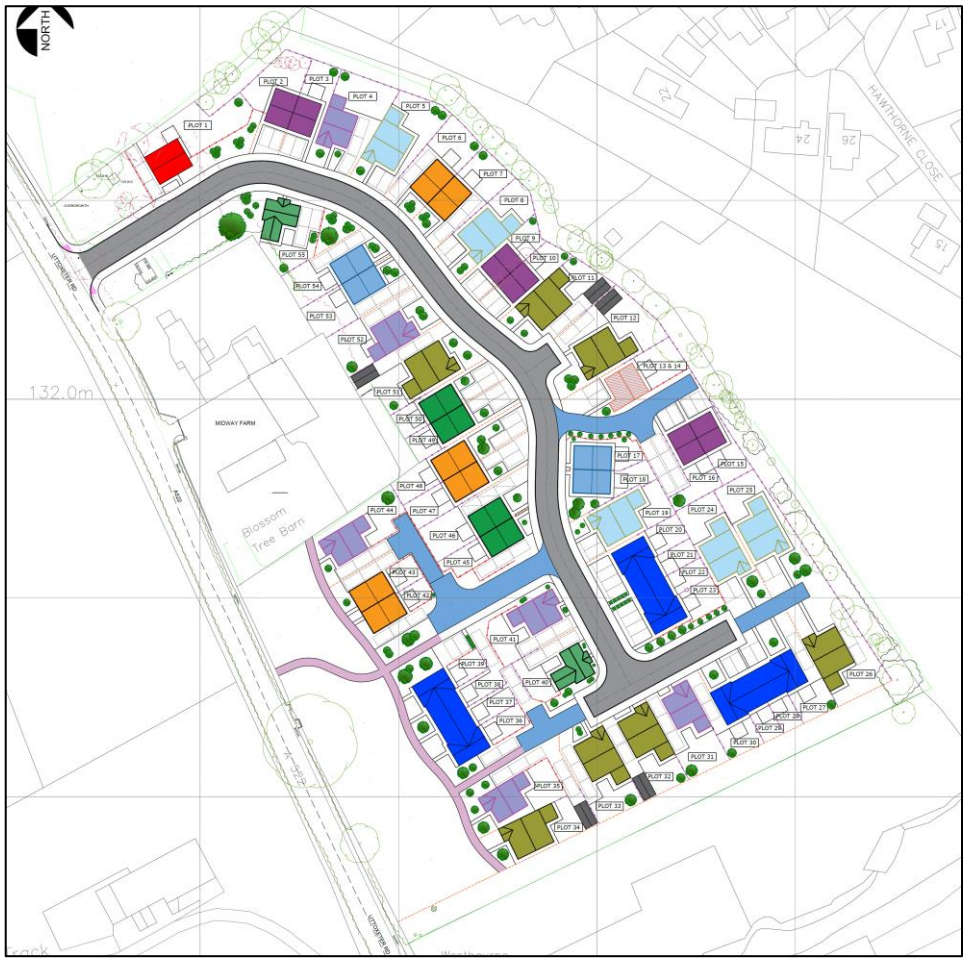
Land Adjacent to Daisy Bank Farm, Upper Tean, ST10 4LJ

Noise Assessment



784-B034743

Geraint John Planning Ltd.

March 2022

Prepared by Tetra Tech Limited.

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1.0 INTRODUCTION

PURPOSE OF THIS REPORT

This report presents the findings of a noise assessment for a residential development on land adjacent to Daisy Bank Farm, Upper Tean to support a Reserved Matters planning application. Condition 26 of outline planning permission reference SMD/2018/0509 states:

> 26. *Development shall not commence until a site-specific scheme for protecting the proposed residential units from noise has been submitted to and approved in writing by the Local Planning Authority. The submitted scheme shall have due regard for the British Standard BS8233:2014 Guidance on Sound Insulation for Buildings and be designed to achieve noise levels of less than 30 dB L_{Aeq} in bedrooms, less than 40 dB L_{Aeq} in living areas and 55dB L_{Aeq} in outside living areas. A report shall be produced containing all raw data and showing how calculations have been made. Thereafter a copy of such report shall be submitted to the Local Planning Authority for its written approval the approved scheme shall be implemented in full before any of the dwellings hereby approved are occupied."*

A description of the existing noise environment in and around the site is provided. Noise surveys have been undertaken and the results used to verify predictions of the short-term and long-term effects of noise. The noise levels from the proposed development have been predicted at local representative receptors using CADNA noise modelling software which incorporates ISO 9613 and CRTN methodologies and calculations.

A list of acoustic terminology and abbreviations used in this report is provided in Appendix A.

ACOUSTIC CONSULTANTS' QUALIFICATIONS AND PROFESSIONAL MEMBERSHIPS

The lead project Acoustic Consultant is David Fink. The report has been checked by Ashley Shepherd and verified by Nigel Mann. Relevant qualifications, membership and experience are summarised below.

