

NOISE ASSESSMENT

on behalf of

EDGEFOLD HOMES LIMITED

for the site at

LAND OFF UTTOXETER ROAD, TEAN

REPORT DATE: 02 MAY 2023

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Summary

A noise assessment was undertaken in connection with a planning application to predict the potential impact of the existing sound environment on the proposed development consisting of 30 residential dwellings at Land off Uttoxeter Road, Tean.

The main source of existing noise affecting the site is road traffic from Uttoxeter Road. Future noise at the site will include existing road traffic.

The results of noise surveys carried out at the site have been used to calculate and predict the impact of the existing noise climate on the amenity of the future dwellings at the site. The assessment has found that for dwellings most exposed to noise from Uttoxeter Road, a higher performing specification in terms of sound insulation is required to achieve suitable internal noise limit criteria than across the rest of the site.

It was found that road traffic noise would be below $L_{Aeq,16hour}$ 55dB during the daytime in all proposed gardens. The majority of proposed gardens will experience daytime sound levels lower than 50dB.

A noise model has been assembled for the proposed development site, the results from which are provided within this report.

Record of changes

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Reviewed By: Michael Rickard MIOA

Signed:



Signed:



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1 Introduction

- 1.1 Miller Goodall Ltd has, on behalf of Edgefold Homes Limited, undertaken a noise assessment in respect of the impact of noise from road traffic on a proposed residential development for 30 dwellings at Uttoxeter Road, Tean, Stoke-on-Trent.

2 Site Description

- 2.1 The site is located at Land off Uttoxeter Road, Tean. The site location is shown outlined in red on plan *ref '20-049-1000A Location Plan'*, shown in Appendix 1.
- 2.2 The site is located to the southwest of the A522 Uttoxeter Road, which is the dominant noise source affecting the proposed development site. Topographically, the site is generally level with Uttoxeter Road across the site.
- 2.3 To the south is a farm property and fields, with fields and the River Tean located to the west. To the north of the site are residential properties fronting onto Uttoxeter Road, Hall Yard and Riverside Crescent. Uttoxeter Road runs adjacent to the site along its east boundary.

3 Proposed Development

- 3.1 The proposal is to develop a greenfield site for residential use involving the erection of 30 dwellings. Road access to the development site is located on Uttoxeter Road. The proposed site plan for the development is shown in drawing *ref 20-049-A-1001-D Proposed Site Plan* provided by Bowker Sadler Architecture.

4 Policy Context

4.1 Noise Policy Statement for England

- 4.1.1 The Noise Policy Statement for England (NPSE¹), published in March 2010, sets out the long-term vision of Government noise policy. The Noise Policy aims, as presented in this document, are:

“Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

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

- 4.1.2 The NPSE makes reference to the concepts of NOEL (No Observed Effect Level) and LOAEL (Lowest Observed Adverse Effect Level) as used in toxicology but applied to noise impacts. It also introduces the concept of SOAEL (Significant Observed Adverse Effect Level) which is described as the level above which significant adverse effects on health and the quality of life occur.

¹ Noise Policy Statement for England, Defra, March 2010

- 4.1.3 The first aim of the NPSE is to avoid significant adverse effects, taking into account the guiding principles of sustainable development (as referenced in Section 1.8 of the Statement). The second aim seeks to provide guidance on the situation that exists when the potential noise impact falls between the LOAEL and the SOAEL, in which case:

“...all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development”.

- 4.1.4 Importantly, the NPSE goes on to state:

“This does not mean that such adverse effects cannot occur”.

- 4.1.5 The Statement does not provide a noise-based measure to define SOAEL, acknowledging that the SOAEL is likely to vary depending on the noise source, the receptor and the time in question. NPSE advises that:

“Not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available”

- 4.1.6 It is therefore likely that other guidance will need to be referenced when applying objective standards for the assessment of noise, particularly in reference to the SOAEL, whilst also taking into account the specific circumstances of a proposed development.

4.2 National Planning Policy Framework

- 4.2.1 The National Planning Policy Framework (NPPF²) initially published in March 2012, was updated in July 2021. One of the documents that the NPPF replaces is Planning Policy Guidance Note 24 (PPG 24) “Planning and Noise”³.

- 4.2.2 The revised NPPF advises that the planning system has three overarching objectives, which are interdependent and need to be pursued in mutually supportive ways (so that opportunities can be taken to secure net gains across each of the different objectives). One of these is an environmental objective which is described in par. 8 (c):

“to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.”

- 4.2.3 At par. 174 we are advised that:

“Planning policies and decisions should contribute to and enhance the natural and local environment by:

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability.

² National Planning Policy Framework, Ministry of Housing, Communities and Local Government, July 2021

³ Planning Policy Guidance 24: Planning and Noise, DCLG, September 1994

Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans.”

4.2.4 Par. 185 goes on to state:

“Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;

b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.”

4.2.5 Par. 187 seeks to ensure that any development does not prejudice the legally permitted operations and activities of other, existing non-residential uses, stating:

“Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or ‘agent of change’) should be required to provide suitable mitigation before the development has been completed.”

4.3 Planning Practice Guidance – Noise

4.3.1 As of March 2014, a Planning Practice Guidance⁴ for noise was issued which provides additional guidance and elaboration on the NPPF, the guidance was updated in July 2019. It advises that when plan-making and decision-taking, the Local Planning Authority should consider the acoustic environment in relation to:

- Whether or not a significant adverse effect is occurring or likely to occur;
- Whether or not an adverse effect is occurring or likely to occur; and
- Whether or not a good standard of amenity can be achieved.

4.3.2 In line with the Explanatory Note of the NPSE, the PPG goes on to reference the LOAEL and SOAEL in relation to noise impact. It also provides examples of outcomes that could be expected for a given perception level of noise, plus actions that may be required to bring about a desired outcome. However, in line with the NPSE, no objective noise levels are provided for LOAEL or SOAEL although the PPG acknowledges that:

“...the subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any particular situation”.

⁴ Planning Practice Guidance – Noise, <https://www.gov.uk/guidance/noise--2> 22nd July 2019.

4.3.3 Examples of these factors include:

- The source and absolute noise level of the source along with the time of day that it occurs;
- Where the noise is non-continuous, the number of noise events and pattern of occurrence;
- The frequency content and acoustic characteristics of the noise;
- The effect of noise on wildlife;
- The acoustic environment of external amenity areas provided as an intrinsic part of the overall design;
- The impact of noise from certain commercial developments such as night clubs and pubs where activities are often at their peak during the evening and night.

4.3.4 The PPG also provides general advice on the typical options available for mitigating noise. It goes on to suggest that Local Plans may include noise standards applicable to proposed developments within the Local Authority's administrative boundary, although it states that:

"Care should be taken, however, to avoid these being implemented as fixed thresholds as specific circumstances may justify some variation being allowed".

