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NOISE ASSESSMENT AND MITIGATION SCHEME

PROPOSED RESIDENTIAL DEVELOPMENT ON LAND OFF PLOUGHLEY ROAD, AMBROSDEN

BELLWAY HOMES LIMITED (NORTHERN HOME COUNTIES)

NOVEMBER 2022

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Revision	Prepared By	Date
1.1	L Jephson BEng (Hons) MIOA	17/11/22

CONTENTS

1. Introduction

LF Acoustics Ltd have been appointed by Bellway Homes Limited (Northern Home Counties) to undertake a noise assessment to support an outline planning application for a proposed residential development on land off Ploughley Road, Ambrosden.

It is proposed to construct the development on land to the north of existing residential development within Ambrosden. The site is bounded to the west by Ploughley Road, with the A41 running further to the north, beyond the site. Road traffic noise is the main influence on the noise environment within the site.

This report presents an preliminary assessment of the noise levels within the Proposed Development, based upon the framework development plan and provides details of the noise mitigation measures which would be implemented to ensure the requirements of BS 8233 are achieved.

The following section of this report describes the standards and guidance applicable to this development. Section 3 provides a brief description of the proposed development to be constructed, which has taken noise into account within the final layout. Section 4 presents the results of a noise monitoring exercise, carried out to establish the current noise levels within the area of the site closest to Rothwell Road. Section 5 presents the results of noise modelling exercise carried out to predict the noise levels within the proposed development, with the design and mitigation measures implemented and assesses the levels against the relevant criteria. Finally, Section 6 provides a summary of the report.

This assessment and report has been prepared by L Jephson BEng(Hons) MIOA, Director of LF Acoustics Ltd.

2. Applicable Standards and Guidance

2.1. A description of the noise units referred to in this report is provided in Appendix A.

2.2. National Planning Policy Framework

The National Planning Policy Framework (NPPF), revised in July 2021 [1], sets out the Government's planning policies for England and how these should be applied. It provides a framework upon which locally-prepared plans for housing and other development can be produced.

The purpose of the planning system is to contribute to the achievement of sustainable development and at the heart of the Framework is a presumption in favour of sustainable development.

With regards noise, local planning policies and decisions should contribute to and enhance the natural and local environment for new noise sensitive developments by preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of noise pollution.

2.3. British Standard BS 8233

BS 8233 [2] recommends design aims for noise levels to be achieved in buildings.

For residential properties, Table 4 within the guidance recommends that it is desirable that the ambient noise levels do not exceed the following guideline values during the daytime (07:00 – 23:00) and night-time (23:00 – 07:00) periods:

- 35 dB $L_{Aeq,T}$ within living rooms and bedrooms during the daytime (07:00 – 23:00);
- 40 dB $L_{Aeq,T}$ within dining areas / rooms during the daytime (07:00 – 23:00); and
- 30 dB $L_{Aeq,T}$ within bedrooms during the night-time (23:00 – 07:00).

With regards internal noise levels, Note 7 of the table advises:

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

Where the above limits require windows to be closed to maintain the standard of noise, there needs to be appropriate alternative ventilation provided that does not compromise the façade insulation or resulting noise level.

For outdoor amenity spaces, such as gardens or patios, it is desirable that the external noise level does not exceed an upper guideline value of 55 dB $L_{Aeq,T}$. It is recognised in the Standard that these guideline values may not be achievable in all circumstances. Where development might be desirable, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, the development should be designed to achieve the lowest practicable levels, but should not be prohibited.

2.4. World Health Organisation Guidelines

The WHO guidance [3] provides guidance of a similar nature to BS 8233, although the emphasis is more on health effects associated with noise. The document recommends internal and external noise levels to provide an acoustic environment conducive to un-interrupted speech and sleep. The WHO guidance is summarised below for information purposes.

- It will be important to consider the maximum noise levels and number of noisy events.
- Satisfactory protection should be provided to avoid sleep disturbance, annoyance and speech communication interference.
- Recommended internal noise levels in bedrooms are given as 30 dB $L_{Aeq,T}$ for continuous noise and recommends that a level of 45 dB $L_{Amax,F}$ for single events is not exceeded more than 10 – 15 times within bedrooms during the night-time period.

2.5. ProPG: Planning and Noise

Professional planning guidance on planning and noise was published in May 2017 [4]. The guidance seeks to provide a recommended approach to the management of noise within the planning system in England. The guidance has been prepared jointly between the Association of Noise Consultants, The Institute of Acoustics and the Chartered Institute of Environmental Health with the aim of providing a coherent approach to achieving the requirements of the NPPF.

The guidance advocates a systematic, proportionate, risk based, 2-stage approach, encouraging early consideration of noise within the design process for new residential developments:

- Stage 1 provides an initial noise risk assessment of the development site;
- Stage 2 provides systematic consideration of four key elements: demonstrating a good acoustic design process; observing internal noise level guidelines; undertaking an external amenity area noise assessment; and consideration of other relevant issues.

The initial risk assessment should identify the risk of adverse effects from noise and identifying whether the site poses a negligible, low, medium or high risk. The level of risk does not determine whether a site may be unsuitable for development, but highlights an increasing requirement for noise to be considered within the design of the development and the likelihood of a need for specific noise mitigation measures, as follows:

