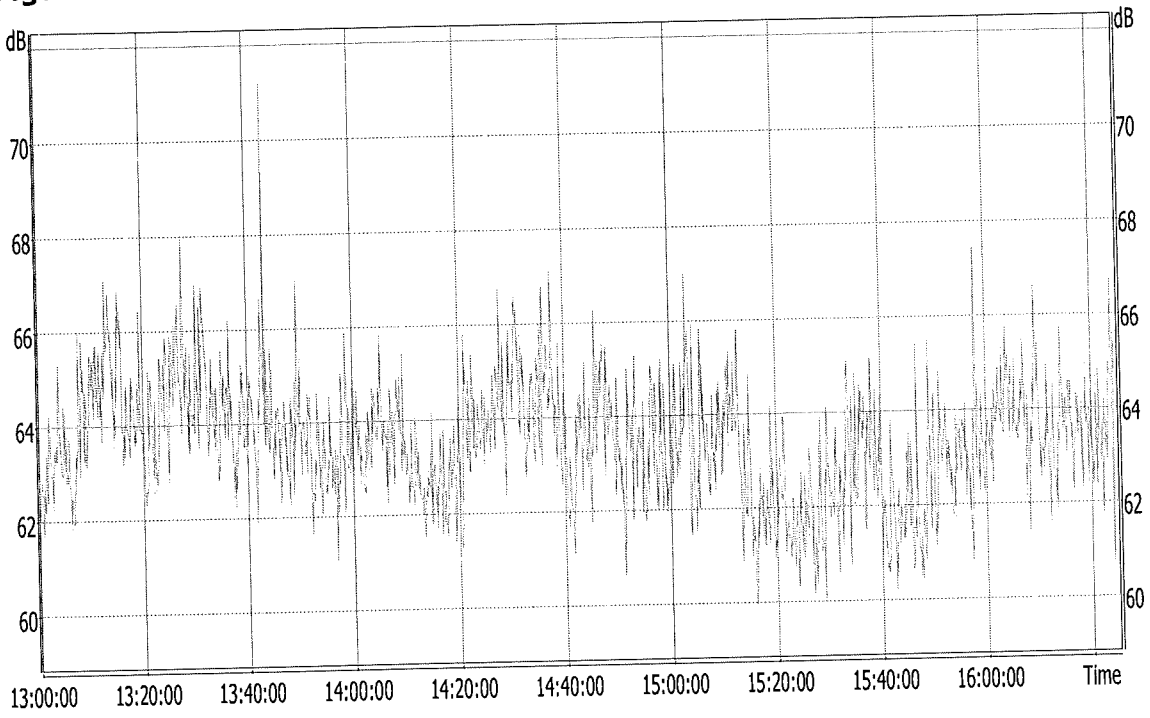
Start date & time	Duration	LAeq [dB]	LAmax [dB]	LAmin [dB]	L1	L10	L50	L90
05/04/2019 13:00:00	01:00:00.000	64.61	75.1	60.0	69.9	66.1	64.1	62.4
05/04/2019 14:00:00	01:00:00.000	63.99	72.5	59.6	67.8	65.6	63.6	62.0
05/04/2019 15:00:00	01:00:00.000	63.17	74.2	58.7	67.5	64.9	62.7	61.0

Table 5 - Octave Band Levels (Total Monitoring Period)

125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
63.7	57.9	58.1	60.4	56.2	52.3	51.9

In addition to the above, the maximum readings were recorded and the typical LAmax readings for passing vehicles were noted to be around 67dB for the monitoring period – with only a few incidents above the higher levels).

Figure 5



When considering maximum noise levels generated by road traffic, it is generally found that these levels are not governed by the volume of traffic, but by specific single events such as a car or motorbike passing by at high speed, an empty lorry passing over bumps or potholes in a section of road, a car horn, emergency siren or a vehicle skidding (see impression below).

4.3 Subjective Impressions

Road noise and passing vehicles were the principal and

dominant sources of noise at this location.

5.0 ASSESSMENT AND DISCUSSION

5.1 Road Traffic Noise

This assessment is based on the shortened 3-hour measurement technique, which is detailed in the Department of Transport document, "Calculation of Road Traffic Noise".

Three consecutive one-hour measurements of the L_{A10} were made to estimate the $L_{A10(18hr)}$, from which the $L_{Aeq(16hr)}$ can be calculated.