Table 1.2 Acoustic Consultants' Qualifications & Experience

Name	Job Title	Education	Experience in Undertaking Noise Assessments (Start date of working in noise & acoustics)	Attained Associate Membership of the Institute of Acoustics (date)	Attained Membership of the Institute of Acoustics (date)
David Fink	Environmental Consultant	BEng 2016	Mar 2017	Jun 2017	-
Ashley Shepherd	Principal Consultant	BSc 2013	Feb 2014	Feb 2014	Nov 2017
Nigel Mann	Director	BSc 1997 MSc 1999	Nov 2001	Nov 1998	Nov 2001

2.0 ASSESSMENT CRITERIA

In order to enable the assessment of the proposed development in terms of LOAEL and SOAEL, Table 2.1 presents equivalent noise levels and associated actions with the target noise level criteria identified. The noise level criteria detailed below have been derived from requirements outlined within Condition 26 and standards and design guidance outlined below:

- *BS 8233:2014 'Guidance on sound insulation and noise reduction for buildings – Code of practice'*

Table 2.1 Noise Level Criteria and Actions

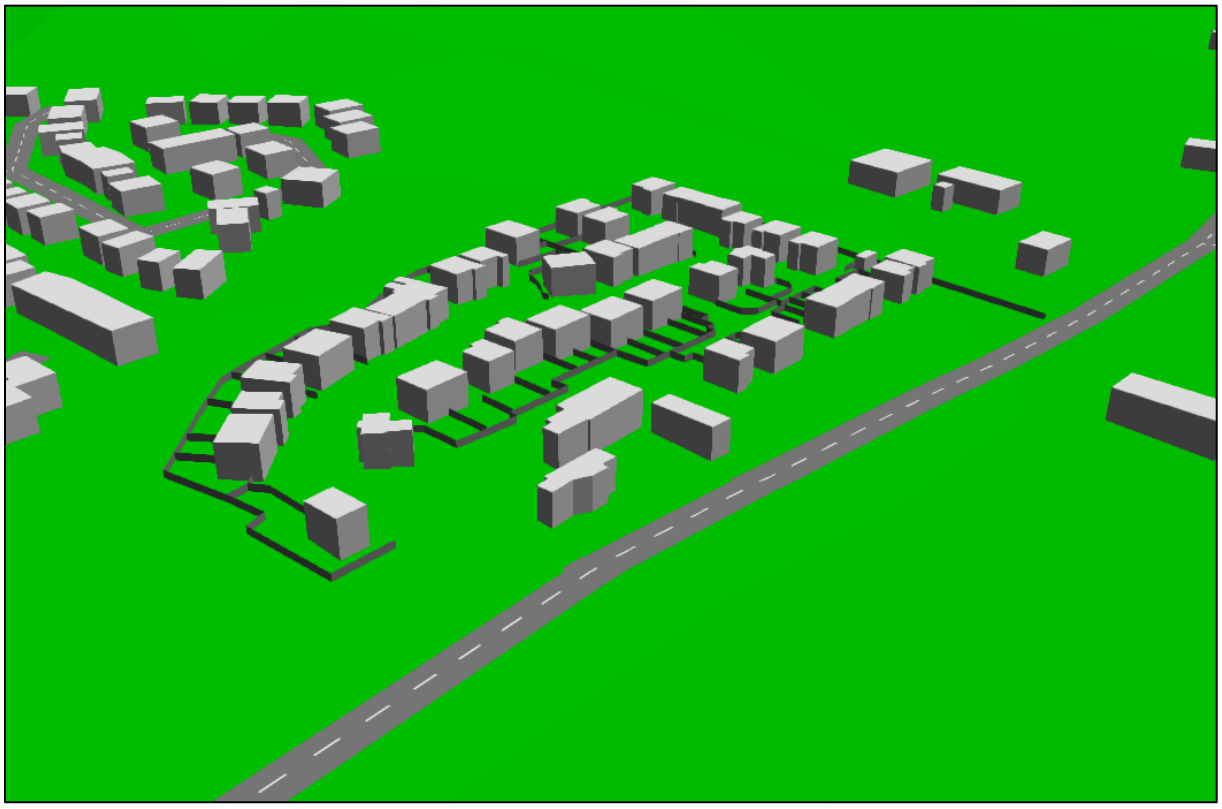
Effect Level	Noise Level Criteria	Action/Justification
No Observed Adverse Effect Level (NOAEL)	Internal noise levels do not exceed (with windows open): Bedrooms (night-time) – 30 dB $L_{Aeq,8hours}$ Living Rooms (daytime) – 40 dB $L_{Aeq,16hours}$ Private external Amenity Space (daytime) – 55 dB $L_{Aeq,16hours}$	No Action Required Within BS8233 Criteria
Lowest Observed Adverse Effect Level (LOAEL)	Internal noise levels do not exceed (with windows open): Bedrooms (night-time) – 30 dB $L_{Aeq,8hours}$ Living Rooms (daytime) – 40 dB $L_{Aeq,16hours}$ Private external Amenity Space (daytime) – 55 dB $L_{Aeq,16hours}$	No Action Required Within BS8233 Criteria
Significant Observed Adverse Effect Level (SOAEL)	Internal noise levels exceed (with windows closed): Bedrooms (night-time) – 30 dB $L_{Aeq,8hours}$ Living Rooms (daytime) – 40 dB $L_{Aeq,16hours}$ Depending on context, external noise levels exceed: Private external Amenity Space (daytime) – 55 dB $L_{Aeq,16hours}$	Mitigate to achieve: Bedrooms – 30 dB $L_{Aeq,8hours}$ Living Rooms – 40 dB $L_{Aeq,16hours}$ Depending on context, external amenity space Mitigate and reduce to a minimum
Unacceptable Observed Adverse Effect Level (UOAEL)	Noise levels with mitigation exceed: Bedrooms – 35 dB $L_{Aeq,8hours}$ Living Rooms – 45 dB $L_{Aeq,16hours}$	Prevent

3.0 ASSESSMENT METHODOLOGY

NOISE MODELLING METHODOLOGY

Three-dimensional noise modelling has been undertaken based on the monitoring data to predict L_{Aeq} noise levels both horizontally and vertically. CADNA noise modelling software has been used as shown in Figure 3.1. The figure shows the proposed development and the surrounding road network. This model is based on ISO 9613 noise propagation methodology and allows for detailed prediction of noise levels to be undertaken for large numbers of receptor points and different noise emission scenarios both horizontally and vertically.

