



Noise Impact Assessment

Doncaster Road, Darfield, Barnsley

Saul Homes and Keepmoat Homes

MAN.916.001.NO.R.001



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Noise Impact Assessment

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1 Introduction

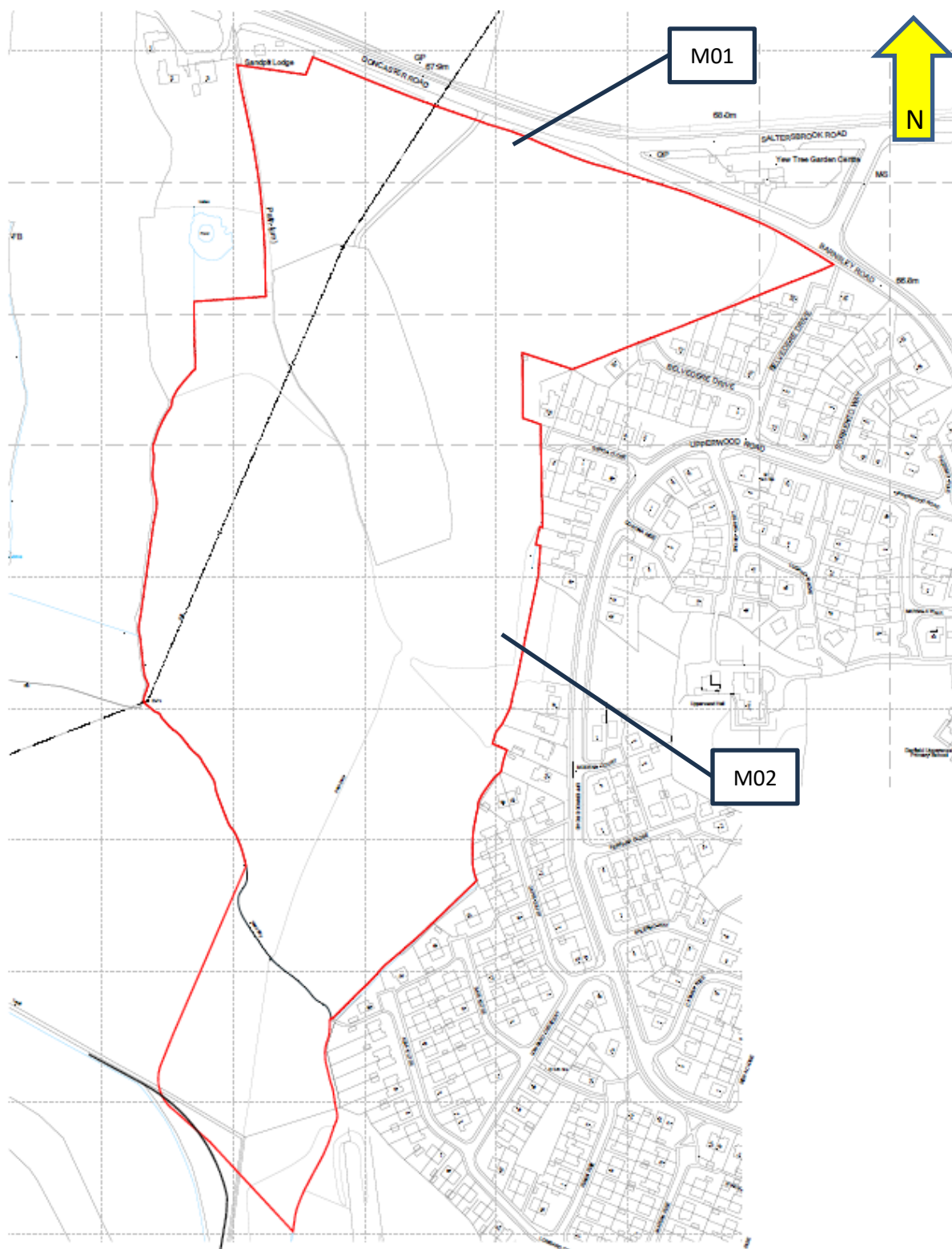
1.1 Project Introduction

- 1.1.1 Enzygo Limited has been commissioned by Saul Homes and Keepmoat Homes to undertake a noise assessment for a proposed residential development of land off Doncaster Road, Darfield, near Barnsley.
- 1.1.2 The assessments in this report have been informed by a noise monitoring survey and noise modelling exercise to assess the potential impacts on the proposed residential led development and to provide mitigation advice where necessary.
- 1.1.3 Details of the assessment methodology employed, together with the results of the surveys, predictions, assessment, and conclusions are presented in this report.

1.2 Site Location

- 1.2.1 The site is located on farmland between Barnsley and Darfield. The area surrounding the site is described as follows:
- To the immediate east of the site are dwellings on Upperwood Road, on the outskirts of the village of Darfield;
 - To the south of the site are further dwellings on the outskirts of Darfield and beyond this, agricultural land. Further south, at a distance of approximately 800m is Netherwood Academy, a secondary school, just north of Wombwell;
 - To the west is open agricultural land with a few dwellings in the vicinity of New Hall Farm; and,
 - To the north of the site is Doncaster Road, (A635), a major transport link running east/west between Barnsley and Darfield.
- 1.2.2 The site location and red line boundary is presented in Figure 1-1 below. The noise monitoring locations are included for reference.

Figure 1-1: Site Location Plan



1.3 Proposed Development

1.3.1 The development site is split in to two areas: Area 1, to the north of the site, is being considered under a full planning application; Area 2 is towards the southern end of the site, and is only given outline consideration at this stage.

1.3.2 The site is a joint venture between Saul Homes and Keepmoat Homes. The portion of Area 1 being developed by Saul Homes is to the north and west of the site area, adjacent to Doncaster Road and the rear of the dwellings off Upperwood Road.

1.3.3 The information provided indicates that Area 1 is to accommodate the following:

- Provision for up to 260 dwellings;
- Public open space; and,
- Driveways and private garden areas.

1.3.4 The layout plan for the site is presented in Figure 1-2 below.

Figure 1-2: Site Layout – Phase 1 & 2



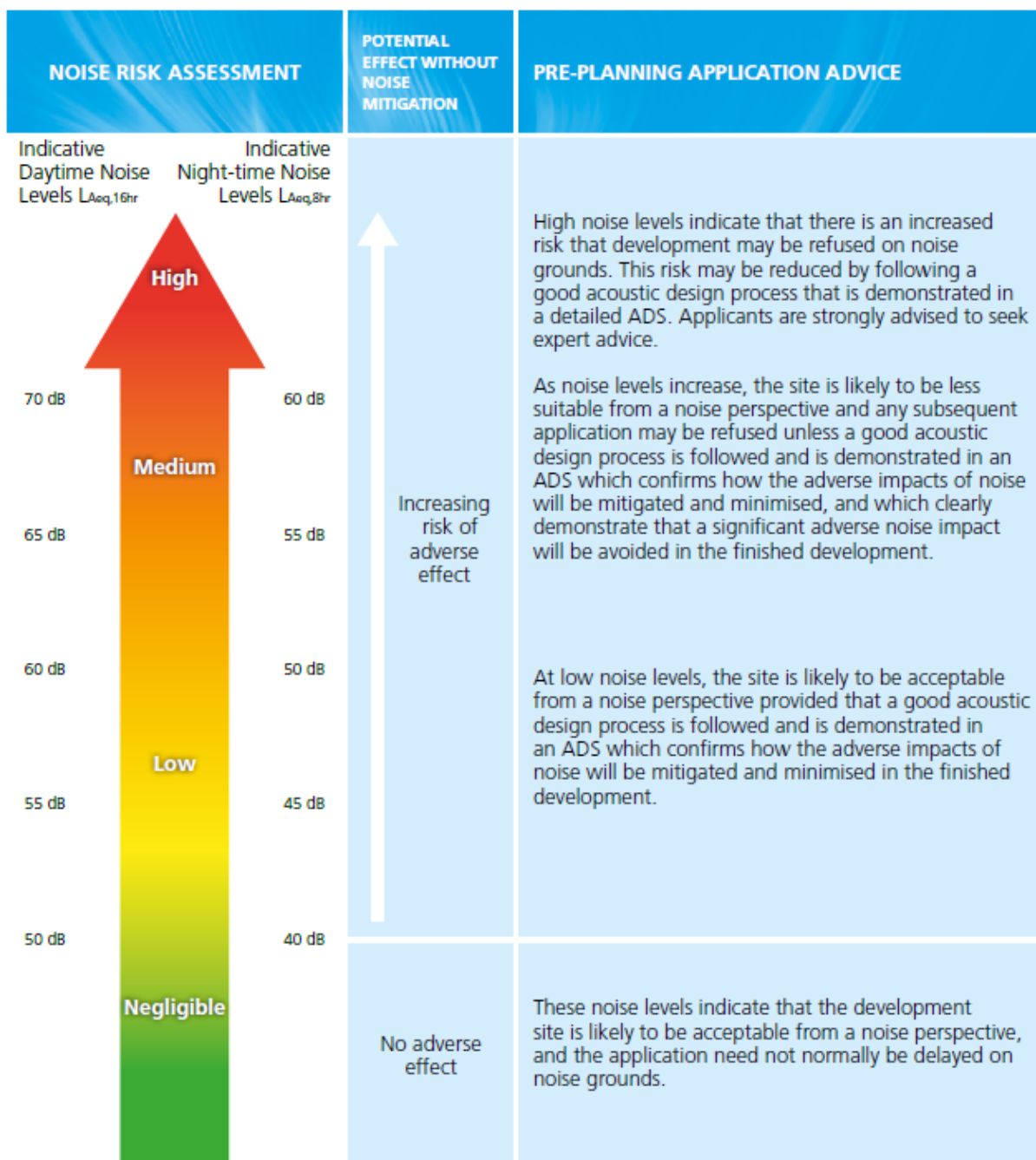
2 Standards and Guidance

- 2.1.1 The assessments for the development have been informed by several relevant standards and guidance including *British Standard 8233:2014 Guidance on sound insulation and noise reduction for buildings* (BS8233). This is considered the relevant guidance for developments of a residential nature. Reference has also been made to the Professional Practice Guidance on Planning and Noise. A summary of the relevant standards and guidance is presented below.
- 2.1.2 This report does not provide detailed assessment of any requirements under the building regulations, i.e., Approved Document E or Approved Document O. It does provide outline commentary on Approved Document O for information purposes. This does not include thermal modelling.

2.2 Professional Practice Guidance on Planning and Noise

- 2.2.1 The Professional Practice Guidance (ProPG) on Planning and Noise (May 2017) provides guidance on transport noise affecting new residential developments. The guidance was prepared by a working group formed from members of the Institute of Acoustics (IoA), the Association of Noise Consultants (ANC) and the Chartered Institute of Environmental Health (CIEH). It has no formal planning status but nevertheless represents industry good practice. It is specifically for assessing noise from predominantly transportation sources.
- 2.2.2 The guidance a two staged approach to an assessment:
- Stage 1 – a noise risk assessment of the proposed site; and,
 - Stage 2 – a more detailed consideration of the development including good acoustic design, internal noise levels, external amenity, and other issues.
- 2.2.3 The Stage 1 noise risk assessment, based on noise from transport sources is presented as an infographic in Figure 2-1 of the document and is presented below.
- 2.2.4 It is noted that the risk levels are not directly correlated to specific noise levels to allow for the flexible consideration of potential impacts, including factors such as locality of the project and the wider context.

Figure 2-1: ProPG Stage 1 Risk Assessment



2.2.5 The Stage 1 assessment demonstrates that rising $L_{Aeq,T}$ noise levels relate to an increased risk of noise impacts.

2.2.6 Notes to the figure include a caveat that more than 10 noise events exceeding 60dB L_{AFmax} during the night would put the site above the negligible risk category.