The DEFRA publication "*Method for Converting the UK Road Traffic Noise Index $L_{A10,18h}$ to the EU Noise Indices for Road Noise Mapping*" [5] includes formulae (shown at Appendix 4) to convert $L_{A10,\ 18Hr}$ into L_{Day} (07:00-19:00), LAeq,8hr (L_{Night}), Levening (19:00-23:00) and LAeq,16hr which give results for non-motorways of:

LAeq,16hr = **62.1dB**

5.2 Night time Levels (23:00 to 07:00)

The same DEFRA publication can be used to calculate night time levels, LAeq,8hr which give results for non-motorways of:

LAeq,8hr = **54.3dB**

5.3 ProPG

ProPG is aimed principally at transport noise so is likely to apply to this site. Given the levels of noise present, this would place the site in the **low risk** category from ProPG as shown below. Therefore, Good Acoustic Design (GAD) should be followed (see recommendations below).

Table 6 - ProPg

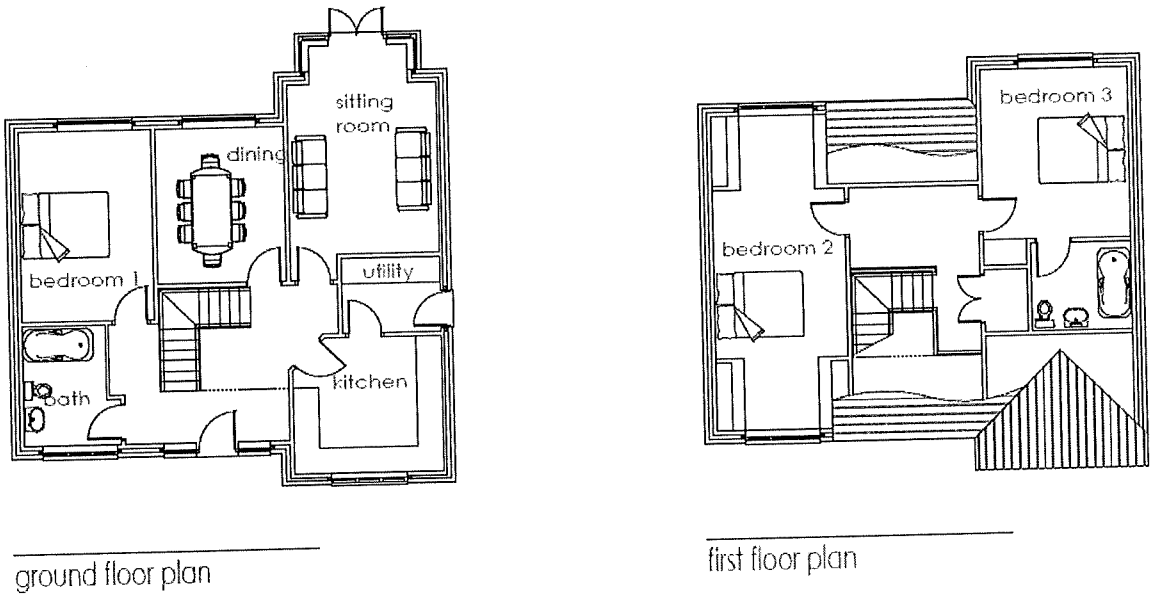
Between 50 and 60-65 dB(A) day	Between 40 and 50-55 dB(A) night	**Low Risk**	Likely to be acceptable provided that Good Acoustic Design (GAD) is followed

5.5 Internal Noise Levels

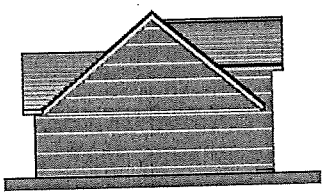
Detailed internal levels have been calculated using the typical octave band levels (see above) and an example construction using the methodology described in BS EN 12354-3:2000 [6].

