



Noise Assessment Report

Report: 4625-R1 – Middlewood Farm, Sarn Road, Threapwood, Cheshire, SY14 7AW

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1. Introduction

Clover Acoustics Ltd has been commissioned by Samantha Andrews to undertake a noise impact assessment for the conversion of existing farm buildings and Grooms Cottage into new residential accommodation at Middlewood Farm, Sarn Road, Threapwood, Cheshire, SY14 7AW.

A baseline noise survey has been carried out over a 24-hour period to assess the impact of noise from the surrounding area on the proposed development. The survey was conducted at two monitoring positions representative of the proposed facades on Thursday 9th September 2021. Attended readings were taken on Tuesday 7th September 2021.

The purpose of this report is to demonstrate that due consideration for noise affecting the proposed dwellings has been considered.

2. Scope

Noise Policy Statement for England

The Noise Policy Statement for England (NPSE), published in March 2010, states the long-term vision of Government noise policy is to “promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development”. The aims of the NPSE are to:

- avoid significant adverse impacts on health and quality of life;
- mitigate and minimise adverse impacts on health and quality of life; and,
- where possible, contribute to the improvement of health and quality of life.

The intention is that the NPSE should apply to all types of noise apart from noise in the workplace (occupational noise).

National Planning Policy Framework (NPPF)

This report is intended to provide information relevant to the local planning authority and their consultees in support of a planning application for the above proposed development. Policy guidance with respect to noise is found in National Planning Policy Framework. With regard to noise and planning, NPPF contains the following 4 short statements (section 123):

Planning policies and decisions should aim to:

- avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development.
- mitigate and reduce to a minimum other adverse impacts 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.
- 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.

National Planning Practice Guidance

The National Planning Practice Guidance (PPG) is a web-based resource, launched by the Department for Communities and Local Government (DCLG) in March 2014 to support the NPPF and make it more accessible¹. It advises on how planning can manage potential noise impacts in new development. The guidance is regularly reviewed and updated and noise is listed as a specific category. A summary of the effects of noise exposure (in terms of health and quality of life) associated with both noise generating developments and noise sensitive developments is presented within the PPG and reproduced in 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	No specific measures required
Lowest Observed Adverse Effect Level			
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, eg turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported 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			
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, eg avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. 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, eg regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, eg auditory and non-auditory	Unacceptable Adverse Effect	Prevent

Table 1 – Noise Exposure Hierarchy

¹ <http://planningguidance.communities.gov.uk/>

3. Assessment Criteria

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

Internal Guideline Values

BS8233 gives guidance for internal noise levels within buildings to achieve reasonable or good resting/sleeping conditions within residential properties as follows:

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

Table 2 – BS8233 Guideline Values

These values are based on World Health Organisation (WHO) publications and assume normal diurnal fluctuations in external noise. They are expected to be achieved based on normal annual data and not in all circumstances. For example, it is normal to exclude occasional events such as fireworks night or New Year's Eve.

World Health Organisation – Guidelines for Community Noise 1999.

The World Health Organisation gives guidance for maximum recommended noise levels outside residential properties as follows:

Specific Environment	Critical health effect	dB L_{Aeq}	Time (hr)	dB L_{Amax}
Outdoor living area	Serious annoyance, daytime and evening	55	16	-
	Moderate annoyance, daytime and evening	50	16	-
Outside bedrooms	Sleep disturbance, window open (outdoor values)	45	8	60

In external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50dB $L_{Aeq,T}$ with an upper guideline value of 55dB $L_{Aeq,T}$ which would be acceptable in noisier environments. It is also recognised that these guideline values may not be achievable in all circumstances. In such cases, the lowest practicable levels should be achieved in external amenity areas, but the development should not be prohibited.

Ventilation and Overheating

The guidance from BS8233 makes it clear that, if relying on closed windows to achieve the guideline values, there needs to be an appropriate alternative ventilation scheme that does not compromise the facade sound insulation or the resulting noise level. This means that rooms should have adequate ventilation whilst also achieving the guideline internal levels; however, this does not necessarily mean that open windows are required.

Ventilation requirements for dwellings are covered under Building Regulations Approved Document F (“ADF”). This document describes the purpose of ventilation as:

“for the removal of stale air from inside a building and replacement with fresh air from outside”

ADF prescribes three types of ventilation provision:

1. **Whole dwelling ventilation** – running continuously (includes background ventilation)
2. **Extract ventilation** – removing vapour/pollutants from a space e.g. from bathrooms and kitchens
3. **Purge ventilation** – manually controlled rapid ventilation

Where a means of ventilation is required as an alternative to open windows, there are four broad categories of ventilation system that each meet the requirements of ADF:

- **System 1** – Background ventilators and intermittent extract fans
- **System 2** – Passive stack ventilation
- **System 3** – Continuous mechanical extract ventilation (MEV)
- **System 4** – Continuous mechanical supply and extract with heat recovery (MVHR)

Systems 1-3 require a penetration in the building façade to allow fresh air into the building; typically this is provided via trickle ventilators in the glazing unit. Acoustically treated trickle ventilators may be required in higher noise areas. The sound insulation of these, typically small, penetrations is often specified in terms of the element normalised sound pressure level difference, $D_{n,e,w}$, which is often corrected for the spectrum shape of road traffic using the C_{tr} correction term.

Ventilation provisions, including open windows, will not necessarily meet cooling needs. Building Regulations Approved Document L2a² (“ADL2a”) requires that overheating be mitigated by controlling the solar gains by means of building orientation, shading and the g-value of the glazing. It recommends that the developer assess the overheating risk using CIBSE TM 37.³ If these assessments indicate that open windows are required to control overheating, the impact that this has on the internal noise levels should be considered. A two-stage assessment methodology is prescribed in guidance published by the ANC⁴.

Stage one of the assessment considers the external incident sound pressure levels, as outlined in Figure 1.

² Approved Document L2a : Conservation of Fuel and Power (2013 Edition)

³ CIBSE Guide TM 37 “Design for Improved Solar Shading Control”

⁴ Acoustics Ventilation and Overheating – Residential Design Guide, January 2020

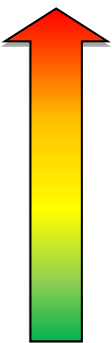
Risk	Day		Night	Level 2 Assessment Required?
High	≈ 70dB(A)		≈ 60 dB(A)	Recommended
Medium	≈ 60dB(A)		≈ 55dB(A)	
Low	≈ 55dB(A)		≈ 50dB(A)	Optional
Negligible	≤50dB(A)		≤40dB(A)	Not Required

Figure 1 – Stage 1 acoustics, ventilation and overheating assessment.

If the stage one assessment indicates a medium or high noise risk, a stage two assessment might be appropriate, which considers the internal sound pressure levels. The ANC guidelines indicate that a 13dB attenuation should be allowed for through an open window. The stage two assessment has been outlined in Figure 2.

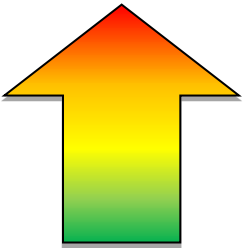
Internal Ambient Noise Level			Examples of Outcomes
L _{Aeq,T} during 07:00-23:00	L _{Aeq,T} during 23:00-07:00	Individual noise events 23:00-07:00	
> 50dB	> 42dB	Normally exceeds > 65dB L _{AF,max}	Noise can cause a material change in behaviour e.g. having to close windows most of the time.
			Increasing likelihood of disruption to speech communication and sleep.
≤ 35dB	≤ 30dB	Do not normally exceed L _{AF,max} 45dB more than 10 times a night	Noise can be heard but does not cause any material change in behaviour.