Figure 3.1 CADNA Noise Model



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The modelling software calculates noise levels based on the emission parameters and spatial settings that are entered. Input data and model settings as given in the table below have been used.

Table 3.1 Modelling Parameters Sources and Assumptions

Parameter	Source	Details
Horizontal distances – around site	Ordnance Survey	Ordnance Survey
Ground levels	Ordnance Survey	OS Terrain 50 Contour Data
Traffic Data, main surrounding roads	Tetra Tech Observations	Tetra Tech validated noise measurements.
Building heights	Tetra Tech	8 m height for two storey residential properties. Other height properties reviewed using Google Street View and amended as required
Receptor positions	Tetra Tech	1 m from façade, height of 1.5 m for ground floor, 4 m for first floor properties with ground floor with a further increase of 4.0m per storey.
Site Layout	Sauro Architectural Design Ltd.	Ref: Proposed Site Block Plan E-652-02-A Dated: 08/04/2022

It is acknowledged that a number of these assumptions will affect the overall noise levels presented in this report. However, it should be noted that certain assumptions made, as identified above, are worst case.

MODEL VERIFICATION (EXISTING AMBIENT NOISE CLIMATE)

Following a review of the baseline survey data, noise models were verified by modelling the monitoring locations for the 'existing' scenario, including contributions from the surrounding road network. Worst-case daytime and night-time L_{Aeq} scenarios have been verified. The comparison between the monitoring and modelling results are shown in Tables 3.2 & 3.3 below.

Table 3.2 Modelled vs. Monitored Results $L_{Aeq;\ daytime\ 07:00 – 23:00}$

Location	Monitored L_{Aeq}	Modelled L_{Aeq}	Difference between Monitored and Modelled Results
LT1	68.0	67.3	-0.7
LT2	63.7	66.3	2.6

All values are sound pressure levels in dB re: $2x\ 10^{-5}$ Pa

Table 3.3 Modelled vs. Monitored Results $L_{Aeq;\ night\text{-}time\ 23:00– 07:00}$

Location	Monitored L_{Aeq}	Modelled L_{Aeq}	Difference between Monitored and Modelled Results
LT1	62.7	61.8	-0.9
LT2	58.4	61.1	2.7

All values are sound pressure levels in dB re: $2x\ 10^{-5}$ Pa

Within the verification exercise, greater weight and confidence has been given to the long-term measurements due to a longer exposure time representing noise around the site. The verification points show a divergence between monitored and modelled results of no more than +/- 3 dB during both the daytime and night-time L_{Aeq} and L_{Amax} scenarios for all long-term measurement locations.

SENSITIVE RECEPTOR LOCATIONS

The locations of proposed receptor locations are presented in Figures 3.2 & 3.3 below.

