H&H Acoustic Consultancy Division

Proposed Residential Development
Bath Street
Leek

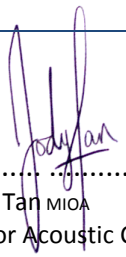
Environmental Noise Assessment

For Ian Wooliscroft

28th July 2016

Ref: HHACY/Q14362/R01/IRF

DOCUMENT CONTROL

Reference:	HHACY/Q14362/R01/IRF
Report Title:	Proposed Residential Development Bath Street, Leek Environmental Noise Assessment
Client:	Ian Wooliscroft 1 Villa Road Cheedleton Leek Staffordshire ST13 7EA
Prepared By:	 …… …… Ian French BSc(Hons) AMIOA Senior Acoustic Consultant
Authorised By:	 …… …… Jody Tan MIOA Senior Acoustic Consultant

Revision	Comment	Date
-	First Issue	28th July 2016
A	Second Issue – underpass construction revision	29th July 2016

CONTENTS

APPENDICES

1. INTRODUCTION

1.1 Hodgson & Hodgson Group Ltd has been commissioned to undertake an environmental noise assessment for a proposed residential development on Bath Street, Leek.

1.2 This report details the methodology and results of a noise survey conducted at the site and assesses the potential impact with regard to existing local noise sources that may affect both internal and external areas of the proposed development. Where necessary, suitable mitigation measures are recommended.

1.3 A glossary of terminology used within this report is contained in Appendix A.

2. ASSESSMENT CRITERIA

British Standard 8233:2014

2.1 BS 8233:2014[1] presents recommendations for the control of noise both in and around buildings and suggests criteria and limits appropriate to their function.

2.2 For dwellings, the main considerations are:

a) for bedrooms, the acoustic effect on sleep; and
b) for other rooms, the acoustic effect on resting, listening and communicating.

2.3 It is desirable that the internal ambient noise level does not exceed the guideline values as replicated in Table 2.1.

Table 2.1: Indoor Ambient Noise Levels for Dwellings

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

2.4 For traditional external areas that are used for amenity space, such as gardens, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$.

2.5 The levels shown in Table 2.1 above are consistent with the existing guidelines issued by the WHO as outlined below.

[1] British Standard 8233:2014 Guidance on sound insulation and noise reduction for buildings. BSI

World Health Organisation Criteria

2.6 The World Health Organisation '*Guidelines for Community Noise*'[2] aims to provide environmental health authorities and professionals with guidance on the adverse health effects of community noise on people.

2.7 The following guideline values have been derived according to specific environments. The values relevant to proposed residential development are shown in Table 2.2.

Table 2.2: Guideline Values for Community Noise in Specific Environments

Specific Environment	Critical Health Effect(s)	L_{Aeq} (dB)	Time base (hrs)	$L_{Amax,f}$ (dB)
Outdoor living area	Serious annoyance, daytime and evening	55	16	-
	Moderate annoyance, daytime and evening	50	16	-
Dwelling, indoors	Speech intelligibility and moderate annoyance, daytime and evening	35	16	-
Inside bedrooms	Sleep disturbance, night-time	30	8	45
Outside bedrooms	Sleep disturbance, window open (outdoor values)	45	8	60

3. NOISE SURVEY AND RESULTS

3.1 A noise survey was conducted at the site between approximately 12:30 hrs on 20th July 2016 and 13:00 hrs on 21st July 2016. The data collected during this period has been used to characterise the existing daytime and night-time noise levels currently experienced at the proposed development site.

3.2 Continuous unattended long term noise measurements were obtained at a location (illustrated in Appendix B as 'LT') considered representative of the front facade positions of the proposed units. In addition, short term attended measurements were also made at street level to further characterise the existing noise environment.

3.3 During the survey it was noted that noise levels were dominated by road traffic noise from Bath Street (one way system). Other sources included distant vehicle movements to the rear of the site (A523).

3.4 Measurements were undertaken in accordance with the procedures outlined in BS 7445-1:2003[3]. Measurements at were 'free field' (no vertical reflective surfaces within 3.5 metres of the microphone) at a height of between 1.2 – 1.5 metres above ground level. During all measurements the microphone was protected with a windshield. The long term measurements were made in the corner of site at a distance of 1.5 metres from the nearest façade. These locations were chosen for health and safety reasons in addition to the security of the meter and validity of the measured levels.

[2] World Health Organisation. Guideline for Community Noise (1999)

[3] British Standard 7445-1:2003 Description and measurement of environmental noise. Guide to quantities and procedures. BSI (2003)

3.5 Weather conditions during the survey period were dry with light winds (less than 2 m/s) and temperatures ranging from 17-29 ^{o}C.

3.6 Noise monitoring was undertaken using the following equipment detailed in Table 3.1. Calibration certificates are available upon request.

Table 3.1: Noise Monitoring Equipment

Instrument	Serial No.	Calibration Due Date
Cirrus CR811B Class 1 Sound Level Meter	C17352FD	29/03/2018
Cirrus CR511E Portable Calibrator	036345	29/03/2017
B&K Sound Level Meter Type 2260	2370572	01/04/2017
B&K Type 4231	2389159	14/04/2017

3.7 The instruments were calibrated immediately before and after each survey period using a portable calibrator, no significant drift in the calibration levels was observed.