Figure 2 – Stage 2 acoustics, ventilation and overheating assessment.

If internal sound pressure levels are expected to regularly exceed the levels in Figure 2, additional design measures might be warranted to mitigate overheating. This could include increasing solar shading, increasing the rate of mechanical ventilation or provide comfort cooling.

BS4142:2014 Methods for rating and assessing industrial and commercial sound.

BS4142 gives a method for rating sound from industrial and commercial sources affecting people inside or outside dwellings or premises used for residential purposes. An initial estimate of the significance of the sound from the industrial/commercial nature can be assessed by subtracting the measured background noise level from the rating level (this is the specific sound level of the source with any corrections or penalties for distinctive acoustic characteristics). Typically, the greater the difference, the greater the magnitude of the impact.

- A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context.
- The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

4. Site Description

The proposal is for the development of a former stable and existing grooms' cottage at Middlewood Farm into residential dwellings. The site is located within the farm grounds close to the existing farmhouse. Subjectively the background sound climate is low with occasional distant road traffic from the surrounding area and occasional farm workshop noise.

Figure 3 shows the site monitoring positions, figure 4 shows the proposed plan.

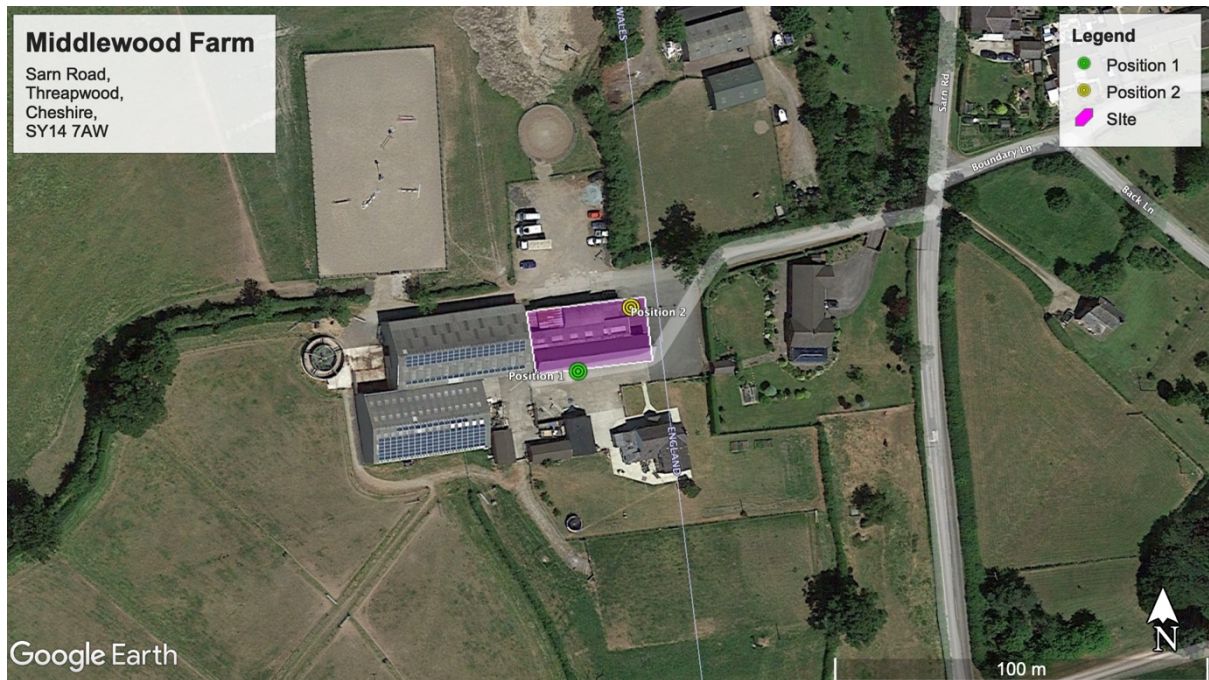


Figure 3 – Site location with background monitoring locations



Figure 4 – Proposed Layout Plan

5. Survey Information

Measurement Instrumentation

The measurement instrumentation used on the survey was as follows:

Equipment	Manufacturer & Type	Serial Number	Calibration Certificate
Sound Level Meter	Norsonic 139	1392705	35951
Acoustic Calibrator	Norsonic 1251	32856	21/1165

The equipment was calibrated to comply with section 4.2 of BS7445:1-2003 before and after the surveys. The calibration was as follows:

Meter	Serial	Before		After	
Norsonic 139	1392705	113.9	-27.0	113.9	-27.0

Measurements & Timescales

During the background survey measurements were made over a typical 24-hour period on Thursday 9th September 2021 at a location representative of the affected façades. Attended readings were taken on Tuesday 7th September 2021 to assess any noise from the normal operation of the farm workshops. Over two site visits no significant noise from these sources was noted and the client states this is typical. Some short duration speech and radio noise was in evidence on one occasion. The following measurements are reported: $L_{Aeq,T}$, $L_{A90,T}$, $L_{Amax,T}$. The measurements and their interpretation shall be in accordance with BS 7445: Parts 1 and 2. All sound pressure levels are in dB (re 20 μ Pa).

Meteorology

During the survey the weather was dry with no precipitation during the monitoring period. Temperature was recorded at 10-15°C during the 24-hour survey, and 15°C during the attended survey.

Position of Monitoring Equipment

The equipment was mounted at locations representative of the affected façades. The equipment was mounted 1.5m from the ground away from reflecting surfaces to represent the free field level. Figure 1 identifies background monitoring locations.

6. Survey Results

Background Summary

The following tables show the summary of the background noise levels monitored. The reported results represent the free field sound pressure levels at the receivers.



Site: Middlewood Farm, Sarn Road, Threapwood, Cheshire, SY14 7AW

Table 1a: Background Summary

Report: 4625

Start Date: 09/09/2021

End Date: 09/09/2021

Hourly Summary				
Hour Start	LAeq,1Hour	LAMax,1hour	Ave LA90,5min	
07:00	44.5	48.5	36.7	
08:00	57.8	61.5	38.3	
09:00	47.3	52.2	37.8	
10:00	63.3	62.0	38.3	
11:00	52.5	53.4	36.3	
12:00	44.8	50.7	37.3	
13:00	48.8	55.2	38.6	
14:00	47.4	52.6	38.1	
15:00	56.8	47.7	36.0	
16:00	51.4	48.9	35.8	
17:00	44.2	49.9	35.7	
18:00	40.8	47.0	34.9	
19:00	38.3	44.1	34.1	
20:00	39.2	45.0	34.1	
21:00	37.0	41.2	33.3	
22:00	35.6	38.8	33.1	
23:00	35.0	38.7	33.2	
00:00	35.5	39.5	34.1	
01:00	34.3	36.1	34.0	
02:00	34.1	36.8	33.9	
03:00	33.7	34.4	33.5	
04:00	36.5	43.2	33.5	
05:00	41.4	45.7	35.0	
06:00	41.0	45.4	35.2	
24-Hour Summary				
Measurement	Daytime	Hour Ending/ Period	Night-time	Hour Ending/ Period
Minimum dB LAeq,1hr	36	22:00	34	03:00
Maximum dB LAeq,1hr	63	10:00	41	05:00
Average dB LAeq,16hr/LAeq,8hr	54	07:00 – 23:00	38	23:00 – 07:00
Night dB LAmax	–	–	58	05:23