2.2.7 The ProPG states the following in Paragraph 2.22, in relation to openable windows:

‘Using fixed unopenable glazing for sound insulation purposes is generally unsatisfactory and should be avoided; occupants generally prefer the ability to have control over the internal environment using openable windows, even if the acoustic conditions would be considered unsatisfactory when open.’

2.2.8 The guidance further states:

‘Any reliance upon building envelope insulation with closed windows should be justified in supporting documents.’

2.3 British Standard 8233:2014 Guidance on sound insulation and noise reduction for buildings

2.3.1 National guidance on noise limits for dwellings is set out in BS8233:2014. This sets limits in terms of two noise parameters: the ambient level L_{Aeq} and the maximum level L_{AFmax} . The L_{AFmax} is the highest noise level in a given period and is determined by individual events such as a vehicle pass-bys. An L_{AFmax} limit is usually only applied at night when sleep disturbance is more likely to be an issue. The L_{Aeq} is defined as the steady-state noise level which has the same energy as the actual time-varying noise over the same period. It is effectively the energy average noise level.

2.3.2 Appropriate internal noise levels are recommended in BS8233:2014 (shown in Table 2-1 below) and in the World Health Organisation (WHO) Guidance “Guidelines for Community Noise”, 1999.

Table 2-1: BS8233 Indoor Ambient Noise Levels for Dwellings

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

2.3.3 The guidance values are generally taken as applying to noise sources without specific character, previously termed ‘anonymous noise’ in earlier versions of the standard.

2.3.4 Whilst it is considered desirable to achieve these internal noise levels with the windows open, it is not stipulated within the Standard which states:

“If relying on closed windows to meet the guide values, there needs to be appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level.”

2.3.5 BS8233 also sets out a design-criteria for external noise in external amenity spaces such as gardens and patios stating:

“it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments.”

2.4 ISO9613 Acoustics – Attenuation of sound during propagation outdoors – Part 2: Engineering method for the prediction of sound pressure levels outdoors

2.4.1 Noise levels have been predicted across the proposed site using the calculation methodology set out in ISO9613-2. The methodology considers all the relevant factors in the propagation of noise:

A_{div} – Attenuation due to geometric divergence;

A_{atm} – Attenuation due to atmospheric absorption;

A_{gr} – Attenuation due to the ground effect;

A_{bar} – Attenuation due to barriers and other obstacles; and,

A_{misc} – attenuation due to other, miscellaneous effects.

3 Baseline Survey Information

3.1 Introduction

3.1.1 The baseline noise climate across the site area has been informed by a comprehensive baseline noise monitoring survey undertaken between Tuesday 28th and Thursday 30th May 2024.

3.1.2 The noise monitoring was undertaken by means of longer term, unattended measurements at two locations within the site. The locations are highlighted in Figure 1-1 above and detailed in Table 3-1 below:

Table 3-1: Noise Monitoring Locations

Monitoring Location	OS Grid Co-ordinates		Description
	Easting	Northing	
M01	440323	405233	Location adjacent to Doncaster Road, approximately 10m from the carriageway edge
M02	440306	404837	In the southeastern corner of the site, towards Upperwood Road.

3.1.3 The noise monitoring equipment used during the surveys is shown in Table 3-2 below and was set to record the $L_{Aeq,T}$, L_{A90} , L_{A10} and L_{Amax} parameters.

3.1.4 The following set-up parameters were used on the sound level meter during survey:

Time Weighting: Fast
Frequency Weighting: "A"

3.1.5 The sound level meters were field calibrated, using an acoustic calibrator, prior to and upon completion of the overall survey. No significant drift in calibration was noted.

Table 3-2: Noise Monitoring Equipment

Equip. Make & Model	Class	Calibration		Serial No.	Calibration Date
		Before	After		
SVAN 971 Mole SLM	1	94.0	94.0	55531	November 2023
01dB Solo SLM	1	94.0	94.0	65396	February 2024
Rion NC-75 Calibrator	NA	--	--	34724233	November 2023

3.1.6 The external calibration documentation for the equipment used is available upon request.

3.2 Weather Conditions

3.2.1 The weather conditions during the set-up period were noted as mild, with 100% cloud cover and a slight drizzle. The ambient air temperature was 14°C

3.2.2 During the unattended portions of the survey, the prevailing weather conditions were summarised from publicly available weather data¹. The weather conditions recorded during the survey are summarised in Table 3-3 below.

Table 3-3: Weather Conditions

Day	Period	Wind Speed (Average), m/s	Wind Direction	Average Temperature, °C	Rain
Tuesday 28 th May 2024	Daytime	<1	S	14	Showers at 09:45 to 13:15 and 17:30 to 19:15
	Night	Up to 3	S	10	Showers between 23:00 to 00:00
Wednesday 29 th May 2024	Daytime	<5	S	15	No
	Night	4	S	12	No
Thursday 30 th May 2024	Daytime	<5	WSW	12	Showers 07:00 to 09:00

3.3 Subjective Observations

3.3.1 Road traffic noise was audible to varying degrees across the site, being more prominent at location M01, adjacent to Doncaster Road. To the south, at location M02, traffic noise was less significant, attenuated by distance from the nearest roads. Traffic noise on Upperwood Road was audible, though vehicles were sporadic.

3.3.2 No other significant noise sources were noted during the survey. Some general environmental sounds were evident, i.e., bird song, etc.

3.4 Noise Survey Data

3.4.1 The results of the baseline surveys are summarised in the sections below. The periods of rain have been removed. The full survey data is presented in Appendix A.

Table 3-4: Summary of Baseline Noise Survey Results

Location	Duration Hh:mm	Period	Average $L_{Aeq,T}$, dB ¹	Max L_{AFmax} , dB ²	Average, L_{A90} , dB ³	Average, L_{A10} , dB ³
M01	24:30	Day	59.6	83.7	51.1	62.0
	14:30	Night	54.6	81.6	37.3	56.5
M02	24:30	Day	51.7	81.0	43.6	52.3
	14:30	Night	48.7	73.1	39.0	49.3

1) The logarithmic average of the L_{Aeq} parameter is presented.
 2) The maximum recorded L_{AFmax} event is reported.
 3) The arithmetic average and minimum background sound level (L_{A90}) are presented.

¹ <https://www.wunderground.com/dashboard/pws/IBARNS17/graph/2024-05-28/2024-05-28/daily>

- 3.4.2 The noise levels measured at M01 are higher due to the proximity to Doncaster Road. During most of the daytime hours, the ambient (L_{Aeq}) levels are frequently at or around 59dB L_{Aeq} , only falling away from 20:30hrs, towards lower levels during the evening/night-time. During the night, ambient sound levels fall to around 50dB L_{Aeq} .
- 3.4.3 At M02, noise levels are markedly lower than at M01, likely a result of the proximity to the surrounding noise sources. The daytime ambient noise levels are generally around 50dB L_{Aeq} . During the night-time the ambient noise levels fall to lows of around 30dB L_{Aeq} for brief periods.
- 3.4.4 The noise climate at M02 appears to be susceptible to brief increases in noise levels due to changes in wind speed/direction and the proximity of the surrounding trees.

3.5 L_{Amax} Analysis

- 3.5.1 The L_{Amax} values reported in Table 3-4 above are the maximum reported during the day and night periods over the entire survey. Further analysis of the measured data has informed the derivation of the more pertinent, 10th highest $L_{Amax,1min}$ values during the night-time periods.

Table 3-5: Typical $L_{Amax,1min}$ values

Measurement Location	10 th Highest $L_{Amax,1min}$, dB
M01	72
M02	68*
* The $L_{Amax,1min}$ values have been derived using the information detailed in the Proceedings of the Institute of Acoustics Vol43.Pt 1. 2021. Empirical Relationship Between L_{night} and L_{max} . Conlan, Wei, Harvie-Clark.	

4 Noise Modelling Assessment

4.1 Introduction

4.1.1 The noise levels measured around the site have been used to inform a noise modelling assessment, to demonstrate propagation across the site.

4.1.2 The noise model has been constructed using the proprietary noise modelling software package CadnaA utilising Google Earth geo-referenced 1:1 scaled aerial photography, openstreetmap.org mapping data and the latest iteration of the site layout plan provided by Saul Homes.

4.2 Foundations of the noise model

4.2.1 In the first instance, the measured survey data was used to inform the base model of the site, reflecting the existing noise climate across the site during the daytime and night-time periods. The following factors were included in the model.

Calculation Methodology	<ul style="list-style-type: none">• ISO 9613-2
Noise Model Configuration	<ul style="list-style-type: none">• Ground Absorption set to $G = 1$ with localised areas amended as appropriate, i.e., $G = 0$ for areas of hard standing• Order of Reflection = 2
Meteorological Conditions	Temperature 10°C Relative Humidity 70% Wind and temperature gradient assisted sound propagation has been assumed to all receptors.

5 Noise Assessment

5.1 Introduction

5.1.1 The assessment of noise across the site has primarily been undertaken in accordance with the guidance of the ProPG to establish the risk of noise impacts on the amenity of the development. Following on from this, indicative consideration is given to the implications on proposed dwellings, including predictions to facades across the site and the impact of noise in external amenity areas.

5.2 Noise Risk Assessment

5.2.1 The measured noise levels at location M01 put the site in the 'Low' to 'Medium' risk category during the daytime and 'Medium' during the night.

5.2.2 At location M02, the noise climate would put the site in the 'Low' risk category during the day and 'Low' during the night.

5.2.3 In either case, the measured L_{Amax} noise levels would preclude the site from being considered 'Negligible' risk.

5.2.4 Further to the above, noise levels have been predicted across a flattened, level site, assuming all buildings and structures have been removed. The contour plots demonstrating this scenario are presented in Figures B-1 and B-2 in Appendix B.

5.2.5 The contour plots indicate that, during the daytime period, most of the site falls within the 'Negligible' risk banding which is taken as indicating the following:

'These noise levels indicate that the development site is likely to be acceptable from a noise perspective, and the application need not normally be delayed on noise grounds.'

5.2.6 Portions of the site towards the surrounding roads fall within the 'Low' risk banding (yellow) which is taken as indicating the following:

'At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development.'

5.2.7 During the night-time period, the site largely falls within the 'Low' risk category, with some areas adjacent to surrounding roads falling within the 'Medium' risk category. Note, the difference between the predicted and measured assessments is a result of the predictions being made to 4m above ground.

5.2.8 Overall, it is considered unlikely that the general noise climate in the vicinity would result in any significant restrictions on amenity, etc., though some acoustic design measures would be beneficial in ameliorating noise impacts.

5.3 L_{AFmax} Events

5.3.1 The measured $L_{AFmax,1min}$ values at location M01 give a 10th highest event of 72dB $L_{AFmax,1min}$ on both nights surveyed.

5.3.2 The measured noise levels at M02 give a 10th highest recorded $L_{AFmax,5min}$ event, of between 67dB and 62dB during the night-time period. The paper published in the Proceedings of the Institute of Acoustics² indicates that $L_{AFmax,5min}$ values relate to $L_{AFmax,1min}$ values in the formula $L_{AFmax,1min} = L_{AFmax,5min} + 0.69dB$. This would give a conservative $L_{AFmax,1min}$ value at M02 of around 68dB.

5.3.3 At both locations, the levels of the 10th highest L_{Amax} events would preclude the site from falling in the 'Negligible' risk category.

5.4 Noise Ingress Calculations

5.4.1 The noise model has been revised to include the site plan presented in Figure 1-2 above. The model has been used to calculate noise levels at the facades of the buildings in Area 1 of the site. From this, façade mitigation measures have been proposed to ensure appropriate internal noise levels are achieved.

