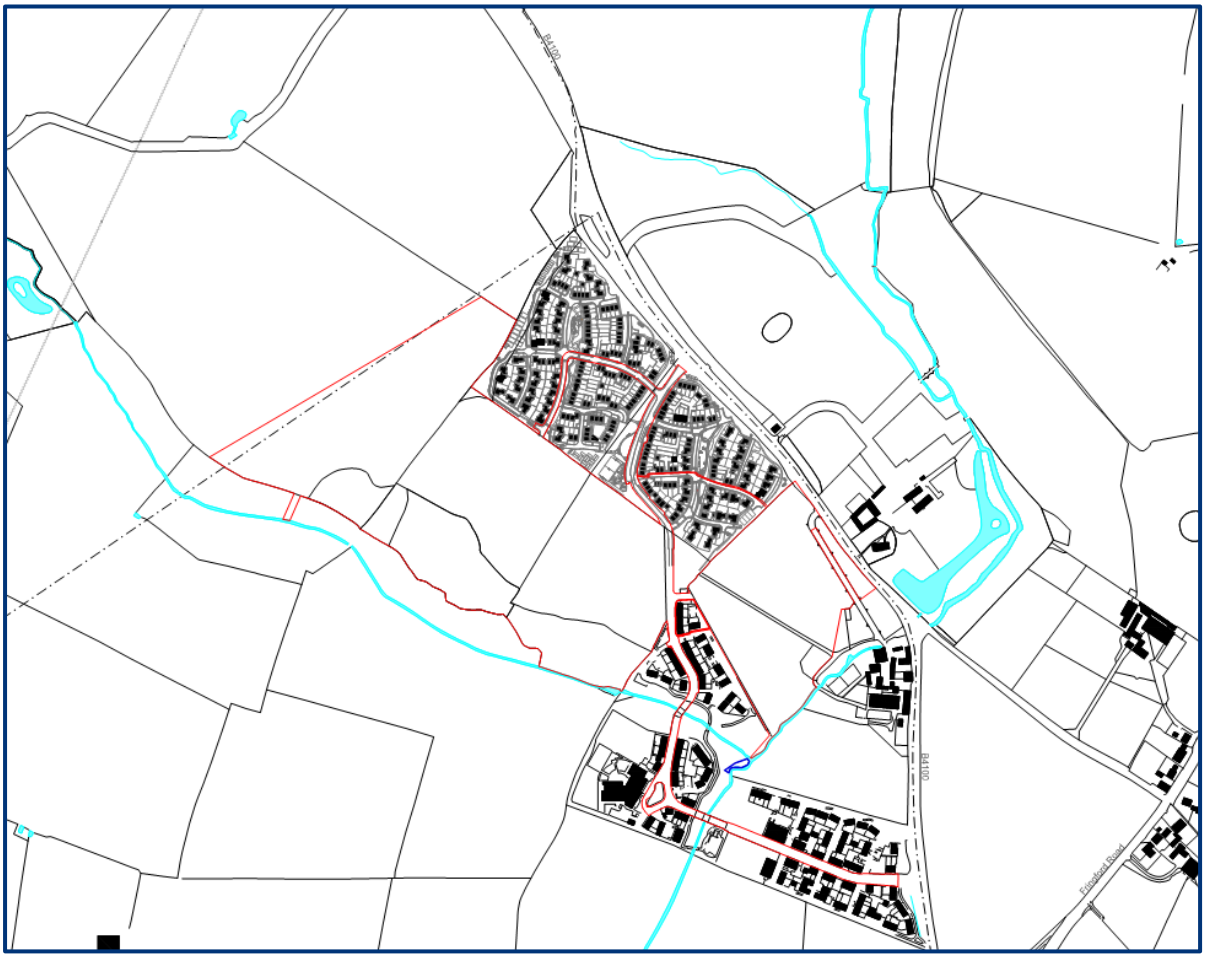
APPENDIX 8.1
NOISE ASSESSMENT

Land at North West Bicester

Noise Assessment

784-A118757



Noise Assessment for Proposed Residential Development

13th April 2021

Prepared on Behalf of Firethorn Developments Limited.

tetratecheurope.com

Tetra Tech Leicester, Executive Park, Avalon Way, Anstey, Leicester, United Kingdom, LE7 7GR
Tetra Tech Limited. Registered in England number: 01959704
Registered Office: 3 Sovereign Square, Sovereign Street, Leeds, United Kingdom, LS1 4ER

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CONTENTS

1.0 INTRODUCTION

1.1 PURPOSE OF THIS REPORT

This report presents the findings of a noise assessment undertaken for a proposed residential development including up to 550 dwellings on Land at North West Bicester.

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 effects of noise. The noise levels across the site have been predicted at proposed 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 and a set of location plans, noise contour plots relevant to the assessment are presented throughout the document.

1.2 LEGISLATIVE CONTEXT

This report is intended to provide information relevant to the local planning authority and their consultees in support of a planning application for the above proposed development. Policy guidance with respect to noise is found in NPPF, published on 19th February 2019. With regard to noise and planning, NPPF contains the following statement at paragraph 170:

"170. 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. 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

A further 2 short statements are presented at paragraph 180, which state:

"180. 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 an amenity value for this reason."

Furthermore, paragraphs 182 and 183 state:

> *"182. 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.*
>
> *183. The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities."*

Planning Practice Guidance (PPG): Noise provides further guidance with regard to the assessment of noise within the context of Planning Policy. The overall aim of this guidance, tying in with the principles of the NPPF and the Explanatory Note of the Noise Policy Statement for England, is to, *'identify whether the overall effect of noise exposure is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation.'*

A summary of the effects of noise exposure associated with both noise generating developments and noise sensitive developments is presented within the PPG and repeated as follows:

Table 1.1 NPPG Noise Exposure Hierarchy

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not present	No Effect	No Observed Effect	No Specific Measures Required
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed Adverse Effect	No Specific Measures Required
Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

The NPPF, NPSE and NPPG do not, however, present absolute noise level criteria which define SOAEL, LOAEL and NOEL which is applicable to all sources of noise in all situations. Therefore, within the context of the Proposed Development, national planning policy and appropriate guidance documents, Section 2.0 presents the noise level criteria used as a basis of this assessment.

The NPPG also states that *neither the NPSE nor the NPPF (which reflects the Noise Policy Statement) expects noise to be considered in isolation, separately from the economic, social and other environmental dimensions of the proposed development.*

1.3 PROPG PLANNING AND NOISE - NEW RESIDENTIAL DEVELOPMENT

Professional Practice Guidance on Planning and Noise for new residential development (ProPG) was launched on 22nd June 2017 by the Chartered Institute of Environmental Health (CIEH), the Association of Noise Consultants (ANC) and the Institute of Acoustics (IOA). The publication provides practitioners with guidance on the management of noise within the planning system in England.

The guidance is specifically for 'new residential development that would be exposed predominantly to noise from existing transport sources' and reflects the Government's overarching Noise Policy

Statement for England (NPSE), the National Planning Policy Framework (NPPF), and Planning Practice Guidance (including PPG-Noise), as well as other authoritative sources of guidance.

The guidance provides advice for Local Planning Authorities (LPAs) and developers, and their respective professional advisers which complements Government planning and noise policy and guidance and, in particular, aims to:

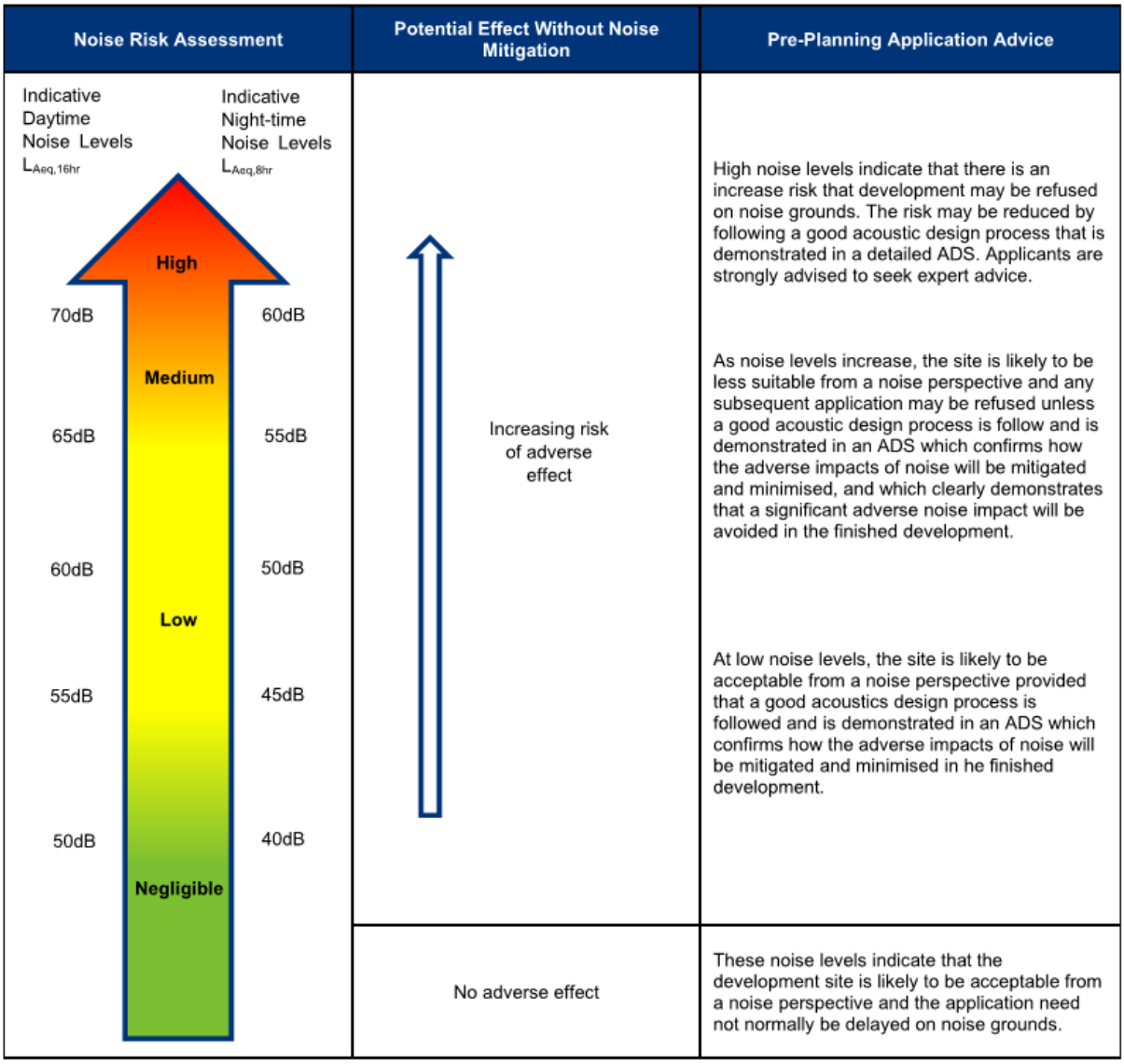
- Advocate full consideration of the acoustic environment from the earliest possible stage of the development control process;
- Encourage the process of good acoustic design in and around new residential developments;
- Outline what should be taken into account in deciding planning applications for new noise-sensitive developments;
- Promote appropriate noise exposure standards; and
- Assist the delivery of sustainable development.

There are two stages of the overall approach outlined in the ProPG:

- Stage 1 – an initial noise risk assessment of the proposed development site; and
- Stage 2 – a systematic consideration of 4 key elements which is underpinned by an Acoustic Design Statement.