Table 1a – Background Summary – Monitoring Position 1



Site: Middlewood Farm, Sarn Road, Threapwood, Cheshire, SY14 7AW

Table 2a: Background Summary Start Date: 09/09/2021

Report: 4625 End Date: 09/09/2021

Hourly Summary				
Hour Start	L _{Aeq,1Hour}	L _A Max,1hour	Ave L _{A90,5min}	
07:00	45.6	49.8	34.9	
08:00	45.8	50.5	35.4	
09:00	50.6	54.6	36.6	
10:00	58.7	62.3	38.7	
11:00	49.9	56.7	38.3	
12:00	49.6	54.9	40.8	
13:00	51.1	56.0	44.1	
14:00	48.4	51.5	41.6	
15:00	48.3	52.7	37.8	
16:00	47.7	50.4	37.2	
17:00	51.7	56.2	36.3	
18:00	43.7	49.3	34.8	
19:00	42.3	45.8	34.3	
20:00	39.1	44.2	33.6	
21:00	35.5	40.7	32.7	
22:00	37.7	43.1	33.0	
23:00	35.8	42.1	33.1	
00:00	36.0	40.5	33.3	
01:00	33.3	35.3	32.8	
02:00	33.4	37.4	32.5	
03:00	32.7	33.7	32.5	
04:00	32.7	33.7	32.3	
05:00	38.6	44.6	34.1	
06:00	44.6	50.2	33.8	
24-Hour Summary				
Measurement	Daytime	Hour Ending/ Period	Night-time	Hour Ending/ Period
Minimum dB L _{Aeq,1hr}	35	22:00	33	04:00
Maximum dB L _{Aeq,1hr}	59	10:00	45	06:00
Average dB L _{Aeq,16hr} /L _{Aeq,8hr}	50	07:00 – 23:00	38	23:00 – 07:00
Night dB L _{Amax}	–	–	62	06:00

Table 2a – Background Summary – Monitoring Position 2

Attended short term noise measurements

Attended short term noise measurements were undertaken on Tuesday 7th September 2021 during the day commencing at 13:05.

Monitoring Position 1: Attended Monitoring Summary						
ID	Position	Notes	Time	dB L _{Aeq}	dB L _{AFmax}	dB L _{A90}
1	1	Chickens	13:05	35	46.7	34.3
2	1	Horse Braying	13:10	49.8	65.2	36.8
3	1	Occasional Chickens	13:15	35.4	43.2	34.1
4	1	Occasional Chickens	13:20	36.8	47.2	35.2
5	1	Occasional Chickens	13:25	38.2	40.1	37.1
6	1	Occasional Chickens	13:30	37.5	47.1	36
dB(A) Average/Max				39	65	36
7	2	Occasional chickens	13:40	42.3	52	36.2
8	2	Talking	13:45	36.3	41.9	35.1
9	2	Workshop noise	13:50	37.4	47.2	36.3
10	2	Workshop noise	13:55	37.1	48.7	36.2
11	2	Workshop noise	14:00	37.5	46.4	36.4
12	2	Occasional chickens	14:05	35.1	44.8	34.4
dB(A) Average/Max				38	52	36

Table 3 – Attended Summary – Monitoring Position 1

Discussion

Noise levels on site are low. Attended readings were broadly in line with unattended data over a similar time period. There was occasional specific sound from animals and farm workshop noise in the context of an agricultural setting.

Commercial Noise – BS4142 advises in section 8.5 “*NOTE Where a new noise-sensitive receptor is introduced and there is extant industrial and/or commercial sound, it ought to be recognized that the industrial and/or commercial sound forms a component of the acoustic environment. In such circumstances other guidance and criteria in addition to or alternative to this standard can also inform the appropriateness of both introducing a new noise-sensitive receptor and the extent of required noise mitigation*”.

We would consider that as a new noise receptor is to be introduced as above, then consideration of BS8233 is appropriate.

7. Design Criteria

Internal Design Criteria

The internal design criteria proposed is in line with the guidance from BS8233:2014 for indoor ambient noise levels within spaces when they are unoccupied.

Area	Internal Level, dB(A)
Living Rooms (07:00 – 23:00)	35
Dining Rooms (07:00 – 23:00)	40
Bedrooms (23:00 – 07:00)	30

8. Mitigation

Internal Noise Level Guidelines

The following tables summarise the levels at the receiver locations and show the glazing performance requirement to achieve the recommended internal noise level guidelines. This uses the simple calculation method from the Appendix in BS8233:2014. Standard forms of construction are assumed therefore it is likely the glazing will be the lowest performing façade element.

Glazing Design Specification - Position 1

Assessment Location	Living Room Areas	Dining Room Areas	Bedroom Areas	
Daytime/Night-time Average Levels	54 dB $L_{Aeq,16hr}$	54 dB $L_{Aeq,16hr}$	38dB $L_{Aeq,8hr}$	58 dB L_{AMAX}^5
Internal Design Criteria	35 dB(A)	40 dB(A)	30 dB(A)	45 dB L_{AMAX}
Glazing Performance Requirement	19 dB R_{TRA}	14dB R_{TRA}	8 dB R_{TRA}	13 dB R_{TRA}

Glazing Design Specification - Position 2

Assessment Location	Living Room Areas	Dining Room Areas	Bedroom Areas	
Daytime/Night-time Average Levels	50 dB $L_{Aeq,16hr}$	50 dB $L_{Aeq,16hr}$	38dB $L_{Aeq,8hr}$	62 dB L_{AMAX}
Internal Design Criteria	35 dB(A)	40 dB(A)	30 dB(A)	45 dB L_{AMAX}
Glazing Performance Requirement	15 dB R_{TRA}	10dB R_{TRA}	8 dB R_{TRA}	17 dB R_{TRA}

The glazing performance requirement is based on the road traffic corrected sound reduction index R_{TRA} . Where the night-time single event L_{Amax} criteria exceeds the average $L_{Aeq,8hr}$ criteria it should be used for selection in glazing performance for bedroom areas.

Monitoring Position 1 – In living areas to ensure the values identified in Table 4 of BS8233:2014 for suitable “Indoor ambient noise levels for dwellings” are achieved a minimum glazing performance of 19dB R_{TRA} is required and in bedroom areas a minimum glazing performance of 13dB R_{TRA} is required.

Monitoring Position 2 – In living areas to ensure the values identified in Table 4 of BS8233:2014 for suitable “Indoor ambient noise levels for dwellings” are achieved a minimum glazing performance of 15dB R_{TRA} is required and in bedroom areas a minimum glazing performance of 17dB R_{TRA} is required.

⁵ The 10th highest LAMAX has been selected as in line with good sleep conditions identified in “The Guidelines for Community Noise” Section 3.4 Sleep Disturbance and ProPG Guidance.

Example Glazing Configurations

The table below is a summary of the typical performance of Pilkington glazed units as detailed in *Pilkington Design Guide "Glass & Noise Control" – Technical Bulletin May 1997*. Glazing from any other manufacturer can be used providing it can be shown that it will achieve the glazing performance requirements above.

Pilkington Configurations	dB R _{TRA}	Position 1	
		Living	Bed
Double Glazing			
4.12.4	25	✓✓	✓✓
6.12.6	26	✓✓	✓✓
6.12.6-4pvb ⁶	27	✓✓	✓✓
10.12.4	29	✓✓	✓✓
10.12.6	32	✓✓	✓✓
10.12.6-4pvb	34	✓✓	✓✓
Secondary Glazing			
6.150.4 Secondary	39	✓✓	✓✓
10.200.6 Secondary	45	✓✓	✓✓
4.12.4	25	✓✓	✓✓
6.12.6	26	✓✓	✓✓
6.12.6-4pvb	27	✓✓	✓✓

⁶ PVB laminated glass - polyvinyl butyrate.