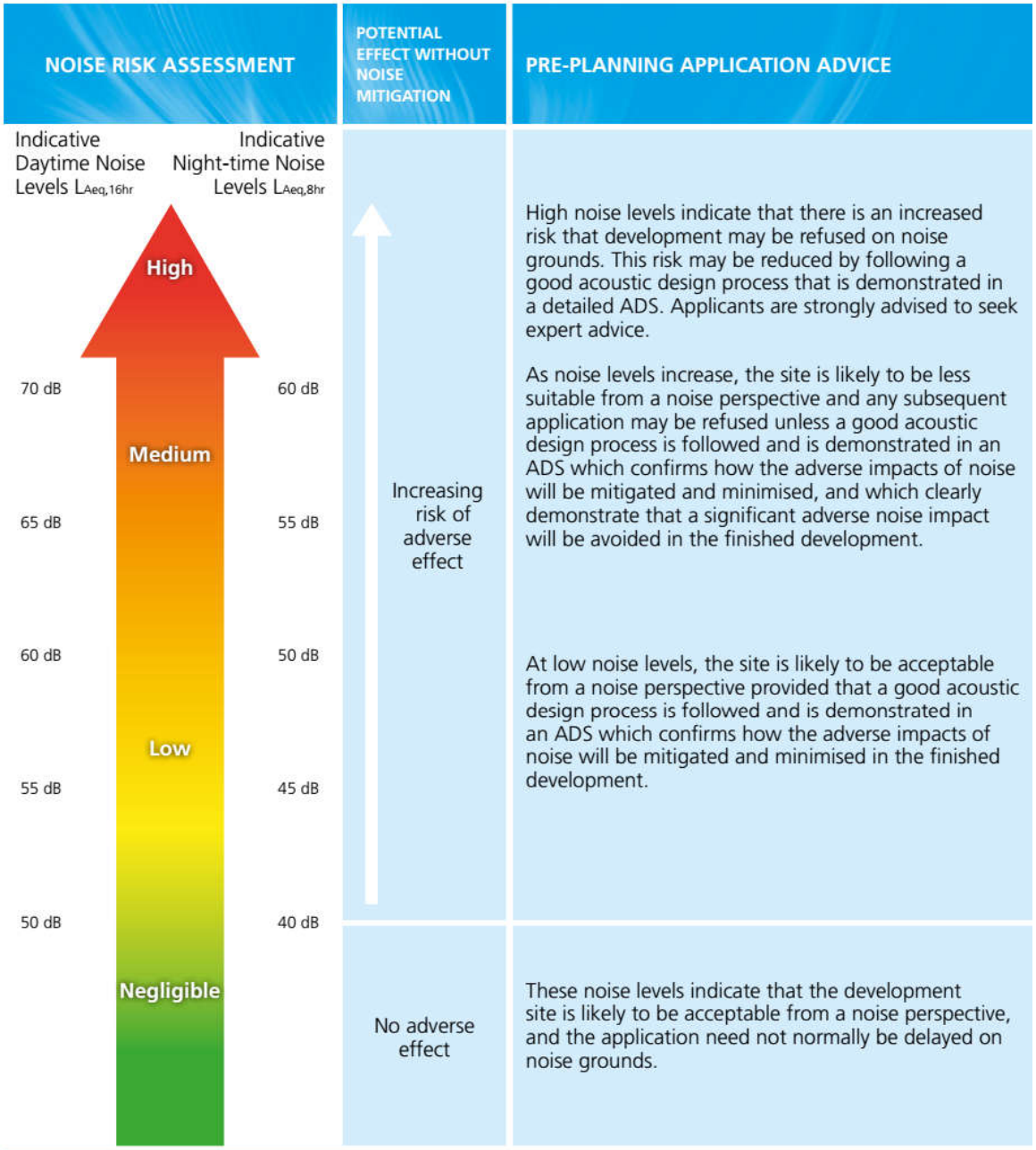

Figure 1 Notes:

a. Indicative noise levels should be assessed without inclusion of the acoustic effect of any scheme specific noise mitigation measures.

b. Indicative noise levels are the combined free-field noise level from all sources of transport noise and may also include industrial/commercial noise where this is present but is "not dominant".

c. $L_{Aeq,16hr}$ is for daytime 0700 – 2300, $L_{Aeq,8hr}$ is for night-time 2300 – 0700.

d. An indication that there may be more than 10 noise events at night (2300 – 0700) with $L_{Amax,F} > 60$ dB means the site should not be regarded as negligible risk.

For a Stage 2 assessment, the guidance additionally refers to BS 8233 with respect of achieving an acceptable internal noise environment and within gardens.

Internally, the guidance recommends that the targets within BS 8233 are adopted as an aim. Expanding upon the guidance within BS 8233, for internal noise environments It is stated:

"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."

Within external amenity areas, the guidance reflects BS 8233, as follows:

"These guideline values (i.e. a level of between 50 – 55 dB L_{Aeq}) may not be achievable in all circumstances where development might be desirable. In such a situation, development should be designed to achieve the lowest practicable noise levels in these external amenity spaces but should not be prohibited."

ProPG additionally provides guidance upon acceptable maximum noise levels within bedrooms at night to minimise the potential for sleep disturbance. The guidance recommends that a level of 45 dB $L_{Amax,F}$ is normally exceeded 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 upon the maximum noise levels but also other factors such as source, number, distribution, predictability and regularity of noise events.

3. Proposed Development Layout

At this stage outline planning consent for the proposed development is being sought and a detailed development layout has not been prepared at this stage.

The assessment has therefore been based upon the development framework plan, which provides details of the extent of the proposed development areas. The plan is indicated on Figure 1.

Noise levels within the development are principally influenced by traffic travelling along Ploughley Road and the A41 to the north.

At the time of this assessment, Ploughley Road was closed due to long term road works. The assessment of noise from this road has therefore been based upon the forecast traffic flows for the road with the development completed. At present the road is subject to a 60 mph speed limit past the site, however, this would be reduced to 30 mph once the development was completed.

This assessment has been based upon the noise levels at the extent of the development areas identified on the framework plan, to provide a worst case assessment, as it is likely that the properties would be set further into those areas and thus further from the surrounding roads.

As a general measure within the design, drives and accesses to the properties closest to Ploughley Road would be located in front of the properties to ensure they are set further back from the road, thus maximising the separation, which additionally ensures the gardens to these properties are to the rear of the dwellings and thus effectively screened from the road.

4. Baseline Noise Monitoring

4.1. Introduction

To establish the current noise levels within the site, unattended noise surveys were carried out between Monday 10th and Thursday 13th October 2022.

Weather conditions for the survey remained generally dry with either calm conditions or light south westerly winds throughout and thus suitable for undertaking an environmental noise survey.

Unattended noise surveys were carried out at two positions, once located along the north-eastern boundary at the rear of the site, closest to the A41 and a second along the western boundary close to Ploughley Road. As noted previously, Ploughley Road was closed to traffic at the time of the survey and the survey at this location was used to determine noise levels attributable to the A41 traffic and any other surrounding noise sources.

Rion NL-52 Class 1 Sound Level Meters were used for the surveys, which were calibrated before and after the exercise using a Rion NC-74 Class 1 Acoustic Calibrator, with the instrument reading 94.0 dB on each occasion. The instrumentation had been laboratory calibrated in accordance with national standards within the previous 12 / 24 months.

At each position, the microphone was set in freefield conditions, with the microphone set at a height of 1.3 metres above the ground. The instruments were configured to record over continuous 5 minute periods during the survey period, to allow any particular events to be identified. In addition, the instrument's audio recording capability was used to capture audio recordings of events generating higher noise levels.

The monitoring locations are indicated on Figure 2.

Sheep were in the fields adjacent to where the noise monitoring equipment was located. Whilst the sheep had minimal influence on ambient noise levels, their bleating did influence maximum noise levels periodically during the survey periods, which were noted to be the higher levels recorded during the surveys.