With regards to Stage 1, ProPG provides guidance to produce an initial site risk assessment, pre-mitigation, with regards to noise based on the prevailing daytime and night time noise levels across the site, from which the site (or areas thereof) can be allocated a Noise Risk as shown in Figure 1.1 below, together with their corresponding sound levels as referred to in the ProPG.

Figure 1.1 ProPG Stage 1, Noise Risk Assessment



An Acoustic Design Statement is then produced which addresses issues found in Stages 1 & 2 of the ProPG approach including recommendations for mitigation.

1.4 LOCAL PLANNING POLICY

Policy Bicester 1: North West Bicester Eco-Town of the Cherwell Local Plan 2011-2031 Part 1 adopted by Cherwell District Council (CDC) states the following in reference to noise:

- “Consideration and mitigation of any noise impacts of the railway line.”

1.5 ACOUSTIC CONSULTANTS' QUALIFICATIONS, PROFESSIONAL MEMBERSHIPS

The lead acoustic consultant for this assessment is Emma Aspinall. The report has been verified by Nigel Mann. Relevant qualifications, membership and experience are summarised below.

Table 1.2 Acoustic Consultants' Qualifications & Experience

Name	Education	Institute of Acoustics Post Graduate Diploma in Acoustic and Noise Control (Pass Date)	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)
Emma Aspinall	MGeol (2017)	Dec (2020)	Jul (2017)	Jan (2021)	-
Ashley Shepherd	BSc (2013)	-	Feb (2014)	Feb (2014)	Nov (2017)
Nigel Mann	BSc (1997) Msc (1999)	Nov (2001)	Nov (1998)	Nov (2001)	Jul (2005)

2.0 ASSESSMENT CRITERIA

2.1 NOISE ASSESSMENT CRITERIA

In order to enable the assessment of the proposed development in terms of LOAEL and SOAEL, Table 2.1-2.3 presents equivalent noise levels and associated actions with the target noise level criteria identified. The noise level criteria detailed below have been derived from the following standards and design guidance:

- BS 8233:2014 *'Guidance on sound insulation and noise reduction for buildings – Code of practice*'
- BS 5228-1: 2009 + A1:2014 *'Code of Practice for Noise and vibration control on construction and open sites'*
- World Health Organisation 'Guidelines on Community Noise' 1999
- *Tables 3.54a & 3.54b of LA 111 'Noise and Vibration' (Design Manual for Roads and Bridges)*
- IEMA (Institute for Environmental Management and Assessment) *'Guidelines for Environmental Noise Impact Assessment October 2014'*

Table 2.1 Noise Level Criteria and Actions

Effect Level	Noise Level Criteria	Action / Justification
No Observed Adverse Effect Level	Noise levels below: Bedrooms – 30 dB $L_{Aeq,8hours}$ / 45 dB L_{Amax} Living Rooms – 35 dB $L_{Aeq,16hours}$	No Action Required Within BS8233 Criteria
Lowest Observed Adverse Effect Level	Noise levels exceed: Bedrooms – 30 dB $L_{Aeq,8hours}$ / 45 dB L_{Amax} Living Rooms – 35 dB $L_{Aeq,16hours}$	Mitigate to achieve: *Bedrooms – 30 dB $L_{Aeq,8hours}$ / 45 dB L_{Amax}* *Living Rooms – 35 dB $L_{Aeq,16hours}$*
Significant Observed Adverse Effect	Noise levels exceed: Bedrooms – 35 dB $L_{Aeq,8hours}$ Living Rooms – 40 dB $L_{Aeq,16hours}$	Mitigate to achieve: *Bedrooms – 30 dB $L_{Aeq,8hours}$ / 45 dB L_{Amax} Living Rooms – 35 dB $L_{Aeq,16hours}$*
Unacceptable Observed Adverse Effect	Noise levels with mitigation exceed: Bedrooms – 35 dB $L_{Aeq,8hours}$ Living Rooms – 40 dB $L_{Aeq,16hours}$	Prevent

Table 2.2 Noise Level Criteria and Actions (Traffic Noise Assessment)

Short-term Change in Noise Levels $L_{A10,18hr}$ (dB)	Category (Short-term)
0.0	No Change
0.1 – 0.9	Negligible Adverse
1.0 – 2.9	Minor Adverse (LOAEL)
3.0 – 4.9	Moderate Adverse (SOAEL)
> 5.0	Major Adverse

Table 2.3 Noise Level Criteria and Actions (Construction Noise Assessment)

Effect Level	Assessment	Noise Level Criteria	Action / Justification
No Observed Adverse Effect Level	Construction Noise Assessment	Fixed Limits In rural areas noise levels exceed 50dB In urban areas noise levels exceed 55dB	No Action Required Complaints Relating to Construction Noise Unlikely
Lowest Observed Adverse Effect Level	Construction Noise Assessment	Fixed Limits In rural areas noise levels exceed 60dB In urban areas noise levels exceed 65dB	Mitigate to achieve total noise levels below relevant category threshold
Significant Observed Adverse Effect	Construction Noise Assessment	Fixed Limits In rural areas noise levels exceed 70dB In urban areas noise levels exceed 75dB	Mitigate to achieve total noise levels below relevant category threshold
Unacceptable Observed Adverse Effect	Construction Noise Assessment	Fixed Limits In rural areas noise levels exceed 80dB In urban areas noise levels exceed 85dB	Mitigate to achieve total noise levels below relevant category threshold

3.0 ASSESSMENT METHODOLOGY

3.1 NOISE MODELLING METHODOLOGY

Three-dimensional noise modelling has been undertaken based on the monitoring data to predict noise levels at a number of locations both horizontally and vertically. CADNA noise modelling software has been used. 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.

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 Input Data

Parameter	Source	Details
Horizontal distances – around site	Ordnance Survey	Ordnance Survey
Ground levels – around site	Ordnance Survey	Ordnance Survey
Ground levels – other areas	Site Observations and Ordnance Survey	OS 1:25,000 contours and OS 1:10,000 spot heights.
Traffic data	Velocity Transport Planning	Provided by Velocity Transport Planning transport consultants
Building heights – around site	Tetra Tech Observations	8 m height for two storey residential properties, and 4 m for Bungalows. 3m per storey for multi-storey developments.
Barrier heights	Tetra Tech Observations	All existing barriers at 1.8 m with the exception of hedges and trees which are considered to offer no noise protection. Proposed garden fences are considered to be 1.8m.
Receptor positions	Tetra Tech	1 m from façade, height of 1.5 m for ground floor, 4 m for first floor properties. 1.5 m height for model grid and monitoring locations for validation.
Plans	Mosaic	Drawing Title: Location Plan Rev G Dated: 02.03.2021

It is acknowledged that a number of the values of parameters chosen will affect the overall noise levels presented in this report. However, it should be noted that the values used, as identified above, are worst case.

3.2 MODEL INPUT DATA

3.2.1 Model Verification

The model was verified by modelling the monitoring locations for the 'existing' weekday scenario. Daytime and night-time L_{Aeq} and night-time L_{Amax} scenarios have been verified. The comparison between the monitoring and modelling results are shown in the tables 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	65.7	65.7	0.0
LT2	51.7	51.7	0.0
ST1	51.0	51.0	0.0
ST2	72.8	71.8	-1.0
ST3	57.4	55.3	-2.1
ST4	70.0	72.2	2.2
ST5	75.6	74.1	-1.5
ST6	49.0	55.0	6.0
ST7	69.4	69.4	0.0

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	60.2	60.2	0.0
LT2**	41.6	42.5	0.9
ST1	46.0	46.0	0.0
ST2	65.2	66.4	1.2
ST3	34.0	37.8	3.8
ST4	60.0	62.6	2.6
ST5	67.4	68.2	0.8
ST6	34.3	38.7	4.4
ST7	58.8	58.8	0.0

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

Table 3.4 Modelled vs. Monitored Results $L_{Amax;\ night\text{-}time\ 23:00– 07:00}$

Location	Monitored L_{Amax}	Modelled L_{Amax}	Difference between Monitored and Modelled Results
LT1*	79.4	79.4	0.0
LT2**	64.4	62.0	-2.4

All values are sound pressure levels in dB re: 2x 10^{-5} Pa
*10^{th} Highest L_{Amax}
**Contamination associated with dawn chorus removed

The verification points show a divergence between monitored and modelled results of no more than +/- 2.4 dB. This is with exception of location ST6 during the daytime L_{Aeq} scenario and ST3 and ST6 during the night-time L_{Aeq} scenario, where the model is predicting a higher level than was recorded during short term measurements. Following a review of sound files, this is due to a lower frequency of vehicles passing during the short-term 15-minute measurements. Greater weight and confidence within verified noise levels have been given to the long-term monitoring positions due to the longer exposure time. Therefore, the models are considered to be suitably verified.

3.2.2 Model Input Data – Road Traffic

Traffic flows have been based on traffic data provided by Velocity Transport Planning transport consultants which are presented in the table below; the assessment scenarios are as follows:

- 2031 "Do Minimum" = Baseline conditions + committed development flows; and,
- 2031 "Do Something" = Baseline conditions + committed development flows + proposed development flows.

Table 3.5 Traffic Data

Link	2031	
	Do Minimum	Do Something
	AAWT	
B4100 to Braeburn Avenue	16288	16595
B4100 Banbury Road	18960	20620
A4095 Lord's Lane	11642	12480
Banbury Road	9060	9257
A4095	21844	22307
Braeburn Avenue	1465	2695
Charlotte Avenue	4446	5184

3.2.3 Model Input Data – Construction Noise

Information regarding noise emissions from equipment used during the construction phase has been obtained from Annex C of BS 5228-1:2009 + A1:2014 *Code of practice for noise and vibration control on construction and open sites – Part 1: Noise*. This annex presents a range of current sound level data on typical site equipment and common site activities.

This data is obtained by field measurements for items of plant in actual use on construction and open sites in the UK. Levels quoted in the database are based on an average (logarithmic) of measured sound levels, and where appropriate have been derived from more than one model of similarly sized plant. The results are presented as un-weighted octave band activity L_{eq} levels, and overall A-weighted activity L_{eq} levels in dB. All sound pressure levels are standardized to 10 metres from the plant.

The items of plant and associated noise levels shown in Table 3.6 below has been used for the purposes of this assessment and consider the range of typical activities likely to be employed during the construction phase of the proposed development. These have been determined in conjunction with the Chapter 5 of the ES Chapter: Construction Methodology and Phasing. Items of mobile plant have been positioned in the areas on the development site that are close to existing sensitive receptors.

Table 3.6 Mobile Plant Construction Phase

Mobile Plant	BS 5228-1:2009 Annex C Ref.	Octave Band Sound Pressure Levels (Hz)								Model Input $L_{Aeq,1hour}$ at 10 m
		63	125	250	500	1K	2K	4K	8K	
Articulated Dump truck	Table C.2 No.33	85	87	77	75	76	73	69	62	81 dB
Tracked Excavator-loading truck	Table C.1 No.10	82	78	82	81	81	78	72	64	85 dB
Tracked Excavator	Table C.2 No.19	95	84	79	73	70	68	64	57	77 dB
Crane	Table C.4 No.48	82	77	80	76	66	66	56	50	76 dB
Delivery Trucks	Table C2 No.34	73	78	78	78	74	73	68	66	80 dB
Concrete Pumps	Table C4 No.28	79	80	73	72	69	68	59	53	75 dB
Hand-held Pneumatic Breaker	Table C.1 No. 6	83	83	81	74	73	76	78	77	83 dB
Percussive Piling Rig	Table C.3 No.1	82	82	82	89	83	78	75	70	89 dB
Road Sweeper	Table C.4 No.90	80	75	69	75	71	67	61	58	76 dB
Angle Grinding (Power Tools)	Table C.4 No.93	57	51	52	60	70	77	73	73	80 dB
Concrete Mixer Truck	Table C.4 No.20	83	74	66	69	70	78	60	55	80 dB
Lifting Platform	Table C.4 No.57	78	76	62	63	60	59	58	49	67 dB

3.3 SENSITIVE RECEPTORS

The tables below summarise receptor locations that have been selected to represent worst-case existing and proposed residential receptors with respect to construction noise and site-related traffic noise. The locations of existing receptors are shown on Figure 3.1 and Figure 3.2 below, whilst the locations of indicative proposed receptors are shown on Figure 3.3.