Ventilation Specification

The guideline internal sound pressure levels from BS8233 of 30dB(A) in bedrooms and 35dB(A) in living areas can be achieved with a suitable glazing and ventilation strategy. The acoustic performance of glazing is dependent upon the window being closed, if the occupier chooses to open the window the sound reduction performance will be reduced. Partial open window performance of sound reduction from external to internal noise is generally considered ~13dB. In most cases this drop in performance would present internal noise levels above the BS8233 criteria. Windows would have to be closed to achieve the desirable internal noise levels. It should be noted that this is the case for the majority of development sites across the UK.

The whole house *ventilation* requirements in line with Approved Document F can be achieved with an appropriate passive or mechanical scheme and would not depend on open windows (excluding purge conditions). It is generally accepted though that it is desirable to have windows open to achieve thermal comfort and prevent overheating within dwellings.

The following points from *The Acoustics Ventilation and Overheating: Residential Design Guide 2020* are considered appropriate:

- *“Where a development is considered necessary or desirable, the levels (Table 4 of BS 8233:2014) may be relaxed by up to 5 dB and reasonable internal conditions still achieved.*
- *It is suggested here that the desirable internal noise standards within Table 4 of BS 8233:2014 should be achieved when providing adequate ventilation as defined by ADF whole dwelling ventilation. However, it is considered reasonable to allow higher levels of internal ambient noise from transport sources when higher rates of ventilation are required in relation to the overheating condition.*
- *The basis for this is that the overheating condition occurs for only part of the time. During this period, occupants may accept a trade-off between acoustic and thermal conditions, given that they have some control over their environment. In other words, occupants may, at their own discretion, be more willing to accept higher short-term noise levels in order to achieve better thermal comfort.*

This acknowledges that the BS8233 internal noise levels could be relaxed by up to 5dB and in addition a higher internal noise level would be acceptable where windows would rarely be opened. To avoid a Significant Observed Adverse Effect Level the acceptable internal noise levels would range between:

- Daytime Internal –
 - 50dB(A) where windows were open rarely
 - 40dB(A) where windows were open most of the time
- Night-time Internal –
 - 42dB(A) where windows were open rarely
 - 35dB(A) where windows were open most of the time

These figures are best demonstrated in the *AVO Diagrams* from the AVO guide:

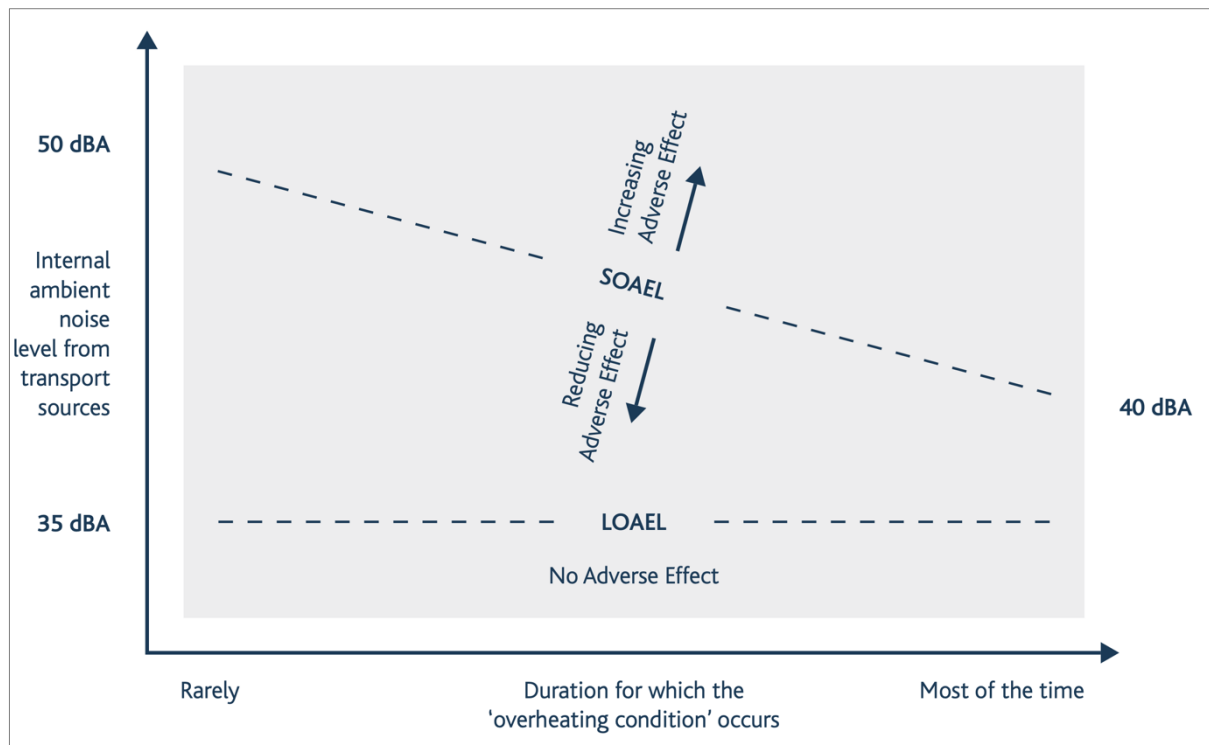


Figure 5 – ‘AVO Diagram B-2’ indicating noise levels associated with adverse effects during the daytime

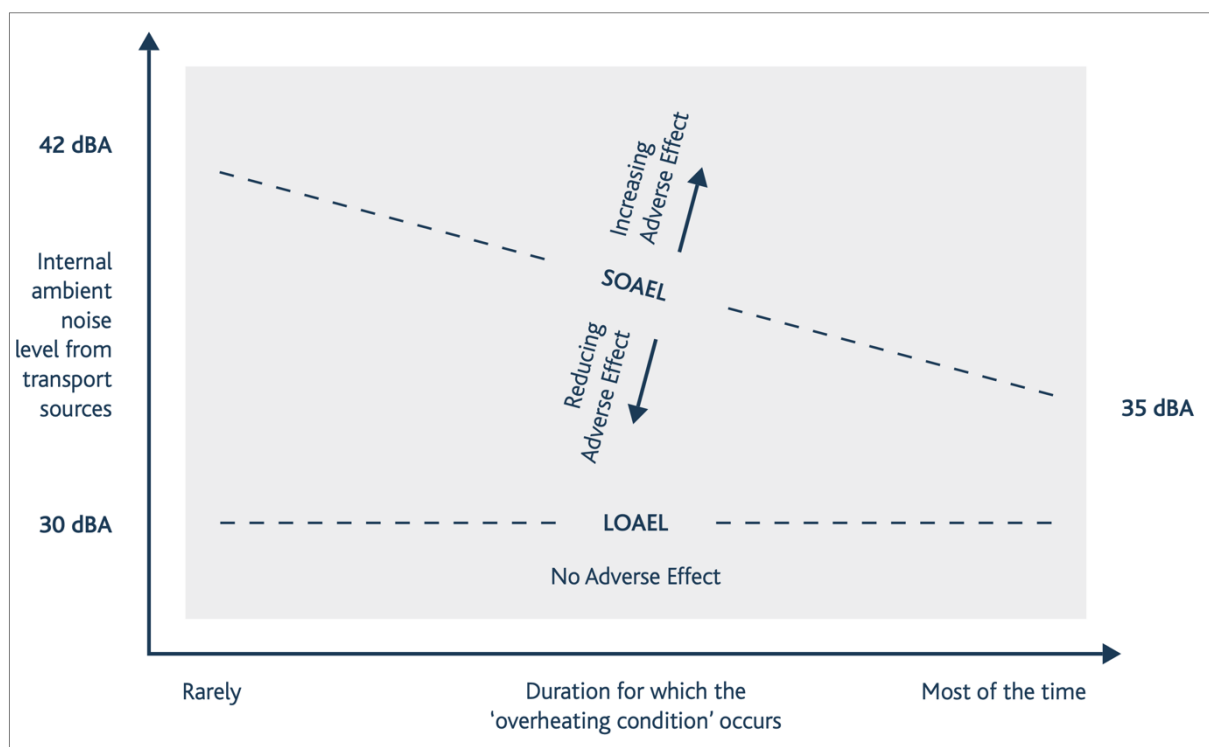


Figure 6 – ‘AVO Diagram B-3’ indicating noise levels associated with adverse effects during the night-time