Figure 3.2 Sensitive Receptor Locations

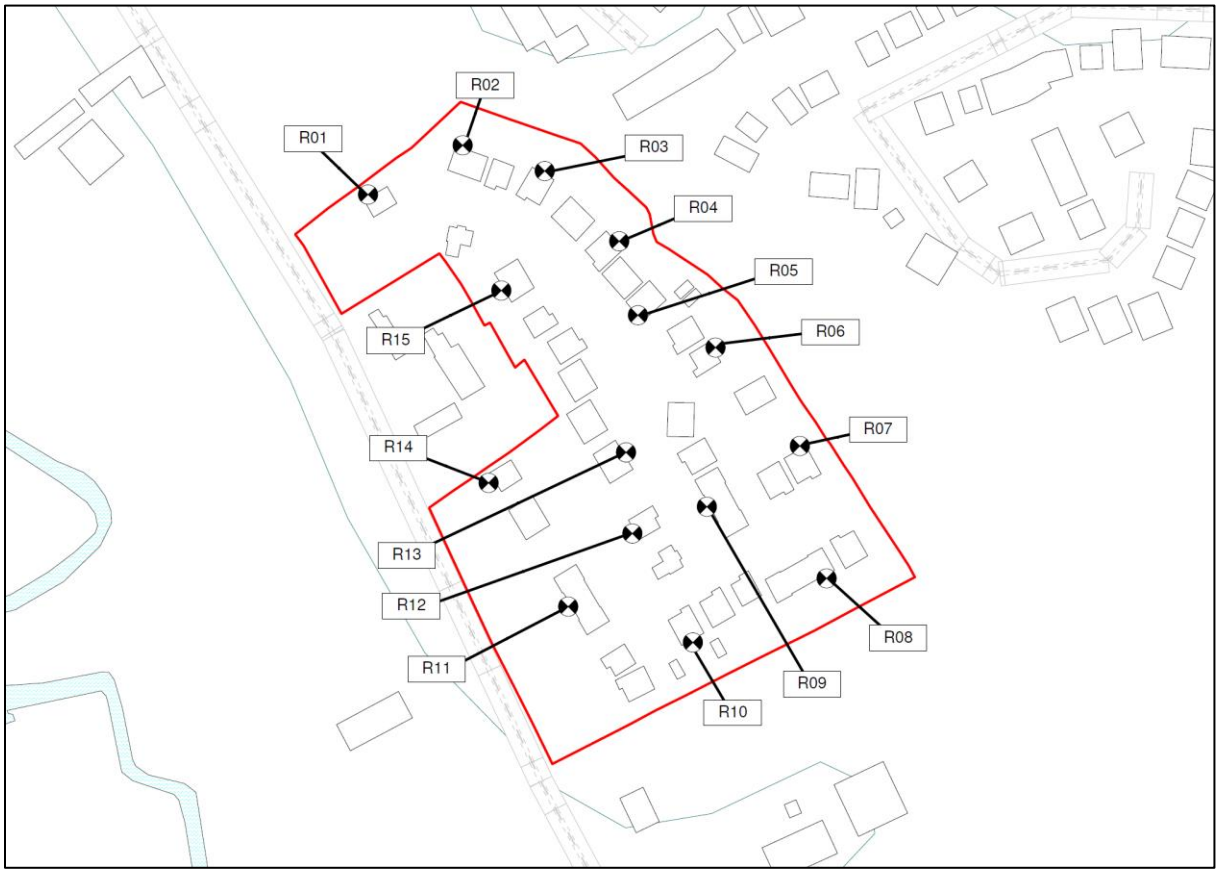

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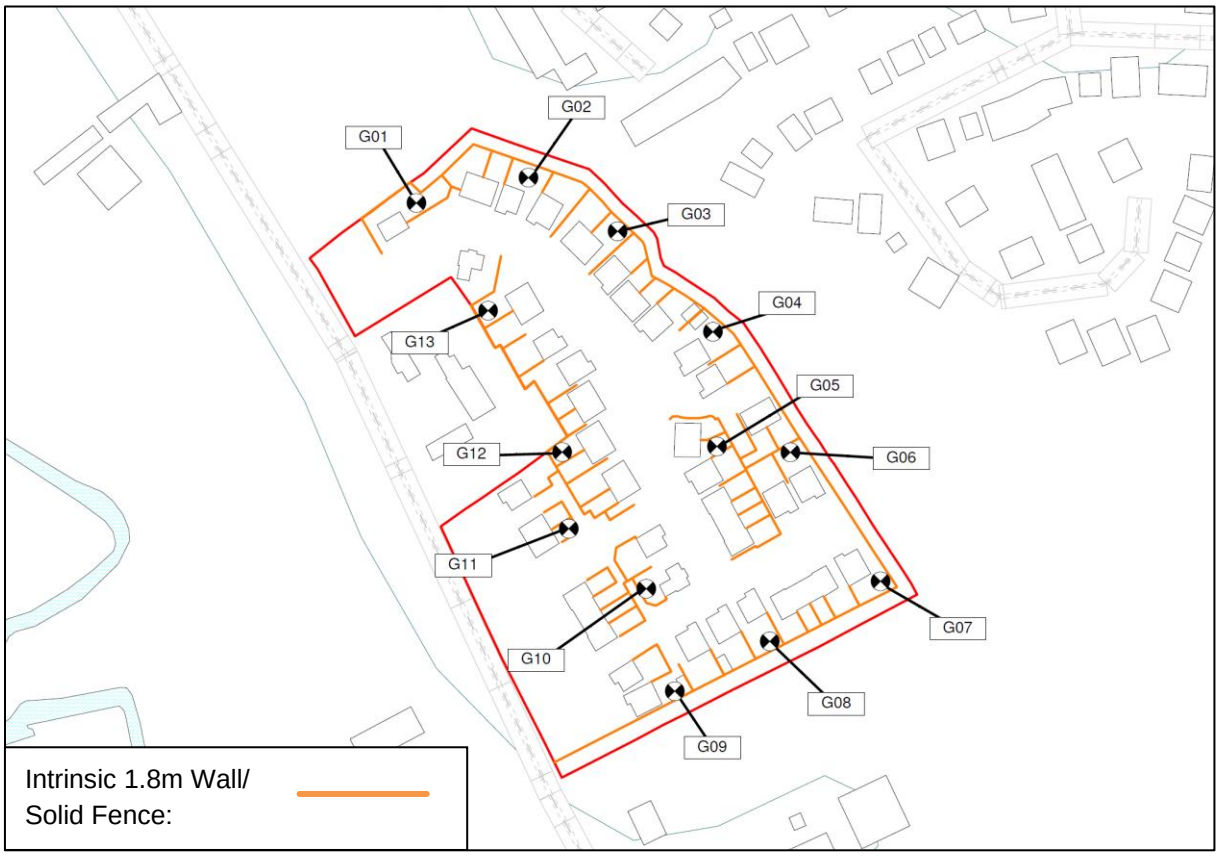
Figure 3.3 Garden Receptor Locations



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4.0 BASELINE NOISE SURVEY

BASELINE NOISE SURVEY

A monitoring survey was undertaken to characterise baseline ambient noise levels currently experienced on the site and to establish the relative local background and traffic noise levels. Equipment used during the survey included

Rion NL-52	*Environmental Noise Analyser (WYG15)*	*s/n*	*00620858*
Rion NL-52	*Environmental Noise Analyser (WYG18)*	*s/n*	*00843173*
Rion NL-52	*Environmental Noise Analyser*	*s/n*	*00710471*
Rion NC-75	*Sound Calibrator*	*s/n*	*34313029*

The measurement equipment was checked against the appropriate calibrator at the beginning and end of the measurements, in accordance with recommended practice, a maximum drift of +0.1 dB was observed. The accuracy of the calibrators can be traced to National Physical Laboratory Standards, calibration certificates for which are available on request.