Table 3.7 Existing/Proposed Sensitive Receptor Locations (Construction Assessment)

Ref.	Description	Approximate Distance to Source (m)	Assessed Height (m) (Daytime)
C01	Bicester Eco Town Exemplar Site Caversield	84	1.5
C02	Bicester Eco Town Exemplar Site Caversield	47	1.5
C03	Bicester Eco Town Exemplar Site Caversield	45	1.5
C04	Bicester Eco Town Exemplar Site Caversield	80	1.5
C05	Bicester Eco Town Exemplar Site Caversield	80	1.5
C06	Bicester Eco Town Exemplar Site Caversield	94	1.5
C07	Bicester Eco Town Exemplar Site Caversield	60	1.5
C08	13 Haricot Vale Road	51	1.5
C09	Stable Cottage, Caversfield	85	1.5
C10	St Laurence Church, Caversfield	96	1.5
C11	Home Farm Cottage, Banbury Road	100	1.5
C12	10 Pippin Close	265	1.5
C13	3 Wintergreen Fields	45	1.5
C14	1 Caraway Fields	45	1.5
C15	1 Lovage View	98	1.5

Figure 3.1 Existing/Proposed Sensitive Receptor Locations (Construction Assessment)

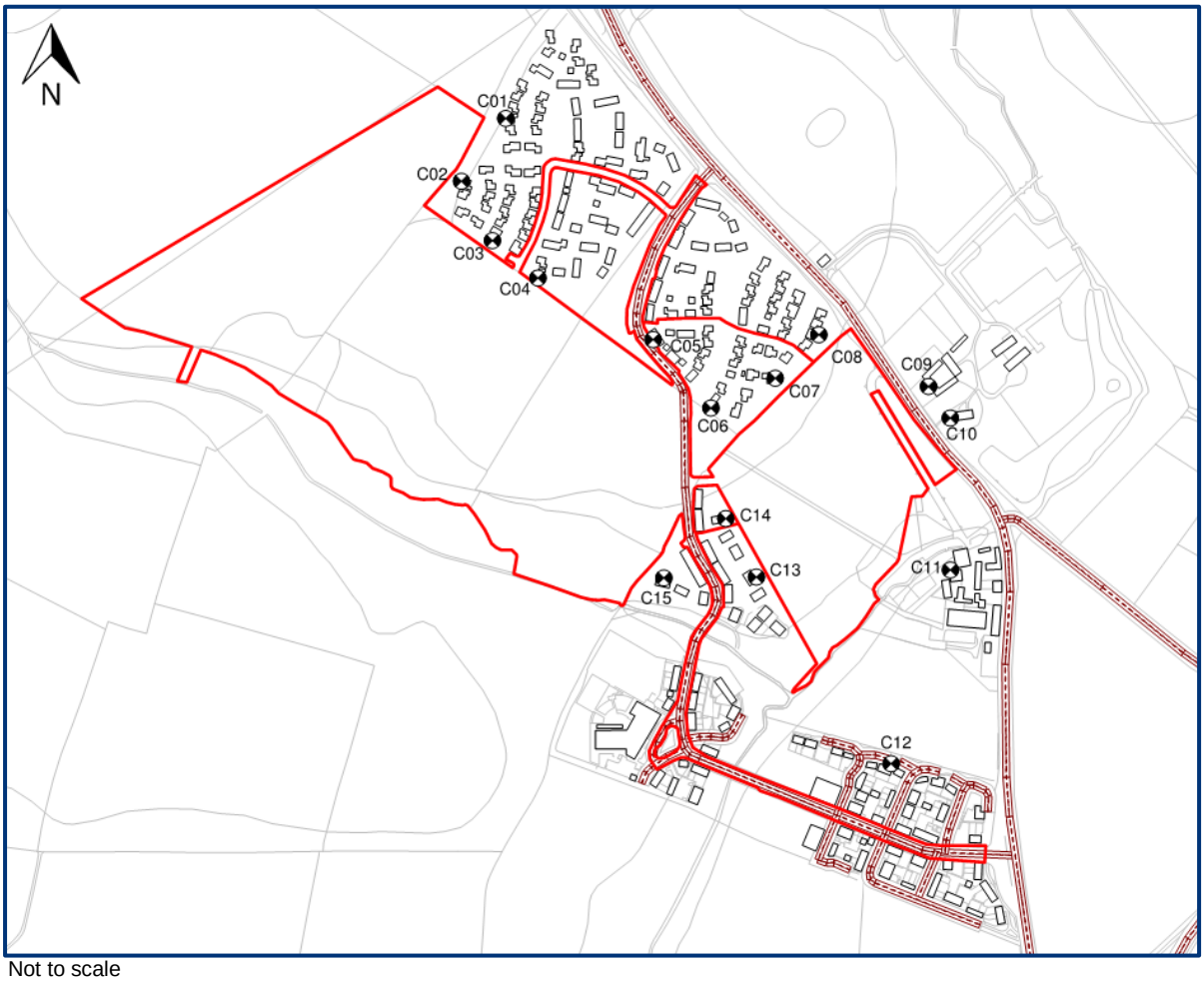


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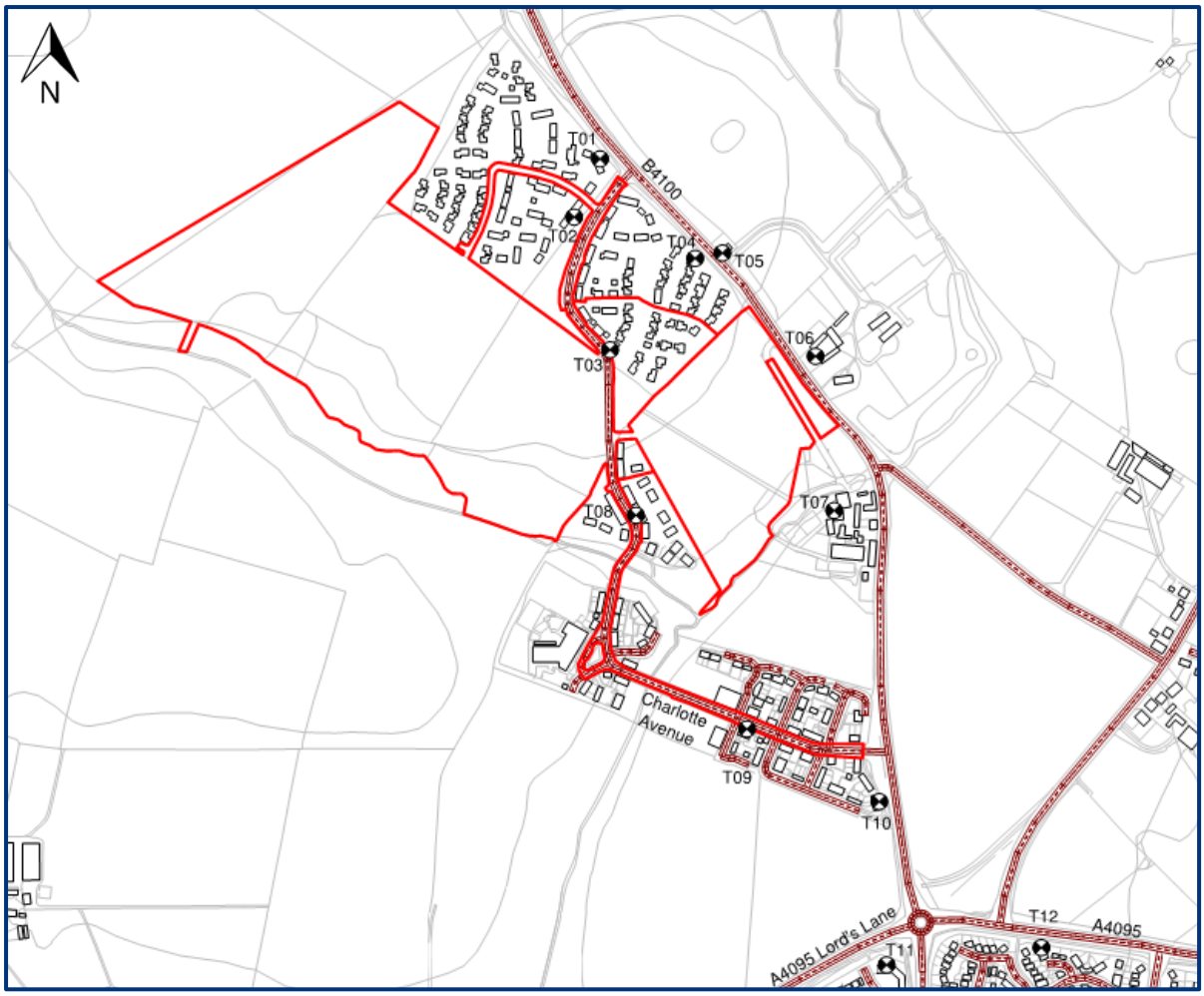
Table 3.8 Existing/Proposed Sensitive Receptor Locations (Traffic Noise Assessment)

Ref.	Description	Closest Source	Approximate Distance to Source (m)
T01	Bicester Eco Town Exemplar Site Caversield	B4100	18
T02	Bicester Eco Town Exemplar Site Caversield	Braeburn Avenue	20
T03	22 Sage Street	Braeburn Avenue	5
T04	9 Autumn Close	B4100	16
T05	Northside Lodge, Caversfield	B4100	6
T06	Stable Cottage, Caversfield	B4100	22
T07	Home Farm Cottage, Banbury Road	B4100	60
T08	82 Charlotte Avenue	Charlotte Avenue	5
T09	31 Charlotte Avenue	Charlotte Avenue	5
T10	8 Orchard Walk	B4100	18
T11	104 Mullein Road	A4095 Lord's Lane	30
T12	14 Tamarisk Gardens	A4095	18

Figure 3.2 Existing/Proposed Sensitive Receptor Locations (Traffic Noise Assessment)