Based on the AVO diagrams and assuming a partial open window performance of 13dB, this would translate to acceptable external noise levels ranges of:

- Daytime External –
 - 63dB(A) where windows were open rarely
 - 53dB(A) where windows were open most of the time
- Night-time External –
 - 55dB(A) where windows were open rarely
 - 48dB(A) where windows were open most of the time

For this development the external noise levels monitored were 50-54dB(A) and 38dB(A) for daytime and night-time respectively. These levels are below the upper range for external day and night-time levels advised above. If overheating were to be identified as a potential issue at this development, the external noise levels would allow windows to be open, if needed for the majority of time.

Passive Ventilation Requirements – Acoustic Performance

Where a passive ventilation system is adopted the acoustic performance should have an ‘open’ sound insulation performance as follows:

Passive Ventilation Design Specification

Space	Daytime Internal Criteria dB(A)	Ventilation Requirement dB $D_{n,e,w} + C_{tr}$	Example Suitable Window Vent
Specification 1			
Living	35	29	Vent 2500EA
Bedroom	30	27	Vent 2500EA

This ventilator performance requirement selected is to avoid compromising the paired glazing performance requirements specified above. Ventilators from any other manufacturer can be used providing it can be shown that it will achieve the ventilation performance requirements above.

World Health Organisation – Guidelines for Community Noise 1999.

The World Health Organisation gives guidance for maximum recommended noise levels outside residential properties as follows:

Specific Environment	Critical health effect	dB L _{Aeq}	Time (hr)	dB L _{Amax}
Outdoor living area	Serious annoyance, daytime and evening	55	16	-
	Moderate annoyance, daytime and evening	50	16	-
Outside bedrooms	Sleep disturbance, window open (outdoor values)	45	8	60

External levels are below the guideline value of 55dB(A) for outdoor living areas. External levels outside bedrooms are generally below the above criteria. Internal noise levels can be achieved with the correct glazing and ventilation specification.

9. Conclusion

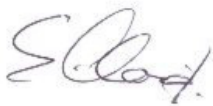
The site has been surveyed in line with the recommendations in BS7445:1 – 2003 and BS7445:2 – 1991. This report has shown that the target internal noise levels for bedroom and living/dining areas in accordance with internal ambient levels from the guidance in BS8233:2014 can be achieved by using an adequate glazing specification.

Position 1

In living areas to achieve the design target internal ambient levels from the guidance in BS8233:2014 a glazing specification with a performance up to 19dB R_{TRA} is required. In bedroom areas to achieve the design target internal ambient levels from the guidance in BS8233:2014 a glazing specification with a performance up to 13dB R_{TRA} is required.

Position 2

In living areas to achieve the design target internal ambient levels from the guidance in BS8233:2014 a glazing specification with a performance up to 15dB R_{TRA} is required. In bedroom areas to achieve the design target internal ambient levels from the guidance in BS8233:2014 a glazing specification with a performance up to 17dB R_{TRA} is required.



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10. Appendix

Glossary of Terms

Specific Noise Source

The noise source under investigation for assessing the likelihood of complaints.

Specific Noise Level, $L_{Aeq,T}$

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

Rating Level, $L_{A,T}$

The specific noise level plus any adjustment for the characteristic features of the noise.

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.

Residual Noise

The ambient noise remaining at a given position in a given situation when the specific noise source is suppressed to a degree such that it does not contribute to the ambient noise.

Ambient Noise

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

Reference Time Interval, T

The specified interval over which an equivalent continuous A-weighted sound pressure level is determined.

$L_{Aeq,T}$

The A-weighted equivalent continuous sound level – the sound level of a notionally steady sound having the same energy as the fluctuating sound over a specified measurement period, T.

$L_{A10,T}$

The A-weighted sound level exceeded for 10% of the specified measurement period, T.

L_{Amax}

The highest short duration A-weighted sound level recorded during a noise event.

A-Weighting

The 'A' weighting is a correction term applied to the frequency range in order to approximate to the sensitivity of the human ear to noise. It is generally used to obtain an overall noise level from octave or third octave band frequencies.

Octave Band

A frequency band in which the upper limit of the band is twice the frequency of the lower limit.

One-third-octave Band

A frequency band in which the upper limit of the band is 1/3 times the frequency of the lower limit.