5.4.2 The noise modelling output is presented in Figures B3 and B4 of Appendix B. The façade predictions relate to the key presented in Table 5-1 below.

Table 5-1: Indicative Façade Treatments

Assessment Period	Façade Colour	Parameter	Noise Levels Incident on the Façade, dB	Rationale
Daytime	Blue	L_{Aeq}	<48dB	Assuming 35dB $L_{Aeq,daytime}$ + 13dB open window
	Green		48dB to 63dB	Up to 35dB $L_{Aeq,daytime}$ + 28dB $R_w + C_{tr}$
	Yellow		63dB to 67dB	Up to 35dB $L_{Aeq,daytime}$ + 32dB $R_w + C_{tr}$
	Orange		>67dB	Greater than 32dB $R_w + C_{tr}$ required
Night-time	Blue	L_{Aeq}	<43dB	Assuming 30dB $L_{Aeq,night}$ + 13dB open window
	Green		43dB to 58dB	Up to 30dB $L_{Aeq,night}$ + 28dB $R_w + C_{tr}$
	Yellow		58dB to 62dB	Up to 30dB $L_{Aeq,night}$ + 32dB $R_w + C_{tr}$
	Orange		>62dB	Greater than 32dB $R_w + C_{tr}$ Required

Daytime

5.4.3 During the daytime period, standard thermal double glazing (28dB $R_w + C_{tr}$) is suitable for all facades. This level of attenuation can be provided by a glazing configuration of 4mm/20mm/4mm though other configurations may also work.

Night-time

5.4.4 The assessment of the night-time period is similar to the day; the majority of facades would achieve appropriate internal noise levels with relatively standard thermal double glazing (28dB $R_w + C_{tr}$).

5.4.5 The 10th highest L_{AFmax} value at location M01 is 72dB $L_{AFmax,1min}$ at approximately 10m from the nearside carriageway edge of the Doncaster Road. When distance corrected to the façade of the closest plot, the $L_{AFmax,1min}$ value would be 66dB. With the proposed façade treatment on

² Proceedings of the Institute of Acoustics. Vol. 43. Pt. 1. 2021. Empirical Relationship between L_{Night} and L_{Amax} . Conlan, Wei, Harvie-Clark.

these facades ($28\text{dB } R_w + C_{tr}$), the internal noise level from L_{AFmax} events would be $38\text{dB } L_{AFmax,1min}$ during the night, comfortably achieving the required internal criteria (L_{AFmax} 45dB).

- 5.4.6 Most facades facing towards the surrounding roads would require an alternative form of ventilation, allowing appropriate changes of air with windows closed. This requirement is easily achieved by acoustically robust trickle vents ($\approx 31\text{dB } D_{ne,w}$).
- 5.4.7 While the calculations assume closed windows, it is noted that windows should remain openable at the future occupant's discretion on the assumption that slightly elevated noise levels would be tolerated at times.
- 5.4.8 The ventilation recommendations above are based on achieving appropriate levels of background ventilation and do not address purge ventilation or overheating control. The calculations assume one vent per room. If additional vents are required, the performance requirements increase by $10\log(n)$ where n is the number of vents, i.e., for two vents the performance requirement increases by 3dB.

5.5 Ventilation and Overheating

- 5.5.1 The AVO and the Building Regulations: Approved Document O³ highlight the importance of considering the potential for overheating and its implications on noise impacts.
- 5.5.2 Consideration of the overheating risk, in accordance with the toolkit described in the Good Homes Alliance document⁴ puts the risk of overheating at the site in the 'Low' risk category. This would indicate that overheating is likely to be a relatively infrequent occurrence and, as a result, residents are more likely to be tolerant of slightly higher noise levels when it occurs.
- 5.5.3 It is noted that these risk categories in this section relate solely to the risk of overheating and do not relate to the noise levels reported in subsection 5.2.
- 5.5.4 Approved Document O of the Building Regulations 2010 establishes that a relaxation of the normal, internal acoustic criteria is allowed for periods when overheating is a concern, i.e., peak summer months. During these periods, the Approved Document identifies that windows are likely to be closed during sleeping hours if internal noise levels exceed the following:
- $40\text{dB } L_{Aeq,8hr}$ between 23:00 and 07:00; and,
 - $55\text{dB } L_{AFmax}$ more than 10 times per night.

Assessment Criteria

- 5.5.5 Based on the above, relaxed criteria, the following scale has been derived to identify dwellings where overheating is a risk. The scale has been used for the plot in Figure B-5 of Appendix B.

³ The Building Regulations 2010. Approved Document O. Overheating. Requirement O1: Overheating Mitigation. 2021

⁴ Good Homes Alliance. Overheating in New Homes. Tool and guidance for identifying and mitigating early-stage overheating risks in new homes. July 2019

Table 5-2: Overheating Risk Criteria

Assessment Period	Façade Colour	Parameter	Noise Levels Incident on the Façade, dB	Rationale
Night 23:00 to 07:00	Green	L _{Aeq}	<49dB	Assuming 40dB L _{Aeq,T} + 9dB open window ¹
	Yellow		49dB to 55dB	Assuming 40dB L _{Aeq,T} + 15dB open window ²
	Orange		>55dB	Greater than 40dB L _{Aeq,T} + 15dB
Note 1 – 9dB attenuation for an open window in accordance with guidance in the ADO. Note 2 - 15dB attenuation for an open window in accordance with document ref NANR116. Napier University. 2007				

5.5.6 Figure B-6 demonstrates that most façades across the development would fall in the green band. For these dwellings, open window heating control is appropriate. Some facades facing towards the roads, i.e., Doncaster Road and Upperwood Road fall in the yellow band. It is recommended that thermal modelling be undertaken to more accurately ascertain the degree of overheating risk and determine the requirement for mitigating measures.

5.6 External Amenity Areas

5.6.1 The proposed dwellings are to include provision for private, external amenity areas (gardens) throughout the site.

5.6.2 The noise modelling assessment indicates that, without any specific mitigation measures, noise levels in the external amenity areas fall comfortably below 50dB L_{Aeq,T}. Therefore, it is concluded that noise would not be a prohibiting factor in the amenity of any garden spaces across the development. The contour plot demonstrating the extent of the 50dB L_{Aeq,T} noise band is presented in Figure B-6 of Appendix B.

5.7 Assessment Summary

5.7.1 The assessments presented in this report demonstrate that, with some consideration of the various façade elements, appropriate internal noise levels can be achieved with relatively standard façade treatments.

5.7.2 The calculations demonstrate that standard thermal double glazing (28dB R_w + C_{tr}) would provide sufficient attenuation to achieve appropriate internal noise levels. This could be achieved by a glazing configuration of 4mm/20mm/4mm. A specification sheet is included in Appendix C of this report. Note the level of attenuation applies to the whole window unit: glazing and frame.

5.7.3 Alternative means of providing background ventilation would be required for most dwellings across the site. This could be provided by acoustically robust trickle vents which should provide commensurate levels of attenuation to the windows, i.e., ≈31dB D_{ne,w}.

6 Conclusion

- 6.1.1 Enzygo Limited has been commissioned by Saul Homes and Keepmoat Homes to undertake a noise assessment for a residential development of land off Doncaster Road, Darfield near Barnsley.
- 6.1.2 The assessment has been undertaken to evaluate the potential impacts of the existing noise climate on the proposed development. The assessments have been undertaken in accordance with the relevant standards and guidance and have been informed by a baseline noise monitoring survey.

6.2 Noise Assessment

- 6.2.1 The noise monitoring survey data puts the site in the 'Low' to 'Medium' risk category during the daytime period and 'Medium' category during the night. Levels towards Doncaster Road and Upperwood Road are higher, though are outside of the area identified for residential dwellings.
- 6.2.2 Indicative façade calculations demonstrate that, for most of the site, open window ventilation would be appropriate, comfortably achieving the required internal noise levels. Some facades facing towards the surrounding roads require more robust treatments though standard thermal double glazing and acoustically robust trickle vents would suffice.
- 6.2.3 The noise levels incident on some facades indicate more detailed consideration of the risks associated with overheating are required. It is recommended that dynamic thermal modelling would be needed to more accurately assess the potential for overheating.
- 6.2.4 Noise levels across the site are generally conducive for private external amenity spaces, comfortably achieving 50dB L_{Aeq} across all identified garden spaces.
- 6.2.5 The assessments presented in this report have demonstrated that, with appropriate consideration of noise through the detailed design stages, the development site would be entirely suitable for the proposed residential use.

Glossary of Terminology

Noise is defined as unwanted sound. The range of audible sound is known to be from 0dB (threshold of hearing) to 140dB (threshold of pain). Examples of typical noise levels relating to ‘everyday’ occurrences are given in Table G-1 below.

Table G-1: Typical Noise Levels

Source	Sound Pressure Level in dB(A)	Subjective Level
Gun shot	160	Perforation of eardrum
Military Jet take-off	140	Threshold of pain
Jet Aircraft at 100m	120	Very Loud
Rock Concert, front seats	110	Threshold of Sensation
Pneumatic Drill at 5m	100	Very Loud
Heavy goods vehicle from pavement	90	
Traffic at kerb edge	70 – 85	Loud
Vacuum Cleaner, Hair Dryer	70	
Normal conversation at 1m	60	Moderate
Typical Office	50 – 60	
Residential area at night	40	Quiet
Rural area at night, still air	30	
Leaves Rustling	20	
Rubbing together of fingertips	10	
	0	Threshold of hearing

The frequency response of the human ear to noise is usually taken to be around 18Hz (number of oscillations per second) to 18,000Hz. However, the human ear does not respond equally to different frequencies at the same level; it is more sensitive in the mid-frequency range than lower and higher frequencies and, because of this when undertaking the measurement of noise, the low and high frequency components of any given sound are reduced in importance by applying a filtering (weighting) circuit to the noise measuring instrument. The weighting which is widely accepted to correlate best with the subjective nature of human response to noise and is most widely used to quantify this is the A-weighted filter set. This is an internationally accepted standard for noise measurement.

For variable noise sources within an area an increase of 3dB(A) would be the minimum perceptible to the human ear under normal conditions. It is generally accepted that an increase/decrease of 10dB(A) corresponds to a doubling or halving in perceived loudness. The ‘loudness’ of a noise is a purely subjective parameter, dependant not only upon the sound pressure of the event but also on the dynamics of the listener’s ear, the time of the day and the general mood of the person.

With regards to environmental noise levels (in the open air), these are rarely steady but rise and fall according to the activities being undertaken within the surrounding area at any given time. Attempting produce a figure that relates this variable nature of noise to human subjective response, various statistical noise metrics have been developed. These and other useful terminology and descriptors are presented in Table G-2 below.