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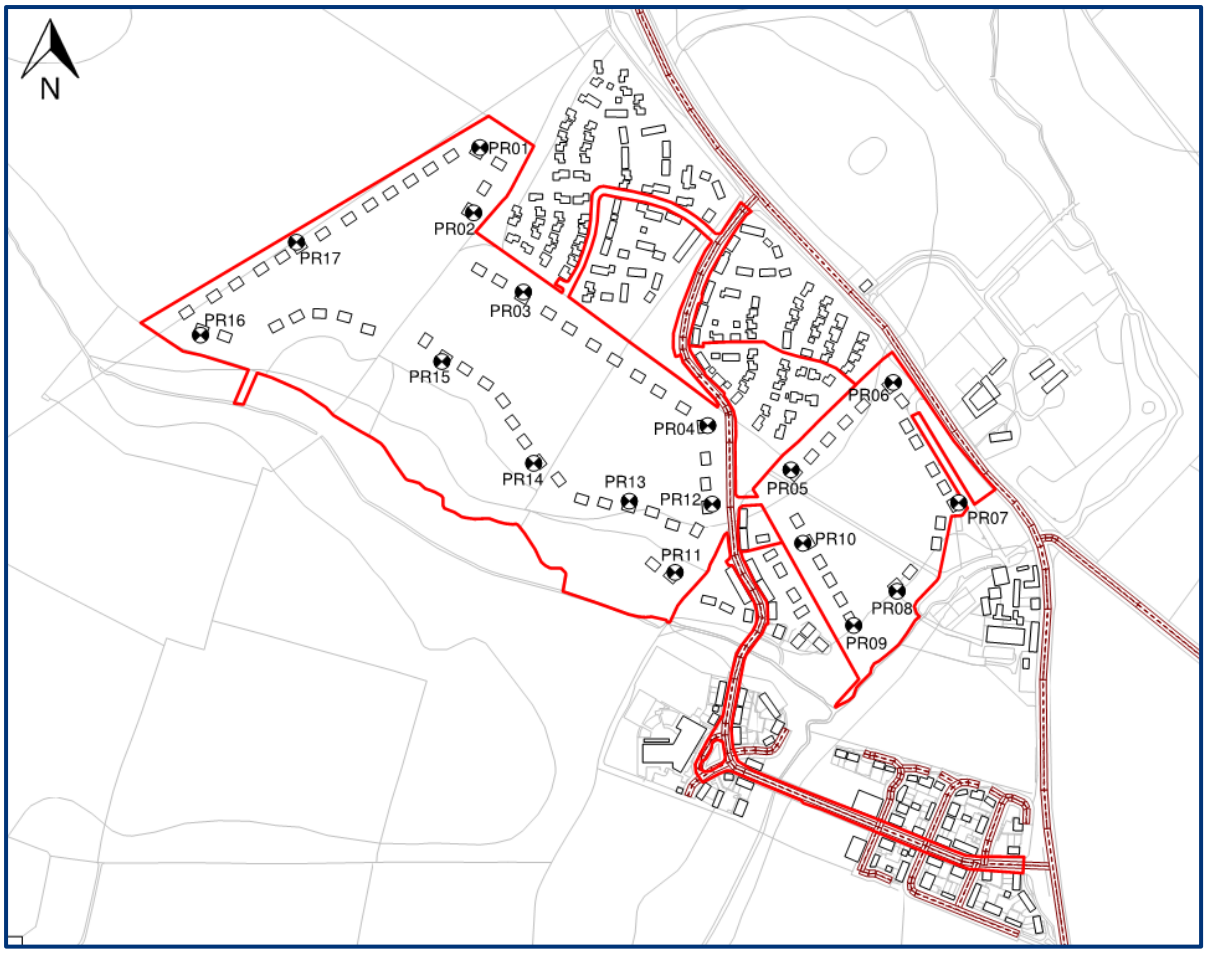
For the purposes of the noise intrusion assessment, due to the outline nature of the scheme, indicative worst-case building locations with respect to surrounding noise sources have been used in order to determine the noise exposure of future occupiers and to produce a suitable glazing and ventilation strategy. The location of indicative proposed receptors is shown on Figure 3.3 below.

Figure 3.3 Indicative Proposed Sensitive Receptor Locations



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3.4 TRANQUILLITY RATING

An assessment of the existing tranquillity level of the site has been based on the mapping data published by CPRE, the countryside charity. This uses a colour coded system and a 500m assessment grid for the whole of England, and a tranquillity rating of between 1 and 10 is assigned (1 being least tranquil and 10 being most).

4.0 NOISE SURVEY

4.1 NOISE SURVEY METHODOLOGY

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	s/n	253701
Rion NL-52	Environmental Noise Analyser	s/n	1021331
Rion NL-52	Environmental Noise Analyser	s/n	976224
Rion NC-75	Sound Calibrator	s/n	35270131

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 0.0 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 nine locations (as specified in the following table and shown on Figure 4.1) from Wednesday 9th August 2020 to Wednesday 16th August 2020. Attended short term measurements were undertaken at seven locations during day, evening and night-time periods with two additional locations being measured unattended over a 164-hour period. The raw data collected from the long-term monitoring is available upon request.

The baseline survey was undertaken with additional restrictions in place due to COVID-19. However, during the attended monitoring, all major roads were observed to have continuous, free-flowing traffic and were considered to be representative of typical conditions.

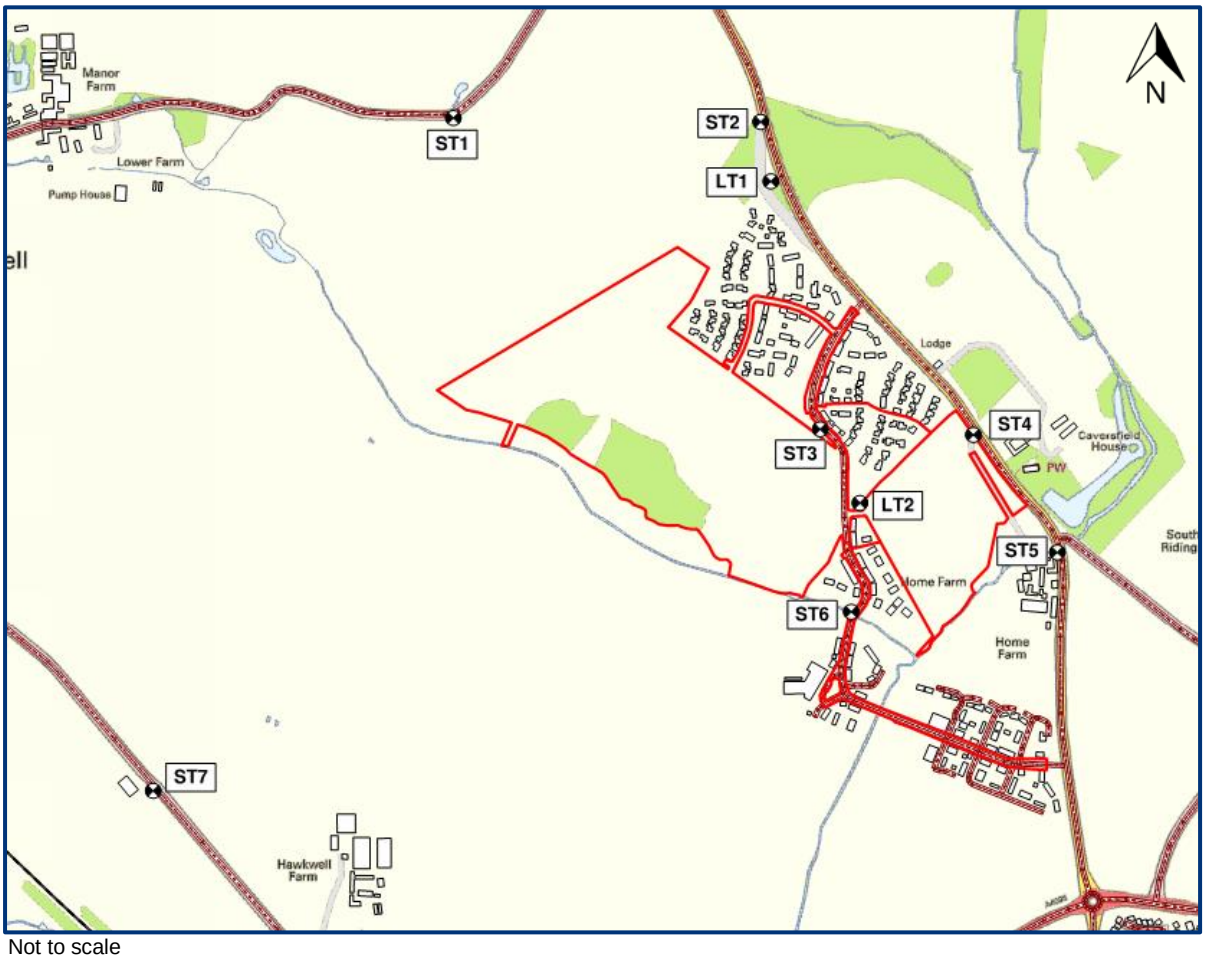
Measurements were taken in general accordance with BS 7445-1:2003 The Description and Measurement of Environmental Noise: Guide to quantities and procedures. Weather conditions during the survey period were observed as being dry and overcast. Anemometer readings confirmed that wind speeds were less than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

Table 4.1 Noise Monitoring Locations

Ref	Description
LT1	Lay-by off the B4100, north west of the site
LT2	Centre of the site by the currently completed houses
ST1	Bainton Rd by the residents of Bucknell
ST2	In the lay-by off the B4100
ST3	On Braeburn Ave by the child's playpark
ST4	At the top of the entrance to The Courtyard by the B4100

Ref	Description
ST5	Outside the farm buildings on the corner of the B4100
ST6	On Charlotte Ave by the completed buildings on the estate
ST7	On Bicester Rd outside the farm buildings

Figure 4.1 Noise Monitoring Locations



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4.2 NOISE SURVEY RESULTS

The ambient noise climate is characterised by road traffic noise from the B4100 and background traffic from the M40 as well as rail noise, some localised noise from smaller roads and residents as well as some distant aircraft noise.

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 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	15/09/2020 14:04:00	24	0-1	NE	1	Background traffic from B4100 and M40, minor traffic on Bainton Rd
Day ST2	15/09/2020 12:47:16	24	0-1	NE	1	Traffic on B4100
Day ST3	15/09/2020 12:29:47	23	0-1	NE	1	Background traffic from B4100, minor traffic on Charlotte Ave
Day ST4	15/09/2020 13:04:29	24	0-1	NE	1	Traffic on B4100
Day ST5	15/09/2020 13:21:34	24	0-1	NE	1	Traffic on B4100
Day ST6	15/09/2020 12:12:09	23	1-2	NE	1	Background traffic from B4100, minor traffic on Braeburn Ave
Day ST7	15/09/2020 13:44:19	24	0-1	NE	1	Traffic on Bicester Rd
Evening ST1	15/09/2020 19:56:34	24	0-1	WNW	3	Background traffic from B4100 and M40, minor traffic on Bainton Rd
Evening ST2	15/09/2020 20:14:44	23	0-1	NW	3	Traffic on B4100
Evening ST3	15/09/2020 21:27:14	23	0-1	NW	3	Background traffic from B4100, minor traffic on Charlotte Ave
Evening ST4	15/09/2020 20:31:23	23	0-1	NW	3	Traffic on B4100
Evening ST5	15/09/2020 20:48:42	23	0-1	NW	3	Traffic on B4100
Evening ST6	15/09/2020 21:08:00	23	0-1	NW	3	Background traffic from B4100, minor traffic on Braeburn Ave
Evening ST7	15/09/2020 19:37:02	24	0-1	WNW	3	Traffic on Bicester Rd
Night ST1	15/09/2020 23:25:46	20	0-1	N	4	Background traffic from B4100 and M40, minor traffic on Bainton Rd
Night ST2	15/09/2020 23:44:52	20	0-1	N	4	Traffic on B4100
Night ST3	16/09/2020 00:58:23	19	0-1	N	4	Background traffic from B4100 and M40
Night ST4	16/09/2020 00:03:03	19	0-1	N	4	Traffic on B4100
Night ST5	16/09/2020 00:20:05	19	0-1	N	4	Traffic on B4100
Night ST6	16/09/2020 00:39:22	19	0-1	N	4	Background traffic from B4100 and M40
Night ST7	15/09/2020 23:05:54	20	0-1	N	4	Traffic on Bicester Rd, Background traffic from M40