For the purposes of prediction, the following have been assumed using the available plans for bedrooms overlooking the front and rear of the proposed property:

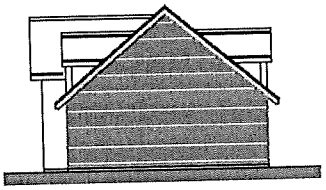
Figure 6 – Internal Layout



Elevation Facing Road (below)



side elevation



side elevation

- Reverberation time is 0.3s for bedrooms
- Reverberation time for living rooms is 0.5s
- Volume for rear bedroom 3 = $32m^3$
- Window area for bedroom 3 = $2m^2$
- Volume for sitting room = $42m^3$
- Window area for sitting room = $4m^2$
- Assume that first floor bedroom has a "partial" view of the road above the earth embankment +5dBA as a worst case
- Wall Area = $10m^2$
- Brick / block cavity construction
- Tiled/slated roof, plasterboard ceiling, absorbing layer above the ceiling (e.g. mineral wool loft insulation)

5.6 Example Construction and Glazing

With (daytime) external levels of 62.1dBLAeq, 16 hours, desirable internal levels should be achievable using solid brickwork, brick clad timber frame or timber frame with lightweight cladding, tiled/slated roof, $9kg/m^3$ plasterboard ceiling, 100mm absorbing layer above the

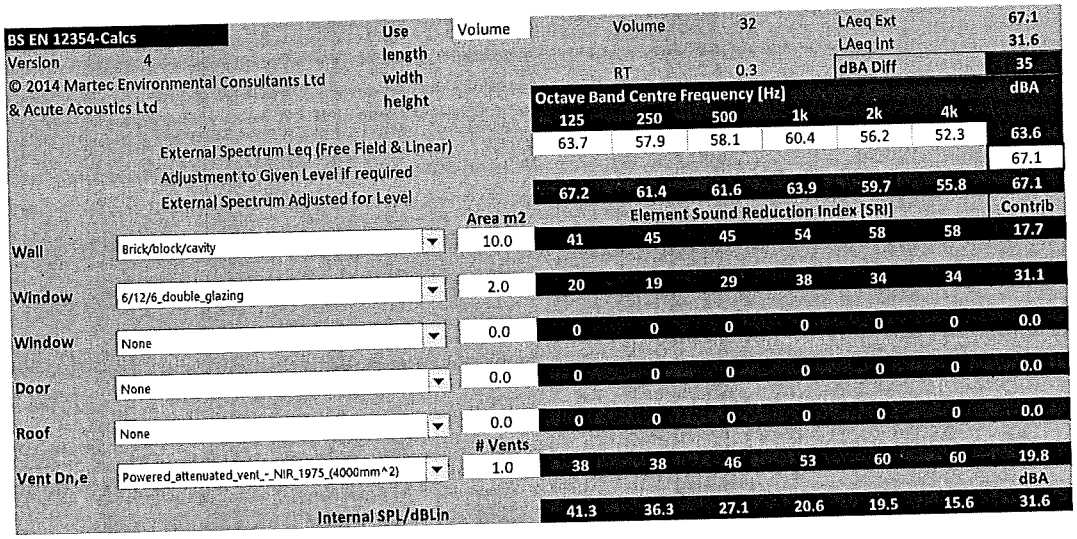
ceiling (e.g. mineral wool loft insulation); window and ventilation specification (as below). An example of suitable construction and glazing is also described below, based on the overall external octave band levels established during the monitoring period – this should achieve target levels.

5.7 First Floor – Bedroom 3

From ProPG, desirable internal levels are not likely to be met at night where windows are opened to cool bedrooms, allowing for 15dBA attenuation for a partially open window [54.3-15=39.3dBA]. In which case alternative ventilation as noted below may be preferable.

For bedroom 3 which we are assuming may have a partial view of the A50, it can be seen (Table 7) that the predicted internal daytime noise level of **31.6dB LAeq,16hr** using double glazing [6/12/6] with powered ventilation (or PIV) would meet the daytime criteria of 35dB LAeq, 16hr from BS8223:2014 for bedrooms.

Table 7 (Bedroom 3)



BS EN 12354-Calcs	Use	Volume	Volume	32	LAeq Ext	67.1
Version 4	length				LAeq Int	31.6
© 2014 Martec Environmental Consultants Ltd & Acute Acoustics Ltd	width		RT	0.3	dBA Diff	35
	height		Octave Band Centre Frequency [Hz]			dBA
			125	250	500	1k	2k	4k	
External Spectrum Leq (Free Field & Linear)			63.7	57.9	58.1	60.4	56.2	52.3	63.6
Adjustment to Given Level if required									67.1
External Spectrum Adjusted for Level			67.2	61.4	61.6	63.9	59.7	55.8	67.1
		Area m2	Element Sound Reduction Index [SRI]						Contrib
Wall	Brick/block/cavity	10.0	41	45	45	54	58	58	17.7
Window	6/12/6_double_glazing	2.0	20	19	29	38	34	34	31.1
Window	None	0.0	0	0	0	0	0	0	0.0
Door	None	0.0	0	0	0	0	0	0	0.0
Roof	None	0.0	0	0	0	0	0	0	0.0
		# Vents							
Vent Dn,e	Powered_attenuated_vent_-_NIR_1975_(4000mm^2)	1.0	38	38	46	53	60	60	19.8
									dBA
Internal SPL/dBLin			41.3	36.3	27.1	20.6	19.5	15.6	31.6