3.8 The sound level meters were set to measure various noise parameters including the L_{Aeq}, L_{A10}, L_{A90}, and L_{Amax} values using a 'fast' time weighting over 15 minute averaging periods (see Appendix A for an explanation of the parameters used).

3.9 Charts to show the measured noise time history of each unattended measurement location are presented in Appendix C and the relevant noise parameters for all measurements made during the survey are summarised in Table 3.2.

Table 3.2: Summary of Noise Survey Results (Average Levels)

Time Period	dB $L_{Aeq,15min}$ (LT1) *
16hr Daytime (07:00-23:00)	55.2
8hr Night-time (23:00-07:00)	49.0

* ***Logarithmic average***

3.10 Octave band noise measurements were also obtained in order to characterise the environmental noise affecting the site in terms of spectral component. The measured data, presented in Table 3.3, are considered to be typical of the noise affecting the proposed development site and have been used to assist with the calculation of internal ambient noise levels within habitable rooms of proposed residential dwellings.

Table 3.3: Measured Spectral Noise Content

Date / Time	dB L_{eq} per Octave Band Centre Frequency (Hz)								
	31.5	63	125	250	500	1k	2k	4k	8k
20/07/2016 14:00 – 14:05 hrs	65.1	62.5	58.2	55.1	54.5	52.3	47.4	40.9	33.5
21/07/2016 11:50 – 11:55 hrs	66.5	66.3	58.7	57.0	56.6	54.0	50.3	44.6	37.2
Average	**65.8**	**64.4**	**58.4**	**56.1**	**55.5**	**53.1**	**48.8**	**42.7**	**35.4**

4. NOISE ASSESSMENT

4.1 In order to perform the noise assessment, the following drawings supplied by Sammons Architectural have been considered:

- *2015-2051-04A LOCATION AND BLOCK PLAN*
- *2015-2051-05E PLANNING APPLICATION - PROPOSED SITE PLAN*
- *2015-2051-06B PLANNING APPLICATION - PLOTS 1-4 HOUSETYPE*
- *2015-2051-07D PLANNING APPLICATION - PLOT 5 PLANS AND ELEVATIONS*

External Noise Levels

4.2 The results of the survey indicate that any private external amenity areas are expected to experience noise levels below the 50 dB lower limit outlined in BS 8233 guidance.

4.3 The assessment of $L_{Amax(f)}$ night noise levels has been undertaken based on typical levels which occur on a regular basis throughout the night-time period. Atypically high or one-off $L_{Amax(f)}$ events have not been used to specify a scheme of glazing and ventilation. A chart to show night-time $L_{Amax(f)}$ noise levels is presented in Appendix C. It can be seen that typical measured night-time $L_{Amax(f)}$ levels were in the region of 59 dB.

Internal Noise Levels

4.4 Internal noise levels with living rooms and bedrooms of the proposed development have been determined via calculation based on the measured survey data.

4.5 The exact construction details for the proposed units are not yet known and so internal noise calculations have been performed based on a number of assumptions regarding typical construction materials. The sound reduction indices of the proposed external walls and roof are assumed to be as per Table 4.1.

Table 4.1: Assumed Sound Reduction Indices of Building Envelope

Element	Sound Reduction Index (dB) per Octave Band Centre Frequency (Hz)					
	125	250	500	1k	2k	Weighted
Brick/Block Cavity Wall	41	45	45	54	58	53 dB R_w
Tiled/slated roof, 12mm plasterboard ceiling and mineral wool insulation	24	34	40	45	49	43 dB R_w
Floor build-up to rooms over private access drive (see 4.12- 4.14 for details).	30	37	41	45	48	44 dB R_w

4.6 Internal noise levels have been calculated using the methodology outlined in Annex G.2 of BS 8233:2014. To predict the internal noise levels of habitable rooms the room and glazing dimensions detailed in Table 4.2 were determined from the drawings and have been incorporated in the calculations.

Table 4.2: Assumed Typical Room and Glazing Dimensions

Room	Room Volume (m^3)	Facade Area (m^2)	Surface Area of Glazing (m^2)
Lounge / Kitchen Areas	75	35	5
Bedrooms	30	19	2

4.7 In order to adhere to the requirements set out in BS 8233 it is necessary to incorporate mitigation measures at the development in the form of appropriate glazing and background ventilation with the minimum specifications presented in Table 4.3. Location details are shown in Appendix D where a colour coded scheme is defined.

Table 4.3: Required Sound Reduction Indices of Building Elements

Element	Location	Indicative Specification	Required Sound Reduction Index (dB) per Octave Band Centre Frequency (Hz)					
			125	250	500	1k	2k	4k
Glazing	All rooms	4/6/6 Double Glazing	23	27	24	26	37	38
Ventilation	ORANGE	Standard Trickle Ventilation Unit*	0	0	0	0	0	0
Ventilation	GREEN	Open-able Windows	Assumed 'A' weighted reduction of 15dB					

Assumed performance – equivalent to open aperture.