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	76 Hours	09/09/2020 - 16/09/2020 07:00 - 23:00	LT1	65.7	89.6	23.9	69.0	55.0
Weekday Night-time 23:00 – 07:00	40 Hours	09/09/2020 - 16/09/2020 23:00 - 07:00		60.2	82.0	23.0	59.0	32.0
Weekend Daytime 07:00 - 23:00	32 Hours	09/09/2020 - 16/09/2020 07:00 - 23:00		63.9	99.0	33.1	67.7	50.0
Weekend Night-time 23:00 – 07:00	16 Hours	09/09/2020 - 16/09/2020 23:00 - 07:00		57.0	83.2	32.7	56.3	40.0
Weekday Daytime 07:00 - 23:00	76 Hours	09/09/2020 - 16/09/2020 07:00 - 23:00	LT2	51.7	97.8	24.9	49.9	44.0
Weekday Night-time 23:00 – 07:00	40 Hours	09/09/2020 - 16/09/2020 23:00 - 07:00		41.6	61.1	24.0	43.9	34.0
Weekend Daytime 07:00 - 23:00	32 Hours	09/09/2020 - 16/09/2020 07:00 - 23:00		47.6	90.1	33.5	45.7	40.0
Weekend Night-time 23:00 – 07:00	16 hours	09/09/2020 - 16/09/2020 23:00 - 07:00		40.0	64.4	31.5	42.1	38.0
Daytime 07:00 - 19:00	15 Mins	15/09/2020 14:04:00	ST1	51.0	74.6	30.3	46.8	32.4
	15 Mins	15/09/2020 12:47:16	ST2	72.8	90.5	40.8	77.0	52.5
	15 Mins	15/09/2020 12:29:47	ST3	57.4	82.7	33.6	51.0	38.5
	15 Mins	15/09/2020 13:04:29	ST4	70.0	83.8	36.9	74.4	52.3
	15 Mins	15/09/2020 13:21:34	ST5	75.6	89.0	40.0	80.3	48.5
	15 Mins	15/09/2020 12:12:09	ST6	49.0	69.2	37.4	48.3	41.0
	15 Mins	15/09/2020 13:44:19	ST7	69.4	90.0	44.4	69.5	47.0
Evening 19:00 - 23:00	15 Mins	15/09/2020 19:56:34	ST1	56.4	81.3	38.2	47.4	40.7
	15 Mins	15/09/2020 20:14:44	ST2	69.4	85.9	39.1	74.8	46.9
	15 Mins	15/09/2020 21:27:14	ST3	42.6	53.1	29.8	45.8	34.9
	15 Mins	15/09/2020 20:31:23	ST4	61.8	78.0	40.7	67.1	42.9
	15 Mins	15/09/2020 20:48:42	ST5	70.8	89.4	31.3	75.2	37.0
	15 Mins	15/09/2020 21:08:00	ST6	40.9	64.6	32.5	40.0	34.9
	15 Mins	15/09/2020 19:37:02	ST7	64.3	84.6	46.7	65.7	48.7
Night-time 23:00 - 07:00	15 Mins	15/09/2020 23:25:46	ST1	46.0	72.0	25.8	47.2	31.7
	15 Mins	15/09/2020 23:44:52	ST2	65.2	85.0	25.0	63.8	29.5
	15 Mins	16/09/2020 00:58:23	ST3	34.0	52.8	23.1	38.0	26.8
	15 Mins	16/09/2020 00:03:03	ST4	60.0	79.4	24.4	61.3	32.5
	15 Mins	16/09/2020 00:20:05	ST5	67.4	91.7	23.6	61.7	28.7
	15 Mins	16/09/2020 00:39:22	ST6	34.3	57.5	24.4	37.5	27.0
	15 Mins	15/09/2020 23:05:54	ST7	58.8	84.1	31.8	53.7	34.2

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

5.0 ASSESSMENT OF KEY EFFECTS

5.1 CONSTRUCTION NOISE ASSESSMENT

Noise levels from potential construction activity associated with the proposed development of the application site have been assessed in accordance with BS 5228 criteria which indicates if a significant effect is likely to occur at noise sensitive properties.

This assessment has been undertaken in order to establish the maximum external noise levels at neighbouring properties for the proposed construction activity of the site and whether typical plant and activities will be within these levels. In order to present a worst-case assessment, the model assumes that all sources will be operating simultaneously across the application site (including piling).

The table below shows predicted levels of construction noise at existing noise sensitive properties and the proposed residential dwellings from cumulative sites for comparison with the BS 5228-1 recommended noise limit criteria of 75 dBA.

Table 5.1 Construction Noise Assessment Results (Fixed Limits Method)

Ref	Description	Construction Noise Level (dBA)	Criteria (dBA)	Within Recommended Fixed Noise Limit?
C01	Bicester Eco Town Exemplar Site Caversield	61.9	75.0	Yes
C02	Bicester Eco Town Exemplar Site Caversield	67.9	75.0	Yes
C03	Bicester Eco Town Exemplar Site Caversield	66.6	75.0	Yes
C04	Bicester Eco Town Exemplar Site Caversield	68.3	75.0	Yes
C05	Bicester Eco Town Exemplar Site Caversield	66.1	75.0	Yes
C06	Bicester Eco Town Exemplar Site Caversield	65.1	75.0	Yes
C07	Bicester Eco Town Exemplar Site Caversield	64.5	75.0	Yes
C08	13 Haricot Vale Road	63.4	75.0	Yes
C09	Stable Cottage, Caversfield	62.4	75.0	Yes
C10	St Laurence Church, Caversfield	61.6	75.0	Yes
C11	Home Farm Cottage, Banbury Road	61.1	75.0	Yes
C12	10 Pippin Close	57.1	75.0	Yes
C13	3 Wintergreen Fields	73.3	75.0	Yes
C14	1 Caraway Fields	70.5	75.0	Yes
C15	1 Lovage View	61.5	75.0	Yes

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

The results indicate that the noise levels at the façades of the existing and proposed noise sensitive properties would be within the recommended criteria. Noise levels within the fixed limit criteria are likely to result in internal conditions where conversation would not be difficult.

In practice, construction noise levels and resulting impacts are likely to vary during the different construction phases of the development depending upon the location of work sites, activities and plant in operation and proximity to sensitive receptors. Given the nature of the area and the scale of works, it is not expected that significant effects would occur for prolonged and continuous periods of time. However, specific mitigation measures will assist in further identifying and minimising construction

noise impacts, examples of best practice measures can be found within the proposed Construction and Environmental Management Plan (CEMP) within Appendix B.

5.2 PROPG STAGE 1 ASSESSMENT

Based on the verified L_{Aeq} noise models, noise levels at the site are between 45-70dB $L_{Aeq,16hours}$ during the daytime and between 38-65dB $L_{Aeq,8hours}$ in the night-time. Therefore, the site falls within 'Negligible' to 'High' Noise Risk Categories during both the daytime and night-time periods, shown illustratively on Figure 5.1 and 5.2 below. As such, these noise levels indicate that a good acoustic design process should be followed and an Acoustic Design Statement showing how adverse impacts of noise will be minimised through mitigation which is detailed in Section 6.0.

Figure 5.1 ProPG Stage 1 Noise Risk Contour Plot Daytime $L_{Aeq,16hr}$ (Grid Height 1.5m)