Given the reduction of -7.8dBA for night time noise levels then the desirable internal level of 30dB LAeq, 8hr from BS8223:2014 for bedrooms would also be met [31.6 – 7.8 = 23.8dB].

LAmax levels are typically around 67dB (see figure 4). Given the predicted difference between external and internal levels of 35dB this would equate to internal levels of **32dB LAmax** which meets the LAmax criteria of 45dB LAmax (ProPG). Assuming that levels may be up to +5dB higher where there is a partial view of the road from first floor rooms then the desirable internal levels would still be met.

For the ground floor sitting room, it can be seen (Table 8) that the predicted internal daytime noise level of **32.2dB LAeq,16hr** using double glazing [6/12/6] with acoustic trickle ventilation would meet the daytime criteria of 35dB LAeq, 16hr from BS8223:2014 for living areas.

Table 8 (Sitting Room)

BS EN 12354-Calcs		Use	Volume		Volume	42		LAeq Ext			62.1
Version 4		length						LAeq Int			32.2
© 2014 Martec Environmental Consultants Ltd & Acute Acoustics Ltd		width			RT	0.5		dBA Diff			30
		height			Octave Band Centre Frequency [Hz]						dBA
					125	250	500	1k	2k	4k	
External Spectrum Leq (Free Field & Linear)					63.7	57.9	58.1	60.4	56.2	52.3	63.6
Adjustment to Given Level if required											62.1
External Spectrum Adjusted for Level					62.2	56.4	56.6	58.9	54.7	50.8	62.1
			Area m2		Element Sound Reduction Index [SRI]						Contrib
Wall	Brick/block/cavity		10.0		41	45	45	54	58	58	13.7
Window	6/12/6_double_glazing		4.0		20	19	29	38	34	34	30.2
Window	None		0.0		0	0	0	0	0	0	0.0
Door	None		0.0		0	0	0	0	0	0	0.0
Roof	None		0.0		0	0	0	0	0	0	0.0
			# Vents								
Vent Dn,e	Acoustic_trickle_vent_(4000mm^2)		1.0		30	33	38	37	36	36	27.6
											dBA
		Internal SPL/dBLin			40.9	35.5	26.7	24.8	22.5	18.6	32.2

5.9 External Areas

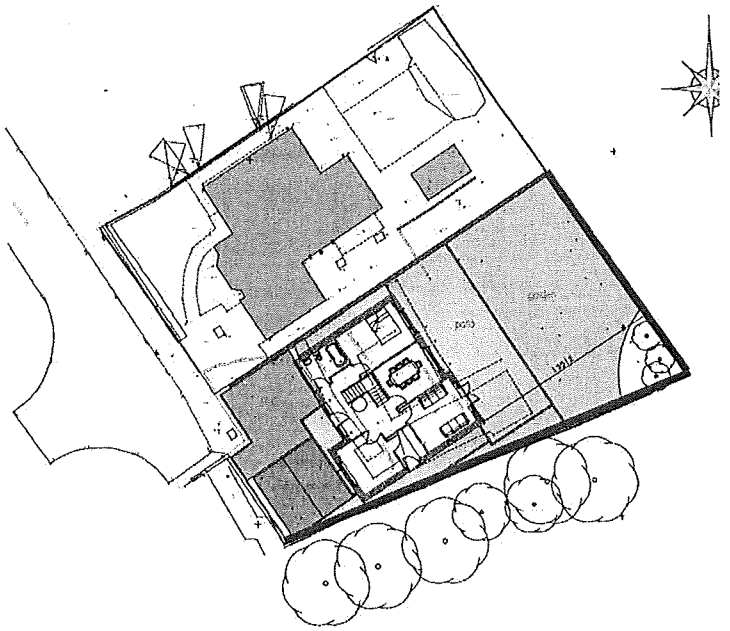
Daytime external levels have been established at 62.1dBLAeq, 16 hours. There is existing screening provided by the earth embankment as noted. There are some broken sections of fencing at the site boundary which will afford no additional attenuation.