4.3.5 The PPG was amended in December 2014 to clarify guidance on the potential effect of noise from existing businesses on proposed new residential accommodation. Even if existing noise levels are intermittent (for example, from a live music venue), noise will need to be carefully considered and appropriate mitigation measures employed to control noise at the proposed accommodation.

4.4 Local Planning Policy

4.4.1 There does not appear to be planning policy specifically regarding the safeguarding of new residential developments from existing noise sources in the Staffordshire Moorlands District Council Local Plan or Supplementary Planning Documents, however Staffordshire Moorlands District Council has been consulted directly on the measurement and assessment methodology.

4.5 Local Authority Consultation

4.5.1 Environmental Health at Staffordshire Moorlands District Council (SMDC) were consulted in respect of the methodology used in this assessment⁵. It was agreed by Mr Denis Colgan, Specialist Pollution Officer for SMDC and High Peak Borough Council, that modelled sound levels based on measurements of Uttoxeter Road will be acceptable in predicting the noise impact on the proposed development. The monitoring location chosen for the survey will include noise Uttoxeter Road. Comparison against criteria in BS8233:2014, ProPG and WHO GCN was also agreed as being in line with the Local Authorities normal advice.

⁵ Email to EHealth.consultation@highpeak.gov.uk on 27th March 2023

5 Acoustic Standards and Guidance

5.1 ProPG: Planning & Noise – Professional Practice Guidance on Planning & Noise – New Residential Development – May 2017

5.1.1 ProPG: Planning and Noise is new guidance with the aim of delivering sustainable development and promoting good health and well-being through the effective management of noise which may impact on new residential developments. The guidance aims to complement the national planning policy and encourages the use of good acoustic design at the earliest phase of the planning process. It builds upon the recommendations of various other guidance documents including NPPF, NPSE and PPG-Noise, BS 8233 and WHO.

5.1.2 The guidance is applicable to new residential developments which would be exposed predominantly to noise from existing transport sources. The ProPG advocates a risk based approach to noise using a two-stage process:

- Stage 1 – an initial noise risk assessment of the proposed development site; and
- Stage 2 – a systematic consideration of four key elements: –
 - Element 1 – demonstrating a ‘Good Acoustic Design Process’;
 - Element 2 – observing internal ‘Noise Level Guidelines’;
 - Element 3 – undertaking an ‘External Amenity Area Noise Assessment’; and
 - Element 4 – consideration of ‘Other Relevant Issues’.

5.1.3 The ProPG approach is underpinned by the preparation and delivery of an ‘Acoustic Design Statement’ (ADS), whereby the higher the risk for noise at the site, the more detailed the ADS. The ADS should address the following issues:

- Present the initial site noise risk assessment, including the pre-development acoustic conditions prior to development;
- Describe the external noise levels that occur across the site both before and after any necessary mitigation measures have been incorporated. The external noise assessment with mitigation measures in place should use an informed judgement of typical worst-case conditions;
- Demonstrate how good acoustic design is integrated into the overall design and how the proposed acoustic design responds to specific circumstances of the site;
- Confirm how the internal noise level guidelines will be achieved, including full details of the design measures and building envelope specifications;
- A detailed assessment of the potential impact on occupants should be undertaken where individual noise events are expected to exceed 45 dB $L_{AF,max}$ more than 10 times a night inside bedrooms;

- Priority should be given to enable the use of openable windows where practical across the development. Where this is not practical to achieve the internal noise level guidelines with windows open, then full details of the proposed ventilation and thermal comfort arrangements must be provided;
- Present the findings of the external amenity area noise assessment;
- Present the findings of the assessment of other relevant issues;
- Confirm for a low risk site how adverse impacts of noise will be mitigated and minimised;
- Confirm for a medium or high noise risk site how adverse impacts of noise will be mitigated and minimised and clearly demonstrate that a significant adverse noise impact has been avoided.

5.1.4 ProPG target noise levels are based on existing guidance from BS 8233 and WHO (see below). Table 1 below outlines the guidance noise levels for different room types during day and night times.

Table 1: ProPG guideline indoor ambient noise levels for dwellings

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Room	35 dB $L_{Aeq,16hr}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16hr}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hr}$	30 dB $L_{Aeq,8hr}$ 45 dB $L_{Amax,F}$

5.1.5 The footnotes to this table suggest that internal noise level limits can be relaxed by up to 5 dB where development is considered necessary or desirable, and still represent “reasonable” internal conditions. They also suggest that in such cases, external levels which exceed WHO guidance target levels (see WHO section below) may still be acceptable provided that reasonable internal noise levels are achieved. Although, where the acoustic environment of external amenity areas is intrinsic to the overall design, “noise levels should ideally not be above the range 50 – 55 dB $L_{Aeq,16hr}$ ”. The wording of ProPG (and BS 8233:2014) is clear that exceedance of guideline noise levels in external areas should not prohibit the development of desirable developments in any event.

5.2 BS 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings

- 5.2.1 This standard carries the full weight of an adopted British Standard, provides recommended guideline acoustic design criteria for new dwellings and is supported by guidance contained within WHO GCN⁶. The guideline noise design criteria of BS 8233 apply to external noise “without a specific character” (previously and sometimes termed or referred to as “anonymous noise”) such as that associated with road and rail traffic.

Internal Amenity

- 5.2.2 The Standard states that for external noise without a specific character, such as road traffic, it is desirable that the internal ambient noise level does not exceed the guideline values shown in Table 2, below.
- 5.2.3 The note to paragraph 7.7.1 states that where noise has a specific character (i.e. it contains features such as a distinguishable, discrete and continuous tone, is irregular enough to attract attention, or has strong low-frequency content) “lower noise limits might be appropriate”.

Table 2: BS 8233: 2014 guideline indoor ambient noise levels for dwellings

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

- 5.2.4 Note 7 to Table 4 of BS 8233 states:

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

- 5.2.5 Guidance on reasonable acoustic design criteria for individual noise events are also provided, and the Standard advises that:

“regular individual noise events...can cause sleep disturbance. A guideline value may be set in terms of SEL^7 or $L_{Amax,F}$ depending on the character and number of events per night. Sporadic noise events could require separate values”.

⁶ World Health Organisation Guidelines for Community Noise, 1999

⁷ Sound exposure level or L_{AE}

5.2.6 For Internal spaces, the Standard states that;

“..to avoid sleep disturbance, sound pressure levels at the outside facades of living spaces should not exceed 45 dB L_{Aeq} (taken as a façade level, and equating to a free-field external level of 42 dB L_{Aeq}) and 60 dB L_{AFmax} so that people may sleep with bedroom windows open.”