Table G-2: Terminology

Term	Definition
Sound	Pressure fluctuations in a fluid medium within the audible range of amplitudes and frequencies which stimulate the organs of hearing.
Noise	Unwanted sound emitted from a source and received by the sensitive receptor.
Decibel (dB)	Unit most often used to describe the sound pressure level. A logarithmic number, it correlates closely to the way in which humans perceive sound. Its wide range of values helps quantify sound pressures from a large variety of magnitudes.
A-Weighting (dB(A))	Human perception of sound is frequency dependant. A-weighting applies a range of corrections at each frequency to provide a 'human-averaged'. Can be frequency band or broadband values.
Frequency (Hz)	The number of cycles per second, for sound this is closely related (and often mistaken for) pitch.
Frequency Spectrum	A more detailed analysis of the frequency components that comprise a sound source.
L_{A10,T}	The 10 th statistical percentile of a measurement period, i.e., the level that is exceeded for 10% of the measurement duration. Closely correlates with traffic sources, A-weighted.
L_{A90,T}	The 90 th statistical percentile of a measurement period, i.e., the level that is exceeded for 90% of the measurement duration. Used to describe background sound levels, as this value is affected less by short, transient sound sources, A-weighted.
L_{Amax}	The root mean square (RMS) maximum sound pressure level within a measurement period, A-weighted.
Ambient Sound	The total sound climate of all noise sources incident at one location, both in the near- and far-field (<i>The ambient sound comprises the residual sound and the specific sound when present</i>).
Ambient Sound Level L_a = L_{Aeq,T}	Equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time, usually from many sources near and far, at the assessment location over a given time interval, T.
Background Sound Level L _{A90,T}	A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels.
Equivalent Continuous A-weighted Sound Pressure Level L_{Aeq,T}	Value of the A-weighted sound pressure level in decibels of continuous steady sound that, within a specified time interval, T = t ₂ – t ₁ , has the same mean-squared sound pressure as a sound that varies with time, and is given by the following equation: $L_{Aeq,T} = 10 \lg_{10} \left\{ \left(\frac{1}{T} \right) \int_{t_1}^{t_2} \left[p_A \frac{(t)^2}{p_0^2} \right] dt \right\}$

Term	Definition
	Where p_0 is the reference sound pressure (20 μ PA); and $P_A(t)$ is the instantaneous A-weighted sound pressure level at time t .
Measurement Time Interval T_m	Total time over which measurements are taken (<i>This may consist of the sum of several non-contiguous, short-term measurement time intervals</i>)
Rating level $L_{Ar,Tr}$	Specific sound level plus any adjustment for the characteristic features of the sound, over time, T .
Reference Time Interval, T_r	Specified interval over which the specific sound level is determined (This is 1hr during the day from 07:00 to 23:00 hours and a shorter period of 15-min at night from 23:00 to 07:00 hours).
Residual Sound	Ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound.
Residual sound level $L_r = L_{Aeq,T}$	Equivalent continuous A-weighted sound pressure level of the residual sound in a given situation at the assessment location over a given time interval, T .
Sound Pressure Level	The level of fluctuation in air pressure, caused by airborne sound sources. Measured in Pascals (Pa).
Sound Power Level	The rate at which sound is radiated by a source. This parameter is useful as it describes sound energy before environmental or decay factors. Quantified in dB and notated usually as L_w or SWL.
Specific sound level $L_s = L_{Aeq,Tr}$	Equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given time interval, T .
Specific Sound Source	Sound source being assessed.

Statement of Uncertainty

This report is based upon a range of measurements, a system of calculations and noise predictions. As such, this report attempts to quantify fluctuations in air pressure and is subject to the effects of meteorology, physical and perceived anomalies, tolerances within the measuring and monitoring equipment and accuracy margins within the noise modelling software. In the interests of repeatability, this report must be considered as being affected by common factors involved in the measurement and calculation of noise propagation.

All measurement values, outcomes and assumptions are subject to a margin of uncertainty. This has been quantified and assessed as follows:

- Rounding errors – systemic tolerance of $\pm 1\text{dB}$;
- Meteorology – allowance of $\pm 1.9\text{dB}$; and
- CadnaA noise propagation modelling software – operational accuracy of $\pm 2.1\text{dB}$

The most influential uncertainty factors for the assessment of noise are deemed to be equipment tolerances, meteorology and software accuracy. A root-sum-square statistical average has been used to provide an overall margin of uncertainty of $\pm 3\text{dB}$.

Statement of Competency

The assessment has been undertaken by Mr Mark Harrison, Principal Acoustic Consultant at Enzygo Limited. Mr Harrison holds a Bachelor of Science degree in Music Technology and a post graduate Diploma in Acoustics and Noise Control.

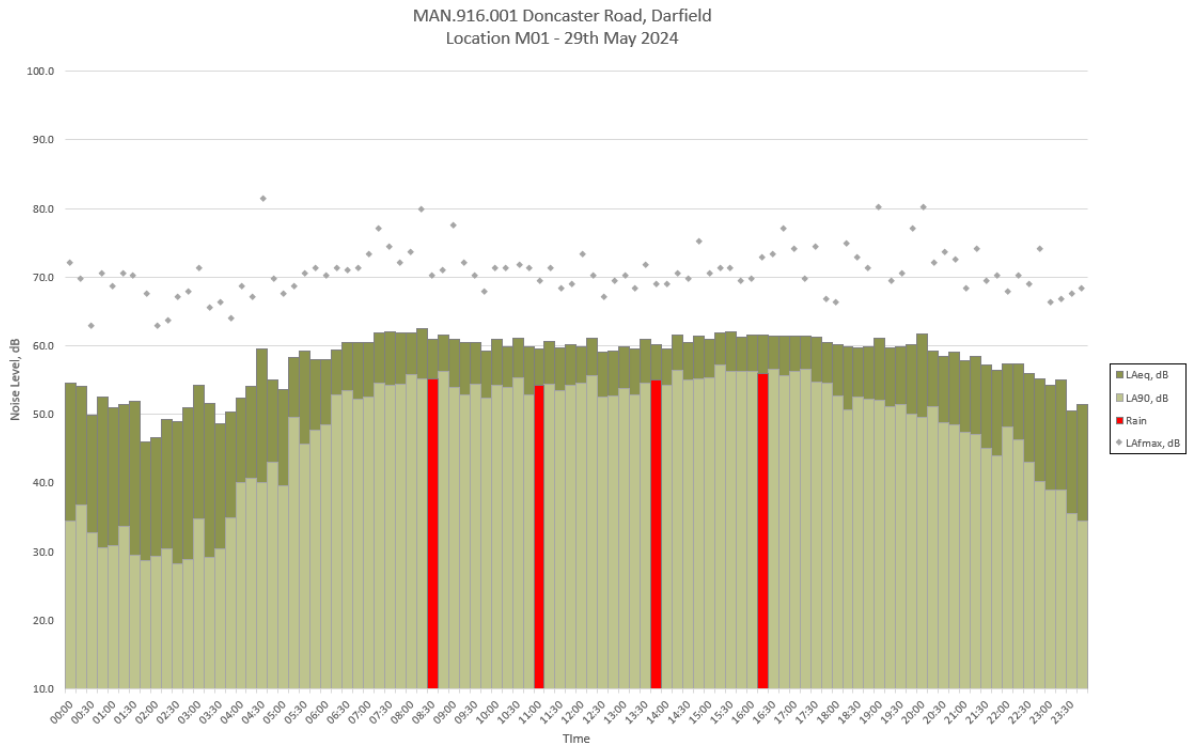
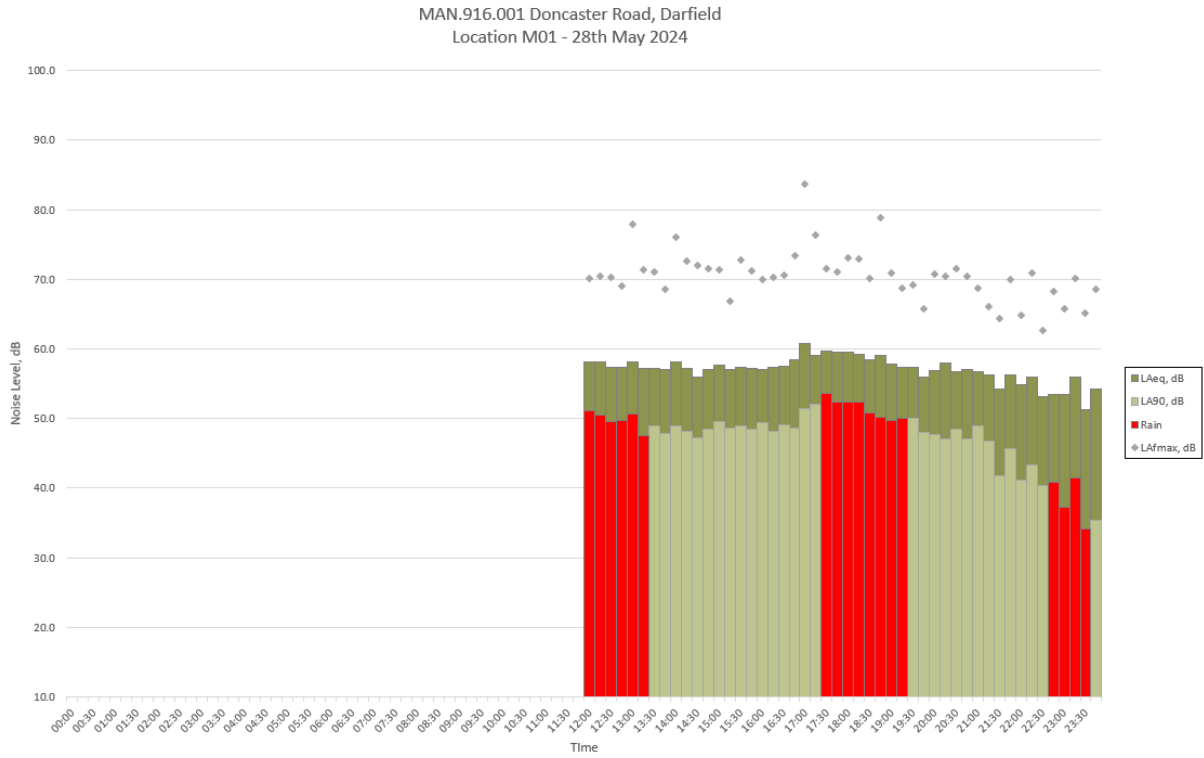
Mr Harrison has worked in acoustic consultancy since 2007 and has worked on noise and vibration assessments in several sectors including industrial / commercial developments; power generation and distribution; residential developments; transport schemes; and mineral extraction and processing.

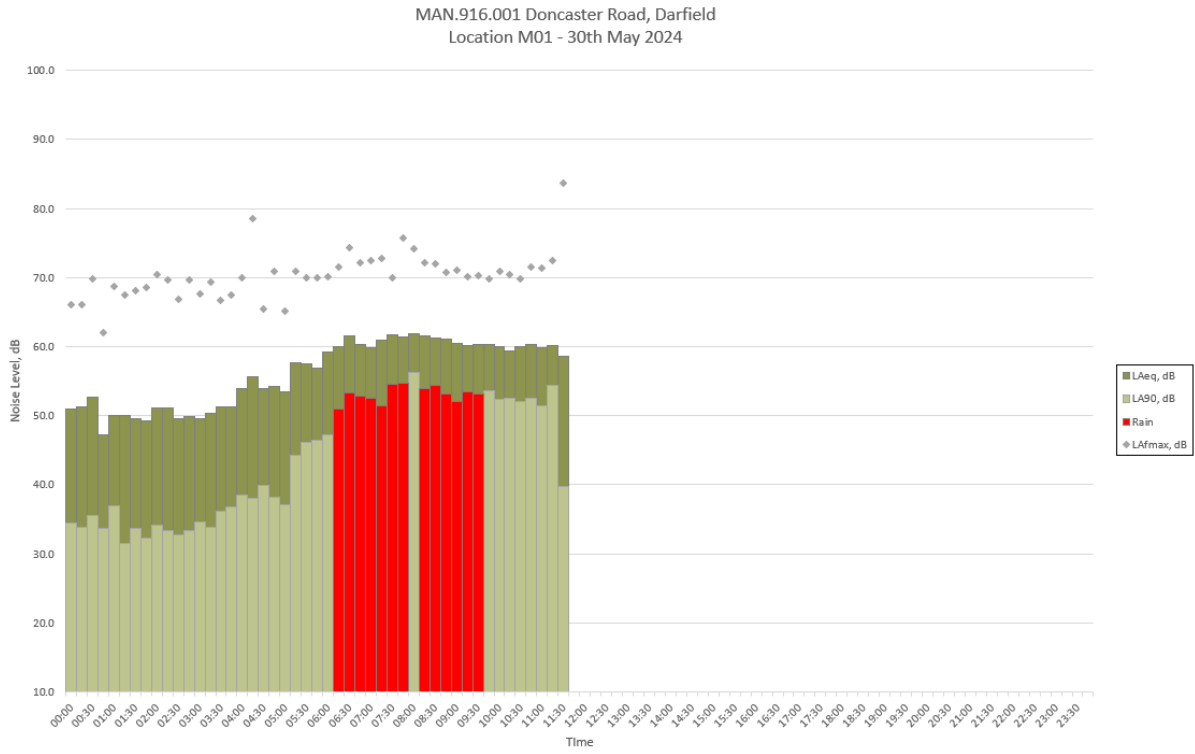
The report has been prepared under the supervision of Mr. Darren Lafon-Anthony who is the Director of Acoustics at Enzygo Limited. Mr. Lafon-Anthony holds a Master of Science Degree in Applied Acoustics and has been a Corporate Member of the Institute of Acoustics since July 2004 having previously been an Associate Member of the institute since October 2001. Mr. Lafon-Anthony is also a Fellow of the Institute of Quarrying based on his contribution to minerals and mining noise assessment and mitigation, a qualification he has held since September 2014.