4.2. Unattended Noise Survey along Northern Boundary

This monitoring position was located along the northern site boundary at a position where there was a good line of sight onto the A41 to the north.

There were long term road works along the A41 at the time of the survey, with traffic noted to be travelling slower during the daytime periods, as they slowed for temporary traffic lights. This is likely to have reduced noise levels compared to the normal traffic flow and this has been accounted for within the subsequent assessment.

Noise levels at this location were principally influenced by traffic travelling along the A41. No noise was audible attributable to the operation of the industrial units located to the north beyond the A41.

The results of the survey are presented graphically in Appendix B and subsequently analysed into the period day and night-time periods, with the results provided below.

Day	Freefield Period Noise Levels [dB]	
	Daytime $L_{Aeq,\ 16\ hour}$	Night-time $L_{Aeq,8\ hour}$
Monday 10th October 2022	48.8	44.9
Tuesday 11th October 2022	47.3	46.8
Wednesday 12th October 2022	45.8	43.3

Notes: * - Period Comprised 11:00 – 23:00 Monday and 07:00 – 11:00 Thursday

Table 4.1 Results of Unattended Noise Survey at Northern Boundary

Maximum noise levels overnight were observed to be typically below 60 dB $L_{Amax,F}$ at the monitoring position.

4.3. Unattended Noise Survey along Ploughley Road Boundary

This monitoring position was along the south-western site boundary, positioned approximately 10 metres into the site boundary from the road.

As Ploughley Road was closed to traffic, the noise levels monitored were observed to be low and attributable to the distant traffic noise from the A41. No other sources of noise were identified from the survey.

The results of the survey are presented graphically in Appendix C and subsequently analysed into the period day and night-time periods, with the results provided below.

Day	Freefield Period Noise Levels [dB]	
	Daytime $L_{Aeq,\ 16\ hour}$	Night-time $L_{Aeq,8\ hour}$
Monday 10th October 2022	47.0	42.8
Tuesday 11th October 2022	46.0	42.7
Wednesday 12th October 2022	45.7	38.9

Notes: * - Period Comprised 11:00 – 23:00 Monday and 07:00 – 11:00 Thursday

Table 4.2 Results of Unattended Noise Survey at Ploughley Road Boundary

5. Calculation and Assessment of Noise Levels

5.1. Calculation of External Noise Levels

A noise model for the proposed layout of the residential development has been prepared within the SoundPlan computer modelling package, based upon the framework plan.

Ground levels for the road, development and surrounding area have been obtained from LiDAR mapping.

The model has been used to calculate the road traffic noise levels within the proposed development from the A41 and Ploughley Road. The model utilises the CRTN methodology [5], amended to provide an assessment of the period daytime and night-time L_{Aeq} noise levels utilising the Defra / TRL methodology [6], which provides a methodology for converting the calculated $L_{A10, 18\ hour}$ noise levels into the $L_{Aeq, 16\ hour}$ day and $L_{Aeq, 8\ hour}$ night-time noise levels.

An initial model was prepared utilising the present open layout to enable the modelled noise levels to be calibrated against the noise levels measured at the monitoring positions. For this model, only the A41 was considered, with account made for the reduced daytime speeds on the road due to the long term roadworks, with the model assuming 40 mph during the day.

A second model has been prepared, which includes the proposed layout, normal traffic conditions along the A41 and noise from traffic using Ploughley Road.

With regards Ploughley Road, future traffic flows have been provided by the traffic consultants, which additionally take account of the development traffic and other committed developments in the surrounding area. On this basis, the following flows have been assumed within the modelling:

- North of access – 8932 vehicles daytime (16 hr) and 748 vehicles night-time (8 hr) with 5.6% HGV; and
- South of access – 8699 vehicles daytime (16 hr) and 728 vehicles night-time (8 hr) with 5.7% HGV.

A speed of 30 mph has been assumed along Ploughley Road.

The results of the modelling for the daytime period, modelled at a height of 1.5 metres are presented on Figure 2, with the night-time noise levels modelled at a height of 4 metres, presented on Figure 3. The figures additionally include predictions of the day and night-time noise levels at the facades of the potentially most affected properties.

5.2. Assessment of External Noise Levels Within Gardens

The modelling for the daytime periods indicates noise levels within the gardens of the properties within the development, assuming those located alongside Ploughley Road would be behind the dwellings, would be below a level of 55 dB L_{Aeq} and thus achieve the requirements recommended within BS 8233.

The noise modelling at this stage has not taken account of close boarded fences which would be constructed around the garden fences, which would further reduce noise levels within the gardens.

Noise levels within the gardens of the properties would therefore be acceptable with no additional noise mitigation measures identified.

5.3. Assessment of Period L_{Aeq} Noise Levels Within Properties

The dwellings to be constructed within the development would be of a standard brick construction. Generally, the weak areas within the construction are the windows. It is proposed to install Munster 4-16-4 glazing, with Munster standard trickle vents with an indirect air path as standard within the development. The glazing would provide a sound reduction of 31 dB R_{W-3Ctr}, with the vents suitable to provide adequate background ventilation into the properties whilst maintaining windows closed, should the occupants choose. The specification for the glazing / vents is provided in Appendix D.

The calculations indicate that the noise levels within the majority of the development would be low, with façade noise levels of 55 dB $L_{Aeq,\ 16\ hr}$ daytime / 50 dB $L_{Aeq,\ 8\ hr}$ night-time or lower predicted within the majority of the development. These levels of noise are low and the standard dwelling construction would ensure the requirements of BS 8233 were met within the properties.

Higher noise levels have been predicted at the properties to be constructed alongside Ploughley Road, with the calculations indicating façade noise levels of up to 61 dB $L_{Aeq,\ 16\ hr}$ daytime / 56 dB $L_{Aeq,\ 8\ hr}$ night-time at the front facades of the properties.

Calculations of the internal noise levels based upon the standard specification, indicate internal noise levels of 27 dB $L_{Aeq,\ 16\ hr}$ daytime and 22 dB $L_{Aeq,\ 8\ hr}$ during the night-time periods. The calculated internal noise levels are substantially below the limits recommended within BS 8233 and would ensure a good standard of noise was achieved within the dwellings utilising the proposed constructions.

The calculation details are provided in Appendix E.

Whilst not forming part of the BS 8233 assessment, consideration has also been given to the maximum noise levels within the properties during the night-time period.