External Amenity

5.2.7 BS 8233:2014 adopts guideline external noise values provided in WHO for external amenity areas such as gardens, patios and private outdoor amenity spaces. BS 8233:2014 adopts guideline external noise level limits provided in WHO for external amenity areas such as gardens and patios. The standard states that it is “desirable” that the external noise does not exceed 50 dB $L_{Aeq,16hr}$ with an upper guideline value of 55 dB $L_{Aeq,16hr}$ whilst recognising in paragraph 7.7.3.2 that development in higher noise areas, such as urban areas or those close to the transport network, may require a compromise between elevated noise levels (i.e., above 55 dB $L_{Aeq,16hr}$) and other factors that determine if development in such areas is warranted. In such circumstances, the development should be designed to achieve the lowest practicable noise levels in external amenity areas, but should not be prohibited.

5.2.8 The standard also states:

“Other locations, such as balconies, roof gardens and terraces, are also important in residential buildings where normal external amenity space might be limited or not available, i.e. in flats, apartment blocks, etc. In these locations, specification of noise limits is not necessarily appropriate. Small balconies may be included for uses such as drying washing or growing pot plants, and noise limits should not be necessary for these uses. However, the general guidance on noise in amenity space is still appropriate for larger balconies, roof gardens and terraces, which might be intended to be used for relaxation. In high-noise areas, consideration should be given to protecting these areas by screening or building design to achieve the lowest practicable levels. Achieving levels of 55 dB $L_{Aeq,T}$ or less might not be possible at the outer edge of these areas, but should be achievable in some areas of the space.”

5.3 World Health Organisation (WHO) Guidelines for Community Noise 1999

5.3.1 The WHO Guidelines 1999 recommends that to avoid sleep disturbance, indoor night-time guideline noise values of 30 dB L_{Aeq} for continuous noise and 45 dB L_{AFmax} for individual noise events should be applicable. It is to be noted that the WHO Night Noise Guidelines for Europe 2009⁸ makes reference to research that indicates sleep disturbance from noise events at indoor levels as low as 42 dB L_{AFmax} . The number of individual noise events should also be taken into account and the WHO guidelines suggest that indoor noise levels from such events should not exceed approximately 45 dB L_{AFmax} more than 10 – 15 times per night.

5.3.2 The WHO document recommends that steady, continuous noise levels should not exceed 55 dB L_{Aeq} on balconies, terraces and outdoor living areas. It goes on to state that to protect the majority of individuals from moderate annoyance, external noise levels should not exceed 50 dB L_{Aeq} .

⁸ WHO Night Noise Guidelines for Europe 2009

6 Noise Survey

6.1 Measurements of Existing Noise Sources

6.1.1 Noise measurements were undertaken at the proposed development site in accordance with BS 7445-1: 2003⁹ by William Wright of Miller Goodall Ltd. The calibration of the sound level meter was checked before and after measurements with negligible deviation (<0.1 dB). Details of the equipment used are shown in Table 3 below.

Table 3: Noise monitoring equipment

Equipment Description	Type Number	Manufacturer	Serial No.	Date Calibrated	Calibration Certification Number
Class 1 ^{10,11} Integrating Real Time 1/3 Octave Sound Analyser	NOR 140	Norsonic	1407510	15/12/2022	05552/1
Microphone	NOR 1225	Norsonic	384687	15/12/2022	05552/1
Class 1 Calibrator ¹²	4231	B&K	2478249	13/10/2022	05925/1
Outdoor microphone housing	NOR 1217	Norsonic	12175738	N/A	N/A

6.1.2 Noise monitoring was undertaken between 11:00 hours on 3rd April 2023 and 11:00 hours on 4th April 2023. Weather conditions were determined both at the start and on completion of the survey as detailed in Table 4. It is considered that meteorological conditions were appropriate for environmental noise measurements.

6.1.3 The measurement location is detailed below and indicated in Appendix 2.

- MP1: Approximately 6m southwest of the edge of Uttoxeter Road's closest lane, along the northeast boundary of the proposed development site as shown in Appendix 2 of this report.

⁹ BS 7445-1: 2003 Description and measurement of environmental noise - Part 1: Guide to quantities and procedures

¹⁰ IEC 61672-1 (2002) Electroacoustics – Sound level meters Part 1: Specifications

¹¹ IEC 61260 (1995) Electroacoustics – Octave-band and fractional-octave-band filters

¹² IEC 60942 (2003) Electroacoustics – Sound calibrators

Table 4: Dates, times and weather conditions during noise measurements

Measurement Locations	Date/Time	Weather conditions		
		Description	At Start of Survey	On Completion
MP1	03/04/23, 11:00 to 04/04/23, 11:00	Temperature:	10 °C	11 °C
		Precipitation:	Dry	Dry
		Cloud cover (oktas – see opposite):	3	1
		Any fog/snow/ice?	No	No
		Any damp roads/wet ground?	No	No
		Wind speed:	4.5 m/s	2.5 m/s
		Wind direction:	Predominantly North and West	
		Any conditions that may cause temp. inversion (e.g. calm nights with no cloud):	No	No

Cloud Cover	
Symbol	Scale in oktas (eighths)
	0 Sky completely clear
	1
	2
	3
	4 Sky half cloudy
	5
	6
	7
	8 Sky completely cloudy
	(9) Sky obstructed from view

- 6.1.4 Measurements were taken at times considered to be representative of the periods during which the proposed residential dwellings would be subject to the highest levels of ambient noise. Measurements were made under free-field conditions at a height of 1.5 m above the ground.
- 6.1.5 We understand that for the duration of the survey traffic conditions were normal, and were not affected by events disruptive to the ambient acoustic environment (e.g. road closures, roadworks, temporary speed limits, route diversions, etc.).
- 6.1.6 The noise sources within the vicinity of the measurement locations are summarised in Table 5 below:

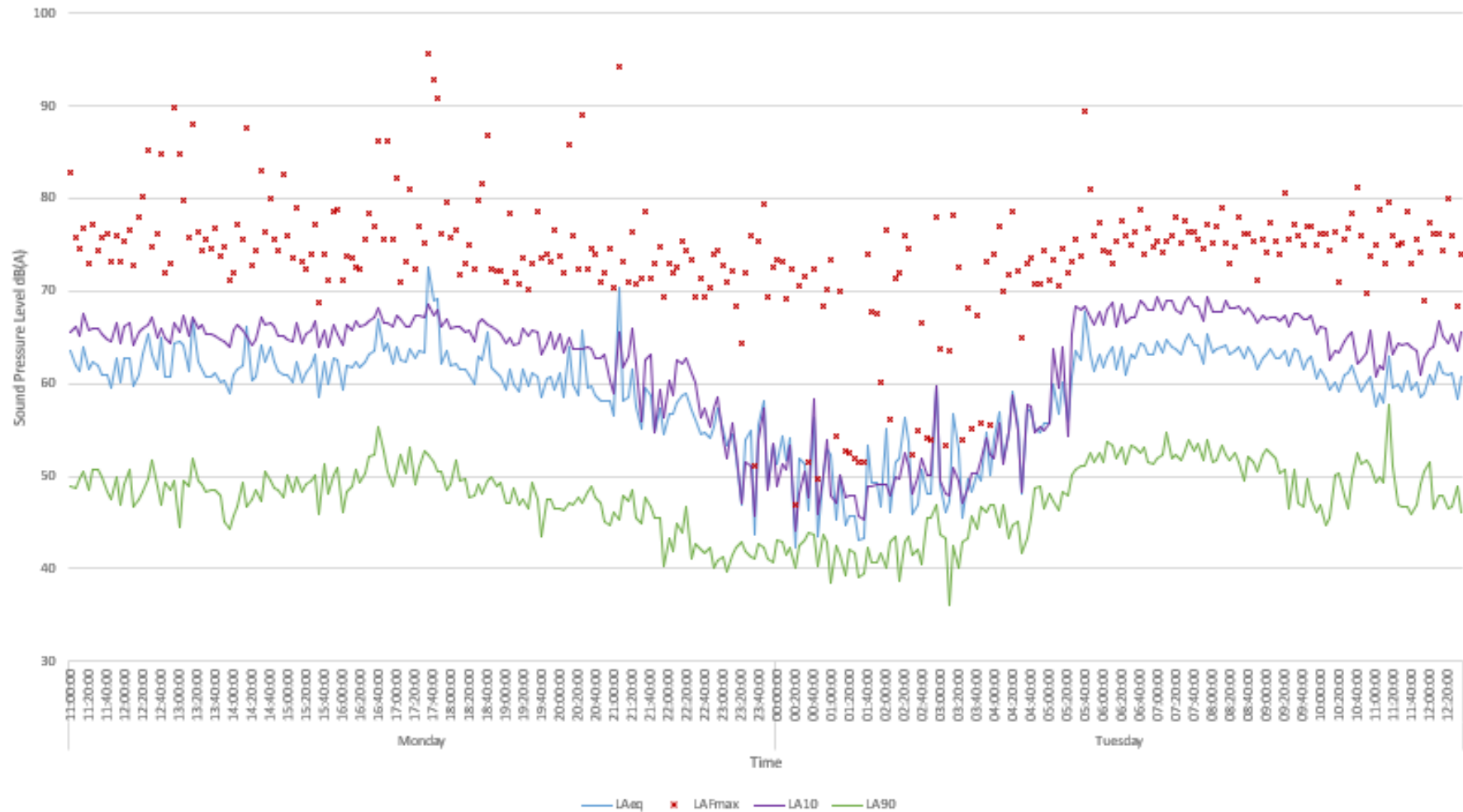
Table 5: Description of noise sources affecting the site

Measurement Location	Noise Sources
MP1	Road traffic noise from Uttoxeter Road

6.2 Monitoring Results

- 6.2.1 A summary of the broadband measurement data is shown graphically in Chart 1 below. The full survey dataset is not presented in this report, however this is held on file and available on request. All data are sound pressure levels in dB re 20 μ Pa.

Chart 1: Noise Monitoring Results at MP1



6.3 Worst-Case Measured Night-Time L_{AFmax} Levels

- 6.3.1 Night-Time L_{AFmax} levels measured during the night-time were typically between 45.4dB and 89.5dB.
- 6.3.2 The 11th highest L_{AFmax} sound level which will be carried forward for the assessment was measured to be 77.4dB and based on the frequency spectrum data was most likely from a vehicle pass on Uttoxeter Road.

7 Impact of Existing Noise Sources on the Development

7.1 Computer Modelling

- 7.1.1 Predictions of existing noise levels on the site have been undertaken using the CadnaA noise modelling package. Specific model parameters were applied as follows:
- Propagation of noise using algorithms within ISO 9613: 1993 *Acoustics - Attenuation of sound during propagation outdoors*. Roads were modelled as line sources at a height of 0.5 m above ground level and calibrated using spectral data measured during the survey.
 - Default ground absorption $G = 0.6$ (equivalent to a mix of tarmacked and grassed areas and consistent with the dominant ground cover at the site).
 - Ground attenuation: spectral all sources
 - No adverse meteorological effects
 - Two orders of reflection
 - Topography for the surrounding area was modelled using 1m DEFRA Lidar survey data for the site. The topography of the proposed development site was modelled based on the development proposals at the time of this report.

7.2 Validation of the Noise Model

- 7.2.1 A noise level receptor point was incorporated into the CadnaA model at the noise survey measurement location to calibrate the model using the measured octave band L_{eq} and L_{Fmax} noise levels.
- 7.2.2 $L_{Aeq,16hour}$ (day) and $L_{Aeq,8hour}$ (night) scenarios were modelled using line sources for Uttoxeter Road.
- 7.2.3 The $L_{Aeq,16hour}$ (day) and $L_{Aeq,8hour}$ (night) spectra were determined by calibration within the model. The night-time L_{AFmax} spectra were derived from the data by adjusting the 90th percentile octave band spectrum of the night-time data to match the 11th highest broadband $L_{AFmax,1min}$ level during the night-time. L_{AFmax} events within the model were modelled as point sources and located at worst-case locations in relation to the proposed development site.

7.2.4 The resultant L_w Sound Power spectra are shown in Table 6 below.

Table 6: L_w Sound Power Level Spectra within the Noise Model (dB)

Measurement Descriptor	Sound Power Level, dB								dB(A)
	in Octave Band Centre Frequency, Hz (linear spectra)								
	63	125	250	500	1k	2k	4k	8k	
MP1 $L_{Aeq,16hour}$ (day)	80.3	79.0	78.5	75.0	74.2	68.5	60.3	53.3	78.1
MP1 $L_{Aeq,8hour}$ (night)	73.9	72.6	70.5	69.7	70.0	64.8	54.9	46.8	73.2
MP1 $L_{AFmax,T}$ (night)	109.8	107.2	105.0	103.2	102.3	97.5	90.1	83.8	106.2

7.3 Noise Model Predictions

7.3.1 Three scenarios were modelled using the indicative master plan provided:

- daytime L_{Aeq} noise levels
- night-time L_{Aeq} noise levels, and
- night-time L_{AFmax} noise levels.

7.3.2 A screen shot of the L_{eq} models is provided in Appendix 3.

7.4 Predicted Internal Noise Levels Assessed to ProPG Guidance Levels

7.4.1 Based on ProPG guidance levels, it is proposed that noise from the development is controlled to 30 dB L_{Aeq} in bedrooms at night and 35 dB L_{Aeq} in habitable rooms during the day, and that noise from individual events such as vehicle pass-bys does not regularly exceed an indoor level of 45 dB L_{AFmax} .