Ideally, outdoor levels should not exceed 50-55dBA to ensure that annoyance is avoided, thus an additional minimum of 7.1dBA of attenuation is desirable.

To achieve this, fencing close to the outdoor amenity area would help in some sections of the garden and patio area – close to the fence; but it is possible that not all locations of the garden may benefit from the screening with sound diffracting over the embankment. Fencing should be free from holes and gaps – close-boarded fencing.

It is suggested that sections of close boarded fencing at 1.8m are installed at the gardens and at the boundary, as shown below for a level of 51dBA (barrier calculation in Table 8 below) in sections of the outdoor amenity areas (blue lines):

Figure 6



Proposed fencing

Table 9 – Barrier (Fencing)

Location	Garden Near
Ht of Ground at Receiver AoD	0
Ht of Receiver Abv local grnd	1.2
Dist of Receiver from C'way Edge	35
Basic Noise Level of Road	62.1
Road Segments	2
Ht of C'way AoD	0
Angle of View	180
Proportion of Soft Ground	0
Height of Propagation Path	0.95
Barrier 1 Ht of Ground at Barrier AoD	0
Ht of Barrier Abv local grnd	1.8
Dist of Barrier top from C'way	32
Total Level	51

However, with regard to external levels, BS8233:2014 states:

"Achieving levels of 55 dB LAeq,T or less might not be possible at the outer edge of these areas but should be achievable in some areas of the space." – i.e. some of the garden / patio.

The wording of BS8233 also makes it clear that the guideline noise levels for gardens, patios, larger balconies etc., are not overriding planning considerations in any event.

6.0 CONCLUSIONS AND RECOMMENDATIONS

The above demonstrates that with considered specification appropriate noise levels can be met with reference to BS8233: 2014 and ProPG.

The following noise control measures are recommended:

- For first floor bedrooms, windows should be fitted with thermal glazing (6/12/6) or better, with alternative ventilation which does not require opening windows.

- A Mechanical Extract Ventilation (MEV) or Positive Input Ventilation (PIV) system will extract/supply air

from the room but will not allow significant noise to enter from the outside, either because of the system's attenuation or because it vents to a quiet façade. Residents could then occupy these rooms without the need to open the windows. The units can be specified for applicable rooms or whole house.

– example systems can be found at:

https://www.nuaire.co.uk/residential/new-build
https://www.envirovent.com/sectors/new-build-developers/
https://www.greenwood.co.uk/mev

- For all other rooms, standard thermal glazing (or any type of well-sealed glazing) with acoustic trickle ventilation should suffice.

- Desirable external levels for sections of the amenity areas are likely to be met with 1.8m high fencing free from holes and gaps as shown above.

APPENDIX 1

EXPLANATION OF ACOUSTIC TERMS

The dB or the decibel, is the unit of noise. The number of decibels or the level, is measured using a sound level meter. It is common for the sound level meter to filter or 'weight' the incoming sound so as to mimic the frequency response of the human ear. Such measurements are designated **dB(A)**.

A doubling of the sound is perceived, by most people, when the level has increased by 10 dB(A). The least discernible difference is 2 dB(A). Thus, most people cannot distinguish between, say 30 and 31 dB(A).

If a noise varies over time then the **equivalent continuous level, or LAeq**, is the notional constant level of noise which would contain the same amount of acoustic energy as the time varying noise.

The following table gives an indication of the comparative loudness of various noises expressed in terms of the A weighted scale:

Source of noise	dB(A)	Nature of Noise
Inside Quiet bedroom at night	30	Very Quiet
Quiet office	40	
Rural background noise	45	
Normal conversational level	60	
Busy restaurant	65	
Typewriter @ 1m	73	
Inside suburban electric train	76	
Alarm clock ringing @ .5m	80	
Hand clap @ 1m	80	
HGV accelerating @ 6m	92	Very Loud

APPENDIX 2

QUALIFICATIONS AND EXPERIENCE OF S.B. MELLOR

My full name is Steven Brian Mellor. I am the principal of the firm of SBM Safety Solutions Ltd, a consultancy company that specialises in health, safety and environmental services including noise assessment and control.