Data Appendix

 Site: Middlewood Farm, Sarn Road, Threapwood, Cheshire, SY14 7AW Table 1b: - Data - Background Report: 4625 Start Date: 09/09/2021 End Date: 09/09/2021																				Table c: - 1min Night-time LAMax Events Highest Ranked		
Time	LAeq	LA90	LAMax	Time	LAeq	LA90	LAMax	Time	LAeq	LA90	LAMax	Time	LAeq	LA90	LAMax	Time	LAeq	LA90	LAMax	#	Time	LAMax
00:00	35.3	34.5	43.0	04:50	33.8	33.5	37.7	09:40	44.7	37.9	58.0	14:30	51.6	38.2	77.4	19:20	40.4	35.1	53.2	1	05:38	62.9
00:05	34.7	34.1	44.4	04:55	34.4	33.5	42.7	09:45	43.3	37.5	60.1	14:35	40.4	36.5	62.9	19:25	36.1	34.1	46.7	2	06:29	60.7
00:10	34.5	34.0	44.3	05:00	34.3	33.4	42.2	09:50	48.7	37.6	64.7	14:40	45.2	37.9	62.1	19:30	36.3	33.7	47.6	3	05:16	60.3
00:15	37.8	34.2	51.4	05:05	41.0	33.6	56.8	09:55	44.8	36.1	71.8	14:45	43.2	36.8	62.2	19:35	38.3	33.8	56.8	4	05:10	60.1
00:20	37.8	34.1	50.6	05:10	42.4	33.5	60.1	10:00	64.8	36.5	93.7	14:50	37.9	35.6	59.2	19:40	35.6	33.6	45.3	5	05:21	59.8
00:25	34.3	33.8	43.2	05:15	39.2	33.5	60.3	10:05	45.5	38.1	57.6	14:55	52.6	36.1	74.8	19:45	36.6	33.7	47.5	6	05:25	59.7
00:30	36.6	34.0	46.7	05:20	40.1	34.2	59.8	10:10	43.1	38.4	53.5	15:00	42.4	36.6	66.6	19:50	36.1	34.3	47.3	7	06:45	59.3
00:35	35.7	33.9	46.5	05:25	39.4	36.1	59.7	10:15	45.9	35.5	63.7	15:05	45.9	36.0	68.5	19:55	37.4	33.7	49.2	8	05:45	58.6
00:40	34.1	33.6	42.2	05:30	38.9	36.0	51.9	10:20	55.6	39.4	81.6	15:10	44.8	36.5	67.2	20:00	39.5	34.2	55.8	9	05:12	58.5
00:45	35.1	33.7	44.3	05:35	43.0	40.1	62.9	10:25	43.3	36.1	67.8	15:15	45.5	35.5	69.6	20:05	37.2	33.5	53.1	10	05:23	58.5
00:50	34.0	33.5	37.3	05:40	41.8	36.1	57.2	10:30	57.5	38.2	70.8	15:20	46.5	36.1	74.6	20:10	45.2	35.8	62.0	11	06:03	58.5
00:55	34.0	33.6	38.5	05:45	44.0	34.7	58.6	10:35	73.3	51.1	86.0	15:25	37.5	35.2	61.7	20:15	34.8	33.5	42.0	12	05:15	58.4
01:00	33.7	33.5	39.1	05:50	43.2	34.1	58.3	10:40	41.5	37.4	56.7	15:30	44.9	37.7	56.1	20:20	37.3	33.8	46.4	13	05:56	58.4
01:05	34.0	33.6	42.8	05:55	41.9	34.3	58.4	10:45	49.0	36.8	74.4	15:35	67.4	35.2	93.2	20:25	34.5	33.9	38.2	14	05:54	58.3
01:10	34.2	33.5	42.7	06:00	43.9	34.0	58.5	10:50	49.3	37.1	80.6	15:40	43.7	34.8	65.4	20:30	35.0	33.4	43.5	15	06:01	58.2
01:15	33.9	33.5	44.6	06:05	40.9	34.0	56.1	10:55	45.5	36.2	71.4	15:45	44.4	36.7	64.6	20:35	35.5	33.4	51.7	16	05:46	58.0
01:20	33.8	33.5	43.7	06:10	40.0	34.6	56.1	11:00	41.4	34.9	73.0	15:50	37.9	34.7	54.6	20:40	35.5	33.4	46.6	17	06:02	58.0
01:25	34.9	33.6	45.8	06:15	40.6	35.5	56.2	11:05	49.4	37.4	71.0	15:55	37.9	34.7	51.9	20:45	35.3	33.4	44.5	18	05:53	57.9
01:30	35.8	34.1	48.7	06:20	40.3	35.3	56.5	11:10	55.6	37.9	78.2	16:00	43.0	35.3	58.9	20:50	43.9	37.1	58.7	19	05:55	57.9
01:35	35.2	33.5	52.8	06:25	38.2	34.4	60.7	11:15	60.3	37.5	81.7	16:05	49.7	39.2	69.3	20:55	36.3	33.5	50.2	20	05:57	57.8
01:40	33.9	33.5	39.6	06:30	39.5	35.1	56.1	11:20	53.8	37.3	71.7	16:10	38.7	35.9	50.9	21:00	34.0	33.1	42.7	21	06:46	57.8
01:45	33.7	33.5	37.3	06:35	43.3	36.8	55.2	11:25	40.0	35.0	56.7	16:15	48.7	37.2	71.5	21:05	34.2	33.4	41.6	22	04:45	57.6
01:50	33.8	33.5	44.9	06:40	40.9	36.1	52.8	11:30	42.1	36.4	61.6	16:20	61.3	35.8	79.9	21:10	35.3	34.3	40.2	23	05:13	57.6
01:55	33.7	33.5	37.2	06:45	42.8	36.9	59.3	11:35	53.9	36.0	82.8	16:25	39.8	34.9	61.0	21:15	34.5	33.1	43.8	24	05:28	57.6
02:00	33.6	33.5	38.4	06:50	39.4	35.4	55.8	11:40	47.6	38.0	66.8	16:30	42.9	35.0	61.0	21:20	34.5	33.0	46.7	25	05:11	57.5
02:05	33.6	33.5	37.9	06:55	36.6	34.4	55.3	11:45	41.9	34.9	69.1	16:35	45.2	36.9	63.3	21:25	35.1	33.3	46.6	26	05:49	57.3