7.4.2 The generally accepted rule of thumb is that a window left open for ventilation provides 10 - 15 dB attenuation from external noise sources with the WHO Guidelines for Community Noise suggesting 15 dB. The DEFRA report NANR116: Open/Closed Window Research¹³ suggests the figure to be between 12 and 18 dB for road and rail traffic. ProPG indicates that where external noise levels are more than 15 dB higher than the internal noise targets, openable windows should not be relied upon as the sole means of ventilation and some form of acoustically attenuated ventilation may be required. This equates to an external noise level of 45 dB L_{Aeq} / 60 dB L_{Amax} during the night or 50 dB L_{Aeq} during the day.

¹³ NANR116: 'Open/closed window research' Sound Insulation through ventilated open windows, Defra April 2007

7.4.3 Internal noise levels have been predicted based on room dimensions and glazing areas shown in drawings *ref 1111 Plot 7 – Plans* and *1112 Plot 7 - Elevations* provided by Bowker Sadler Architecture and assume an internal reverberation time of 0.5 seconds.

7.4.4 Proposed external walls are assumed to be typical brick and block. As the weakest elements of the façade sound insulation are the glazing and ventilation, slight variations in wall detail from the assumed are unlikely to cause a significant difference to the resulting overall performance.

7.5 Mitigation for Achieving Good Acoustic Design – Glazing and Ventilation

7.5.1 Appendix 4 shows the recommendation glazing and background ventilator specification to be applied to each facade to achieve the internal targets in BS 8233:2014 and ProPG:2017, as identified in Table 7.

Table 7: Predicted internal noise levels

Description	External Noise Levels		Predicted Internal Noise Levels		BS 8233 Criteria		Exceedance of Criteria		Proposed Glazing and Ventilation
	dB $L_{Aeq,T}$	dB L_{AFmax}	dB $L_{Aeq,T}$	dB L_{AFmax}	dB $L_{Aeq,T}$	dB L_{AFmax}	dB $L_{Aeq,T}$	dB L_{AFmax}	
Worst affected Plots Bedrooms (night-time)	58	77	24	45	30	45	-6	0	Option 1
Worst Affected living rooms/dining kitchens (daytime)	63	N/a	31	N/a	35	N/a	-4	N/a	Option 2
Next worst affected Plots Bedrooms (night-time)	56	64	29	38	30	45	-1	-7	Option 3
Next worst affected Plots living rooms/dining kitchens (daytime)	55	N/a	30	N/a	35	N/a	-5	N/a	Option 3

7.5.2 Appendix 4A relates to living areas affected by $L_{Aeq,16hour}$ during the daytime.

- Option 2: 33 dB $R_w + C_{tr}$ glazing and 38 dB $D_{ne,w}$ vent
- Option 3: 27 dB $R_w + C_{tr}$ glazing and 33 dB $D_{ne,w}$ vent

7.5.3 Appendix 4B relates to bedroom areas affected by $L_{Aeq,8hour}$ and L_{AFmax} events during the night-time. The L_{AFmax} events modelled occur at various positions along Uttoxeter Road, and could occur at any point along Uttoxeter Road.

- Option 1: 38 dB $R_w + C_{tr}$ glazing and 44 dB $D_{ne,w}$ vent
- Option 3: 27 dB $R_w + C_{tr}$ glazing and 38 dB $D_{ne,w}$ vent

7.5.4 Table 8 and Table 9 presents the octave band sound reduction performance of each of the recommendations made in Appendix 4. Where glazing and ventilation is selected to achieve the broadband R_w and $D_{ne,w}$ figure these should be checked against the requirements of Table 8 and Table 9 to ensure that the octave-band performance is achieved.

7.5.5 Background ventilation is to be supplied via passive acoustic window trickle vents. All calculations have assumed window trickle vents are in the open position and that a single ventilator is required per room for achieving the required ventilation rate.

Table 8: Minimum sound reduction indices of glazing at worst-case façade

Option No.	Example Glazing Configuration	Sound Reduction Index, dB R_w in Octave Band Centre Frequency, Hz								R_w	C_{tr}	$R_w + C_{tr}$
		63	125	250	500	1k	2k	4k	8k			
1	10/12/6 Acoustic Laminate	24	30	33	42	41	42	56	56	42	-4	38
2	10/12/6	20	26	27	34	40	38	46	46	37	-4	33
3	4/12/4	18	24	20	25	35	38	35	35	31	-4	27

Table 9: Minimum element normalised level difference of trickle ventilator at worst-case façade

Option No.	Ventilator Type	Element Normalised Level Difference D_{ne} dB in Octave Band Centre Frequency, Hz								$D_{ne,w}$	C_{tr}	$D_{ne,w} + C_{tr}$
		63	125	250	500	1k	2k	4k	8k			
1	Acoustic rated trickle vent	29	33	40	45	56	67	75	69	50	-6	44
2	Acoustic rated trickle vent	27	31	33	42	43	39	44	44	41	-3	38
3	Acoustic rated trickle vent	34	38	35	34	31	34	37	42	34	-1	33

7.5.6 Visual indication of which options apply to which façades is given in Appendix 4

7.6 Bedroom Ceilings

7.6.1 Bedroom ceilings in those plots identified as requiring enhanced glazing and ventilation options as described above, are recommended to be of sound insulation performance no less than the following described detail. Tiles on felt, pitched roof with 100mm mineral wool insulation on plasterboard ceiling consisting of 1No. layer of 12.5mm plasterboard.

7.7 External Noise Levels

7.7.1 The noise modelling demonstrates that, with 1.8m high garden fences located as proposed, no gardens will experience daytime sound levels in excess of 55dB(A), the upper limit for serious annoyance described in WHO GCN.

7.7.2 The majority of proposed gardens will experience daytime sound levels lower than 50dB(A), the limit for moderate annoyance described in WHO GCN.

7.7.3 Internal barriers for all gardens are required to be no less than 1.8m high. The garden fences are to be constructed from continuous, imperforate material with a minimum mass of 12 kg/m². Close-boarded or overlapped timber panelling would be suitable in this regard; hit-and-miss fencing would not.

7.8 Consideration of Other Discipline Requirements

- 7.8.1 It is recommended that you confirm the suitability of all recommended noise mitigation measures with your architects, structural engineers, building contractors, fire consultants and material manufacturers prior to procurement and field application so that when the recommended noise control measures are implemented on site they will satisfy the requirements of all disciplines, therefore, should not cause any health and safety issues.