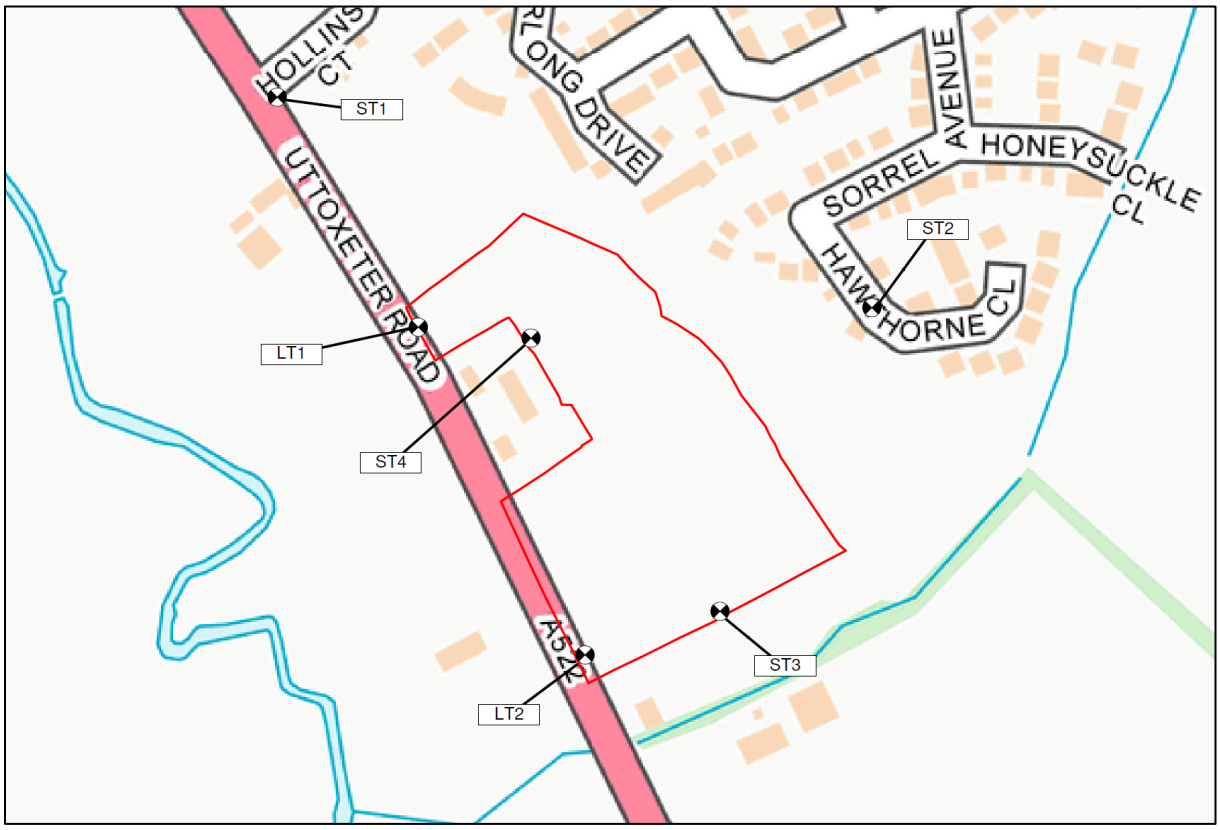
A baseline monitoring survey was undertaken at six locations (as specified in the following table and shown in Figure 4.1 below) from Friday 11th March 2022 to Wednesday 16th March 2022. Attended short term measurements were undertaken at four locations during day, evening and night-time periods with two additional locations being measured unattended over a 115-hour period. The raw data collected from the long-term monitoring is available upon request.

Measurements were taken in general accordance with BS 7445-1:2003 *The Description and Measurement of Environmental Noise: Guide to quantities and procedures*. Weather conditions during the attended survey period were observed as being overcast and mostly dry. Anemometer readings confirmed that wind speeds were less than 5 ms^{-1} at all times during the survey, with a predominant southerly wind direction during the survey.

Table 4.1 Noise Monitoring Locations

Ref	Description
LT1	North western edge of the site boundary, by the side of the A522.
LT2	South western corner of the site boundary.
ST1	Southern corner of Hollinscroft Court, junction with A522.
ST2	Located on Hawthorne close, south of 2 Hawthorne Close.
ST3	Located on the southern site boundary.
ST4	Located north east of the property, along the western boundary of a field.

Figure 4.1 Noise Monitoring Locations



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NOISE SURVEY RESULTS

The dominant noise sources found in the area include: road traffic noise from A50 (which can be heard from each short term locations); road traffic noise from A522 including HGVS and lorries; residential traffic on Hollinscroft Court and Hawthorne Close.

Ambient and background noise levels are usually described using the L_{Aeq} index (a form of energy average) and the L_{A90} index (i.e. the level exceeded for 90% of the measurement period) respectively. Road traffic noise is generally described using the L_{A10} index (i.e. the level exceeded for 10% of the measurement period). For the long-term (LT) locations, the presented $L_{Aeq,T}$ and $L_{A10,T}$ are average noise levels whilst the L_{A90} is the modal noise level of each 5 minute measurement over the stated survey period.