Based upon previous experience of similar roads to Ploughley Road, typical maximum noise levels from the passing vehicles are likely to be of the order of 70 dB $L_{Amax,F}$ at positions representative of the dwellings closest to the road.

Where maximum noise levels are below 75 dB $L_{Amax,F}$, the standard glazing / ventilation proposed would be sufficient to reduce noise levels internally to below 45 dB $L_{Amax,F}$, thus meeting the criteria specified within WHO and ProPG guidance.

6. Summary

LF Acoustics Ltd were appointed by Bellway Homes Limited (Northern Home Counties) to undertake a preliminary noise assessment for a proposed residential development on land off Ploughley Road, Ambrosden. An outline planning application is being suibmitted for the development and the assessment has been based upon the framewwork plan, which dfines the extents of the developable areas wihtin the proposed development.

It is proposed to construct the development on land to the north of existing residential development within Ambrosden. The site is bounded to the west by Ploughley Road, with the A41 running further to the north, beyond the site. Road traffic noise is the main influence on the noise environment within the site.

This report has presented an assessment of the noise levels within the Proposed Development, based upon the proposed framework plan layout.

The assessment based upon the framework plan, which provides worst case noise levels within the developable areas, indicates that with the standard constructions proposed, no specific noise mitigation measures would be required for the dwellings to be constructed alongside Ploughley Road or the A41.

References

1. Ministry of Housing, Communities and Local Government. National Planning Policy Framework. July 2021.

2. British Standards Institute. Guidance on Sound Insulation and Noise Reduction for Buildings. BS 8233. 2014.

3. World Health Organisation. Guidelines for Community Noise. Geneva. 1999.

4. ANC / Institute of Acoustics / Chartered Institute of Environmental Health. ProPG: Planning and Noise. Professional Practice Guidance on Planning & Noise. New Residential Development. May 2017.

5. Department of Transport. A Calculation of Road Traffic Noise. The Stationary Office. 1988.

6. Defra. Method for Converting the UK Traffic Noise Index $L_{A10,18h}$ to the EU Noise Indices for Road Noise Mapping. TRL/ Casella. Doc Ref. st/05/91/AGG04442. 2006

Figures

Figure 1:
Development Layout

Figure 2:
Site Location and Noise Monitoring Positions

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Noise Level LAeq,T
in dB(A)

	< 45
	45 - 50
	50 - 55
	55 - 60
	60 - 65
	65 - 70
	70 - 75
	>= 75

Figure 3:
Calculated Noise Levels - Daytime

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Appendix A
Noise Units

Decibels (dB)

Noise can be defined as unwanted sound. Sound in air can be considered as the propagation of energy through the air in the form of oscillatory changes in pressure. The size of the pressure changes in acoustic waves is quantified on a logarithmic decibel (dB) scale firstly because the range of audible sound pressures is very great, and secondly because the loudness function of the human auditory system is approximately logarithmic.

The dynamic range of the auditory system is generally taken to be 0 dB to 140 dB. Generally, the addition of noise from two sources producing the same sound pressure level, will lead to an increase in sound pressure level of 3 dB. A 3 dB noise change is generally considered to be just noticeable, a 5 dB change is generally considered to be clearly discernible and a 10 dB change is generally accepted as leading to the subjective impression of a doubling or halving of loudness.

A-Weighting

The bandwidth of the frequency response of the ear is usually taken to be from about 18 Hz to 18,000 Hz. The auditory system is not equally sensitive throughout this frequency range. This is taken into account when making acoustic measurements by the use of A-weighting, a filter circuit which has a frequency response similar to the human auditory system. All the measurement results referred to in this report are A-weighted.

Units Used to Describe Time-Varying Noise Sources (L_{Aeq},L_{A90} and L_{Amax})

Instantaneous A-weighted sound pressure level is not generally considered as an adequate indicator of subjective response to noise because levels of noise usually vary with time.

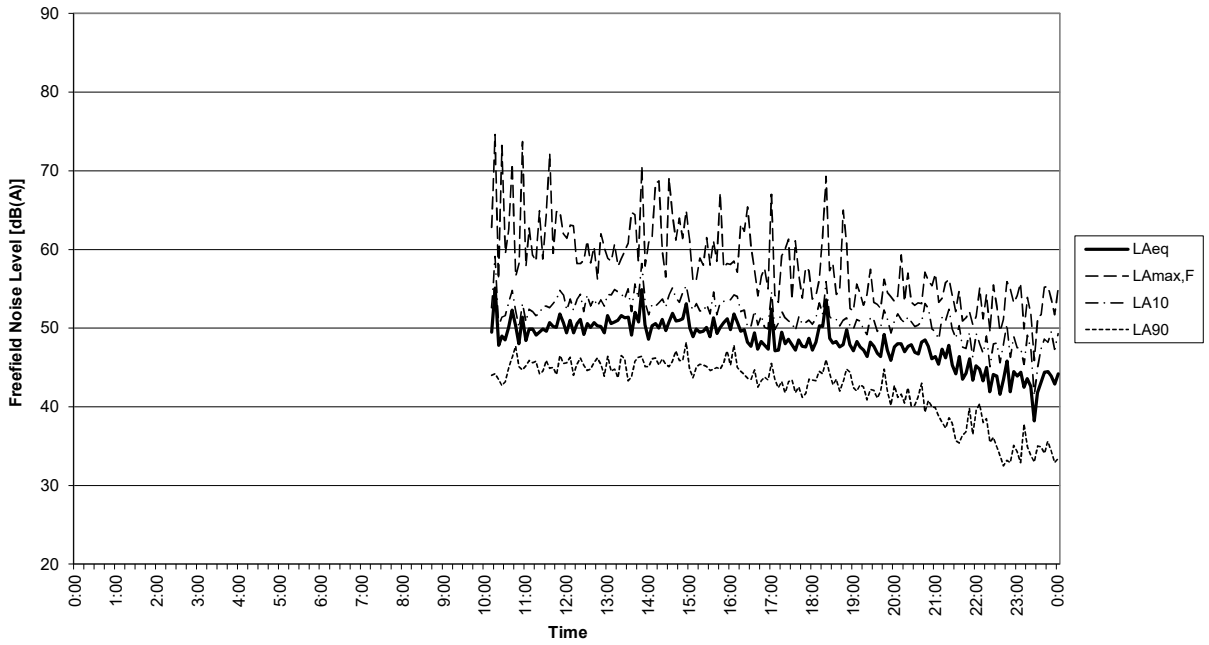
For many types of noise the Equivalent Continuous A-Weighted Sound Pressure Level ($L_{Aeq,T}$) is used as the basis of determining community response. The $L_{Aeq,T}$ is defined as the A-weighted sound pressure level of the steady sound which contains the same acoustic energy as the noise being assessed over a specific time period, T.