I hold a Masters degree in Health, Safety and Environmental Law, British Occupational Health Society (BOHS) M104 certificate in Noise and Vibration and Institute of Acoustics Certificate of Competence in Environmental Noise Measurement (Derby University) and Diploma in Acoustics and Noise Control (Bristol University). I am a member of the professional body for noise and vibration specialists, the Institute of Acoustics - MIOA.

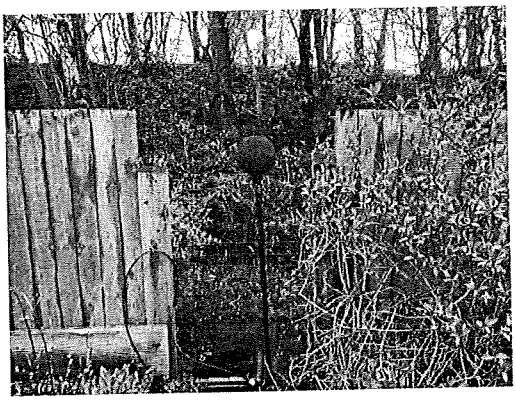
I have some 17 years of experience dealing with problems caused by noise and vibration, both regarding noise and vibration in the environment, the workplace and the home. The firm of SBM Safety Solutions Ltd. was formed 15 years ago. During that time, we have advised many groups including employers, residents and developers about the problems of noise and vibration in the workplace and environment.

APPENDIX 3

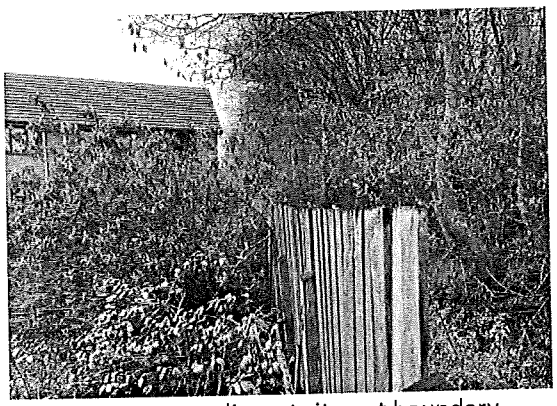
Views of the Site and Location



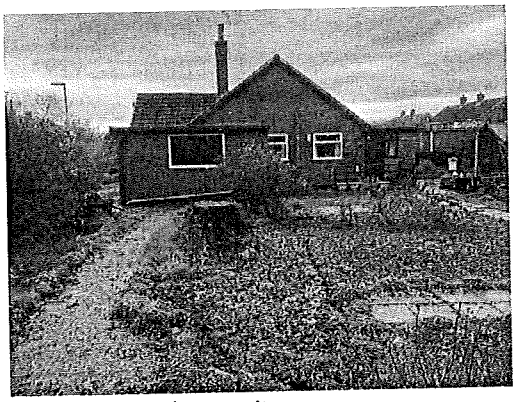
Earth embankment screening road



Monitoring Equipment



Existing Property adjacent site – at boundary



Existing bungalow at site

APPENDIX 4

Formulae to Convert LA10,18h to Lday, Lnight and Levening

For non-motorway roads:

$$L_{day} = 0.95 \times L_{A10,18h} + 1.44 \text{ dB} \quad \textit{(Equation 1)}$$

$$L_{evening} = 0.97 \times L_{A10,18h} - 2.87 \text{ dB} \quad \textit{(Equation 2)}$$

$$L_{night} = 0.90 \times L_{A10,18h} - 3.77 \text{ dB} \quad \textit{(Equation 3)}$$

For motorways:

$$L_{day} = 0.98 \times L_{A10,18h} + 0.09 \text{ dB} \quad \textit{(Equation 4)}$$

$$L_{evening} = 0.89 \times L_{A10,18h} + 5.08 \text{ dB} \quad \textit{(Equation 5)}$$

$$L_{night} = 0.87 \times L_{A10,18h} + 4.24 \text{ dB} \quad \textit{(Equation 6)}$$

Formula to convert Lday and Levening into LAeq,16hr

$$L_{Aeq,16h} = 10 \log_{10}\left[\frac{1}{16}\right]\left[12 \times 10^{L_{day}/10} + 4 \times 10^{L_{evening}/10}\right] dB$$