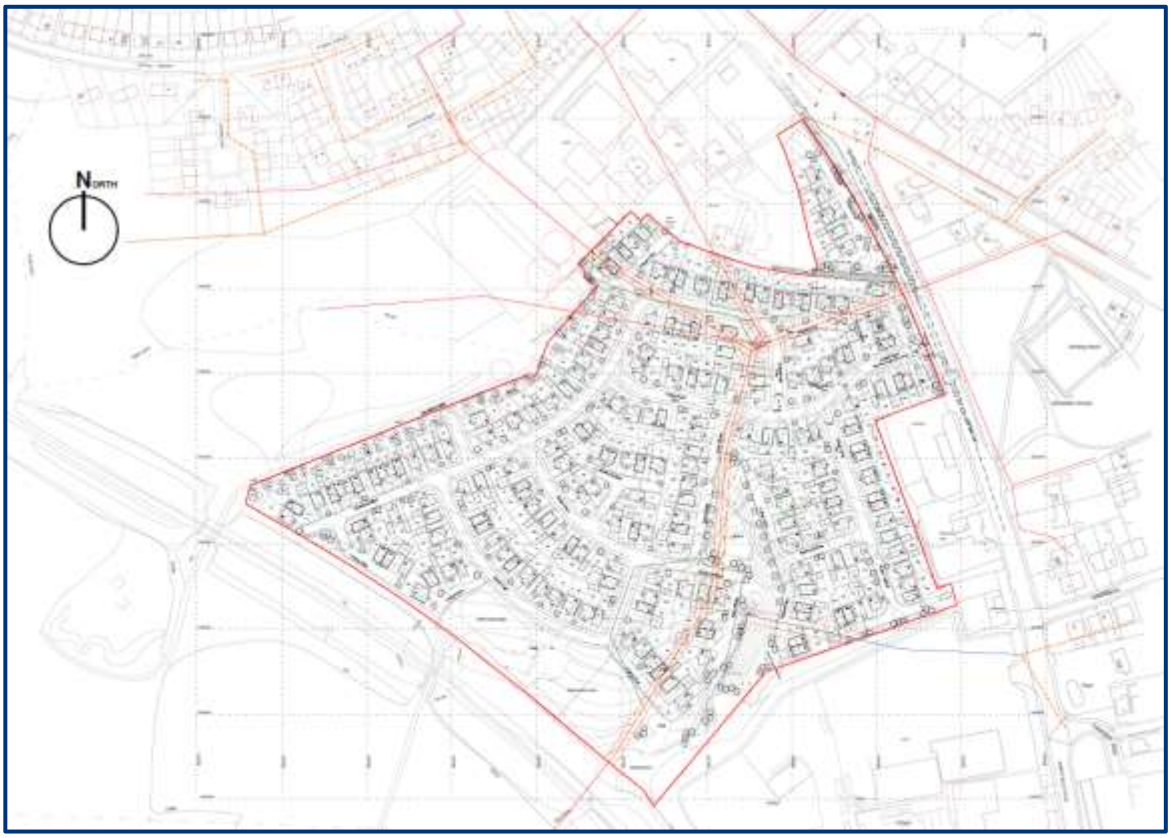
Gleeson Homes
Wakefield Road, Athersley



Noise Assessment

May 2022

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CONTENTS

1.0 INTRODUCTION

1.1 Purpose of this Report

This report presents the findings of a noise assessment undertaken in support of a reserved matters planning application for the proposed residential development on land to the west of Wakefield Road, Athersley.

For reference, the outline planning (ref. 2017/1451) condition 7 is reproduced below:

> *A detailed scheme of noise mitigation measures shall be submitted with the reserved matters application. The scheme shall be accompanied by a plan which clearly identifies where each type of mitigation is proposed and a programme of implementation. Thereafter the development shall be carried out in accordance with the approved measures.*
>
> *Reason: In the interests of noise mitigation in accordance with CSP40.*

A description of the existing noise environment in and around the site is provided. Noise surveys have been undertaken and the results used to predict the effects of existing noise on the proposed residential units and to recommend an appropriate glazing and ventilation strategy.

The noise levels from the proposed development have been predicted at local representative receptors using CADNA noise modelling software which incorporates ISO 9613 methodologies and calculations.

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

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 the National Planning Policy Framework (NPPF), published in July 2021. With regard to noise and planning, the NPPF contains the following statement at paragraph 174:

"*174 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…"*

"185. 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…"

"187. 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.

188. 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."

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 is, tying in with the principles of the NPPF and the Explanatory Note of the Noise Policy Statement for England (NPSE), 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 (LOAEL)			
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 (SOAEL)			
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 PPG 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 including 'BS 8233 – Guidance on Sound Insulation and Noise Reduction for Buildings' (2014). Section 2.0 presents the noise level criteria used as a basis of this assessment.

The PPG 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

Professional Practice Guidance on Planning and Noise for new residential development (ProPG) was published in May 2017 by the Chartered Institute of Environmental Health (CIEH), the Association of Noise Consultants (ANC) and the Institute of Acoustics (IOA). The guidance has been published to provide 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, it 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 (ADS).