The L_{A90} is the noise level exceeded for 90% of the measurement period. It is generally used to quantify the background noise level, the underlying level of noise which is present even during the quietest part of the measurement period.

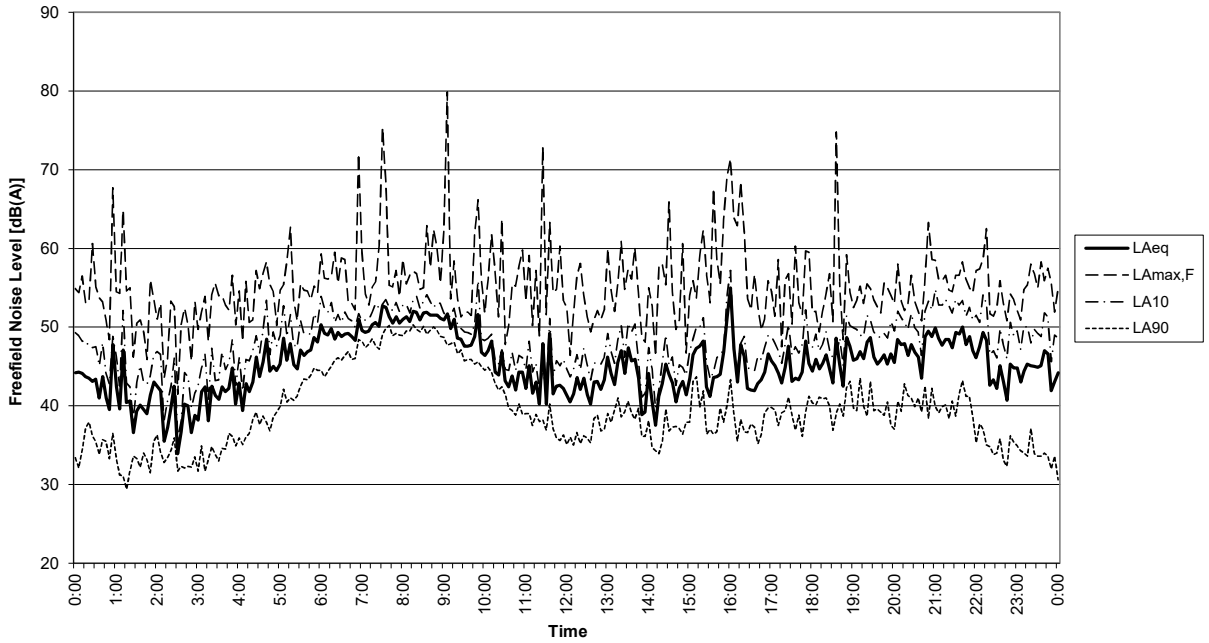
The L_{Amax} is the maximum value that the A-weighted sound pressure level reaches during a measurement period. $L_{Amax,F}$, or Fast, is averaged over 0.125 of a second.