4.8 The glazing and ventilation specification are examples only. Other specifications can be used in the development provided that the minimum Sound Reduction Index, (SRI) values presented in Table 4.3 are satisfied.

4.9 The glazing recommendations are for the glazing within a sealed unit only. It is the responsibility of the window supplier to ensure that the window frame does not compromise the performance of the glazing.

4.10 A summary of the calculated internal noise levels is presented in Table 4.4.

Table 4.4: Summary of Calculated Internal Noise Levels

Room	Calculated Internal Noise Levels		Criteria		Criteria Achieved?
	dB L_{Aeq}	dB $L_{Amax(f)}$	dB L_{Aeq}	dB $L_{Amax(f)}$	
Lounge Areas (Day)	<30	N/A	≤ 35	N/A	Yes
Kitchen/Dining Areas (Day)	38	N/A	≤ 40	N/A	Yes
Bedrooms (Day)	35	N/A	≤ 35	N/A	Yes
Bedrooms (Night)	28	38	≤ 30	≤ 45	Yes

4.11 It can be seen that, if the mitigation strategy is adopted, the internal noise level criteria outlined in BS 8233 will be adhered to.

Construction above access-driveway

4.12 Due to the access road passing directly below bedrooms additional considerations must be made to prevent sleep disturbance. Assessment has been made against the requirements of BS8233 using recommended calculation methodologies.

4.13 It is understood that the external lining is to be attached to the underside of timber joists with mineral insulation between the joists. Celotex insulation is required to the underside and Promat Masterboard will line the construction. The floor build up above the joists is not confirmed so a single layer of T&G board is assumed.

4.14 The proposed construction is calculated to provide a sound reduction of 44dB R_w (octave band data given in table 4.1). As such noise levels within the bedrooms as a result of car access are calculated to be below the criteria of BS8233.

5. SUMMARY

5.1 A noise assessment has been undertaken for the proposed redevelopment of land off Bath Street, Leek.

5.2 A noise survey was conducted at the site between 20th July 2016 and 21st July 2016. The data collected during this period has been used to characterise the existing daytime and night-time noise levels currently experienced at the proposed development site.

5.3 Octave band noise measurements were also obtained in order to characterise the environmental noise affecting the site in terms of spectral component. The measured data have been used to assist with the calculation of internal ambient noise levels within habitable rooms of proposed residential dwellings.

5.4 The assessment has also demonstrated that suitable internal noise levels can be achieved by adopting the proposed minimum glazing and ventilation recommendations or installing alternative building facade elements with an equal sound insulation performance.

APPENDIX A – Terminology

The range of audible sound is from 0 dB to 140 dB from the threshold of audibility to the threshold of pain, respectively. The frequency response of the human ear is usually taken to cover the range from 20 Hz (number of oscillations per second) to 20,000 Hz. The ear does not respond equally to different frequencies at the same sound pressure level. It is more sensitive in the mid-frequency range than the lower and higher frequencies and, because of this, the low and high frequency components of a sound are reduced in importance by applying a weighting (filtering) circuit to noise measurements. The weighting which is most widely used and which correlates best with human subjective response to noise is the A-weighting. This is an internationally accepted standard for noise measurements to represent human subjective response to sound.

For steady state noise levels an increase or decrease of 1 dB (A) is not perceptible to most human beings under normal conditions, although this may be perceptible under laboratory conditions. An increase or decrease of 3 dB (A) is normally only just perceptible under normal conditions. The 'loudness' of a noise is a purely subjective parameter, but it is generally accepted that an increase/decrease of 10 dB (A) corresponds to a doubling or halving in perceived loudness.

External noise levels are rarely steady, but rise and fall according to surrounding activities. In an attempt to produce a figure that relates this variable noise level to the subjective response, a number of noise metrics are used. Relevant noise parameters to this assessment include:

1) *The L_{Aeq} Noise Level*
   This is the 'equivalent continuous A-weighted sound pressure level, in decibels', and is defined in British Standard BS 7445 as the "*value of the A-weighted sound pressure level of a continuous, steady sound that, within a specified time interval, T, has the same mean square sound pressure as a sound under consideration whose level varies with time*". It is a unit commonly used to describe construction noise, noise from industrial premises and is the most suitable unit for the description of many other forms of environmental noise.