Table 4.2 Meteorological Conditions during the Survey

Survey Location	Date & Time	Temperature (ºC)	Wind Speed (m/s)	Wind Direction	Cloud Cover (Oktas)	Dominant Noise Source
Day ST1	15/03/2022 15:18	13	0.8	S	8	road traffic noise from A522, faint sound of radio in resident's garden. Large HGVs and lorries passing.
Day ST2	15/03/2022 15:44	13	0.5/1.5	S	8	Road traffic noise from A522 and A50, minimal residential traffic.
Day ST3	15/03/2022 14:30	13	0.2/0.5	S	8	Road traffic noise from A522 and distant from A50. birdsong.
Day ST4	15/03/2022 14:52	13	0.5	S	8	Road traffic noise from A522 and A50, buffered by house and vegetation.
Evening ST1	15/03/2022 21:46	9	0.4	S	8	Road traffic noise from A522 and A50.
Evening ST2	15/03/2022 21:24	9	0.2	S	8	Road traffic noise from A50, no residential traffic. plane overhead can be heard.
Evening ST3	15/03/2022 22:12	9	0.2	S	8	Road traffic noise from A522 and A50.
Evening ST4	15/03/2022 22:31	9	0.1	S	8	Road traffic noise from A522 and A50.
Night ST1	15/03/2022 24:40	8	0.2	S	8	Road traffic noise from A522 and A50.
Night ST2	16/03/2022 00:01	8	0.1	S	8	Road traffic noise from A50.
Night ST3	15/03/2022 23:00	8	0.2	S	8	Road traffic noise predominantly from A50.
Night ST4	15/03/2022 23:20	8	0.2	S	8	Road traffic noise from A522 and A50.

The results of the statistical measurements and frequency measurements conducted during the survey are summarised in the following table. All values are sound pressure levels in dB (re: 2 x 10^{-5} Pa).

Table 4.3 Results of Baseline Noise Monitoring Survey (Average Levels)

Period	Duration (T)	Monitoring Date and Times	Location	$L_{Aeq,T}$ (dB)	$L_{Amax,T}$ (dB)	$L_{Amin,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)
Weekday Daytime 07:00 - 23:00	43 Hours	11/03/2022 – 16/03/2022 07:00 - 23:00	LT1	68.0	92.6	35.0	71.3	50.0
Weekday Night-time 23:00 – 07:00	24 Hours	11/03/2022 – 16/03/2022 23:00 - 07:00		62.7	86.9	30.8	56.6	42.0
Weekend Daytime 07:00 - 23:00	32 Hours	11/03/2022 – 16/03/2022 07:00 - 23:00		66.5	103.5	38.4	69.7	51.0
Weekend Night-time 23:00 – 07:00	16 hours	11/03/2022 – 16/03/2022 23:00 - 07:00		59.3	86.5	31.1	54.3	40.0
Weekday Daytime 07:00 - 23:00	43 Hours	11/03/2022 – 16/03/2022 07:00 - 23:00	LT2	63.7	99.8	35.8	66.8	50.0
Weekday Night-time 23:00 – 07:00	24 Hours	11/03/2022 – 16/03/2022 23:00 - 07:00		58.4	81.0	31.1	54.6	42.0
Weekend Daytime 07:00 - 23:00	32 Hours	11/03/2022 – 16/03/2022 07:00 - 23:00		62.3	95.8	40.0	65.4	51.0

Period	Duration (T)	Monitoring Date and Times	Location	$L_{Aeq,T}$ (dB)	$L_{Amax,T}$ (dB)	$L_{Amin,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)
Weekend Night-time 23:00 – 07:00	16 hours	11/03/2022 – 16/03/2022 23:00 - 07:00		55.0	83.1	32.0	52.9	40.0
Daytime 07:00 - 19:00	15 Mins	15/03/2022 15:18	ST1	71.8	96.5	47.0	74.9	51.1
	15 Mins	15/03/2022 15:44	ST2	53.5	72.3	46.0	55.0	49.2
	15 Mins	15/03/2022 14:30	ST3	49.7	57.9	44.4	51.5	47.4
	15 Mins	15/03/2022 14:52	ST4	49.3	58.9	43.5	51.1	47.0
Evening 19:00 - 23:00	15 Mins	15/03/2022 21:46	ST1	63.6	84.5	40.2	62.9	46.3
	15 Mins	15/03/2022 21:24	ST2	45.6	54.4	38.2	47.9	42.5
	15 Mins	15/03/2022 22:12	ST3	48.6	55.7	41.1	51.1	44.8
	15 Mins	15/03/2022 22:31	ST4	44.8	55.7	35.9	47.6	40.7
Night-time 23:00 - 07:00	15 Mins	15/03/2022 24:40	ST1	56.9	82.8	38.4	50.4	42.4
	15 Mins	15/03/2022 00:01	ST2	46.2	65.9	37.0	48.2	42.1
	15 Mins	15/03/2022 23:00	ST3	45.7	58.1	34.7	48.8	40.5
	15 Mins	15/03/2022 23:20	ST4	43.7	54.5	38.6	45.6	41.1

All values are sound pressure levels in dB re: 2x 10^{-5} Pa

5.0 ASSESSMENT OF EFFECTS

NOISE INTRUSION ASSESSMENT

Internal noise levels within potential dwellings have been assessed both with windows open, where a reduction from a partially open window of 10 dB has been used, and with windows closed where an assumption of glazing and open trickle vents with specification R_w 30 dB (e.g 4/16/4mm double glazing or equivalent) has been used. The results presented in tables 5.1 & 5.2 below show the predicted noise intrusion levels across the site, with living room and bedroom glazing mitigation strategy outlined in Section 6. The Noise contour plots for the daytime L_{Aeq} scenario is shown illustratively on Figure 5.1.