Mr. Lafon-Anthony has worked in acoustics since January 1981. Initially as an engineer designing and overseeing manufacture of noise control equipment for the water industry, standby power diesel generator and power generation markets for several noise control equipment manufacturers and, since February 2004, as an environmental noise consultant in various sectors, including mineral and mining sites, waste disposal and recycling sites, large industrial developments, energy supply projects (EfW, STOR and Battery Energy sites) and residential developments in the UK, Europe and sub-Saharan Africa.

Appendix A – Baseline Survey Data

Location M01 - Survey Data

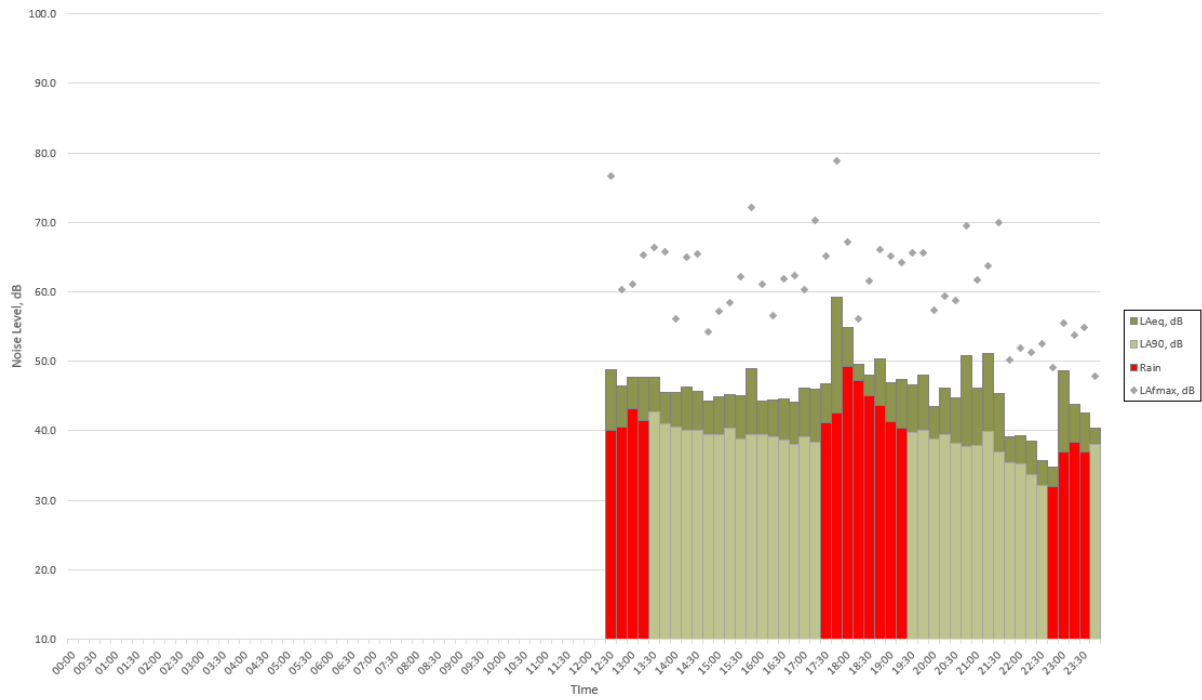




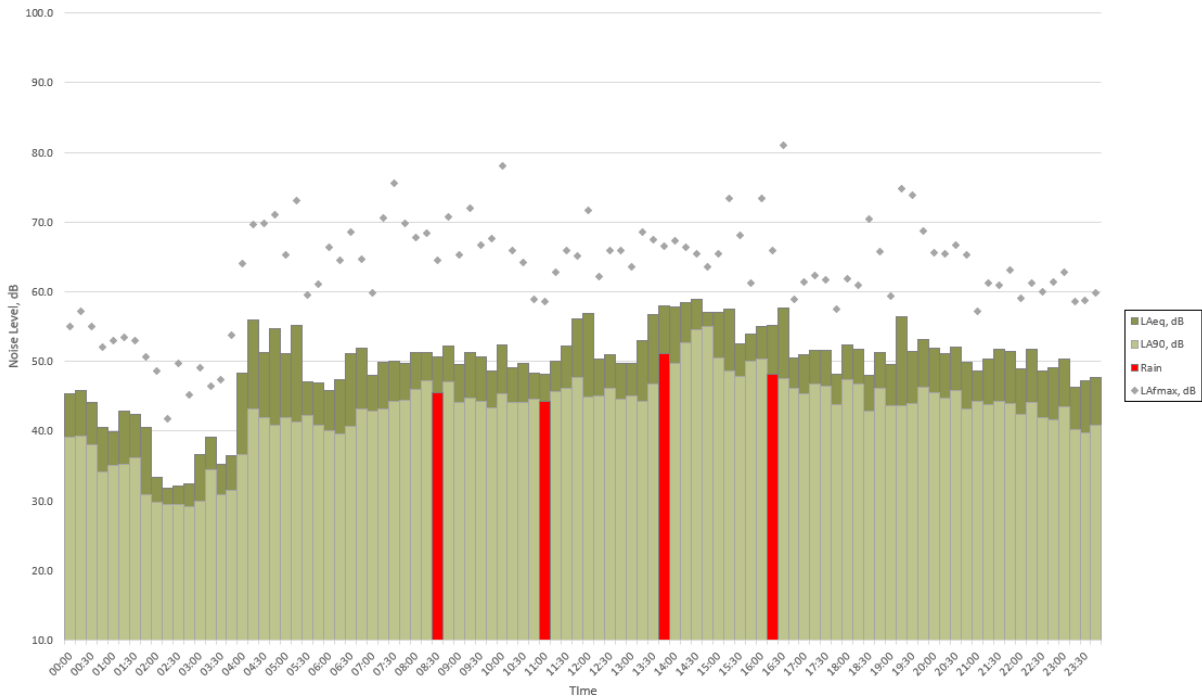
Period Start	L _{Aeqp} dB	L _{Afmaxp} dB	L _{A10p} dB	L _{A90p} dB	Period Start	L _{Aeqp} dB	L _{Afmaxp} dB	L _{A10p} dB	L _{A90p} dB	Period Start	L _{Aeqp} dB	L _{Afmaxp} dB	L _{A10p} dB	L _{A90p} dB
28/05/2024 12:00	58.2	70.1	61.0	51.1	29/05/2024 06:00	57.9	70.1	61.0	48.5	30/05/2024 00:00	50.9	66.1	55.4	34.5
28/05/2024 12:15	58.1	70.4	60.8	50.5	29/05/2024 06:15	59.4	71.5	62.3	52.9	30/05/2024 00:15	51.2	66.1	55.3	33.8
28/05/2024 12:30	57.3	70.3	60.5	49.6	29/05/2024 06:30	60.5	71.0	63.3	53.4	30/05/2024 00:30	52.6	69.8	56.7	35.5
28/05/2024 12:45	57.3	69.0	60.4	49.7	29/05/2024 06:45	60.4	71.4	63.4	52.2	30/05/2024 00:45	47.2	62.0	51.4	33.6
28/05/2024 13:00	58.2	77.9	60.3	50.6	29/05/2024 07:00	60.4	73.2	63.4	52.6	30/05/2024 01:00	50.1	68.8	53.6	36.9
28/05/2024 13:15	57.2	71.3	60.2	47.5	29/05/2024 07:15	61.8	77.0	64.3	54.5	30/05/2024 01:15	50.0	67.5	51.5	31.5
28/05/2024 13:30	57.2	71.1	59.6	48.9	29/05/2024 07:30	62.0	74.6	64.3	54.3	30/05/2024 01:30	49.5	68.1	52.4	33.6
28/05/2024 13:45	57.0	68.5	59.9	47.9	29/05/2024 07:45	61.8	72.1	64.4	54.4	30/05/2024 01:45	49.2	68.5	51.4	32.3
28/05/2024 14:00	58.2	76.0	60.5	49.0	29/05/2024 08:00	61.9	73.7	64.3	55.8	30/05/2024 02:00	51.1	70.5	52.7	34.2
28/05/2024 14:15	57.2	72.6	59.5	48.1	29/05/2024 08:15	62.5	79.9	63.9	55.1	30/05/2024 02:15	51.1	69.6	55.4	33.3
28/05/2024 14:30	56.0	72.0	58.2	47.2	29/05/2024 08:30	60.9	70.2	63.6	55.2	30/05/2024 02:30	49.6	66.9	53.1	32.7
28/05/2024 14:45	57.0	71.5	60.1	48.5	29/05/2024 08:45	61.6	70.9	64.2	56.3	30/05/2024 02:45	49.9	69.6	51.0	33.3
28/05/2024 15:00	57.7	71.3	60.3	49.5	29/05/2024 09:00	60.9	77.6	63.4	53.9	30/05/2024 03:00	49.6	67.6	51.9	34.6
28/05/2024 15:15	57.0	66.9	60.1	48.6	29/05/2024 09:15	60.4	72.3	63.2	52.9	30/05/2024 03:15	50.4	69.3	54.6	33.9
28/05/2024 15:30	57.3	72.8	59.9	49.0	29/05/2024 09:30	60.4	70.2	63.0	54.4	30/05/2024 03:30	51.2	66.7	55.5	36.1
28/05/2024 15:45	57.2	71.2	60.0	48.5	29/05/2024 09:45	59.2	67.8	62.2	52.4	30/05/2024 03:45	51.2	67.5	54.1	36.8
28/05/2024 16:00	57.1	69.9	59.8	49.4	29/05/2024 10:00	61.0	71.3	63.7	54.3	30/05/2024 04:00	54.0	70.0	58.1	38.5
28/05/2024 16:15	57.4	70.3	60.5	48.1	29/05/2024 10:15	59.8	71.5	62.1	53.9	30/05/2024 04:15	55.7	78.5	57.2	38.1
28/05/2024 16:30	57.5	70.6	60.4	49.1	29/05/2024 10:30	61.1	71.8	63.8	55.4	30/05/2024 04:30	53.9	65.4	58.6	39.9
28/05/2024 16:45	58.4	73.4	61.0	48.6	29/05/2024 10:45	59.8	71.2	62.4	52.8	30/05/2024 04:45	54.2	70.9	58.7	38.2
28/05/2024 17:00	60.8	83.7	61.0	51.5	29/05/2024 11:00	59.5	69.6	62.1	54.2	30/05/2024 05:00	53.4	65.1	58.6	37.1
28/05/2024 17:15	59.0	76.4	61.3	52.1	29/05/2024 11:15	60.6	71.3	63.1	54.4	30/05/2024 05:15	57.7	70.9	61.4	44.3
28/05/2024 17:30	59.7	71.6	62.3	53.6	29/05/2024 11:30	59.7	68.3	62.6	53.4	30/05/2024 05:30	57.5	70.0	61.5	46.1
28/05/2024 17:45	59.6	71.0	62.2	52.3	29/05/2024 11:45	60.2	68.9	62.8	54.2	30/05/2024 05:45	56.9	69.9	61.2	46.4
28/05/2024 18:00	59.5	73.1	62.3	52.4	29/05/2024 12:00	59.9	73.3	62.2	54.5	30/05/2024 06:00	59.2	70.2	62.9	47.3
28/05/2024 18:15	59.2	73.0	61.7	52.4	29/05/2024 12:15	61.1	70.1	63.9	55.7	30/05/2024 06:15	60.0	71.6	63.4	50.9
28/05/2024 18:30	58.4	70.1	61.6	50.8	29/05/2024 12:30	59.0	67.2	61.9	52.6	30/05/2024 06:30	61.5	74.3	64.4	53.3
28/05/2024 18:45	59.0	78.9	60.3	50.2	29/05/2024 12:45	59.3	69.5	62.1	52.7	30/05/2024 06:45	60.3	72.1	63.2	52.8