With regard to Stage 1, the ProPG provides guidance for producing 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 1.2. This shows the various Noise Risks Categories (NRC) together with their corresponding sound levels as referred to in the ProPG. It should be noted that the categories are not distinct which allows context to be included within the assessment with the purpose of the Stage 1 assessment to determine the likely acoustic challenges on the site.

Figure 1.2 ProPG Stage1, Noise Risk Assessment

Noise Risk Assessment			Potential Effect Without Noise Mitigation	Pre-Application Planning Advice
Indicative Daytime Noise Levels $L_{Aeq,16hr}$		*Indicative Night-Time Noise Levels* $L_{Aeq,8hr}$		
	High		Increasing Risk of adverse effect	High noise levels indicate that there is an increased risk that development may be refused on noise grounds. The risk may be reduced by following a good acoustic design process that is demonstrated in a detailed ADS. Applications are strongly advised to seek expert advice.
70dB		60dB		
65dB	Medium	55dB		As noise levels increase, the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised, and which clearly demonstrates that a significant adverse noise impact will be avoided in the finished development.
60dB		50dB		
	Low			At low noise levels, the site is likely to be acceptable from a noise perspective, provided that a good acoustic design process is followed and is demonstrated in the ADS which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development.
55dB		45dB		
50dB	Negligible	40dB	No adverse effect	These noise levels indicate that the development site is likely to be acceptable from a noise perspective, and the application need not normally be delayed on noise grounds.

At Stage 2, which is not required to be progressed if the Stage 1 assessment determines a negligible risk, there are 4 elements which should be undertaken in parallel. These are:

- Good Acoustic Design Process
- Internal Noise Level Guidelines
- External Amenity Area Noise Assessment
- Assessment of Other Relevant Issues

There is then the requirement to present an ADS to provide sufficient evidence that the ProPG Stage 1 and Stage 2 Elements 1 to 4 have been followed.

1.4 Acoustic Consultants' Qualifications and Professional Memberships

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

Table 1.2 Acoustic Consultants' Qualifications & Experience

Name	Education	Experience in Undertaking Noise Assessments (Start date of working in noise & acoustics)	Attained Associate Membership of the Institute of Acoustics (date)	Attained Membership of the Institute of Acoustics (date)
Neil Fletcher	BSc 1996 MSc 2005	Mar 2020	Mar 2020	-
Ashley Shepherd	BSc 2013	Feb 2014	Feb 2014	Nov 2017
Nigel Mann	BSc 1997 MSc 1999	Nov 1998	Nov 2001	July 2005

2.0 ASSESSMENT CRITERIA

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

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

BS 4142:2014+A1:2019 *'Methods for rating and assessing industrial and commercial sound'*

Table 2.1 Noise Level Criteria and Actions

Effect Level	Assessment	Noise Level Criteria	Action / Justification
No Observed Effect Level	Noise Intrusion Assessment	Noise levels are below: *Bedrooms: 30 dB $L_{Aeq,8hours}$ / 45 dB L_{Amax}* *Living Rooms: 35 dB $L_{Aeq,16hours}$* *Private Outdoor Amenity Space: 50 dB $L_{Aeq,16hours}$*	No Action Required Within BS 8233 Criteria
	Background Comparison	BS4142 Score of zero or lower	No Action Required Score of zero or lower is an indication of the noise source having a low impact
Lowest Observed Adverse Effect Level (LOAEL)	Noise Intrusion Assessment	Noise levels are at: *Bedrooms: 30 dB $L_{Aeq,8hours}$ / 45 dB L_{Amax}* *Living Rooms: 35 dB $L_{Aeq,16hours}$* *Private Outdoor Amenity Space: 50 dB $L_{Aeq,16 hours}$*	No Action Required Within BS 8233 Criteria
	Background Comparison	BS4142 Score of plus 5	Difference of +5 dB likely to be an indication of an adverse effect Mitigate to achieve: BS4142 Score of plus 5 or lower
Significant Observed Adverse Effect Level (SOAEL)	Noise Intrusion Assessment	Noise levels are exceeded: *Bedrooms: 30 dB $L_{Aeq,8hours}$ / 45 dB L_{Amax}* *Living Rooms: 35 dB $L_{Aeq,16hours}$* *Private Outdoor Amenity Space: 55 dB $L_{Aeq,16hours}$*	Mitigate and reduce to a achieve: Bedrooms: 30 dB $L_{Aeq,8hours}$ Living Rooms: 35 dB $L_{Aeq,16hours}$
	Background Comparison	BS4142 Score greater than +5	Difference of +10 dB likely to be an indication of a significant adverse effect Mitigate to achieve: BS4142 Score of +5 or lower
Unacceptable Observed Adverse Effect Level (UOAEL)	Noise Intrusion Assessment	Noise levels with mitigation exceed: *Bedrooms: 30 dB $L_{Aeq,8hours}$ / 45 dB L_{Amax}* *Living Rooms: 35 dB $L_{Aeq,16hours}$*	Prevent
	Background Comparison	BS4142 Score of +10 or higher	Avoid, depending on context.