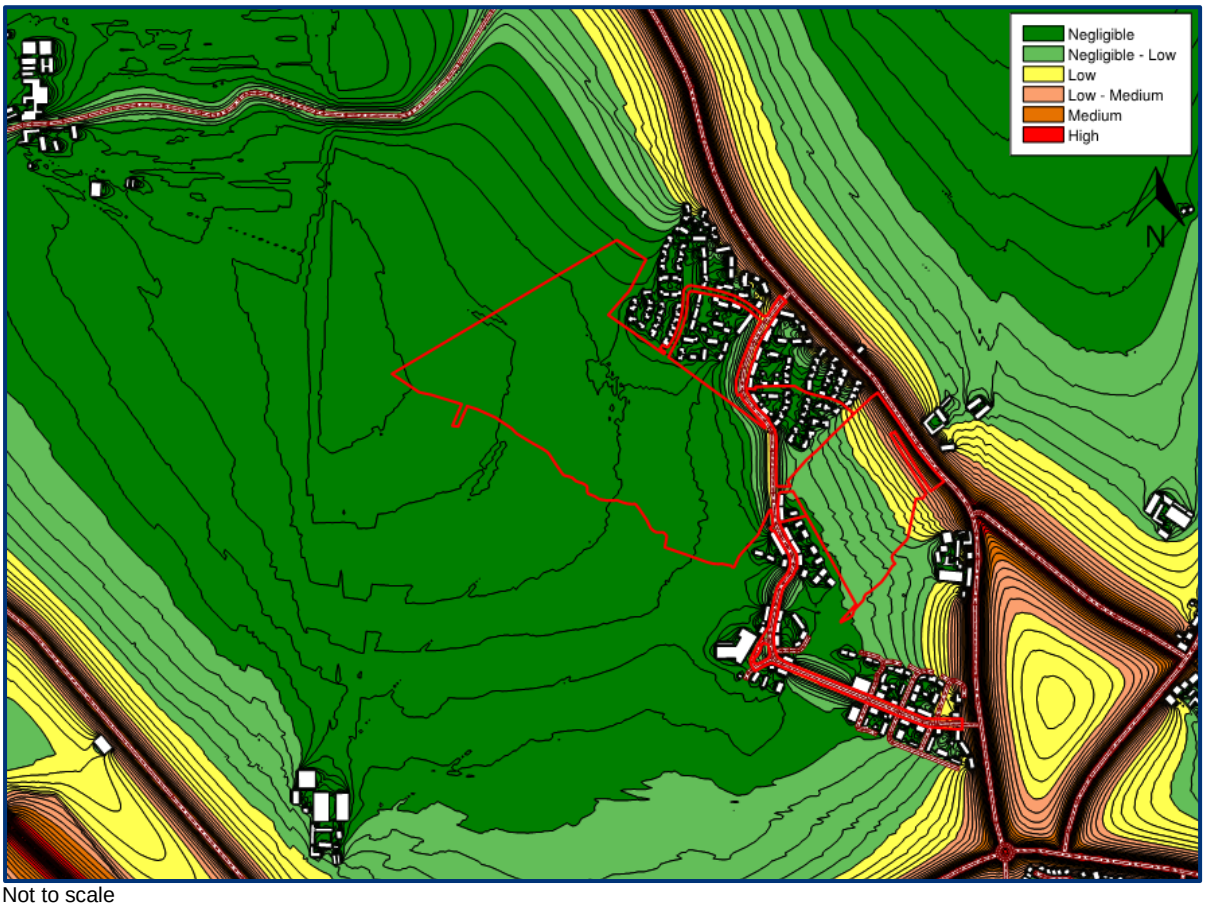

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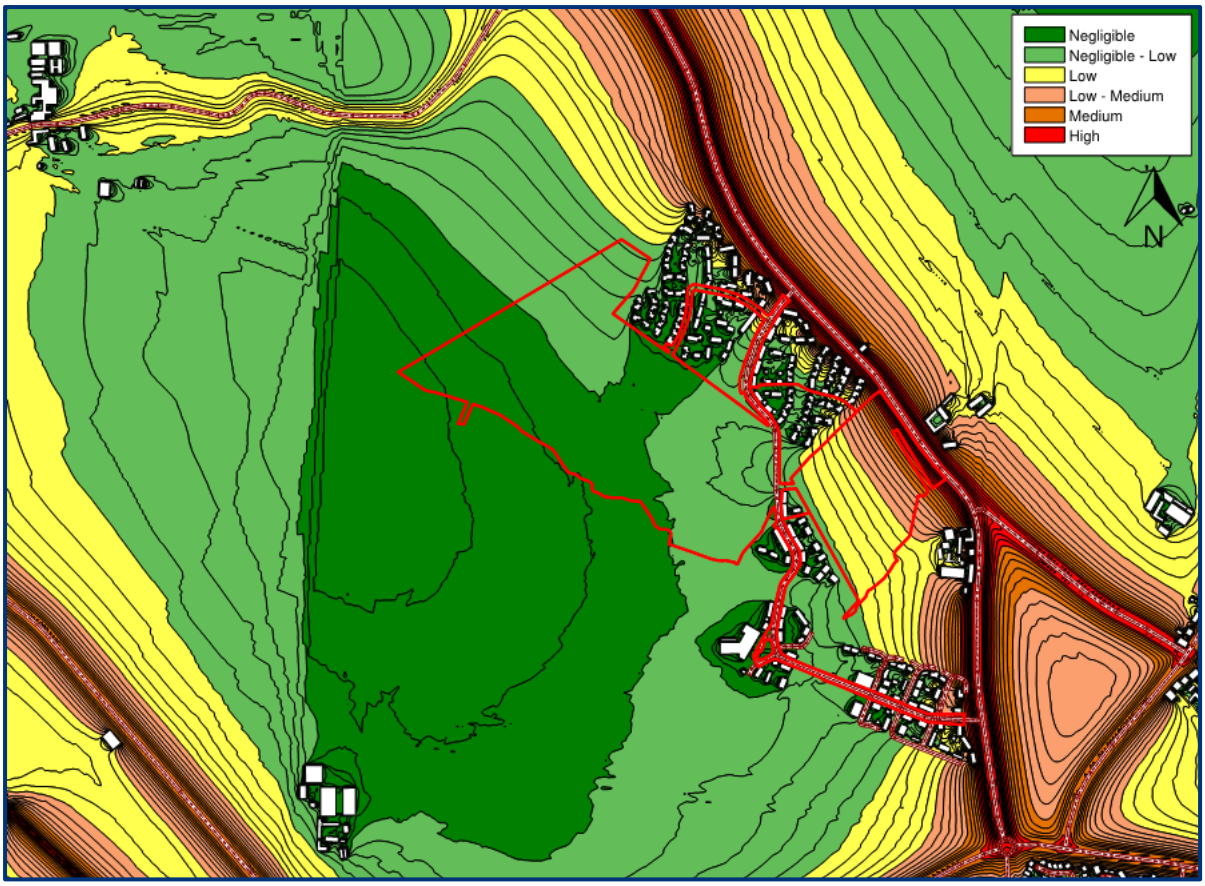
Figure 5.2 ProPG Stage 1 Noise Risk Contour Plot Night-time $L_{Aeq,8hr}$ (Grid Height 4.0m)



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5.3 PROPG STAGE 2 ASSESSMENT – ELEMENT 2: INTERNAL NOISE LEVELS

Modelling and assessment has been undertaken for proposed sensitive properties across the site using an indicative building layout. Internal noise levels within proposed properties 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 with specification R_w+C_{tr} 30 dB (e.g. 6/12/8mm double glazing or equivalent) has been used. The results presented in Tables 5.2 – 5.4 below, show the predicted noise intrusion levels at properties across the site.

Noise intrusion levels have been determined using verified noise levels and road traffic noise levels for 2031 which is considered to represent a worst-case scenario as it incorporates traffic from cumulative sites surrounding the proposed development as well as traffic associated with the proposed development site itself; the following calculations have been used to determine the daytime L_{Aeq} and night-time L_{Night} noise levels.

- Daytime L_{Aeq}

$L_{Aeq(16\text{-}hour)} = L_{A10(18\text{-}hour)} - 2$ dB

- Night-time L_{Aeq}

$L_{night} = 0.90L_{A10(18\text{-}hour)} - 3.77$ dB

Proposed noise levels across the site during the daytime and night-time are shown illustratively on Figure 5.3 and 5.4 below.

Figure 5.3 Proposed Daytime $L_{Aeq,16hr}$ Noise Level Contour Plot (Grid Height 1.5m)

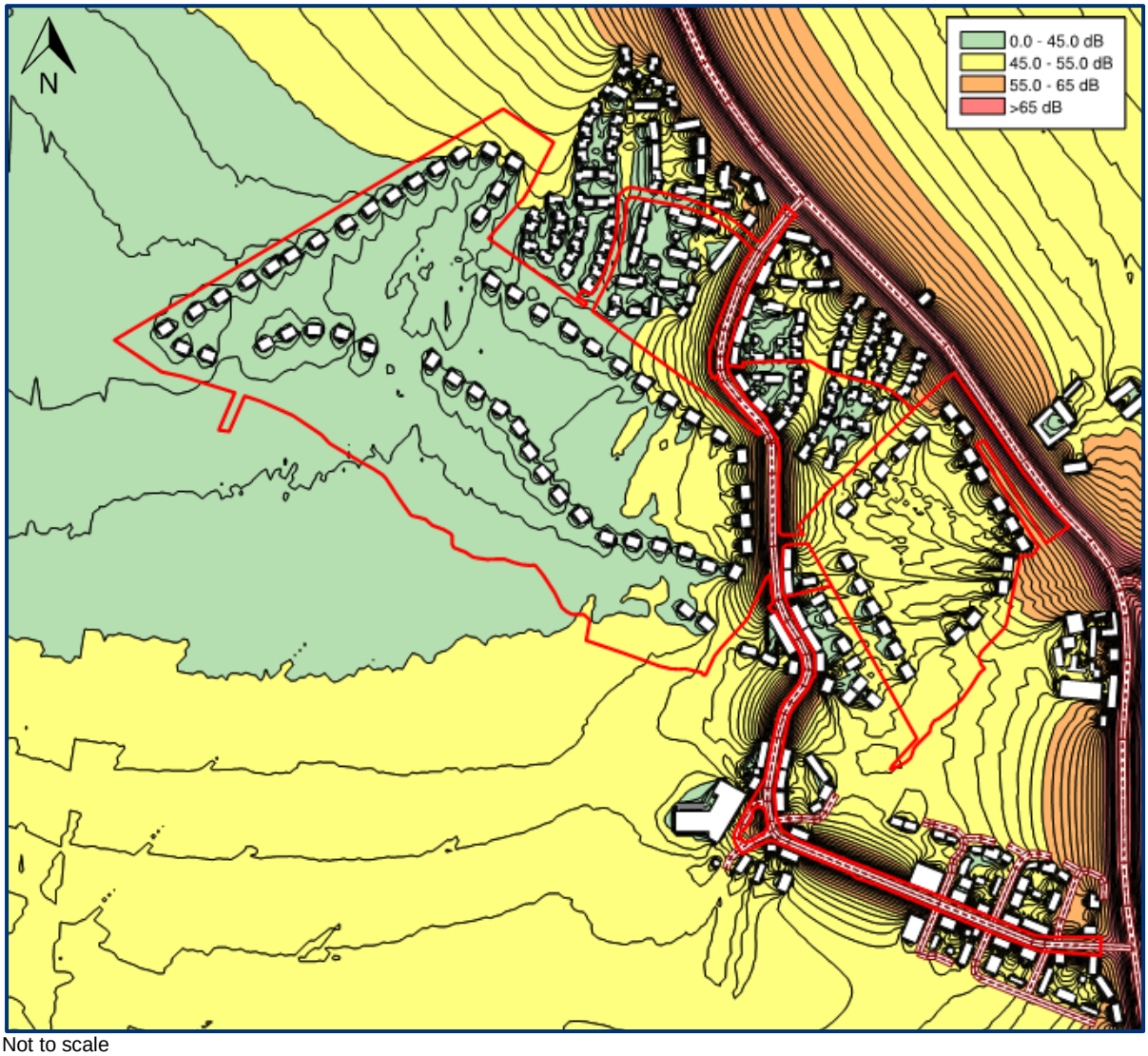

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Figure 5.4 Proposed Night-time $L_{Aeq,8hr}$ Noise Level Contour Plot (Grid Height 4.0m)

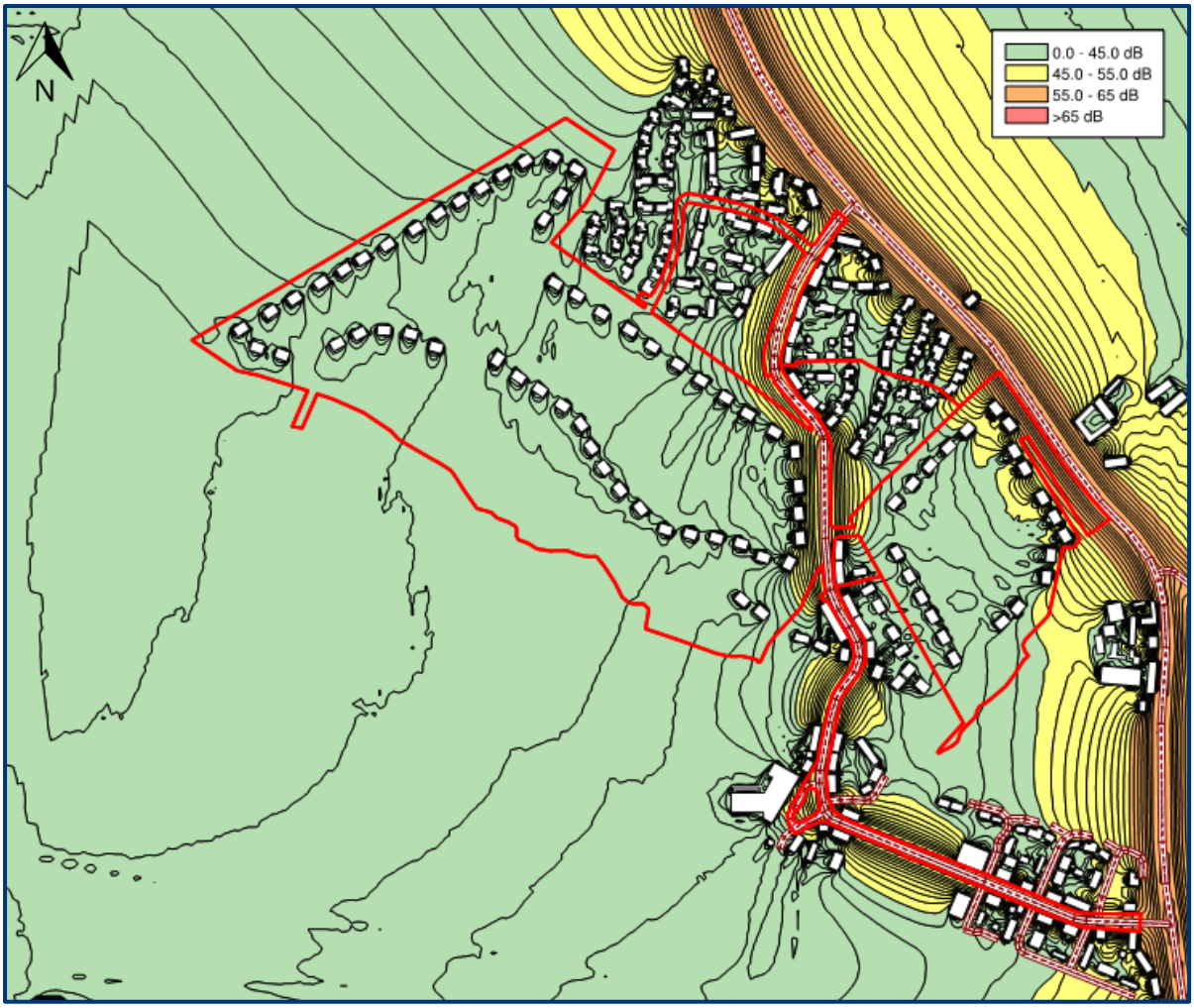

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Table 5.2 Daytime Noise Intrusion Levels $L_{Aeq\ 16\ hour}$