8 Conclusions

- 8.1 A noise assessment was undertaken to predict the impact of noise on a proposed residential development consisting of 30 residential units off Uttoxeter Road, Tean.
- 8.2 Noise measurements were undertaken at the proposed development site, the results of which were used to calibrate a CadnaA noise model of the site. The noise modelling results were used to identify a glazing and ventilation strategy sufficient to achieve ProPG:2017 and BS 8233:2014 criteria for internal noise levels to be achieved throughout the site.
- 8.3 The modelling results also identified that all proposed gardens will experience daytime sound levels below 55dB(A), with the majority of proposed gardens experiencing below 50dB(A). All internal barriers between gardens must be no less than 1.8m high and can be standard solid timber fencing.
- 8.4 With the incorporation of the mitigation outlined in this report, the site would be suitable for development in terms of noise.

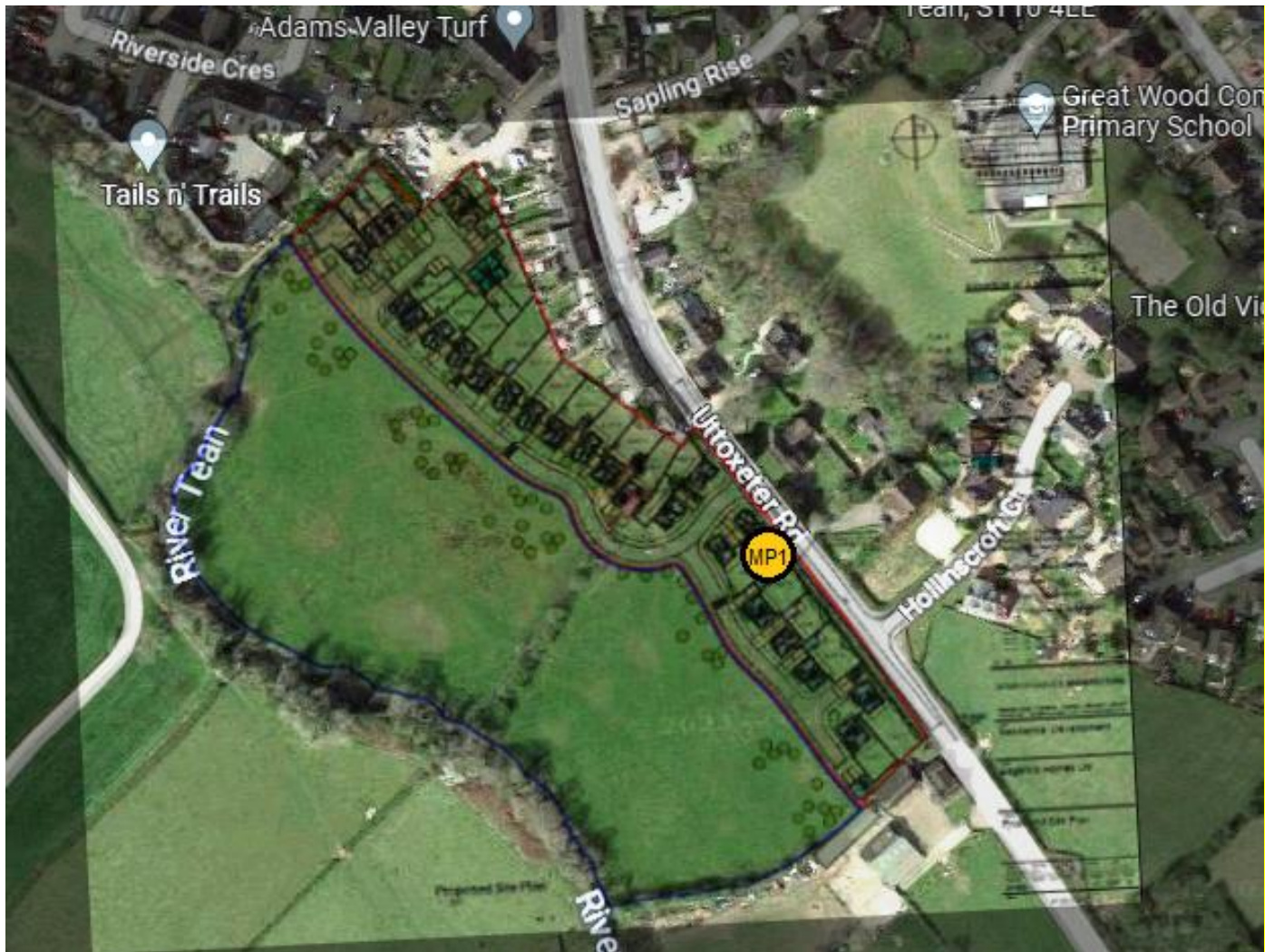
APPENDICES

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Appendix 1: Site Plan

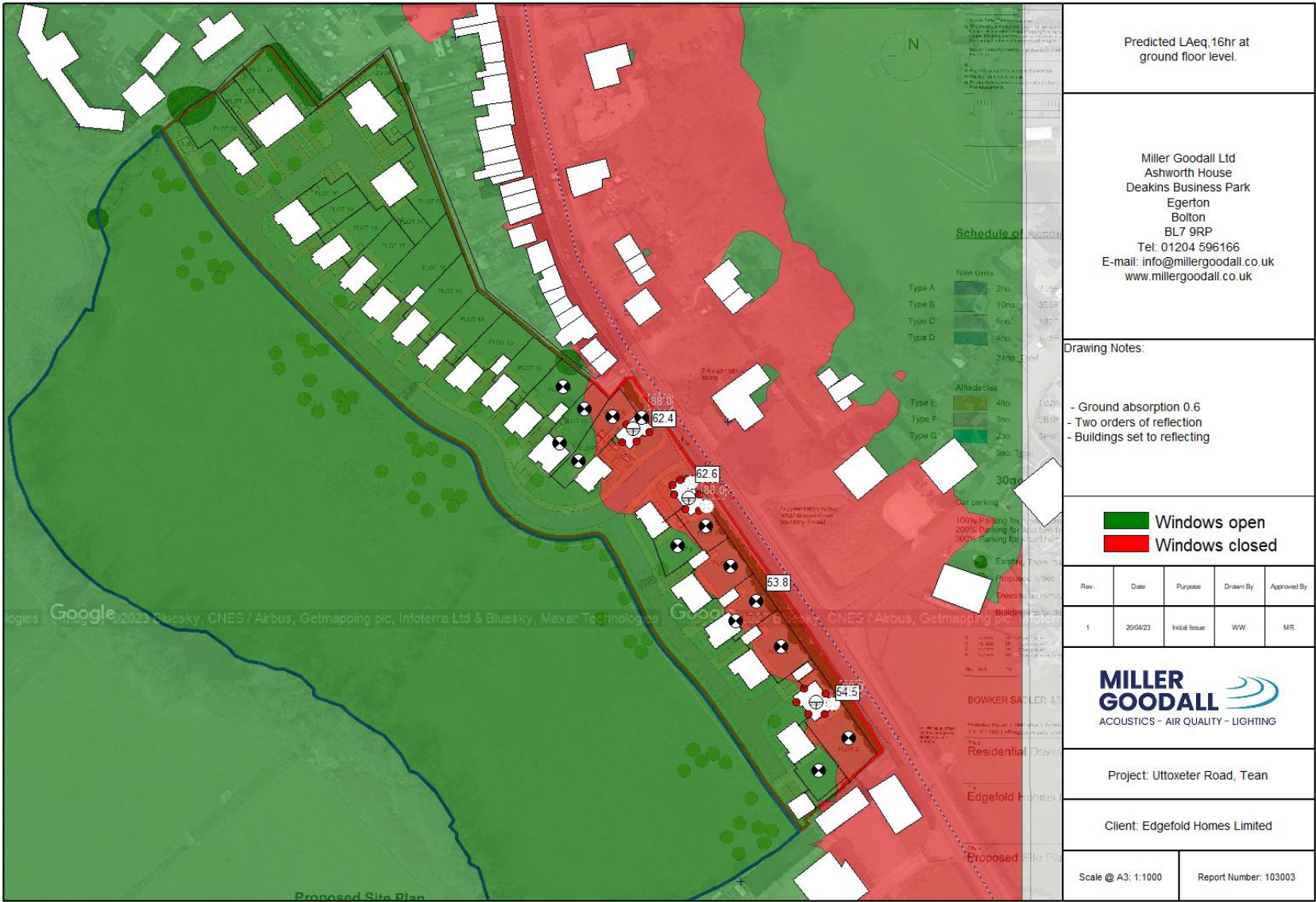


Appendix 2: Measurement Position

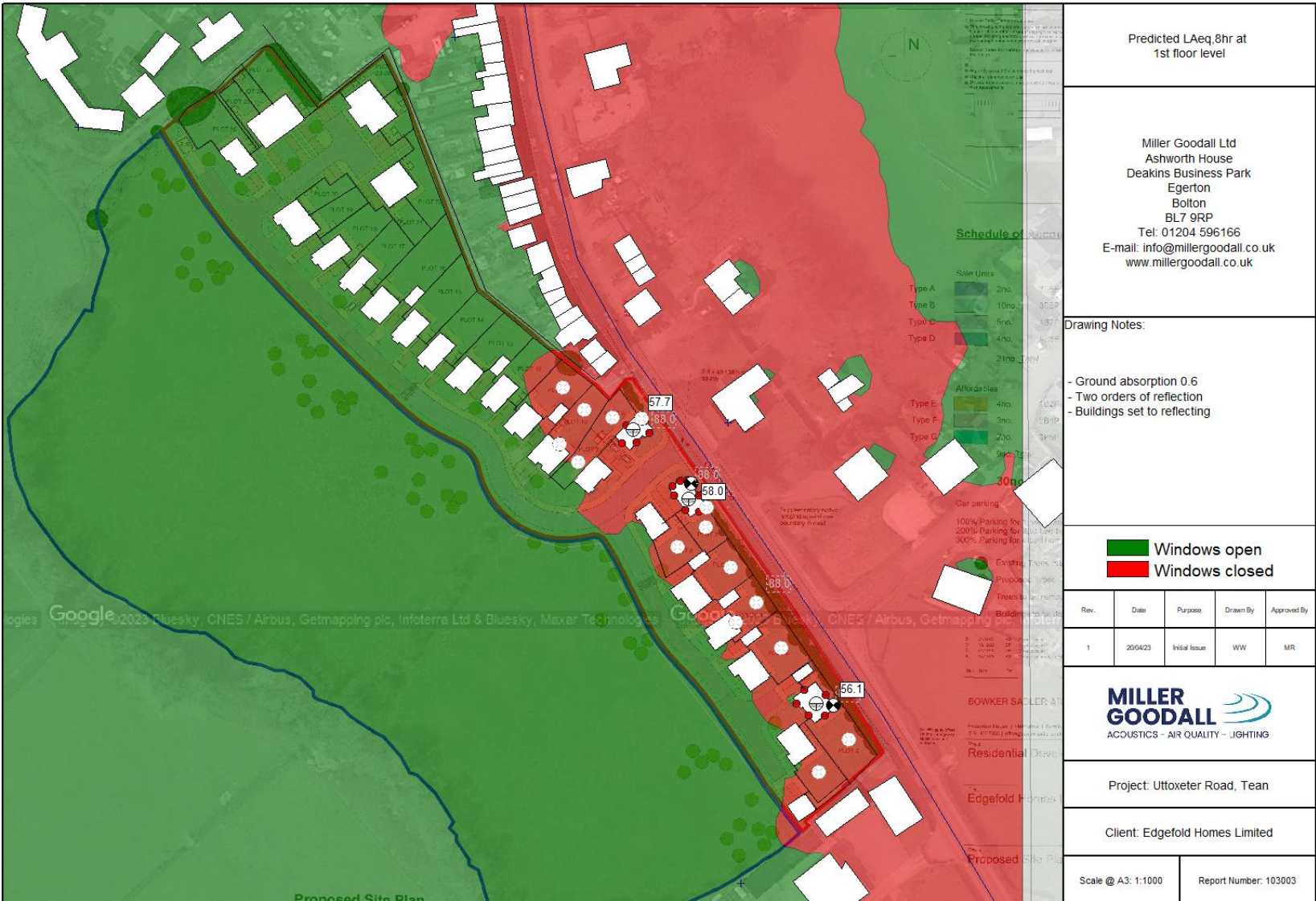


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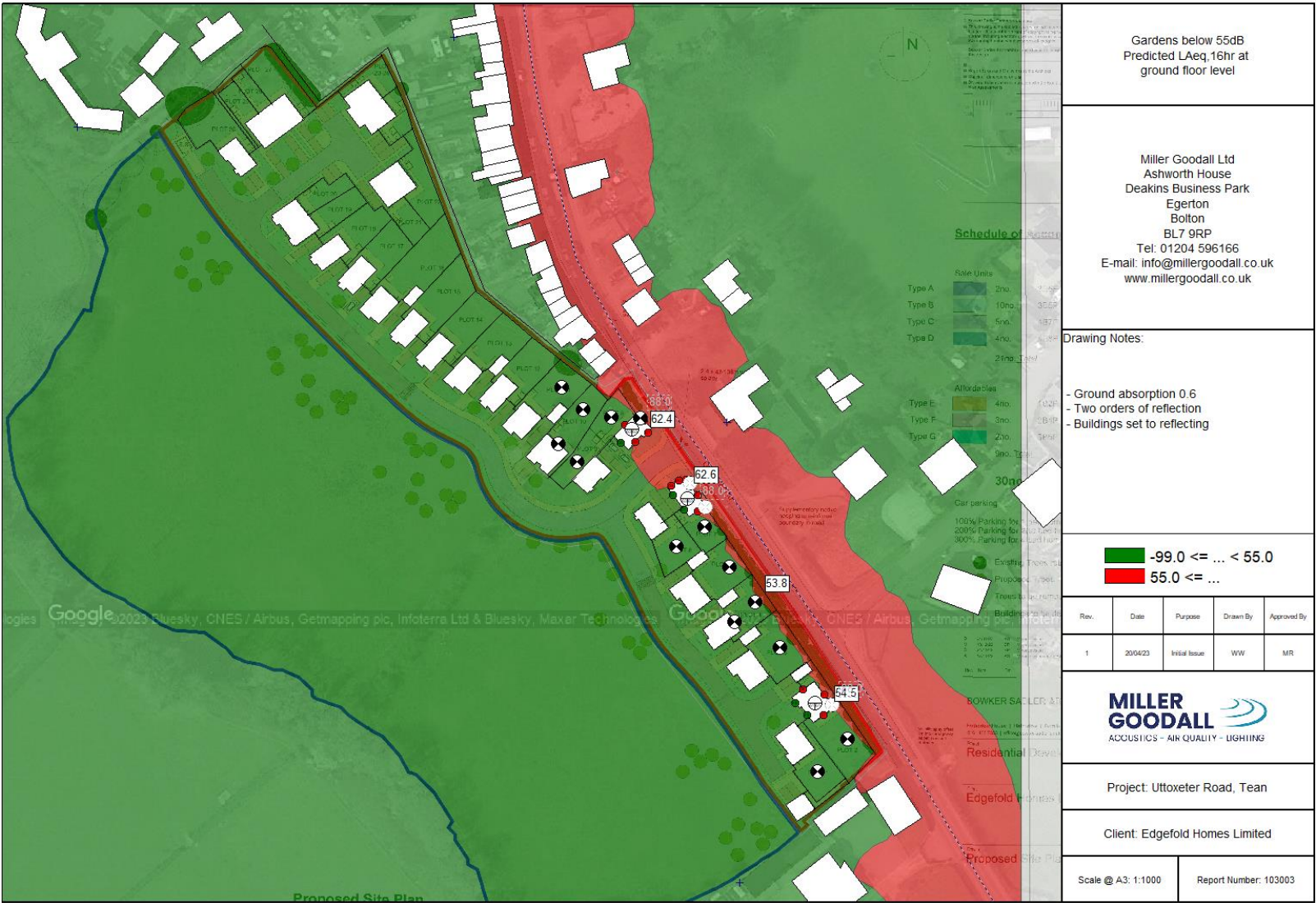
Appendix 3A: Noise Model Output – Daytime $L_{Aeq,16h}$ at 1.5m (dB)



Appendix 3B: Noise Model Output – Night-Time $L_{Aeq,8h}$ at 4m (dB)



Appendix 3C: Noise Model Output – Day-Time $L_{Aeq,16hr}$ in Gardens Above and Below 55dB



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Appendix 4A: Glazing and Ventilation Specification for Ground Floor Living Areas

Option 2

33 dB $R_w + C_{tr}$ glazing (full spec. in Table 8)

38 dB $D_{ne,w} + C_{tr}$ vent (full spec. in Table 8)

Option 3