28/05/2024 19:00	57.8	70.9	60.9	49.7	29/05/2024 13:00	59.9	70.3	62.5	53.7	30/05/2024 07:00	59.9	72.5	62.7	52.5
28/05/2024 19:15	57.4	68.7	60.8	50.1	29/05/2024 13:15	59.5	68.2	62.3	52.9	30/05/2024 07:15	60.9	72.8	63.5	51.5
28/05/2024 19:30	57.4	69.2	60.6	50.1	29/05/2024 13:30	60.9	71.6	63.5	54.6	30/05/2024 07:30	61.7	70.0	64.6	54.5
28/05/2024 19:45	56.0	65.8	59.6	48.0	29/05/2024 13:45	60.1	68.9	62.6	55.0	30/05/2024 07:45	61.4	75.7	64.0	54.7
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28/05/2024 20:15	57.9	70.4	61.5	47.0	29/05/2024 14:15	61.5	70.7	63.9	56.4	30/05/2024 08:15	61.6	72.2	64.1	54.0
28/05/2024 20:30	56.8	71.5	60.3	48.4	29/05/2024 14:30	60.5	70.0	62.9	55.0	30/05/2024 08:30	61.3	72.0	63.7	54.4
28/05/2024 20:45	57.1	70.4	60.5	47.1	29/05/2024 14:45	61.4	75.2	63.5	55.2	30/05/2024 08:45	61.1	70.8	64.1	53.2
28/05/2024 21:00	56.7	68.7	59.7	48.9	29/05/2024 15:00	61.0	70.7	63.8	55.3	30/05/2024 09:00	60.4	71.0	63.3	52.0
28/05/2024 21:15	56.3	66.0	59.9	46.7	29/05/2024 15:15	61.8	71.2	64.2	57.2	30/05/2024 09:15	60.1	70.1	62.9	53.4
28/05/2024 21:30	54.3	64.3	58.4	41.7	29/05/2024 15:30	62.0	71.2	64.5	56.2	30/05/2024 09:30	60.3	70.3	63.2	53.2
28/05/2024 21:45	56.2	69.9	59.3	45.7	29/05/2024 15:45	61.3	69.3	63.7	56.3	30/05/2024 09:45	60.3	69.8	63.2	53.6
28/05/2024 22:00	54.9	64.9	58.8	41.2	29/05/2024 16:00	61.5	69.8	63.7	56.2	30/05/2024 10:00	60.0	70.9	62.8	52.3
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28/05/2024 22:30	53.2	62.6	57.9	40.4	29/05/2024 16:30	61.4	73.4	63.4	56.6	30/05/2024 10:30	60.0	69.8	63.0	52.0
28/05/2024 22:45	53.4	68.2	57.4	40.9	29/05/2024 16:45	61.4	77.0	63.3	55.7	30/05/2024 10:45	60.3	71.6	63.0	52.5
28/05/2024 23:00	53.4	65.8	57.9	37.2	29/05/2024 17:00	61.4	74.1	63.6	56.2	30/05/2024 11:00	59.8	71.3	63.1	51.5
28/05/2024 23:15	55.9	70.1	59.9	41.5	29/05/2024 17:15	61.4	69.9	63.7	56.6	30/05/2024 11:15	60.1	72.4	62.5	54.4
28/05/2024 23:30	51.2	65.2	55.3	34.2	29/05/2024 17:30	61.2	74.5	64.0	54.7	30/05/2024 11:30	58.6	83.7	62.1	39.8
28/05/2024 23:45	54.2	68.6	59.1	35.4	29/05/2024 17:45	60.4	66.6	63.1	54.5	30/05/2024 11:45	0.0	0.0	0.0	0.0
29/05/2024 00:00	54.5	72.1	57.4	34.5	29/05/2024 18:00	60.1	66.4	63.1	52.7	30/05/2024 12:00	0.0	0.0	0.0	0.0
29/05/2024 00:15	54.1	69.8	58.9	36.8	29/05/2024 18:15	59.9	75.0	62.7	50.6	30/05/2024 12:15	0.0	0.0	0.0	0.0
29/05/2024 00:30	49.8	62.8	54.4	32.7	29/05/2024 18:30	59.7	72.9	62.4	52.6	30/05/2024 12:30	0.0	0.0	0.0	0.0
29/05/2024 00:45	52.5	70.8	55.1	30.6	29/05/2024 18:45	59.9	71.4	63.0	52.2	30/05/2024 12:45	0.0	0.0	0.0	0.0
29/05/2024 01:00	50.9	68.7	54.6	30.9	29/05/2024 19:00	61.1	80.3	62.5	52.1	30/05/2024 13:00	0.0	0.0	0.0	0.0
29/05/2024 01:15	51.4	70.7	54.9	33.6	29/05/2024 19:15	59.7	69.5	62.8	51.2	30/05/2024 13:15	0.0	0.0	0.0	0.0
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29/05/2024 01:45	46.0	67.4	47.6	28.7	29/05/2024 19:45	60.2	77.1	62.3	50.0	30/05/2024 13:45	0.0	0.0	0.0	0.0
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29/05/2024 02:45	50.9	67.9	54.1	28.8	29/05/2024 20:45	59.0	72.6	62.3	48.5	30/05/2024 14:45	0.0	0.0	0.0	0.0
29/05/2024 03:00	54.2	71.3	58.3	34.7	29/05/2024 21:00	57.8	68.2	61.3	47.4	30/05/2024 15:00	0.0	0.0	0.0	0.0
29/05/2024 03:15	51.6	65.8	55.9	29.2	29/05/2024 21:15	58.5	73.9	61.6	47.1	30/05/2024 15:15	0.0	0.0	0.0	0.0
29/05/2024 03:30	48.7	66.5	52.3	30.4	29/05/2024 21:30	57.2	69.5	60.8	45.1	30/05/2024 15:30	0.0	0.0	0.0	0.0
29/05/2024 03:45	50.3	63.9	54.2	35.0	29/05/2024 21:45	56.4	70.3	60.1	44.0	30/05/2024 15:45	0.0	0.0	0.0	0.0
29/05/2024 04:00	52.3	68.8	56.0	40.1	29/05/2024 22:00	57.3	68.0	60.9	48.2	30/05/2024 16:00	0.0	0.0	0.0	0.0
29/05/2024 04:15	54.1	67.0	58.4	40.7	29/05/2024 22:15	57.4	70.4	61.0	46.3	30/05/2024 16:15	0.0	0.0	0.0	0.0
29/05/2024 04:30	59.5	81.6	59.6	40.0	29/05/2024 22:30	55.9	69.1	59.8	43.1	30/05/2024 16:30	0.0	0.0	0.0	0.0
29/05/2024 04:45	55.0	69.9	59.1	43.0	29/05/2024 22:45	55.2	73.9	59.3	40.2	30/05/2024 16:45	0.0	0.0	0.0	0.0
29/05/2024 05:00	53.6	67.7	58.2	39.6	29/05/2024 23:00	54.2	66.2	58.7	39.0	30/05/2024 17:00				

Location M02 - Survey Data

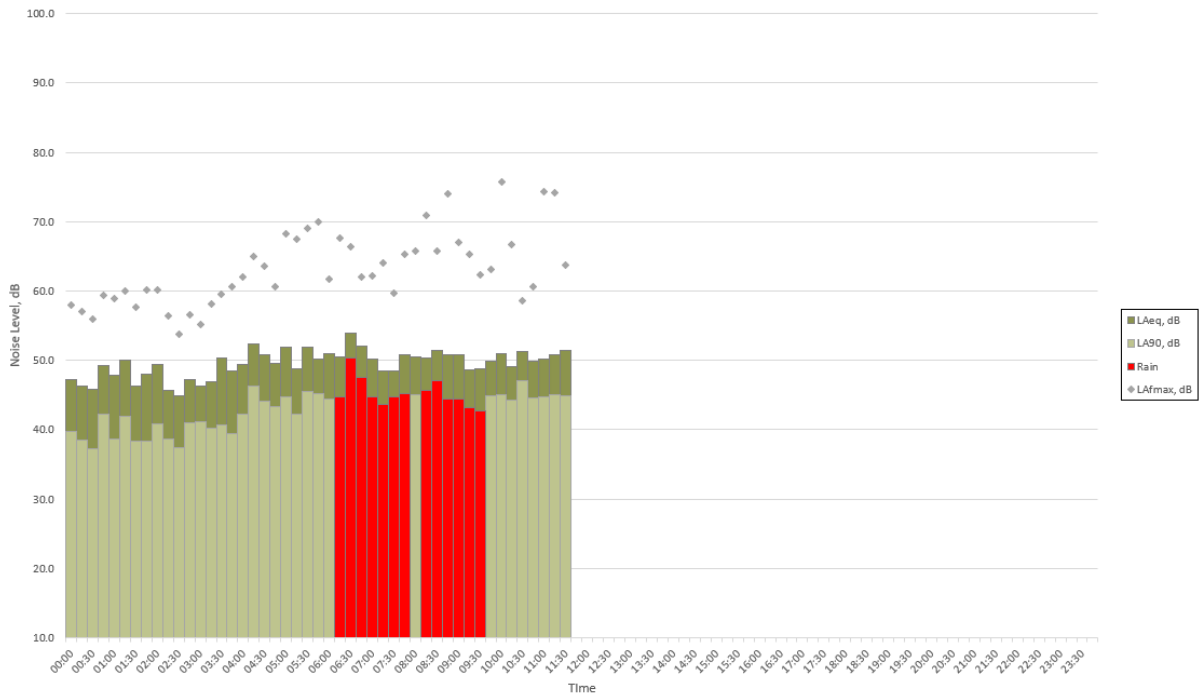
MAN.916.001 Doncaster Road, Darfield
Location M02 - 28th May 2024