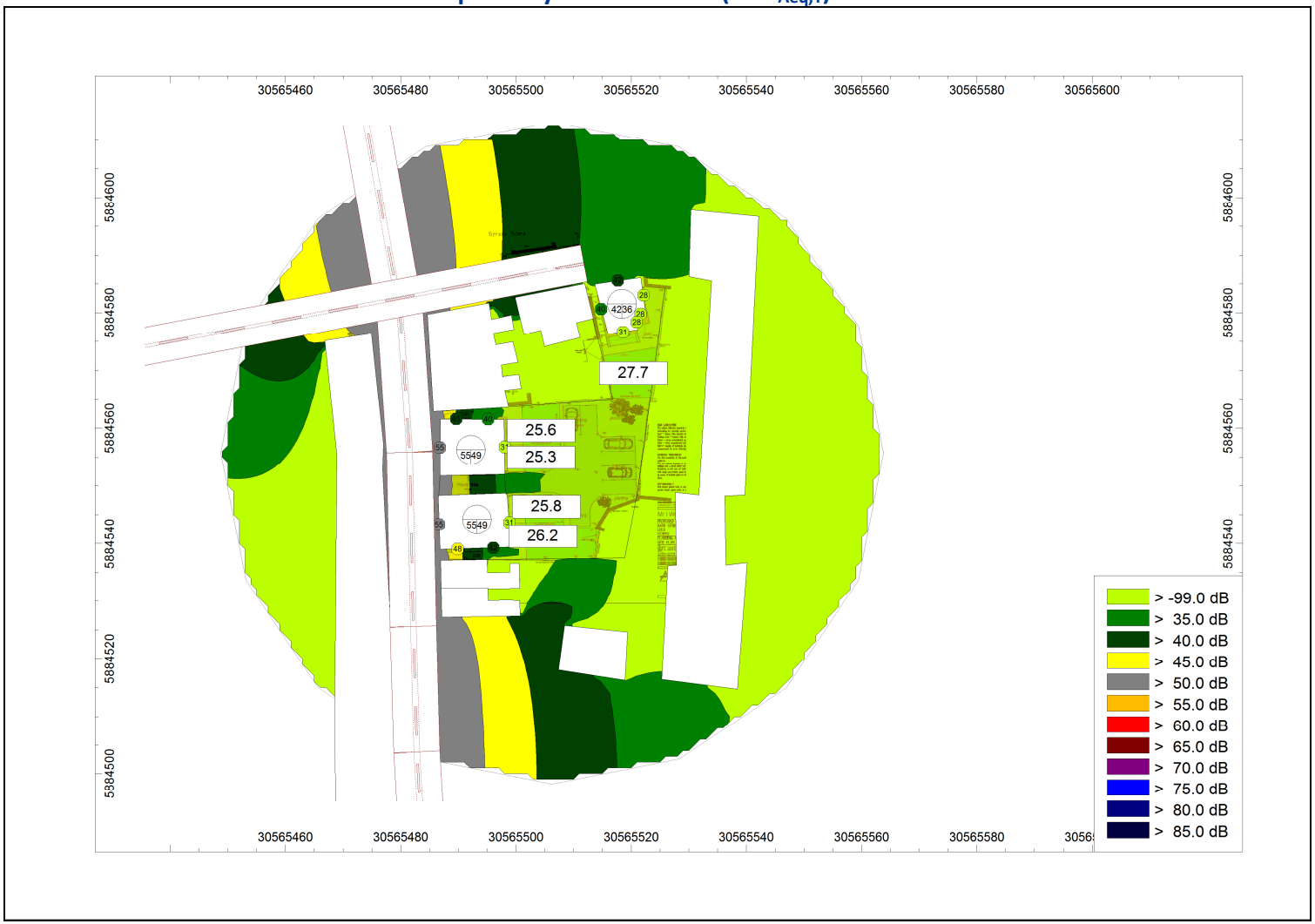
2) *The $L_{Amax,f}$ Noise Level*
   The $L_{Amax,f}$ is the maximum sound pressure level, measured over the measurement period, using a 'fast' time weighting.

3) *The L_{A90} Noise Level*
   The L_{A90} is the noise level that is exceeded for 90% of the measurement period and gives an indication of the noise level during quieter periods. It is often referred to as the background noise level and is used in the assessment of disturbance from industrial noise.