02:10	33.7	33.5	40.9	07:00	40.4	34.9	55.1	11:50	36.4	34.8	47.5	16:40	39.4	34.5	56.7	21:30	40.1	34.7	62.3	27	04:42	57.2
02:15	33.7	33.5	41.4	07:05	40.4	35.4	53.4	11:55	40.4	36.1	61.8	16:45	44.5	34.8	67.8	21:35	39.7	33.4	64.8	28	05:14	57.2
02:20	33.5	33.1	39.5	07:10	43.0	36.3	60.3	12:00	38.1	35.9	48.1	16:50	42.0	35.0	58.2	21:40	42.1	33.4	70.9	29	05:44	57.2
02:25	33.8	33.5	39.4	07:15	42.1	35.5	59.2	12:05	39.8	35.4	55.9	16:55	37.3	34.5	53.4	21:45	34.9	33.1	50.4	30	05:22	57.1
02:30	33.8	33.5	40.4	07:20	47.1	35.8	71.0	12:10	41.4	36.4	57.5	17:00	43.1	37.2	57.7	21:50	33.4	33.0	37.0	31	05:51	56.9
02:35	36.0	33.5	49.8	07:25	47.0	37.5	60.4	12:15	51.2	37.6	71.7	17:05	40.2	34.4	54.0	21:55	33.4	33.0	38.5	32	05:08	56.8
02:40	33.6	33.5	37.1	07:30	44.0	37.5	59.0	12:20	42.7	36.8	60.1	17:10	41.2	35.9	55.2	22:00	33.4	33.0	36.9	33	05:52	56.8
02:45	33.7	33.5	37.6	07:35	44.8	36.9	65.5	12:25	40.1	35.2	56.2	17:15	39.0	34.9	53.1	22:05	35.6	33.4	47.9	34	04:39	56.6
02:50	33.8	33.5	38.7	07:40	38.8	35.6	55.5	12:30	43.7	38.8	61.0	17:20	44.8	36.3	59.9	22:10	35.1	33.2	47.3	35	05:47	56.6
02:55	35.7	33.7	44.2	07:45	47.1	36.5	66.3	12:35	45.3	39.0	63.2	17:25	47.6	36.3	70.1	22:15	35.3	33.1	46.8	36	05:50	56.6
03:00	33.7	33.5	37.1	07:50	44.2	37.1	65.0	12:40	41.2	37.1	51.5	17:30	48.5	38.7	66.1	22:20	36.2	33.2	49.0	37	04:43	56.5
03:05	33.6	33.3	37.2	07:55	46.1	39.0	63.6	12:45	45.9	37.4	75.6	17:35	48.2	36.0	64.3	22:25	33.9	33.1	43.6	38	05:43	56.5
03:10	33.7	33.5	37.0	08:00	65.8	36.1	97.1	12:50	46.4	39.0	61.2	17:40	41.4	35.4	58.5	22:30	37.9	33.3	55.9	39	06:20	56.5
03:15	33.5	33.2	39.5	08:05	49.9	36.5	72.9	12:55	43.7	39.2	59.6	17:45	40.0	34.4	58.3	22:35	37.7	33.5	60.1	40	04:41	56.2
03:20	33.8	33.4	45.5	08:10	50.2	37.5	79.8	13:00	42.4	39.6	55.2	17:50	38.5	34.9	48.0	22:40	35.1	33.3	45.6	41	05:48	56.2
03:25	33.9	33.5	37.3	08:15	52.6	37.0	69.2	13:05	50.8	37.8	72.7	17:55	39.1	35.0	52.2	22:45	35.3	33.1	61.7	42	06:19	56.2
03:30	33.8	33.5	42.8	08:20	62.1	41.6	82.5	13:10	44.0	37.3	62.7	18:00	37.5	33.7	53.0	22:50	34.9	33.4	52.9	43	05:09	56.1
03:35	33.7	33.5	37.2	08:25	52.4	40.0	64.0	13:15	39.4	35.8	54.4	18:05	37.6	34.2	51.7	22:55	34.1	33.0	47.2	44	05:35	56.1
03:40	33.7	33.5	37.0	08:30	47.9	37.4	61.1	13:20	40.5	37.2	62.5	18:10	45.6	37.7	57.3	23:00	37.7	34.9	48.2	45	06:04	56.1
03:45	33.6	33.3	42.6	08:35	48.8	36.9	65.4	13:25	45.2	39.1	62.8	18:15	39.4	34.2	62.1	23:05	33.9	33.1	42.5	46	06:06	56.1
03:50	33.5	33.2	36.9	08:40	41.9	36.8	59.9	13:30	43.6	39.5	60.3	18:20	38.8	34.3	53.2	23:10	34.7	33.1	46.8	47	06:09	56.1
03:55	33.6	33.4	37.1	08:45	38.9	36.2	50.0	13:35	47.0	39.7	60.0	18:25	39.4	34.6	54.8	23:15	34.9	33.3	52.4	48	06:10	56.1
04:00	33.7	33.4	37.1	08:50	60.6	45.0	74.8	13:40	48.6	39.0	62.0	18:30	41.2	36.7	52.5	23:20	33.6	33.0	49.3	49	06:31	56.1
04:05	33.7	33.5	38.9	08:55	43.0	37.6	60.9	13:45	55.0	39.4	70.7	18:35	37.8	34.6	50.8	23:25	34.8	33.3	51.9	50	05:36	55.9
04:10	33.6	33.2	36.9	09:00	51.3	39.5	64.6	13:50	51.0	38.4	71.2	18:40	41.7	34.3	60.5	23:30	34.4	33.1	46.4	51	06:51	55.8
04:15	34.2	33.4	44.5	09:05	44.0	36.9	62.5	13:55	50.0	39.8	66.6	18:45	43.8	35.8	62.7	23:35	34.3	33.2	39.9	52	06:23	55.6
04:20	33.5	33.0	36.9	09:10	52.0	39.8	71.2	14:00	50.5	41.5	69.5	18:50	38.0	34.1	58.7	23:40	33.8	33.1	46.7	53	04:40	55.5
04:25	39.5	34.2	51.3	09:15	42.7	36.0	66.1	14:05	44.6	38.7	65.5	18:55	37.8	34.4	50.1	23:45	36.9	33.2	51.0	54	05:59	55.4
04:30	33.7	33.5	38.6	09:20	43.0	35.7	67.0	14:10	47.7	39.1	69.3	19:00										