Table 5.1 Residential Daytime (L_{Aeq}) Noise Intrusion

Location	External L_{Aeq} at 1m from Facade	Internal L_{Aeq} with Windows Open	Internal L_{Aeq} with Windows Closed	Criteria Internal L_{Aeq}
R01	59.1	49.1	32.1	35
R02	48.5	38.5	18.5	35
R03	39.0	29.0	9.0	35
R04	40.3	30.3	10.3	35
R05	37.2	27.2	7.2	35
R06	41.4	31.4	11.4	35
R07	47.2	37.2	17.2	35
R08	51.3	41.3	21.3	35
R09	48.3	38.3	18.3	35
R10	54.6	44.6	24.6	35
R11	61.3	51.3	31.3	35
R12	45.8	35.8	15.8	35
R13	61.2	51.2	31.2	35
R14	50.8	40.8	20.8	35
R15	53.7	43.7	23.7	35

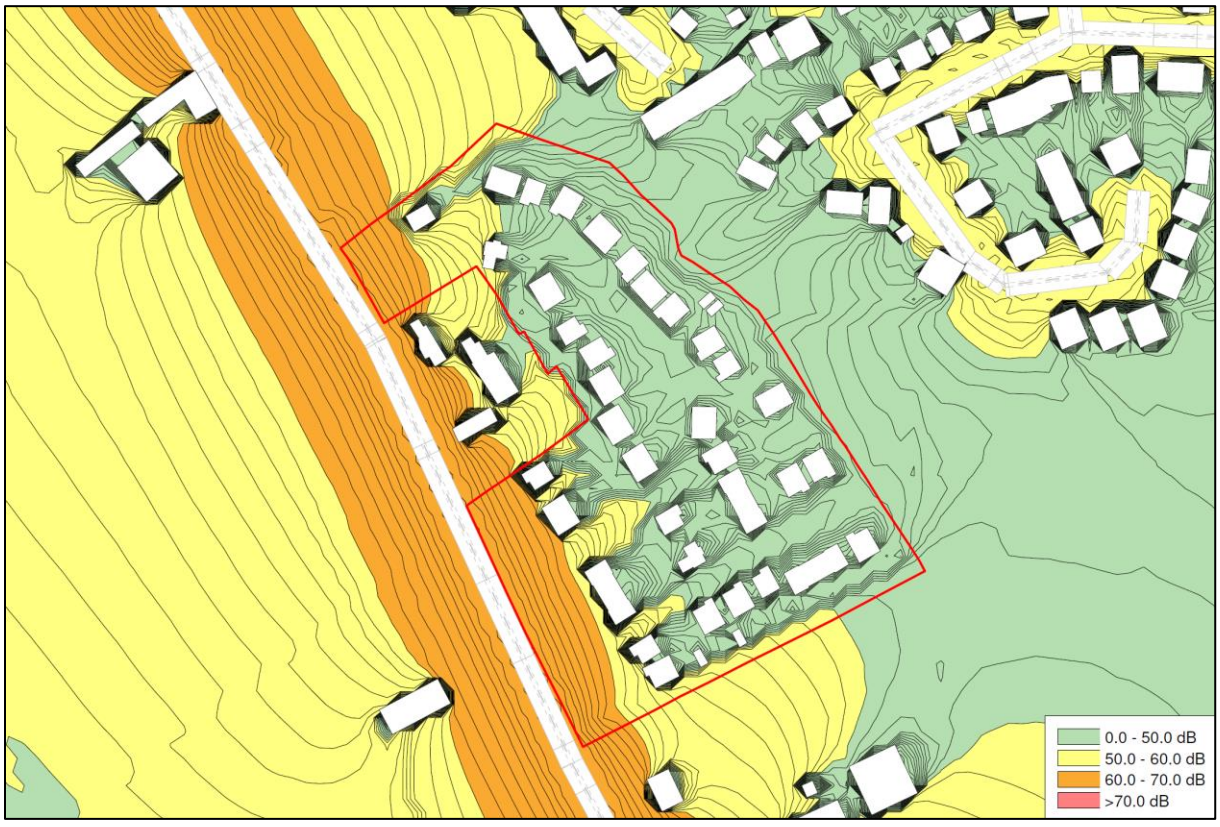
Table 5.2 Residential Night-Time (L_{Aeq}) Noise Intrusion

Location	External L_{Aeq} at 1m from Facade	Internal L_{Aeq} with Windows Open	Internal L_{Aeq} with Windows Closed	Criteria Internal L_{Aeq}
R01	54.5	44.5	24.5	30
R02	47.4	37.4	17.4	30
R03	32.9	22.9	2.9	30
R04	37.9	27.9	7.9	30
R05	30.8	20.8	0.8	30
R06	32.6	22.6	2.6	30
R07	42.7	32.7	12.7	30

R08	46.7	36.7	16.7	30
R09	44.0	34.0	14.0	30
R10	50.1	40.1	20.1	30
R11	57.3	47.3	27.3	30
R12	44.9	34.9	14.9	30
R13	56.4	46.4	26.4	30
R14	47.4	37.4	17.4	30
R15	49.6	39.6	19.6	30

The results presented above demonstrate that the BS 8233:2014 internal noise level targets are exceeded at a number of receptors with windows partially open during both the daytime and night-time periods. In order to achieve the recommended internal noise criteria, mitigation measures are outlined in Section 6.0 of this report.

Figure 5.1 Daytime Noise Contour Plot $L_{Aeq,16hour}$ (Grid Height 1.5m)



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Contour Plot at 1.5m height

EXTERNAL AMENITY AREAS

Predicted daytime noise levels within proposed garden areas are presented in Table 5.3. Predictions are made with intrinsic 1.8m garden walls/fences in place as outlined within Figure 3.3.