27 dB $R_w + C_{tr}$ glazing (full spec. in Table 8)

33 dB $D_{ne,w} + C_{tr}$ vent (full spec. in Table 8)

All other Facades

No special requirements. Open windows acceptable.



Appendix 4B: Glazing and Ventilation Specification for First Floor Bedroom Areas

Option 1

38 dB $R_w + C_{tr}$ glazing (full spec. in Table 8)

44 dB $D_{ne,w} + C_{tr}$ vent (full spec. in Table 8)

Option 3

27 dB $R_w + C_{tr}$ glazing (full spec. in Table 8)

33 dB $D_{ne,w}$ vent+ C_{tr} vent (full spec. in Table 8)

All other Facades

No special requirements. Open windows acceptable.



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Glossary of Terms

Decibel (dB) The unit used to quantify sound pressure levels; it is derived from the logarithm of the ratio between the value of a quantity and a reference value. It is used to describe the level of many different quantities. For sound pressure level the reference quantity is 20 μPa , the threshold of normal hearing is in the region of 0 dB, and 140 dB is the threshold of pain. A change of 1 dB is usually only perceptible under controlled conditions.

dB L_A Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB L_A broadly agree with an individual's assessment of loudness. A change of 3 dB L_A is the minimum perceptible under normal conditions, and a change of 10 dB L_A corresponds roughly to halving or doubling the loudness of a sound. The background noise level in a living room may be about 30 dB L_A ; normal conversation about 60 dB L_A at 1 meter; heavy road traffic about 80 dB L_A at 10 meters; the level near a pneumatic drill about 100 dB L_A .

$L_{A90,T}$ The A weighted noise level exceeded for 90% of the specified measurement period (T). In BS 4142: 2014+A1:2019 it is used to define background noise level.