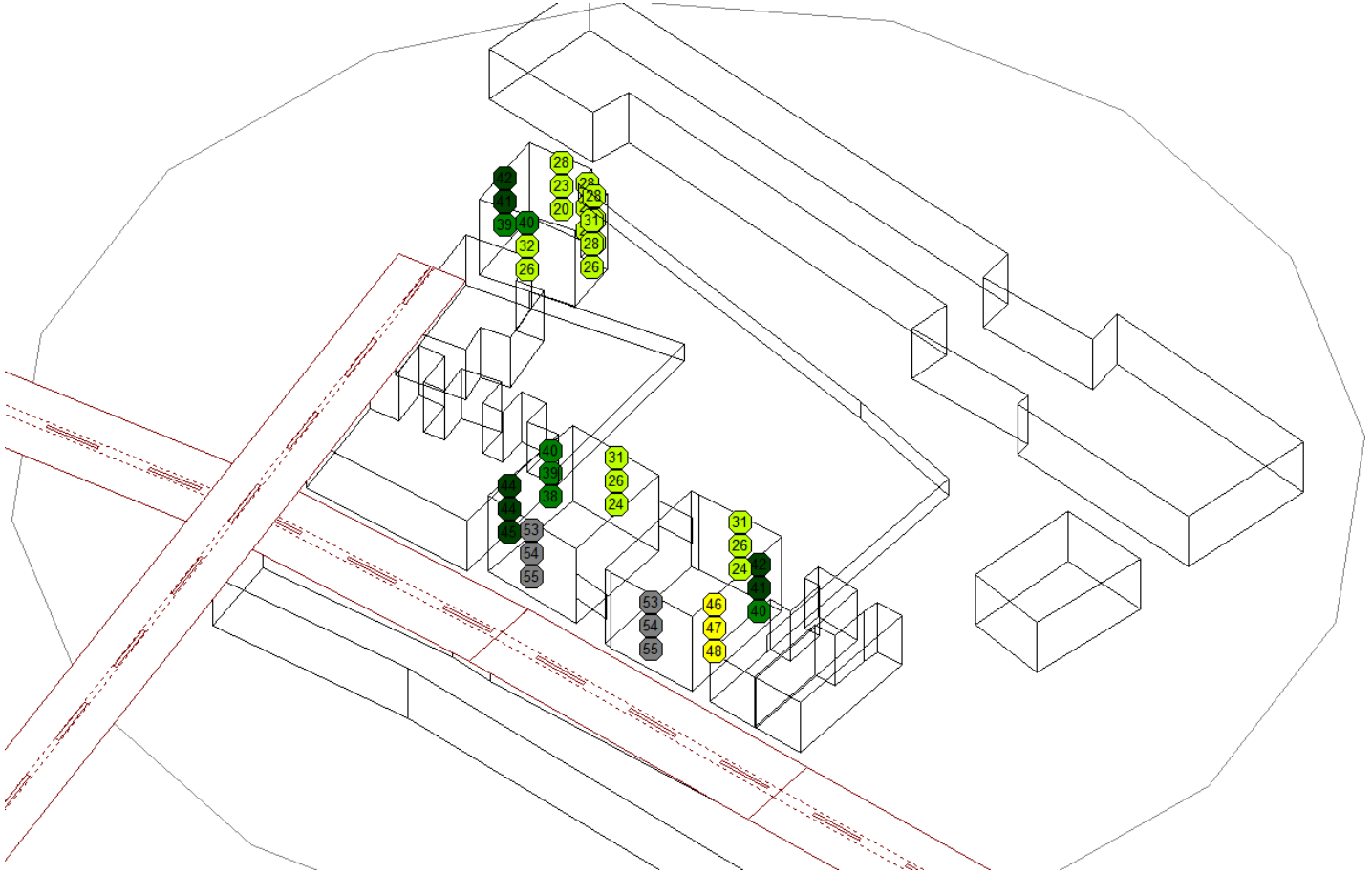
4) *The $L_{Ar,Tr}$ Noise Level*
   The $L_{Ar,Tr}$ is the specific noise level of a source, plus any adjustment for characteristic features of the noise, determined for the reference time interval. It is also occasionally known as the rating level.

APPENDIX B – Noise Monitoring Locations and Noise Map

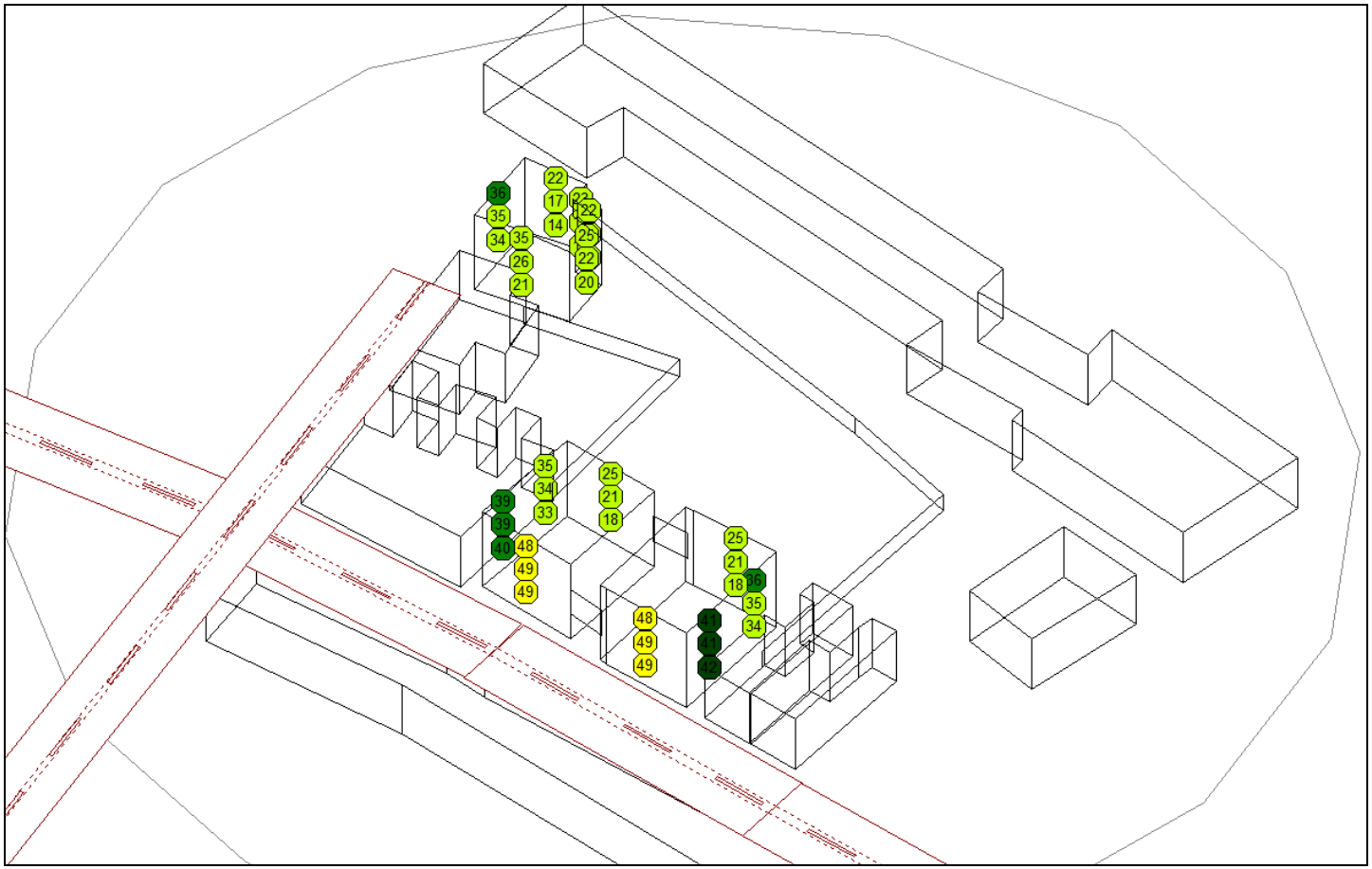
Noise Maps – Daytime Ambient (dB $L_{Aeq,T}$) noise level