				Site: Middlewood Farm, Sarn Road, Threapwood, Cheshire, SY14 7AW															
Table 2b: - Data - Background												Start Date: 09/09/2021							
Report: 4625																End Date: 09/09/2021			
Time	LAeq	LA90	LAMax	Time	LAeq	LA90	LAMax	Time	LAeq	LA90	LAMax	Time	LAeq	LA90	LAMax	Time	LAeq	LA90	LAMax
00:00	34.0	33.2	44.1	04:50	32.5	32.5	36.3	09:40	48.2	36.2	74.0	14:30	50.2	41.0	74.8	19:20	41.6	34.3	56.7
00:05	34.4	33.6	44.2	04:55	33.1	32.5	40.5	09:45	43.9	37.1	60.8	14:35	47.7	41.2	64.5	19:25	37.2	33.5	54.4
00:10	34.5	33.7	45.5	05:00	34.7	32.5	56.5	09:50	49.0	36.3	65.4	14:40	49.3	42.2	61.6	19:30	42.3	33.9	56.9
00:15	38.0	33.4	52.0	05:05	39.3	32.5	57.0	09:55	45.6	35.5	63.1	14:45	45.7	40.7	57.8	19:35	44.8	34.0	70.7
00:20	39.3	33.5	57.8	05:10	38.4	32.5	57.4	10:00	50.8	35.3	68.5	14:50	43.2	40.0	56.5	19:40	40.8	33.8	57.0
00:25	33.7	33.0	44.7	05:15	32.7	32.5	42.6	10:05	50.6	39.3	65.3	14:55	50.8	40.0	74.8	19:45	42.8	34.6	59.0
00:30	39.0	33.8	57.2	05:20	36.6	33.3	55.8	10:10	51.8	38.5	68.4	15:00	55.9	41.5	75.3	19:50	43.7	34.7	60.0
00:35	35.7	33.3	47.3	05:25	39.1	35.5	59.7	10:15	47.5	36.4	64.4	15:05	44.7	38.5	61.2	19:55	43.6	33.6	59.9
00:40	33.2	32.7	42.7	05:30	39.1	35.9	47.7	10:20	46.9	37.1	66.4	15:10	47.9	41.8	65.7	20:00	40.1	33.2	62.2
00:45	36.4	33.0	55.4	05:35	40.4	38.0	47.7	10:25	43.2	35.1	63.8	15:15	44.9	36.9	59.4	20:05	35.9	32.8	54.9
00:50	33.1	32.5	41.1	05:40	39.0	34.6	55.0	10:30	50.1	36.4	79.1	15:20	43.6	37.0	61.7	20:10	41.2	34.9	54.6
00:55	33.2	32.7	41.9	05:45	36.9	33.3	54.3	10:35	69.0	49.7	83.5	15:25	45.6	36.9	69.8	20:15	36.2	32.9	50.4
01:00	33.1	32.5	48.9	05:50	36.9	33.0	59.7	10:40	45.2	36.5	68.0	15:30	46.0	37.9	65.9	20:20	40.4	34.1	56.5
01:05	33.6	32.5	50.7	05:55	42.2	33.3	62.6	10:45	52.9	37.7	67.7	15:35	44.5	36.2	65.1	20:25	34.8	32.9	47.6
01:10	32.7	32.5	38.1	06:00	45.0	33.2	62.0	10:50	50.9	44.2	63.8	15:40	47.5	40.3	57.4	20:30	36.1	32.5	54.8
01:15	32.5	32.4	39.9	06:05	46.2	33.0	63.7	10:55	46.9	38.4	64.1	15:45	48.8	36.1	67.6	20:35	38.5	32.8	55.9
01:20	32.8	32.3	49.0	06:10	45.6	33.1	66.6	11:00	43.0	35.6	64.3	15:50	42.6	34.8	63.9	20:40	38.4	33.3	55.6
01:25	35.6	32.7	55.9	06:15	46.4	34.1	62.4	11:05	51.7	39.9	65.5	15:55	42.3	34.7	59.4	20:45	35.7	32.6	54.8
01:30	34.3	32.8	45.1	06:20	45.4	34.4	61.3	11:10	53.5	42.3	79.2	16:00	49.5	37.5	67.8	20:50	44.1	36.6	58.6
01:35	32.7	32.5	42.5	06:25	44.1	33.4	59.3	11:15	54.6	43.9	76.7	16:05	53.3	39.5	73.7	20:55	36.6	32.7	54.7
01:40	33.1	32.5	40.1	06:30	45.8	34.0	61.0	11:20	53.5	42.2	70.0	16:10	42.3	36.5	61.9	21:00	33.9	32.5	45.5
01:45	32.6	32.5	36.1	06:35	43.5	36.1	57.5	11:25	39.4	34.9	59.4	16:15	45.8	38.7	65.9	21:05	34.3	33.0	49.7
01:50	33.0	32.5	39.6	06:40	42.1	34.4	61.7	11:30	44.9	38.0	62.3	16:20	47.9	38.4	67.8	21:10	35.3	34.0	41.3
01:55	32.7	32.5	44.5	06:45	42.8	34.9	62.4	11:35	44.7	37.6	60.6	16:25	44.6	37.3	59.1	21:15	35.6	32.7	54.5
02:00	32.8	32.5	46.9	06:50	44.1	34.2	60.3	11:40	49.9	37.3	70.0	16:30	44.9	35.4	68.1	21:20	36.5	32.5	55.9
02:05	32.5	32.3	34.3	06:55	40.0	33.4	58.2	11:45	43.2	34.7	64.0	16:35	49.0	36.3	68.8	21:25	37.1	32.6	59.5
02:10	32.5	32.2	42.9	07:00	40.3	33.6	56.0	11:50	45.8	35.6	63.2	16:40	40.4	34.7	60.2	21:30	39.1	33.3	57.4
02:15	32.9	32.5	41.9	07:05	43.1	34.4	59.2	11:55	44.6	36.9	60.2	16:45	44.2	34.4	66.4	21:35	33.1	32.4	45.6
02:20	32.9	32.5	47.8	07:10	43.0	35.6	54.5	12:00	43.6	37.8	57.5	16:50	46.0	34.9	62.1	21:40	32.5	32.0	44.5
02:25	32.6	32.5	37.0	07:15	42.7	33.9	64.4	12:05	54.6	38.0	78.2	16:55	48.5	41.5	66.0	21:45	36.8	32.3	57.9
02:30	32.5	32.0	34.4	07:20	42.0	34.5	59.9	12:10	46.7	38.0	66.4	17:00	49.7	40.2	64.6	21:50	32.6	32.3	38.7
02:35	37.6	32.4	60.1	07:25	44.8	34.3	63.7	12:15	43.4	37.9	57.5	17:05	43.3	33.3	66.3	21:55	32.5	32.3	37.3
02:40	32.6	32.2	38.3	07:30	45.0	35.4	60.5	12:20	42.8	38.2	60.9	17:10	45.0	34.8	60.3	22:00	32.5	32.3	34.9
02:45	32.8	32.5	43.8	07:35	41.2	34.1	56.5	12:25	42.1	36.1	60.6	17:15	42.3	34.8	60.8	22:05	37.1	32.6	55.8
02:50	32.5	32.4	34.3	07:40	39.4	33.7	64.3	12:30	46.7	40.8	63.0	17:20	43.5	35.1	64.1	22:10	36.5	32.5	55.2
02:55	33.0	32.6	38.3	07:45	46.5	34.6	64.2	12:35	51.7	44.0	66.5	17:25	47.8	37.2	67.4	22:15	36.8	32.7	54.3
03:00	32.5	32.5	35.9	07:50	48.6	35.5	65.4	12:40	49.8	41.4	68.5	17:30	57.2	37.2	76.1	22:20	38.0	33.0	58.0
03:05	32.8	32.4	49.1	07:55	51.9	37.9	68.3	12:45	49.4	44.8	60.4	17:35	53.1	38.7	67.9	22:25	34.4	32.7	48.6
03:10	32.7	32.4	37.0	08:00	46.2	34.9	65.0	12:50	52.2	47.0	60.8	17:40	58.8	42.0	75.4	22:30	42.4	32.9	63.0
03:15	32.4	32.0	35.9	08:05	45.5	35.5	64.5	12:55	51.3	46.3	61.7	17:45	40.7	33.8	60.6	22:35	41.6	33.6	62.9
03:20	32.6	32.0	48.3	08:10	49.1	37.0	67.4	13:00	51.4	47.2	60.5	17:50	41.1	35.0	59.7	22:40	36.9	33.1	53.7
03:25	32.6	32.2	37.4	08:15	44.5	34.6	66.0	13:05	47.6	41.7	66.0	17:55	42.5	34.2	59.4	22:45	33.7	32.6	43.7
03:30	33.3	32.5	47.2	08:20	44.2	35.1	71.5	13:10	46.0	40.8	58.0	18:00	37.4	33.2	55.6	22:50	35.5	32.8	53.6
03:35	32.8	32.6	40.5	08:25	48.0	36.0	72.1	13:15	43.9	40.7	59.0	18:05	42.5	34.1	61.0	22:55	32.9	32.5	42.8
03:40	32.6	32.5	39.9	08:30	43.8	35.9	63.1	13:20	48.5	43.2	61.8	18:10	46.6	37.7	63.2	23:00	37.0	34.0	51.8
03:45	32.6	32.5	36.9	08:35	41.9	34.3	61.3	13:25	52.1	45.8	66.7	18:15	42.6	34.2	59.1	23:05	32.6	32.5	38.4
03:50	32.5	32.4	34.6	08:40	47.0	35.1	62.9	13:30	53.2	47.2	61.8	18:20	43.1	35.0	61.4	23:10	36.5	32.6	56.9
03:55	33.0	32.5	48.8	08:45	41.7	33.8	60.4	13:35	52.2	45.7	63.7	18:25	46.0	34.0	72.1	23:15	33.5	32.6	38.4
04:00	32.6	32.4	37.6	08:50	43.9	35.7	59.3	13:40	50.8	44.0	66.6	18:30	44.8	35.8	61.9	23:20	32.6	32.5	39.2
04:05	32.8	32.5	35.6	08:55	46.8	35.9	66.5	13:45	51.3	41.8	65.3	18:35	39.3	34.0	57.2	23:25	35.7	32.6	54.7
04:10	32.5	32.1	37.6	09:00	46.9	36.0	63.3	13:50	51.4	44.7	68.4	18:40	44.8	35.0	64.7	23:30	35.8	32.5	55.2
04:15	32.4	32.0	33.7	09:05	48.2	36.1	66.5	13:55	54.4	45.4	71.8	18:45	42.8	35.9	63.7	23:35	34.4	33.1	44.8
04:20	32.4	32.0	34.3	09:10	59.4	38.5	83.6	14:00	51.0	44.6	71.4	18:50	44.9	34.1	63.8	23:40	33.5	32.5	51.0
04:25	33.2	32.3	43.1	09:15	43.0	35.1	59.3	14:05	49.1	43.6	74.2	18:55	42.3	34.5	64.0	23:45	40.4	32.7	58.3
04:30	32.6	32.3	38.1	09:20	41.6	34.2	59.9	14:10	49.8	43.3	69.7	19:00	41.6	33.5	62.2	23:50	33.8	32.6	42.4
04:35	32.7	32.0	51.2	09:25	48.0	37.6	59.9	14:15	46.5	41.1	62.0	19:05	37.6	33.6	55.8	23:55	36.6	32.6	59.4
04:40	32.7	32.2	43.2	09:30	46.1	36.6	63.8	14:20	45.4	41.0	59.9	19:10	39.3	34.0	57.8				
04:45	32.6	32.4	37.0	09:35	47.2	38.6	69.2	14:25	42.5	39.5	56.2	19:15	44.7	35.0	63.1				

Table 1c: - 1min Night-time LAMax Events Highest Ranked		
#	Time	LAMax
1	06:13	66.6
2	06:09	63.7
3	06:14	63.3
4	05:59	62.6
5	06:17	62.4
6	06:49	62.4
7	06:18	62.2
8	06:04	62.0
9	06:42	61.7
10	06:00	61.6
11	06:21	61.3
12	06:33	61.0
13	06:06	60.7
14	06:30	60.7
15	06:20	60.4
16	06:47	60.3
17	06:54	60.3
18	02:36	60.1
19	06:07	60.1
20	06:32	59.9
21	06:45	59.9
22	06:01	59.8
23	05:27	59.7
24	05:51	59.7
25	06:31	59.6
26	23:59	59.4

Photo Appendix



Figure 7 – View to site rear



Figure 8 – View to site front