$L_{Aeq,T}$ The equivalent continuous sound level. The sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period (T). $L_{Aeq,T}$ is used to describe many types of noise and can be measured directly with an integrating sound level meter.

L_{Amax} The highest A weighted noise level recorded during the time period. It is usually used to describe the highest noise level that occurred during the event.

$L_{A10(18 \text{ hour})}$ Often referred to as the UK road traffic noise index, this is the arithmetic average of the values of L_{A10} hourly for each of the 18 one hour periods between 06:00 and 00:00.

NOEL No observed effect level: the level of noise exposure below which no effect at all on health or quality of life can be detected.

LOAEL Lowest observed adverse effect level: the level of noise exposure above which adverse effects on health or quality of life can be detected.

SOAEL Significant observed adverse effect level: the level of noise exposure above which significant adverse effects on health or quality of life can be detected.

R_w Single number rating used to describe the sound insulation of building elements and is defined in BS EN ISO 10140-2: 2010 (formerly BSEN ISO 140-3:1995). It is derived by measurement under laboratory conditions and does not take into account the effects of flanking transmissions.

$D_{ne,w}$ The weighted element-normalized level difference is a single figure rating used to describe the sound insulation of small elements within a larger construction and is defined in BS EN ISO 10140-2:2010 (BSEN ISO 140-10:1991). It is most often used to rate the sound insulation performance of ventilator units e.g. trickle vents.

C_{tr} A single-number spectrum adaptation term used to characterise the sound insulation rating with respect to urban traffic. It is defined in ISO 717-1:20-13.

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