MAN.916.001 Doncaster Road, Darfield
Location M02 - 29th May 2024



MAN.916.001 Doncaster Road, Darfield
Location M02 - 30th May 2024



Period Start	L _{Aeqp} dB	L _{Afmaxp} dB	L _{A10p} dB	L _{A90p} dB	Period Start	L _{Aeqp} dB	L _{Afmaxp} dB	L _{A10p} dB	L _{A90p} dB	Period Start	L _{Aeqp} dB	L _{Afmaxp} dB	L _{A10p} dB	L _{A90p} dB
28/05/2024 12:30	48.8	76.6	49.3	40.1	29/05/2024 06:30	51.2	68.6	54.5	40.7	30/05/2024 00:30	45.9	55.9	49.9	37.2
28/05/2024 12:45	46.4	60.4	49.5	40.6	29/05/2024 06:45	52.0	64.7	56.3	43.2	30/05/2024 00:45	49.2	59.4	51.9	42.3
28/05/2024 13:00	47.7	61.2	50.4	43.2	29/05/2024 07:00	48.1	59.9	51.1	42.9	30/05/2024 01:00	47.8	58.9	52.0	38.7
28/05/2024 13:15	47.6	65.4	50.2	41.5	29/05/2024 07:15	49.9	70.6	51.4	43.1	30/05/2024 01:15	50.1	60.1	54.1	42.0
28/05/2024 13:30	47.7	66.5	49.9	42.7	29/05/2024 07:30	50.1	75.5	51.9	44.2	30/05/2024 01:30	46.3	57.7	49.5	38.4
28/05/2024 13:45	45.5	65.8	48.1	41.0	29/05/2024 07:45	49.8	69.8	51.6	44.4	30/05/2024 01:45	48.0	60.2	52.3	38.4
28/05/2024 14:00	45.6	56.0	48.6	40.5	29/05/2024 08:00	51.3	67.8	54.1	46.0	30/05/2024 02:00	49.4	60.2	52.9	40.8
28/05/2024 14:15	46.4	65.0	49.6	40.0	29/05/2024 08:15	51.3	68.4	53.2	47.2	30/05/2024 02:15	45.7	56.4	48.8	38.7
28/05/2024 14:30	45.7	65.4	48.8	40.0	29/05/2024 08:30	50.7	64.5	53.7	45.5	30/05/2024 02:30	44.9	53.8	48.4	37.4
28/05/2024 14:45	44.2	54.2	47.1	39.4	29/05/2024 08:45	52.2	70.8	54.4	47.1	30/05/2024 02:45	47.2	56.6	50.5	41.0
28/05/2024 15:00	44.8	57.2	47.8	39.5	29/05/2024 09:00	49.6	65.3	52.0	44.1	30/05/2024 03:00	46.4	55.1	49.6	41.1
28/05/2024 15:15	45.3	58.5	48.2	40.3	29/05/2024 09:15	51.3	72.0	53.9	44.7	30/05/2024 03:15	46.9	58.1	50.2	40.2
28/05/2024 15:30	45.0	62.2	47.3	38.8	29/05/2024 09:30	50.6	66.7	52.9	44.3	30/05/2024 03:30	50.3	59.5	54.4	40.7
28/05/2024 15:45	49.0	72.1	48.4	39.5	29/05/2024 09:45	48.6	67.7	51.2	43.4	30/05/2024 03:45	48.5	60.6	51.1	39.5
28/05/2024 16:00	44.2	61.0	47.1	39.5	29/05/2024 10:00	52.4	78.0	52.8	45.3	30/05/2024 04:00	49.4	62.1	52.9	42.2
28/05/2024 16:15	44.4	56.6	47.6	39.2	29/05/2024 10:15	49.1	65.9	51.6	44.1	30/05/2024 04:15	52.4	65.0	55.6	46.3
28/05/2024 16:30	44.5	61.8	47.7	38.6	29/05/2024 10:30	49.7	64.2	52.4	44.1	30/05/2024 04:30	50.8	63.6	53.7	44.1
28/05/2024 16:45	44.2	62.3	46.7	38.1	29/05/2024 10:45	48.3	58.9	50.8	44.6	30/05/2024 04:45	49.5	60.6	52.9	43.4
28/05/2024 17:00	46.1	60.3	49.2	39.1	29/05/2024 11:00	48.2	58.7	50.8	44.2	30/05/2024 05:00	51.9	68.3	55.3	44.7
28/05/2024 17:15	45.9	70.4	47.0	38.4	29/05/2024 11:15	50.1	62.7	52.7	45.7	30/05/2024 05:15	48.8	67.5	51.2	42.3
28/05/2024 17:30	46.8	65.2	48.3	41.1	29/05/2024 11:30	52.2	66.0	55.0	46.2	30/05/2024 05:30	51.9	69.1	52.8	45.5
28/05/2024 17:45	59.2	78.9	64.6	42.6	29/05/2024 11:45	56.1	65.2	59.5	47.7	30/05/2024 05:45	50.2	69.9	52.7	45.2
28/05/2024 18:00	54.8	67.2	57.8	49.3	29/05/2024 12:00	56.9	71.7	62.3	44.9	30/05/2024 06:00	51.0	61.8	54.9	44.4
28/05/2024 18:15	49.6	56.2	51.5	47.2	29/05/2024 12:15	50.4	62.2	53.4	45.1	30/05/2024 06:15	50.5	67.6	53.4	44.8
28/05/2024 18:30	48.1	61.6	50.2	45.0	29/05/2024 12:30	50.9	65.9	53.5	46.2	30/05/2024 06:30	53.9	66.3	55.9	50.4
28/05/2024 18:45	50.4	66.1	52.2	43.6	29/05/2024 12:45	49.8	65.9	51.6	44.5	30/05/2024 06:45	52.0	62.0	55.0	47.6
28/05/2024 19:00	46.9	65.1	49.7	41.3	29/05/2024 13:00	49.7	63.6	52.2	45.1	30/05/2024 07:00	50.2	62.1	52.9	44.7
28/05/2024 19:15	47.3	64.3	50.2	40.3	29/05/2024 13:15	52.9	68.6	56.9	44.3	30/05/2024 07:15	48.5	64.1	51.0	43.7
28/05/2024 19:30	46.6	65.6	49.0	39.7	29/05/2024 13:30	56.8	67.5	61.2	46.8	30/05/2024 07:30	48.5	59.7	50.9	44.7
28/05/2024 19:45	48.1	65.5	50.8	40.0	29/05/2024 13:45	58.0	66.5	61.9	51.1	30/05/2024 07:45	50.8	65.2	53.3	45.2
28/05/2024 20:00	43.5	57.4	46.5	38.8	29/05/2024 14:00	57.8	67.3	61.7	49.7	30/05/2024 08:00	50.6	65.8	52.3	45.0
28/05/2024 20:15	46.1	59.3	49.2	39.5	29/05/2024 14:15	58.5	66.4	62.0	52.7	30/05/2024 08:15	50.4	71.0	51.9	45.6
28/05/2024 20:30	44.7	58.8	47.8	38.2	29/05/2024 14:30	58.9	65.4	61.6	54.5	30/05/2024 08:30	51.5	65.8	53.4	47.1
28/05/2024 20:45	50.8	69.5	50.8	37.7	29/05/2024 14:45	57.1	63.6	59.1	55.0	30/05/2024 08:45	50.8	74.1	52.5	44.4
28/05/2024 21:00	46.2	61.7	49.2	37.8	29/05/2024 15:00	57.0	65.4	60.4	50.5	30/05/2024 09:00	50.9	67.0	52.6	44.4
28/05/2024 21:15	51.2	63.7	55.0	39.9	29/05/2024 15:15	57.5	73.3	61.4	48.6	30/05/2024 09:15	48.6	65.3	50.8	43.2
28/05/2024 21:30	45.4	70.0	45.4	37.0	29/05/2024 15:30	52.5	68.2	55.1	47.8	30/05/2024 09:30	48.8	62.4	51.8	42.7
28/05/2024 21:45	39.1	50.2	41.1	35.4	29/05/2024 15:45	54.0	61.2	56.4	50.1	30/05/2024 09:45	49.8	63.1	51.8	44.9
28/05/2024 22:00	39.3	51.9	40.9	35.3	29/05/2024 16:00	55.0	73.4	56.8	50.4	30/05/2024 10:00	51.0	75.7	52.9	45.0
28/05/2024 22:15	38.5	51.3	40.7	33.7	29/05/2024 16:15	55.1	65.9	58.1	48.2	30/05/2024 10:15	49.1	66.8	51.7	44.3
28/05/2024 22:30	35.7	52.5	36.0	32.1	29/05/2024 16:30	57.7	81.0	60.4	47.5	30/05/2024 10:30	51.2	58.6	53.7	47.1
28/05/2024 22:45	34.8	49.1	36.8	32.0	29/05/2024 16:45	50.5	59.0	53.6	46.2	30/05/2024 10:45	49.9	60.6	52.8	44.5
28/05/2024 23:00	48.6	55.5	52.2	37.0	29/05/2024 17:00	51.0	61.3	54.0	45.3	30/05/2024 11:00	50.2	74.4	51.8	44.8
28/05/2024 23:15	43.7	53.8	47.4	38.4	29/05/2024 17:15	51.5	62.3	54.5	46.8	30/05/2024 11:15	50.7	74.2	51.8	45.1
28/05/2024 23:30	42.5	54.8	45.7	37.0	29/05/2024 17:30	51.6	61.7	54.9	46.4	30/05/2024 11:30	51.4	63.7	54.1	44.9
28/05/2024 23:45	40.4	47.8	41.8	38.1	29/05/2024 17:45	48.2	57.4	51.0	43.8	30/05/2024 11:45	0.0	0.0	0.0	0.0
29/05/2024 00:00	45.3	55.0	48.8	39.1	29/05/2024 18:00	52.4	61.9	55.3	47.4	30/05/2024 12:00	0.0	0.0	0.0	0.0
29/05/2024 00:15	45.9	57.2	49.3	39.3	29/05/2024 18:15	51.8	61.0	54.9	46.8	30/05/2024 12:15	0.0	0.0	0.0	0.0
29/05/2024 00:30	44.1	55.0	47.4	38.0	29/05/2024 18:30	48.0	70.4	49.9	42.8	30/05/2024 12:30	0.0	0.0	0.0	0.0
29/05/2024 00:45	40.5	52.0	43.8	34.2	29/05/2024 18:45	51.3	65.8	53.6	46.1	30/05/2024 12:45	0.0	0.0	0.0	0.0
29/05/2024 01:00	39.9	53.0	42.6	35.0	29/05/2024 19:00	49.6	59.4	52.6	43.7	30/05/2024 13:00	0.0	0.0	0.0	0.0
29/05/2024 01:15	42.8	53.4	46.6	35.2	29/05/2024 19:15	56.5	74.9	56.6	43.7	30/05/2024 13:15	0.0	0.0	0.0	0.0
29/05/2024 01:30	42.4	53.0	45.5	36.2	29/05/2024 19:30	51.4	73.8	53.2	44.0	30/05/2024 13:30	0.0	0.0	0.0	0.0
29/05/2024 01:45	40.5	50.6	44.7	30.8	29/05/2024 19:45	53.2	68.7	55.6	46.3	30/05/2024 13:45	0.0	0.0	0.0	0.0
29/05/2024 02:00	33.4	48.6	34.8	29.7	29/05/2024 20:00	51.8	65.7	54.4	45.5	30/05/2024 14:00	0.0	0.0	0.0	0.0
29/05/2024 02:15	31.7	41.7	33.6	29.5	29/05/2024 20:15	51.2	65.5	54.3	44.8	30/05/2024 14:15	0.0	0.0	0.0	0.0
29/05/2024 02:30	32.1	49.7	33.8	29.4	29/05/2024 20:30	52.0	66.7	55.3	45.8	30/05/2024 14:30	0.0	0.0	0.0	0.0
29/05/2024 02:45	32.5	45.1	34.7	29.2	29/05/2024 20:45	49.8	65.2	52.5	43.2	30/05/2024 14:45	0.0	0.0	0.0	0.0
29/05/2024 03:00	36.6	49.0	40.3	30.0	29/05/2024 21:00	48.7	57.2	51.7	44.3	30/05/2024 15:00	0.0	0.0	0.0	0.0
29/05/2024 03:15	39.2	46.5	42.2	34.5	29/05/2024 21:15	50.3	61.2	53.9	43.8	30/05/2024 15:15	0.0	0.0	0.0	0.0
29/05/2024 03:30	35.2	47.4	37.8	30.9	29/05/2024 21:30	51.7	60.9	55.4	44.2	30/05/2024 15:30	0.0	0.0	0.0	0.0
29/05/2024 03:45	36.5	53.8	39.0	31.5	29/05/2024 21:45	51.4	63.1	55.3	44.0	30/05/2024 15:45	0.0	0.0	0.0	0.0
29/05/2024 04:00	48.3	64.0	51.3	36.6	29/05/2024 22:00	48.9	59.1	52.0	42.4	30/05/2024 16:00	0.0	0.0	0.0	0.0
29/05/2024 04:15	55.9	69.7	60.7	43.1	29/05/2024 22:15	51.7	61.3	55.5	44.1	30/05/2024 16:15	0.0	0.0	0.0	0.0
29/05/2024 04:30	51.2	69.8	53.1	42.0	29/05/2024 22:30	48.6	60.0	52.0	41.9	30/05/2024 16:30	0.0	0.0	0.0	0.0
29/05/2024 04:45	54.7	71.1	59.1	40.9	29/05/2024 22:45	49.2	61.4	52.6	41.6	30/05/2024 16:45	0.0	0.0	0.0	0.0
29/05/2024 05:00	51.1	65.3	55.0	42.0	29/05/2024 23:00	50.4	62.8	53.5	43.5	30/05/2024 17:00	0.0	0.0	0.0	0.0
29/05/2024 05:15	55.1	73.1	60.0	41.3	29/05/2024 23:15	46.3	58.6	49.6	40.2	30/05/2024 17:15	0.0	0.0	0.0	0.0
29/05/2024 05:30	47.1	59.5	49.6	42.3	29/05/2024 23:30	47.2	58.8	50.7	39.7	30/05/2024 17:30	0.0			