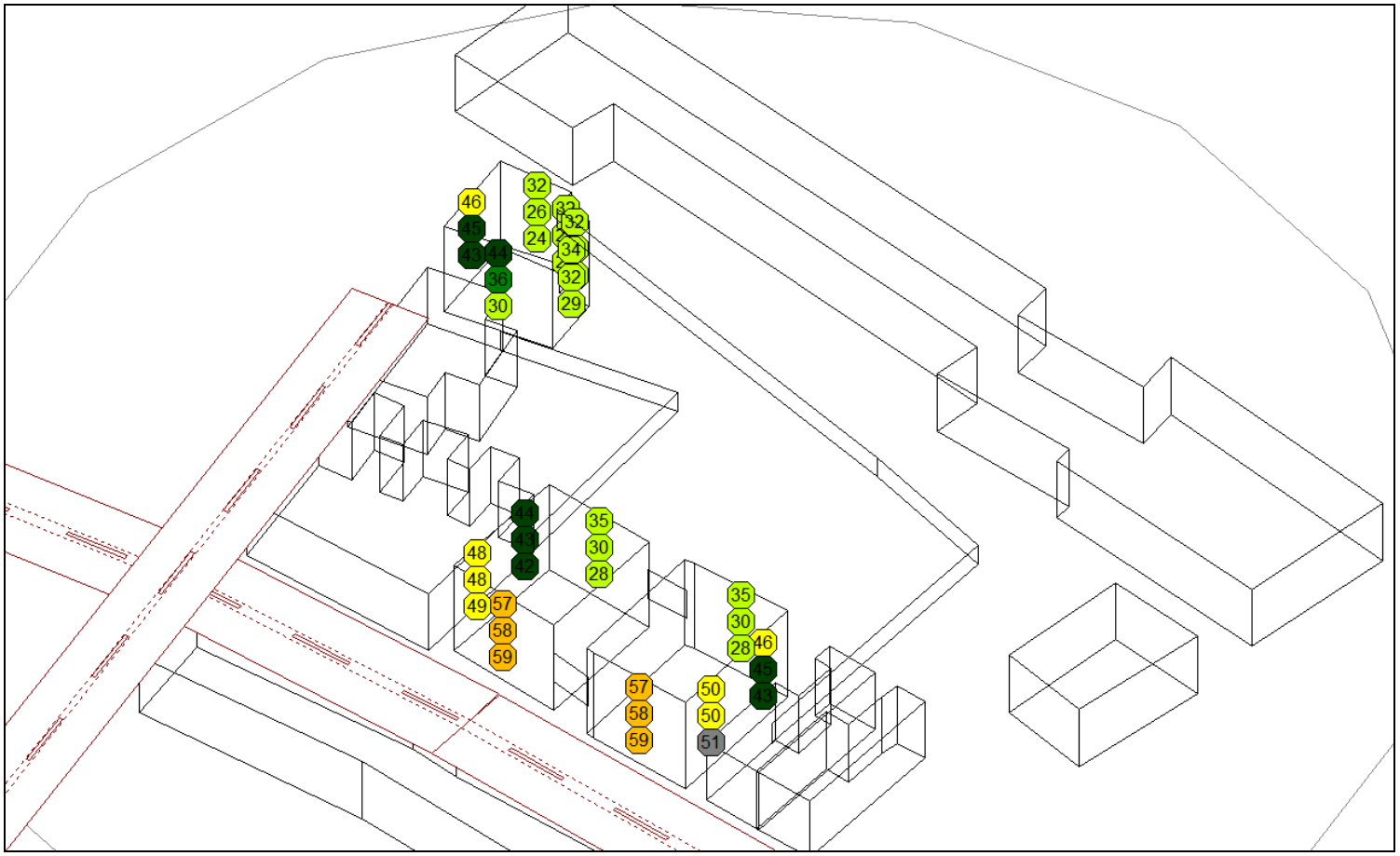
Building Façade Daytime Ambient (dB $L_{Aeq,T}$) Noise Assessment