Location	External L_{Aeq} at 1m from facade	Internal L_{Aeq} with windows open	Internal L_{Aeq} with windows closed	Criteria Internal L_{Aeq}
PR01	46.5	36.5	16.5	35
PR02	42.0	32.0	12.0	35
PR03	42.5	32.5	12.5	35
PR04	54.6	44.6	24.6	35
PR05	47.6	37.6	17.6	35
PR06	62.6	52.6	32.6	35
PR07	60.0	50.0	30.0	35
PR08	50.5	40.5	20.5	35
PR09	48.3	38.3	18.3	35
PR10	43.4	33.4	13.4	35
PR11	45.9	35.9	15.9	35
PR12	56.0	46.0	26.0	35
PR13	43.7	33.7	13.7	35

Location	External L_{Aeq} at 1m from facade	Internal L_{Aeq} with windows open	Internal L_{Aeq} with windows closed	Criteria Internal L_{Aeq}
PR14	40.2	30.2	10.2	35
PR15	40.0	30.0	10.0	35
PR16	41.0	31.0	11.0	35
PR17	41.8	31.8	11.8	35

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

Table 5.3 Night-time Noise Intrusion Levels $L_{Aeq\ 8\ hour}$

Location	External L_{Aeq} at 1m from facade	Internal L_{Aeq} with windows open	Internal L_{Aeq} with windows closed	Criteria Internal L_{Aeq}
PR01	41.6	31.6	11.6	30
PR02	36.8	26.8	6.8	30
PR03	37.5	27.5	7.5	30
PR04	49.1	39.1	19.1	30
PR05	42.6	32.6	12.6	30
PR06	56.2	46.2	26.2	30
PR07	52.8	42.8	22.8	30
PR08	43.1	33.1	13.1	30
PR09	41.5	31.5	11.5	30
PR10	38.8	28.8	8.8	30
PR11	40.7	30.7	10.7	30
PR12	50.3	40.3	20.3	30
PR13	38.4	28.4	8.3	30
PR14	32.7	22.7	2.7	30
PR15	32.9	22.9	2.9	30
PR16	32.1	22.1	2.1	30
PR17	37.1	27.1	7.1	30

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

Table 5.4 Night-time Noise Intrusion Levels L_{Amax}

Location	External L_{Amax} at 1m from facade	Internal L_{Amax} with windows open	Internal L_{Amax} with windows closed	Criteria Internal L_{Amax}
PR01	62.4	52.4	32.4	45
PR02	57.8	47.8	27.8	45
PR03	57.9	47.9	27.9	45
PR04	59.3	49.3	29.3	45
PR05	59.5	49.5	29.5	45
PR06	79.4	69.4	49.4	45
PR07	75.5	65.5	45.5	45
PR08	64.9	54.9	34.9	45
PR09	63.1	53.1	33.1	45
PR10	56.2	46.2	26.2	45
PR11	58.5	48.5	28.5	45
PR12	59.7	49.7	29.7	45
PR13	58.0	48.0	28.0	45

Location	External L_{Amax} at 1m from facade	Internal L_{Amax} with windows open	Internal L_{Amax} with windows closed	Criteria Internal L_{Amax}
PR14	55.4	45.4	25.4	45
PR15	55.4	45.4	25.4	45
PR16	55.8	45.8	25.8	45
PR17	58.0	48.0	28.0	45

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

The recommended WHO/BS 8233 internal noise levels are not exceeded across the site assuming a windows-closed scenario at the majority of receptor locations during the daytime and night-time. However, in a windows-open scenario, target noise level criteria are exceeded at indicative worst-case locations across the site during both daytime and night-time periods.

Therefore, in order to achieve the target internal noise level criteria, mitigation measures are outlined in Section 6.1 of this report.

5.4 ROAD TRAFFIC NOISE

Table 5.5 below presents the results of the traffic noise assessment, comparing the L_{A10} noise levels from the 'with' (DS) and 'without' (DM) proposed development traffic flows in the opening year 2031 at existing/proposed sensitive receptors.

Table 5.5 Traffic Noise Assessment (2031)

Ref	Description	2031 DM dB $L_{A10,18hr}$	2031 DS dB $L_{A10,18hr}$	Difference
T01	Bicester Eco Town Exemplar Site Caversield	69.0	69.1	0.1
T02	Bicester Eco Town Exemplar Site Caversield	55.6	57.4	1.8
T03	22 Sage Street	59.6	61.9	2.3
T04	9 Autumn Close	68.1	68.5	0.4
T05	Northside Lodge, Caversfield	72.6	73.0	0.4
T06	Stable Cottage, Caversfield	66.5	66.8	0.3
T07	Home Farm Cottage, Banbury Road	53.0	53.4	0.4
T08	82 Charlotte Avenue	64.5	65.2	0.7
T09	31 Charlotte Avenue	64.8	65.4	0.6
T10	8 Orchard Walk	68.1	68.5	0.4
T11	104 Mullein Road	63.4	63.6	0.2
T12	14 Tamarisk Gardens	67.7	67.8	0.1

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

When compared to the criteria in Table 2.2 of this report, the change in road traffic noise levels as a result of the proposed development is predicted to be no greater than 2.3 dB at all assessed receptor locations, which indicates a minor adverse impact at the nearest receptors. Noise level changes of up to ±3 dB are generally imperceptible to the human ear and when compared with the criteria presented

within Table 2.2 above, the change in noise levels is within the Lowest Observed Adverse Effect Level and is not considered to be significant.

5.5 TRANQUILLITY ASSESSMENT

An assessment of the existing tranquillity level of the site has been based on the mapping data published by CPRE. This uses a colour coded system and a 500m assessment grid for the whole of England, and a tranquillity rating of between 1 and 10 is assigned (1 being least tranquil and 10 being most).

By reference to these maps the development is assessed as falling into Zone 4 and therefore the area has a degree of tranquillity, although the development site comprises a cultivated field and does not include existing recreation areas. There is a currently no public right of way through the site, therefore, the development will not restrict access to areas of greater tranquillity for existing residents.

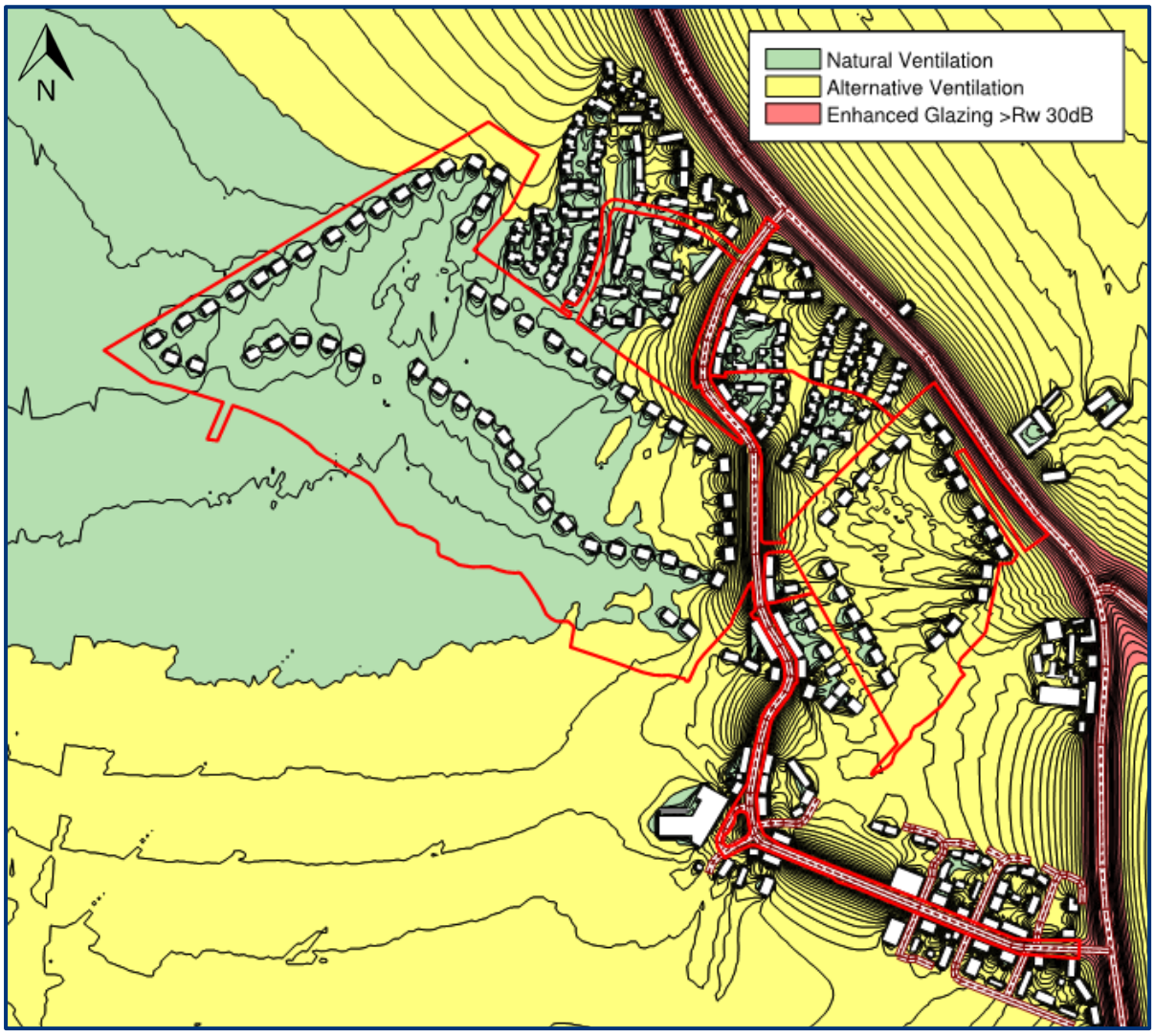
6.0 ACOUSTIC DESIGN STATEMENT (MITIGATION)

6.1 GLAZING AND VENTILATION STRATEGY

The glazing and ventilation strategy is designed to achieve internal daytime L_{Aeq} of 35 dB, an internal night-time L_{Aeq} of 30 dB and an internal night-time L_{Amax} of 45 dB in habitable rooms of the proposed development. It highlights which areas will feature enhanced glazing and an alternative means of ventilation in order to meet both ventilation and internal ambient noise criteria (shown in section 2.1).

Due to the indicative nature of proposed dwellings, Figure 6.1 and 6.2 illustratively show a glazing and ventilation strategy for living rooms and bedrooms respectively, based upon 2031 do something traffic flows for living rooms and verified L_{Amax} noise levels for bedrooms.