Appendix B – Noise Contour Plots

Figure B-1: Daytime Noise Contour Plot – 1.5m

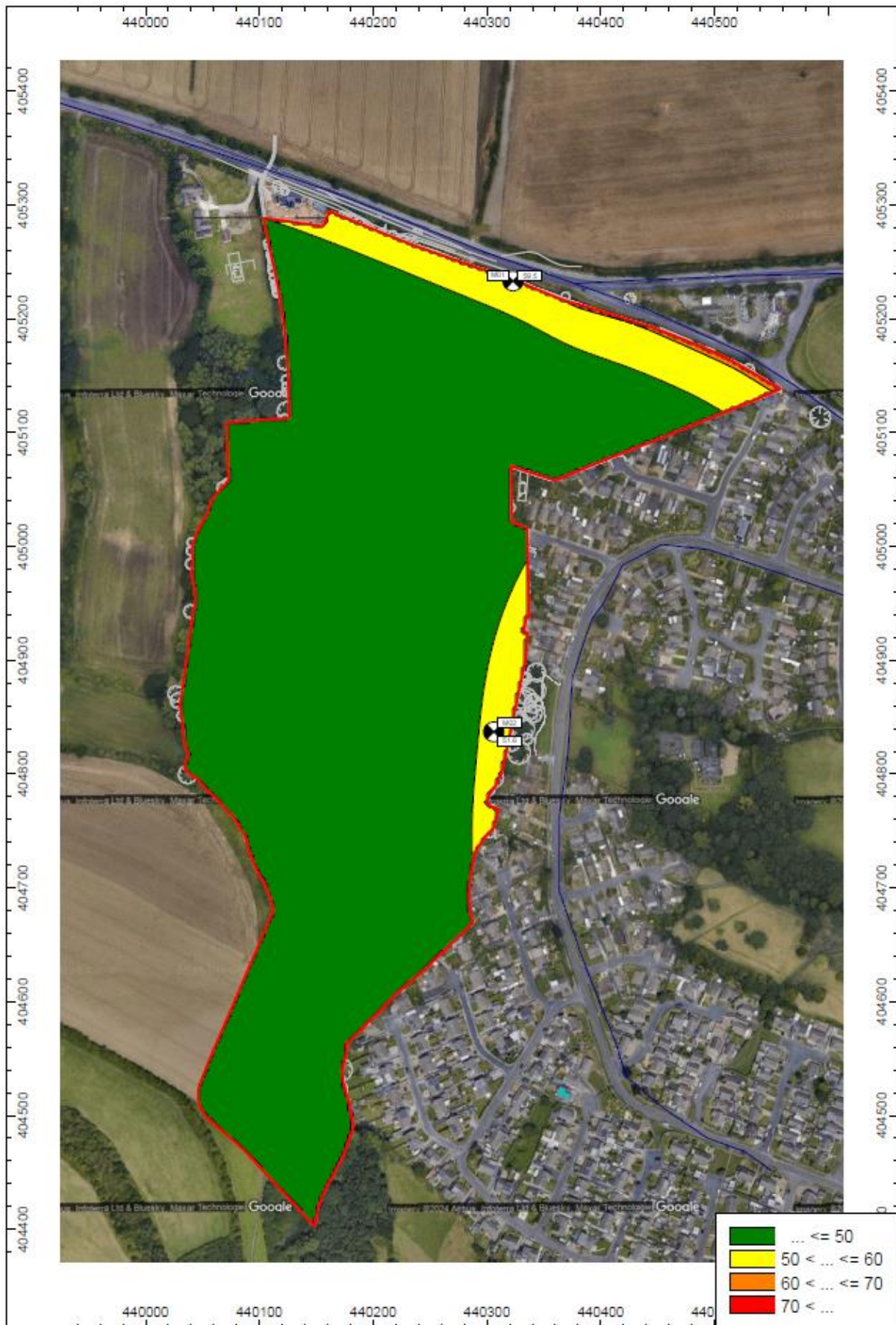


Figure B-2: Night-time Noise Contour Plot – 4m

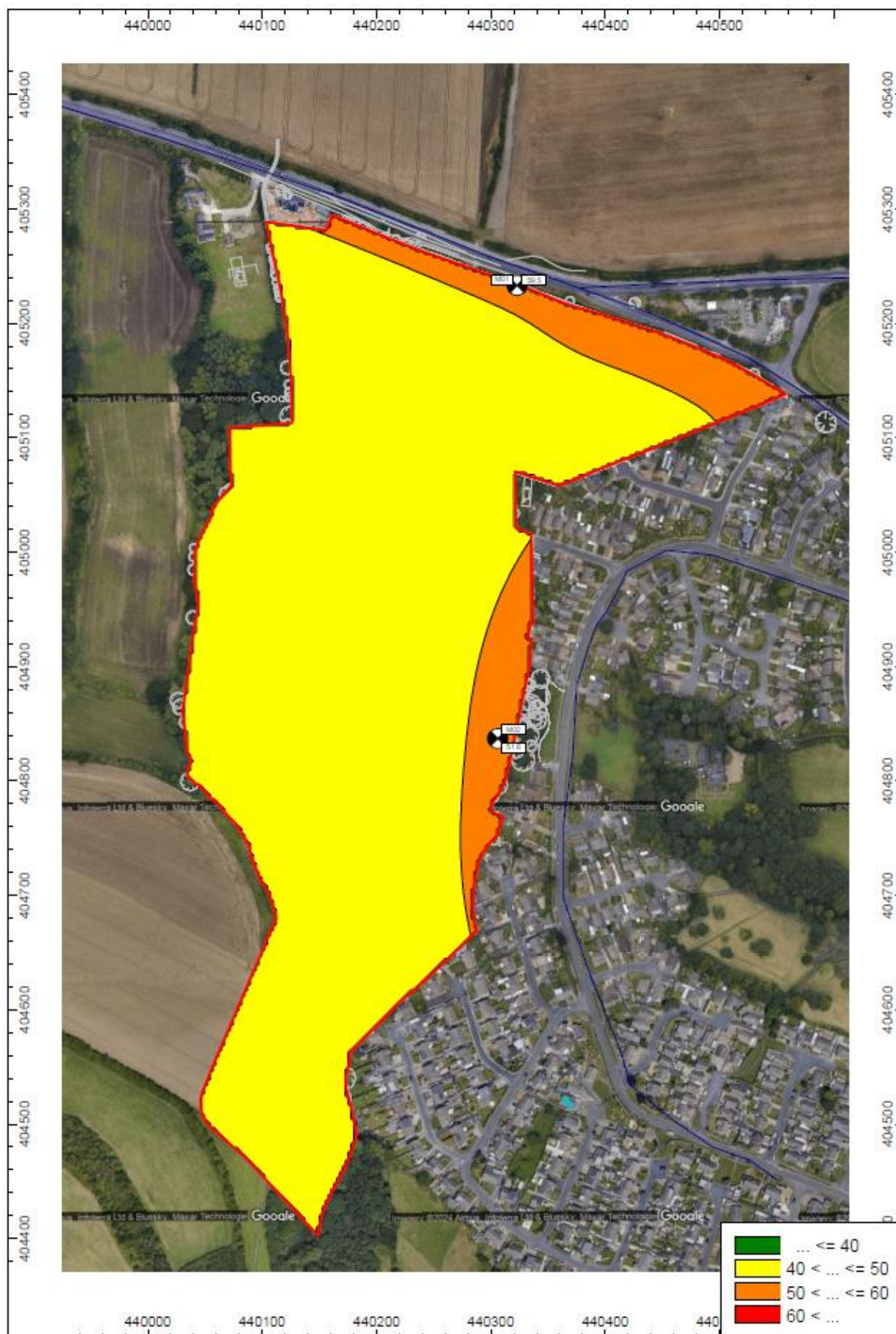


Figure B-3: Daytime Façade Noise Levels



Figure B-4: Night-time Façade Noise Levels



Figure B-5: Night-time Overheating Risk



Figure B-6: External Amenity Area Contour Plot



Appendix C – Glazing Specification



Acoustic Performance

Glazing Configuration

4mm Float Glass
 20mm Cavity
 4mm Float Glass

Sound Reduction Indices

Frequency, Hz / dB						Rw	C	Ctr	OITC	STC
125	250	500	1000	2000	4000	32	-1	-4	27	31
22	21	27	38	46	25					

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. Due to inherent variations in acoustic performance when testing in accordance with EN ISO 10140-3/EN ISO 10140-2, some variation in the calculated performance can also be expected. As such, the weighted performance, Rw, and adaptation terms, C and Ctr, should typically be considered to be accurate within ±2 dB. However, wider deviations can occur. 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.

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Acoustic Performance

Glazing Configuration

6.76mm (33.2) LamiGlass Sound Reduction
 16mm Cavity
 4mm Float Glass

Sound Reduction Indices

Frequency, Hz / dB						Rw	C	Ctr	OITC	STC
125	250	500	1000	2000	4000	38	-2	-6	29	38
21	27	36	44	50	47					

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. Due to inherent variations in acoustic performance when testing in accordance with EN ISO 10140-3/EN ISO 10140-2, some variation in the calculated performance can also be expected. As such, the weighted performance, Rw, and adaptation terms, C and Ctr, should typically be considered to be accurate within ±2 dB. However, wider deviations can occur. 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.

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Acoustic Performance

Glazing Configuration

12.76mm (66.2) LamiGlass Sound Reduction

10mm Cavity

6.76mm (33.2) LamiGlass (PVB)

Sound Reduction Indices

Frequency, Hz / dB						Rw	C	Ctr	OITC	STC
125	250	500	1000	2000	4000	41	-1	-4	35	41
28	29	37	45	48	69					

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. Due to inherent variations in acoustic performance when testing in accordance with EN ISO 10140-3/EN ISO 10140-2, some variation in the calculated performance can also be expected. As such, the weighted performance, R_w , and adaptation terms, C and Ctr, should typically be considered to be accurate within ± 2 dB. However, wider deviations can occur. 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.

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