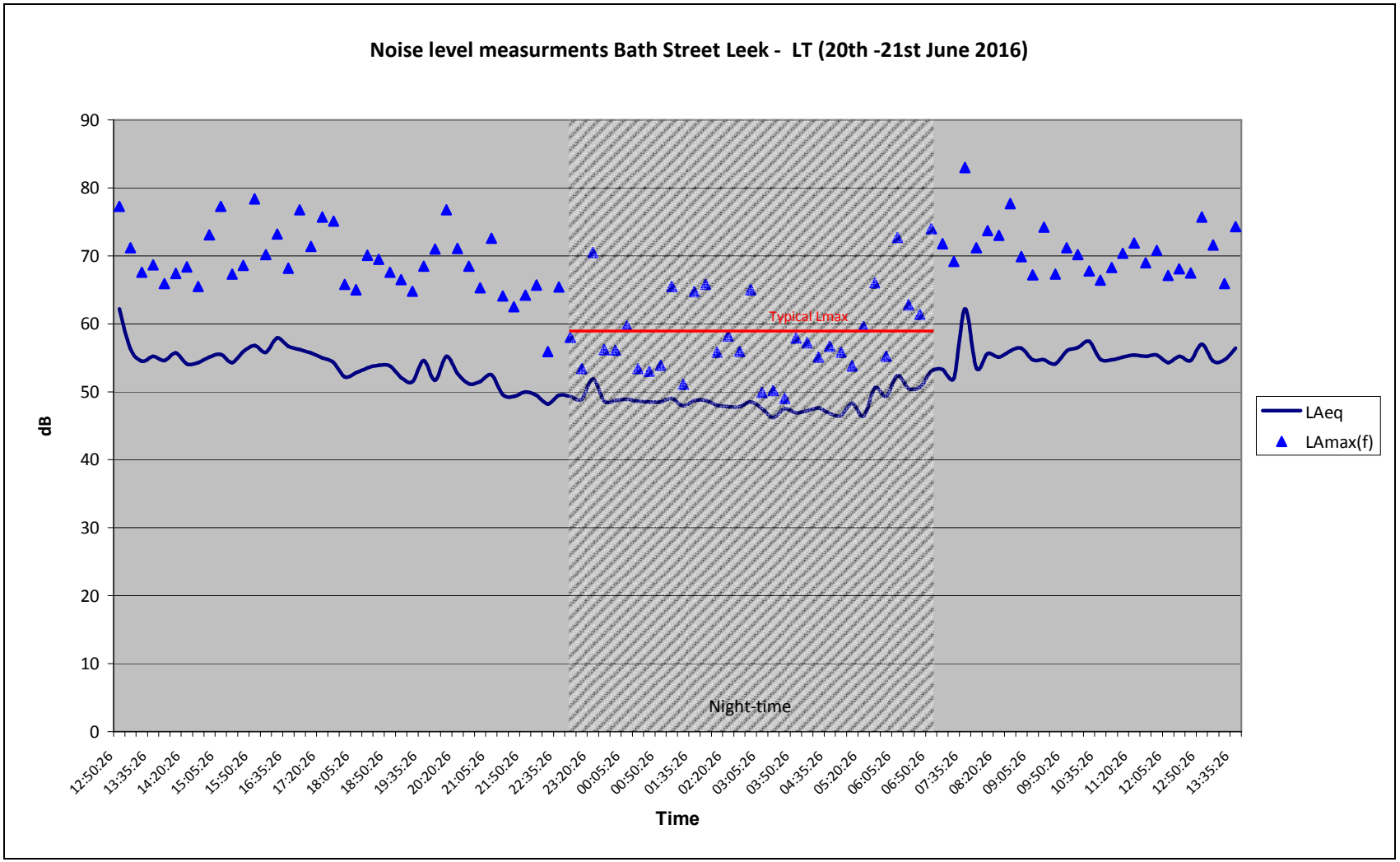
Building Façade Night-time Ambient (dB $L_{Aeq,T}$) Noise Assessment



Building Façade Night-time Maximum (db $L_{Amax(f)}$ Noise Assessment

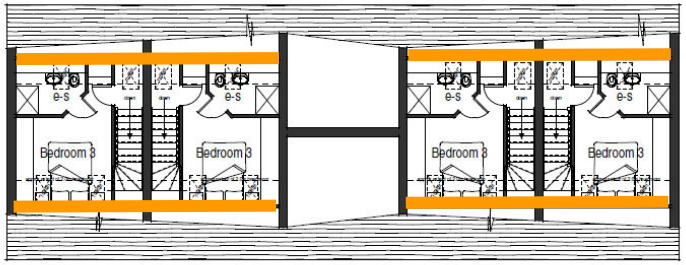


APPENDIX C – Charts to Show Measured Noise Levels at Survey Location LT (20th – 21st July 2016)