Figure 6.1 Indicative Glazing and Ventilation Strategy – Living Rooms (Grid Height 1.5m)



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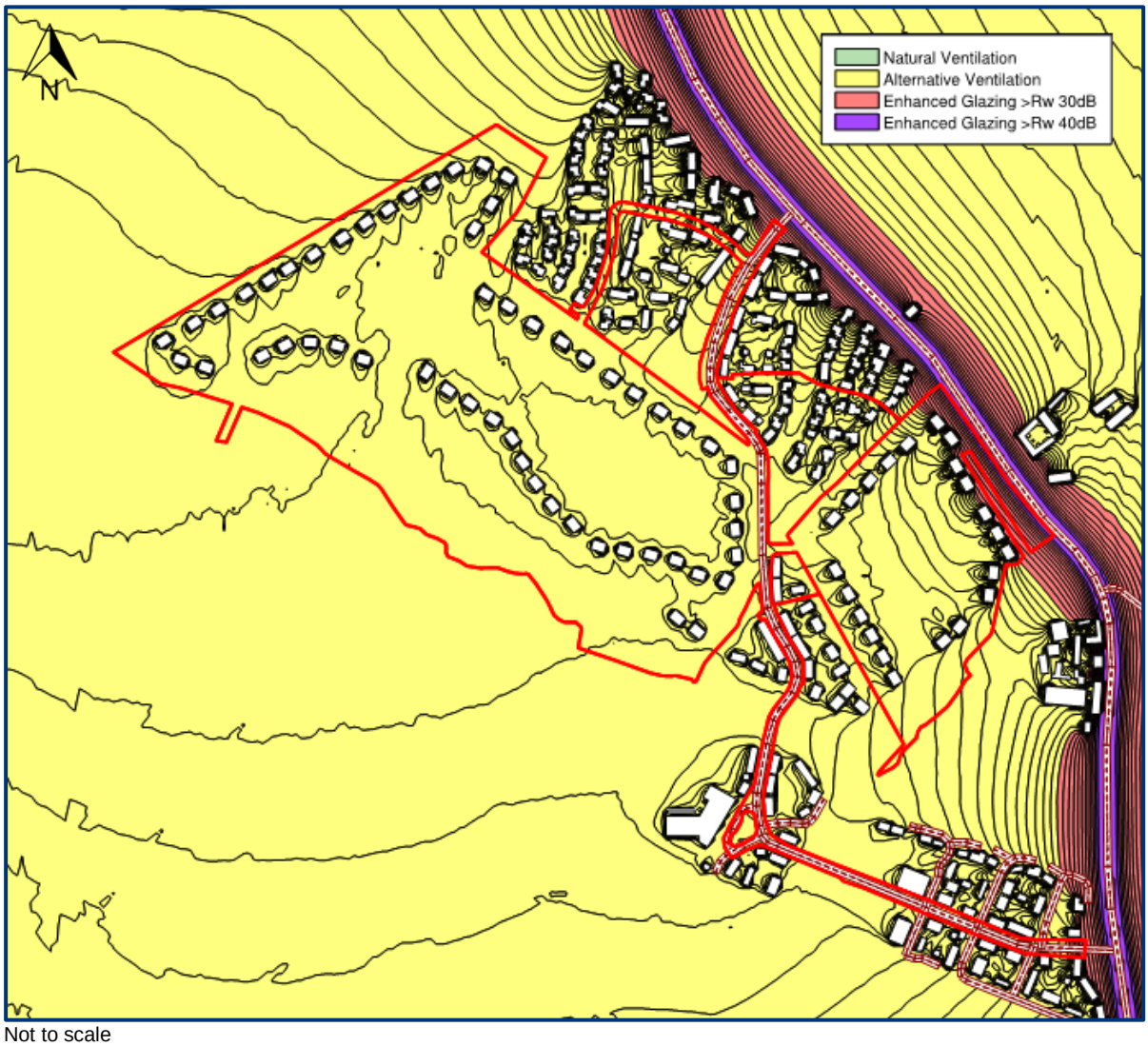
As shown above, all indicative living rooms will benefit from standard double glazing with a sound reduction of R_w + C_{tr} 30 dB as a minimum, along with an alternative means of ventilation across a number of facades. The assessment has demonstrated that this level of glazing is sufficient to meet internal noise level targets in a window-closed scenario across the site.

Figure 6.2 Indicative Glazing and Ventilation Strategy – Bedrooms (Grid Height 4.0m)



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As shown above, nearly all indicative bedroom spaces will benefit from standard double glazing with a sound reduction of R_w + C_{tr} 30 dB as a minimum, along with an alternative means of ventilation across all facades. Bedroom facades within 40m of B4100 will feature enhanced glazing with a sound reduction of up to R_w + C_{tr} 35 dB, along with an alternative means of ventilation which matches the performance of the glazing. The assessment has demonstrated that this level of glazing is sufficient to meet internal noise level targets in a window-closed scenario across the site.

Alternative 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), to other passive ventilation systems.

Due to the outline nature of the scheme, consideration will be given to the orientation of proposed dwellings and the associated internal layout. To provide further protection to future residents from noise associated with road traffic noise along the B4100, the internal layout of these dwellings should be arranged to ensure that non-sensitive rooms (such as kitchens, bathrooms, etc) are positioned on the outer façades (closest to the road/school), with more sensitive rooms (living rooms and bedrooms) located on the sheltered façades of dwellings.

Additionally, proposed amenity spaces will ideally be located upon the shielded facades of proposed dwellings, facing away from the road network. In order to further reduce noise levels within amenity spaces, solid 1.8m high garden fences can be utilised to reduce noise levels as far as practicable, however it should be noted that daytime $L_{Aeq,16\ hour}$ noise levels across the majority of the development site are expected to be below the BS 8233 upper guideline value of 55 dB (as illustrated in Figure 5.3).

7.0 CONCLUSIONS

This report presents the findings of a noise assessment for a proposed residential development including up to 550 dwellings on Land at North West Bicester. The NPPF gives test points relating to noise; considering these the following conclusions can be drawn:

- *NPPF Paragraphs 170 (e) and 180 (a)*

The proposed development is not expected to have an 'adverse impact' on health or quality of life.. As a result of the development generated road traffic, there will be minor changes in noise levels. Therefore, the proposed development will not have a 'significant adverse impact' on health or quality of life.

With regard to proposed residential receptors, it is considered that all 'adverse impacts on health and quality of life' (relating to noise) are mitigated by the use of an appropriate glazing strategy with alternative means of ventilation which is compliant with Building Regulations. The suggested glazing and ventilation specifications will be achievable.

- *NPPF Paragraphs 180 (b), 182 and 183*

An assessment of the existing tranquillity level of the site has some tranquillity and recreational value, however existing rights of way are to be maintained and therefore the development will not restrict access to areas of greater tranquillity. No businesses are located nearby the site which would be adversely affected by the proposals.

Planning Practice Guidance: Noise

Noise levels at both existing and proposed receptors are predicted to fall below the Significant Observed Adverse Effect Level (SOAEL) during both daytime and night-time periods.

APPENDICES

APPENDIX A – ACOUSTIC TERMINOLOGY AND ABBREVIATIONS

Acoustic Terminology

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 12 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.

Abbreviations

CADNA – Computer Aided Noise Abatement

DMRB – Design Manual for Roads and Bridges

HGV – Heavy Goods Vehicle

PPG – Planning Practice Guidance

UDP – Unitary Development Plan

UKAS – United Kingdom Accreditation Service

Although noise from construction is not likely to be significant, a number of additional mitigation measures are recommended to keep construction site noise to a minimum. The following practices are derived from those detailed in BS 5228-1:2009 and those most appropriate to the site are outlined below.

Source Noise Control

Wherever possible noise will be controlled at source.

a) avoid unnecessary revving of engines and switch off equipment when not required;

b) keep internal haul routes well maintained and avoid steep gradients;

c) use rubber linings in, for example, chutes and dumpers to reduce impact noise;

d) minimize drop height of materials;

e) start up plant and vehicles sequentially rather than all together.

As far as reasonably practicable, sources of significant noise will be enclosed or screened. The extent to which this can be done depends on the nature of the machine or process to be enclosed and their ventilation requirements. For maximum benefit, screens will be close to the source of noise.

Plant Location

The plant and activities to be employed on the site will be reviewed to ensure that they are the quietest available for the required purpose; this is in accordance with best practicable means. For an existing operational site, where reasonably practicable, noisy plant or activities will be replaced by less noisy alternatives if noise problems are occurring. Noise from existing plant and equipment can often be reduced by modification or by the application of improved sound reduction methods, but this will only be carried out after consultation with the manufacturer. Suppliers of plant will often have ready-made kits available and will often have experience of reducing noise from their plant.

Working Methods

Where reasonably practicable, quiet working methods will be employed, including use of the most suitable plant, reasonable hours of working for noisy operations, and economy and speed of operations.

Scheduling of Works

It is proposed that the scheduling of any construction works at the site be within daytime hours. The following hours of construction working are proposed, with separate times identified for the use of noisy activities such as plant or machinery on site;

a) Monday to Friday: 09:00 – 15:30

b) Saturday: 08:00 – 13:00

c) Sundays and Bank Holidays: No Noisy Working

Maintenance

Regular and effective maintenance by trained personnel is essential and will do much to reduce noise from plant and machinery. Increases in plant noise are often indicative of future mechanical failure.

Training

Operatives will be trained to employ appropriate techniques to keep site noise to a minimum, and will be effectively supervised to ensure that best working practice in respect of noise reduction is followed. All employees will be advised regularly of the following, as part of their training:

a) the proper use and maintenance of tools and equipment;

b) the positioning of machinery on site to reduce the emission of noise to the neighbourhood and to site personnel;

c) the avoidance of unnecessary noise when carrying out manual operations and when operating plant and equipment;

d) the protection of persons against noise;

e) the operation of sound measuring equipment (selected personnel).

Special attention will be given to the use and maintenance of sound-reduction equipment fitted to power tools and machines.

Community Relations

Good relations with people living and working in the vicinity of site operations are of paramount importance. Early establishment and maintenance of these relations throughout the duration of site operations, will go some way towards allaying people's fears. It is suggested that good relations can be developed by keeping people informed of progress and by treating complaints fairly and expeditiously. The person, company or organization carrying out work on site will appoint a responsible person to liaise with the public.

In general, the longer the duration of activities on a site, the more likely it is that noise from the site will prove to be an issue. In this context, good public relations and communication are important. The hours of working will be planned in advance and disseminated. There will be a need to adhere strictly to the stated schedule and ensure that the community is informed of their likely durations.

APPENDIX C – REPORT CONDITIONS

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The report refers, within the limitations stated, to the environment of the site in the context of the surrounding area at the time of the inspections'. Environmental conditions can vary, and no warranty is given as to the possibility of changes in the environment of the site and surrounding area at differing times. No investigative method can eliminate the possibility of obtaining partially imprecise, incomplete or not fully representative information. Any monitoring or survey work undertaken as part of the commission will have been subject to limitations, including for example timescale, seasonal and weather-related conditions. Actual environmental conditions are typically more complex and variable than the investigative, predictive and modelling approaches indicate in practice, and the output of such approaches cannot be relied upon as a comprehensive or accurate indicator of future conditions. The "shelf life" of the Report will be determined by a number of factors including; its original purpose, the Client's instructions, passage of time, advances in technology and techniques, changes in legislation etc. and therefore may require future re-assessment.

The whole of the report must be read as other sections of the report may contain information which puts into context the findings in any executive summary.

The performance of environmental protection measures and of buildings and other structures in relation to acoustics, vibration, noise mitigation and other environmental issues is influenced to a large extent by the degree to which the relevant environmental considerations are incorporated into the final design and specifications and the quality of workmanship and compliance with the specifications on site during construction. Tetra Tech accept no liability for issues with performance arising from such factors.