Appendix B
Results of Unattended Noise Survey Along Northern Boundary

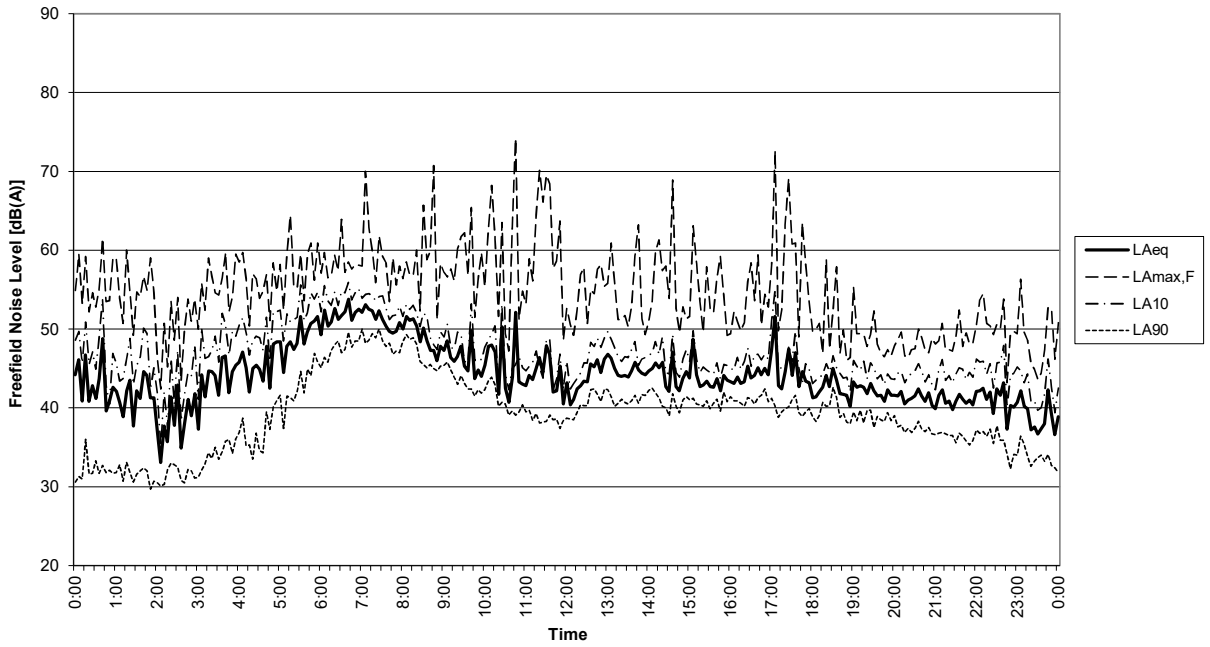
Monday 10/10/22



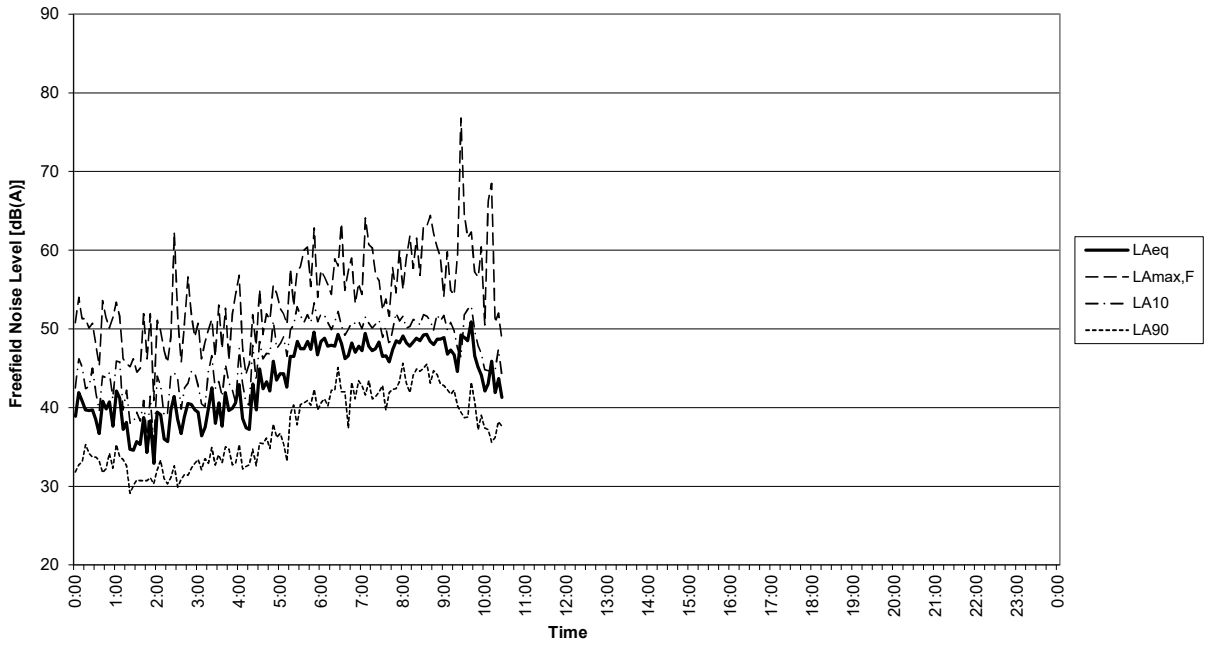
Tuesday 11/10/22



Wednesday 12/10/22

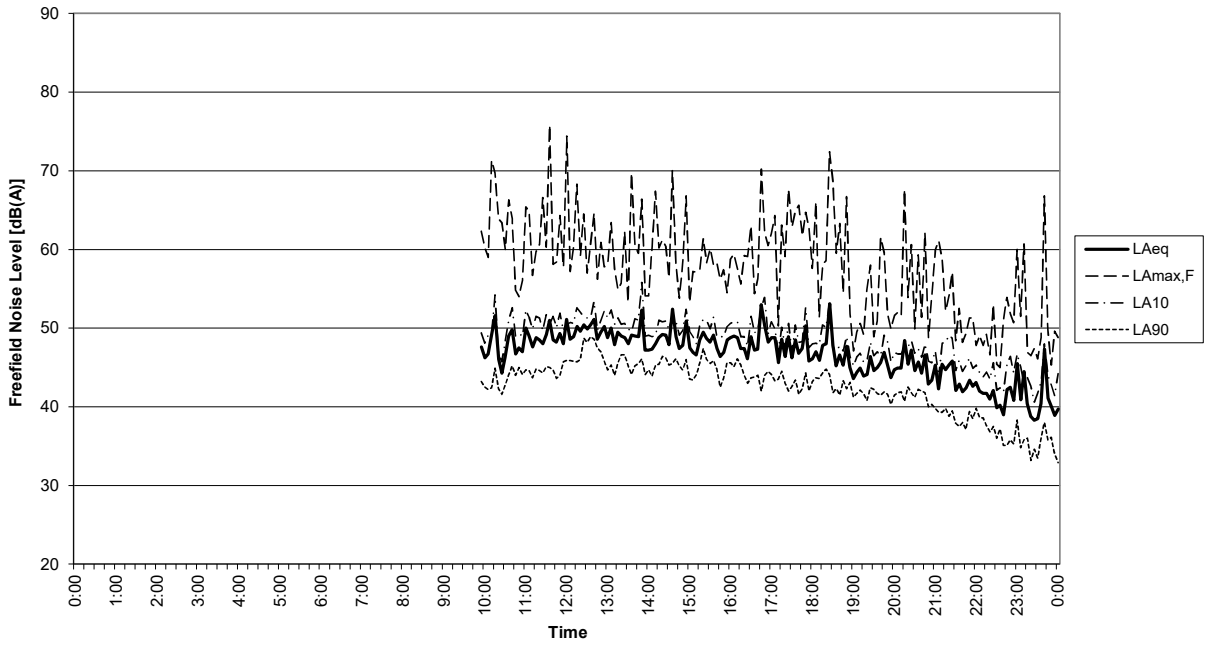


Thursday 13/10/22

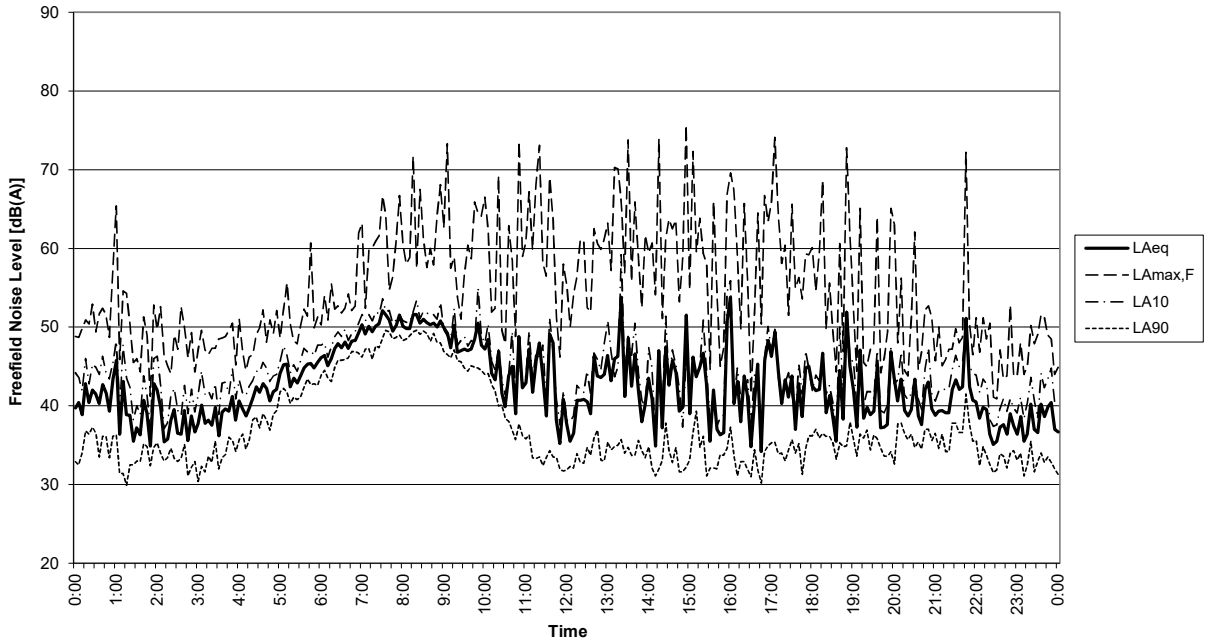


Appendix C
Results of Unattended Noise Survey Along Ploughley Road Boundary

Monday 10/10/22



Tuesday 11/10/22



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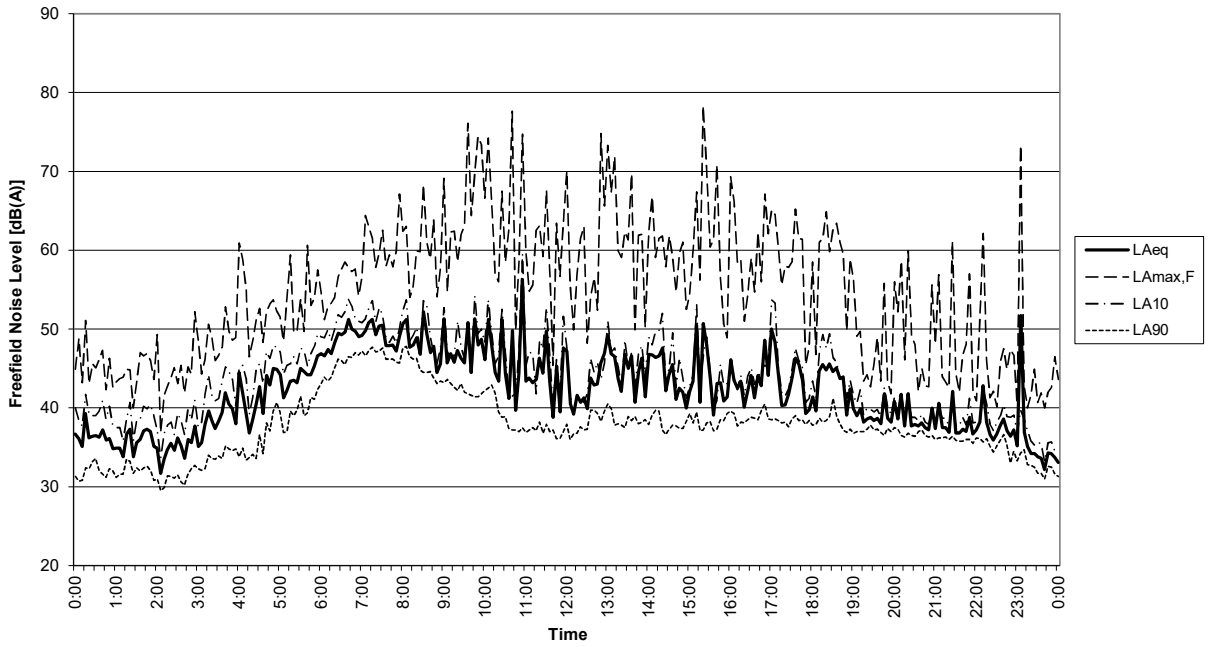
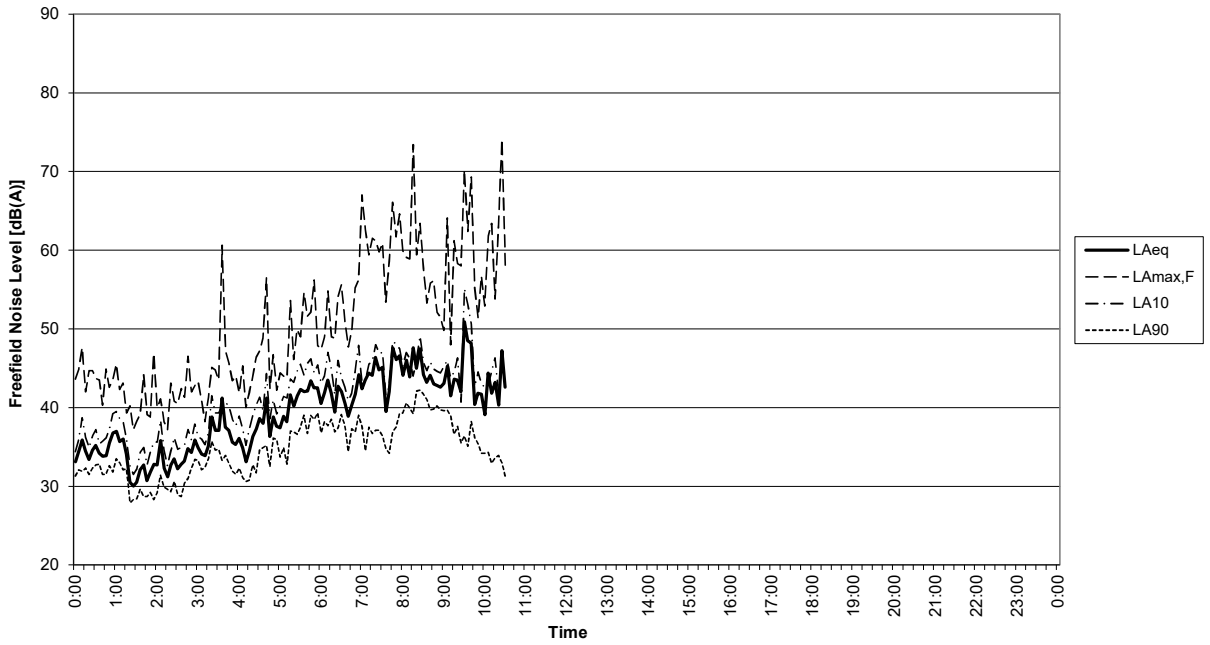


Thursday 13/10/22



Appendix D
Glazing and Vent Specifications

Standard Glazing

Glass
4/16/4

GUARDIAN GLASS

Acoustic Performance

Glazing Configuration

3/22/2019

4mm Float Glass
10mm Cavity
4mm Float Glass

Glass Weight: 20.0kg/m2
Unit Thickness: 18mm

Sound Reduction Indices

Frequency, Hz / dB					Rw	C	Ctr	OITC	STC
125	250	500	1000	2000	31	0	-3	27	31
25	21	26	34	43					

Disclaimer: The acoustic performance data provided in the reports is based on a test protocol or an estimation and may be used if user actual glazing is identical to input data described herein. Acoustic performance data herein is only applicable for glazing dimensions 1,23 m x 1,48 m (as per testing standard). Estimation of acoustic performance is based on component-similarity assumptions which are derived from measured data and interpolation to expand the database of values from test protocols. Actual performance may vary according to the glazing dimensions, frame system, noise sources and many other parameters. The acoustic performance data herein should not be used as a substitute for tests of actual glazing. For more information please consult Assumptions and Terminology section in Guardian Acoustic Assistant.