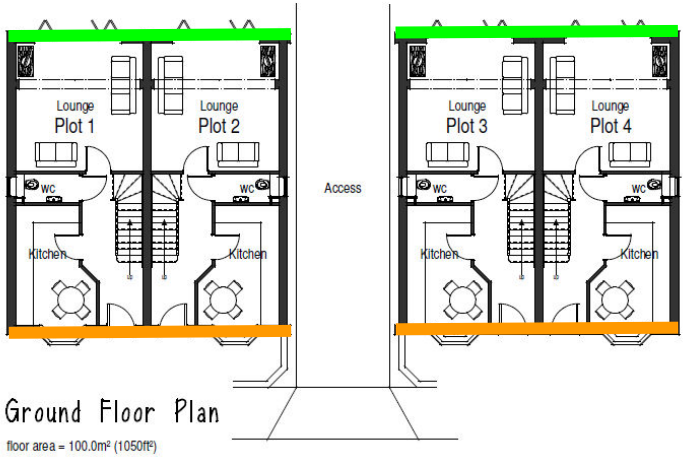


APPENDIX D – Location of Glazing/Ventilation combinations

Plots 1-4

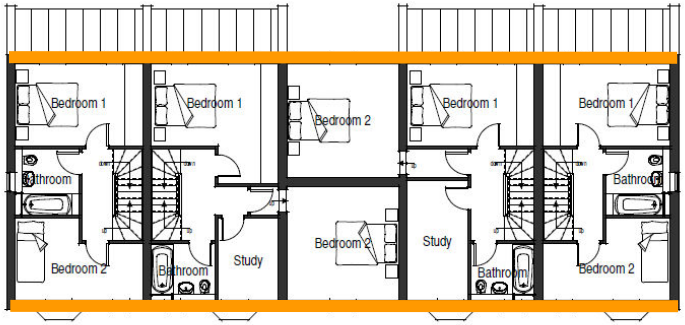


Attic Floor Plan



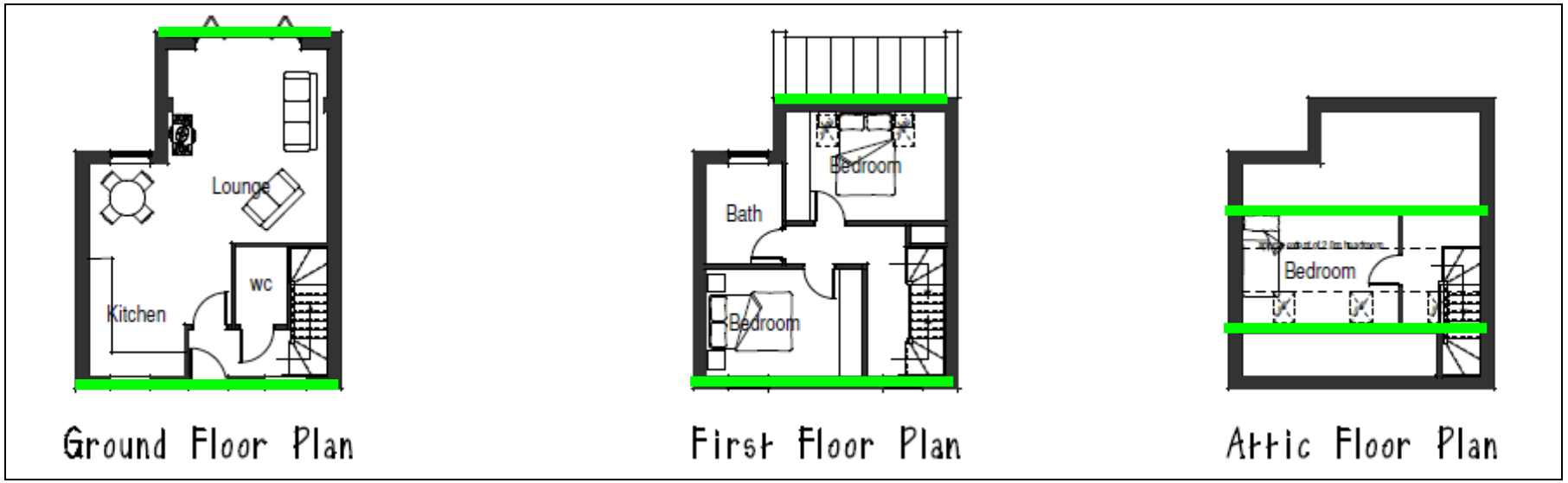
Ground Floor Plan

floor area = 100.0m² (1050ft²)



First Floor Plan

Plot 5


Lounge
wc
Kitchen
Ground Floor Plan
Bedroom
Bath
Bedroom
First Floor Plan
Bedroom
Attic Floor Plan