Table 5.3 External Daytime ($L_{Aeq,16hour}$) Noise Levels

Location	Height (m)	External L_{Aeq}	Criteria External L_{Aeq}
G01	1.5	49.1	55
G02	1.5	43.6	55
G03	1.5	39.6	55
G04	1.5	37.8	55
G05	1.5	41.7	55
G06	1.5	39.4	55
G07	1.5	43.9	55
G08	1.5	46.1	55
G09	1.5	45.3	55
G10	1.5	44.4	55
G11	1.5	47.6	55
G12	1.5	46.4	55
G13	1.5	45.7	55

As demonstrated in the table above, noise limits for external amenity areas outlined in BS 8233 are met across the site with intrinsic 1.8m garden walls/fences in place, and no further measures are required.

6.0 MITIGATION

Internal daytime and night-time noise level targets outlined in Condition 26 are met across the site with windows closed, therefore glazing with a sound reduction of R_w 30 will be acceptable at all locations. Where internal noise criteria cannot be met with windows partially open, alternative ventilation will be required. Ventilation can be provided in several ways from acoustic trickle vents (which need to have a minimum sound reduction equal to or greater than the glazing), other passive ventilation systems or mechanical ventilations systems.

A mitigation strategy outlining the required locations of alternative ventilation for living rooms and bedrooms is outlined in Figures 6.1 and 6.2 below.

Figure 6.1 Mitigation Strategy- Living Rooms



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Figure 6.2 Mitigation Strategy- Bedrooms



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With the ventilation strategy implemented as outlined in Figures 6.1 and 6.2, noise levels within living rooms and bedrooms are predicted to fall below 40dB(A) and 30dB(A) during the daytime and night-time respectively, and therefore below the Lowest Observed Adverse Effect Level (LOAEL).

7.0 CONCLUSIONS OF NOISE ASSESSMENT

This report presents the findings of a noise assessment undertaken for a residential development on land adjacent to Daisy Bank Farm, Uttoxeter. Measurements of the existing ambient noise climate have been undertaken and mitigation measures proposed to demonstrate compliance with the requirements of Condition 26 of outline planning permission reference SMD/2799/MOUT.

Glazing with a sound reduction of R_w 30 will be provided at all sensitive locations across the site. Where internal noise criteria cannot be met with windows partially open, alternative ventilation with a minimum sound reduction equal to or greater than the glazing will be required. With the outlined ventilation strategy in place, it is predicted that internal noise criteria of 40dB L_{Aeq} in Living Rooms and 35dB L_{Aeq} in Bedrooms will be achieved with windows both open and closed.

Inclusive of intrinsic 1.8m garden walls & solid fences, external noise criteria of 55dB L_{Aeq} are predicted to be met, and no further mitigation is proposed.

Therefore, internal and external noise levels across the site are predicted to meet the relevant noise criteria with the mitigation measures specified and it is considered that the requirements of Condition 26 are met.

APPENDICES

APPENDIX A – ACOUSTIC TERMINOLOGY AND ABBREVIATIONS

An explanation of the specific acoustic terminology referred to within this report is provided below.

dB — Sound levels from any source can be measured in frequency bands in order to provide detailed information about the spectral content of the noise, i.e. whether it is high-pitched, low-pitched, or with no distinct tonal character. These measurements are usually undertaken in octave or third octave frequency bands. If these values are summed logarithmically, a single dB figure is obtained. This is usually not very helpful as it simply describes the total amount of acoustic energy measured and does not take any account of the ear's ability to hear certain frequencies more readily than others.

dB(A) — Instead, the dBA figure is used, as this is found to relate better to the loudness of the sound heard. The dBA figure is obtained by subtracting an appropriate correction, which represents the variation in the ear's ability to hear different frequencies, from the individual octave or third octave band values, before summing them logarithmically. As a result, the single dBA value provides a good representation of how loud a sound is.

L_{Aeq} — Since almost all sounds vary or fluctuate with time it is helpful, instead of having an instantaneous value to describe the noise event, to have an average of the total acoustic energy experienced over its duration. The $L_{Aeq,\ 07:00 - 23:00}$ for example, describes the equivalent continuous noise level over the 18-hour period between 7 am and 11 pm. During this time period the L_{pA} at any particular time is likely to have been either greater or lower that the $L_{Aeq,\ 07:00 - 23:00}$.

L_{Amin} — The L_{Amin} is the quietest instantaneous noise level. This is usually the quietest 125 milliseconds measured during any given period of time.

L_{Amax} — The L_{Amax} is the loudest instantaneous noise level. This is usually the loudest 125 milliseconds measured during any given period of time.

L_n — Another method of describing, with a single value, a noise level which varies over a given time period is, instead of considering the average amount of acoustic energy, to consider the length of time for which a particular noise level is exceeded. If a level of x dBA is exceeded for say. 6 minutes within one hour, then that level can be described as being exceeded for 10% of the total measurement period. This is denoted as the $L_{A10,\ 1\ hr}$ = x dB.

The L_{A10} index is often used in the description of road traffic noise, whilst the L_{A90}, the noise level exceeded for 90% of the measurement period, is the usual descriptor for underlying background noise. L_{A1} and L_{Amax} are common descriptors of construction noise.

R_w The *weighted sound reduction index* determined using the above *measurement* procedure, but weighted in accordance with the procedures set down in BS EN ISO 717-1. Partitioning and building board manufacturers commonly use this index to describe the inherent sound insulation performance of their products.

An explanation of abbreviations used within this report is provided below.

CADNA – Computer Aided Noise Abatement
DMRB – Design Manual for Roads and Bridges
HGV – Heavy Goods Vehicle
UDP – Unitary Development Plan
UKAS – United Kingdom Accreditation Service

APPENDIX B – REPORT CONDITIONS

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