CREATED: FRIDAY, MARCH 22, 2019 | SOURCE: ACOUSTIC DATABASE 20180426 | ROW: 4702

Standard Vent

Element-normalized level difference according to ISO 140-10

Laboratory measurements of airborne sound insulation of building elements

Client:	Munster Joinery	Date of test:	21/11/2016
Manufacturer:	Munster Joinery		
Test room identification:	Vinci Technology Centre Airborne Transmision suite		
Test specimen mounted by:	Vinci Technology Centre		
Product identification:	A6179-07		
Description of the specimen:	M335 TV (open)		

Barometric pressure:	1024.0	kPa
Size of test opening:	0.04	m²
Mass per unit area:		kg/m²
Temperature:	9.0	°C
Air humidity:	56	%
Source room volume:	145	m³
Receiving room volume:	125.0	m³

Frequency f [Hz]	$D_{n,e}$ 1/3 octave [dB]
50	16.6
63	15.9
80	24.1
100	15.8
125	21.4
160	26.0
200	34.6
250	34.4
315	34.3
400	33.8
500	33.2
630	34.6
800	31.8
1,000	29.4
1,250	29.4
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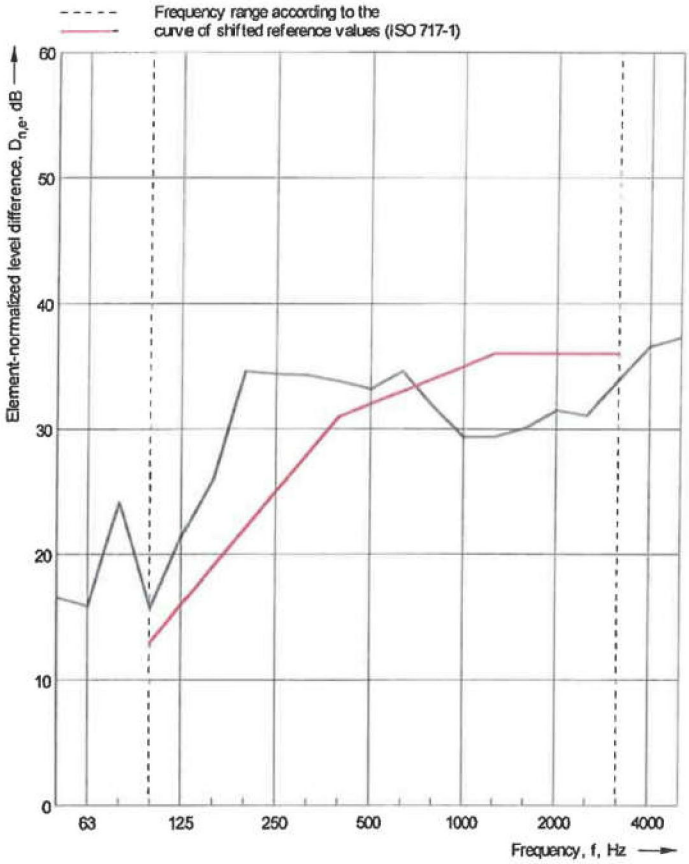
2,500	31.1
3,150	33.9
4,000	36.6
5,000	37.3



Rating according to ISO 717-1

$D_{n,e,w}(C;C_{tr})$ = 32 (-1; -2) dB

Evaluation based on laboratory measurement results obtained in one-third-octave bands by an engineering method.

$C_{50\text{-}3150}$ = -1 dB $C_{50\text{-}5000}$ = 0 dB $C_{100\text{-}5000}$ = 0 dB

$C_{tr,50\text{-}3150}$ = -3 dB $C_{tr,50\text{-}5000}$ = -3 dB $C_{tr,100\text{-}5000}$ = -2 dB

Company: Technology Centre
No. of test report: 25114 Page 10 of 11

Date: 21/11/2016 Signature: [redacted]

Appendix E
Calculation Details

Proposed Residential Development on Land at off Ploughley Road, Ambrosden
Calculation of Internal Noise Levels

Position : Plots Facing onto Ploughley Road

Prepared By: LPJ - 17/11/22

STANDARD GLAZING & OPEN VENTS

Sf	Facade Area (inc Window)	7.98
Swi	Window Area	1.56
Sew	Sf-Swi	6.42
Srr	Area of Ceiling	10.8108
S	Sf+Srr	18.7908
A0	Ref Absorption Area	10

			Overall A-Wtd	1/3 Octave Band Leq 125	250	500	1000	2000	4000	
Source Level	$L_{eq\ Freefield}$	A	**59**	57	53	52	57	51	40	Equivalent Freefield Level (61 dB LAeq Façade)
Window Vent	Dn,e			24	39	40	35	43	44	Munster Standard Vent
		B		0.00222	0.00007	0.00005	0.00015	0.00003	0.00002	
Glazing	Rwi			23	18	26	38	44	38	Standard Glazing 4-20-4 (Munster)
		C		0.00042	0.00132	0.00021	0.00001	0.00000	0.00001	
Wall	Rew			41	45	45	54	58	58	
		D		2.714E-05	1.08E-05	1.08E-05	1.36E-06	5.415E-07	5.415E-07	
Ceiling	Rrr			30	42	50	54	54	54	
		E		0.0005753	3.63E-05	5.753E-06	2.29E-06	2.29E-06	2.29E-06	
	10Log (B+C+D+E)			-24.898545	-28.432507	-35.53541	-37.688127	-44.921202	-44.123891	
	A (Furnished)			11	14	16	16	15	15	
	10*log (S/A)			2.3255259	1.2781723	0.6982529	0.6982529	0.9785401	0.9785401	
	Leq,2			37.3	28.8	20.2	22.8	10.1	0.2	
	A-Weighting			-16.1	-8.6	-3.2	0	1.2	1	
	LAeq,2			21.2	20.2	17.0	22.8	11.3	1.2	

	Day	Night
LAeq, Internal	**27**	**22**
Reduction	**-32**	