3.0 ASSESSMENT METHODOLOGY

3.1 Noise Modelling Methodology

Three-dimensional noise modelling will be undertaken based on the source data to predict noise levels at a large number of locations both horizontally and vertically. CADNA noise modelling software has been used. This model is based on the ISO 9613 noise propagation methodology and allows for detailed prediction of noise levels to be undertaken. The modelling software calculates noise levels based on the emission parameters and spatial settings that are entered. Input data, assumptions and model settings as given in the table below have been used.

Table 3.1 Modelling Parameters Sources and Assumptions

Parameter	Source	Details
Horizontal distances – around site	Ordnance Survey	Ordnance Survey
Ground Levels – around site	Ordnance Survey	2m Contours
Traffic Data	Tetra Tech	Tetra Tech observations and validated noise levels
Building heights – around site	Tetra Tech Observations	8 m height for two storey residential properties, and 4 m for Bungalows.
Barrier heights	Tetra Tech Observations	A barrier around the perimeter of the HSS and partially around the Stagecoach depot of 2.5m
Receptor positions	Tetra Tech	1 m from façade, height of 1.5 m for ground floor, 4 m for first floor facades. 1.5 m height for model grid.
Proposed Plans	PRA Architecture	1225.05I Proposed Site Layout – 09.05.22

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

Figure 3.1 **CadnaA Noise Model**

3.2 Model Input Data

Noise from road traffic and nearby commercial sources within the Wakefield Road Industrial Estate to the south of the site, including the HSS Plant Hire and Stagecoach Depot, have been assessed. In addition, noise from the Arc carwash, an electricity substation, and the Stagecoach car park on Wakefield Road to the east of the site have been included within the assessment. Based on observations made during the noise survey and a review of audio recordings there were no clearly discernible events occurring within the commercial premises to the north of the site with road traffic noise being the principal source of noise in this location. All premises, except for the bus depot, only operate during the daytime period.

The noise sources considered with a brief discussion regarding the proposed assessment approach are outlined below with further details regarding the noise survey and observations made on site presented in Section 4.

HSS Noise Verification

To present a worst-case assessment of noise emanating from the HSS depot, which comprises engine noise / movement of plant (lifts) a source noise level of 55 dB $L_{Aeq,1hour}$ has been established following a review of the noise data at LT3.

Table 3.2 Daytime Modelled vs. Monitored Results $L_{Aeq,T}$

Monitoring Position	Monitored L_{Aeq}	Modelled L_{Aeq}	Difference between modelled and measured noise level (dB)
LT3	55.0	55.0	0.0
ST3	51.0	55.6	4.6

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

At LT3 the verification point is equivalent to the worst-case source noise level. A difference of 5 dB is modelled at ST3 when activities within the HSS depot were occurring which demonstrates the worst-case assessment. The models are considered suitably verified.

Stagecoach Depot and car Park Verification

To present a worst-case assessment, the noise model has been verified against the worst case measured $L_{Aeq,15mins}$ during the early morning period at ST2 with noise from the site comprising buses entering, manoeuvring around and exiting the depot. In addition, the worst-case L_{Amax} associated with vehicle movements has been used for this assessment. The comparison between the monitoring and modelling results are shown in the tables overleaf.

Table 3.3 Bus Depot Daytime Modelled vs. Monitored Results $L_{Aeq,T}$

Monitoring Position	Monitored L_{Aeq}	Modelled L_{Aeq}	Difference between modelled and measured noise level (dB)
ST2	48.2	48.2	0.0

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

Table 3.4 Bus Station Night-time Modelled vs. Monitored Results L_{Amax}

Monitoring Position	Monitored L_{Amax}	Modelled L_{Amax}	Difference between modelled and measured noise level (dB)
ST2	67.7	67.7	0.0

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

The verification points show a divergence between monitored and modelled results of 0 dB. The bus depot models are considered suitably verified.

Noise levels from the existing car parking area on Wakefield Road which services the bus depot have been determined based upon observations within an existing distribution centre during a staff changeover period. L_{Aeq} noise levels, as follows, are modelled as an area source across the entire car park.

- *$L_{Aeq,1hr}$ Noise Level* = 54 dB *at 1.5m height*
- *L_{Amax} = 76.3 dB @3m*

ARC Carwash Verification

There were minimal activities and noise occurring from the Car Wash site with road traffic noise being dominant at the site. However, specific noise measurements were obtained at the car wash including noise from the internal car wash and an external jet spray (which is screened by a Perspex barrier from the site). The comparison between the monitoring and modelling results are shown in the tables below.

Table 3.5 Daytime Modelled vs. Monitored Results $L_{Aeq,T}$

Monitoring Position	Monitored L_{Aeq}	Modelled L_{Aeq}	Difference between modelled and measured noise level (dB)
Adjacent to northern part of car wash	74.4	74.4	0.0
Adjacent to car being washed (jetspray)	75.4	75.4	0.0

Electrical Substation Verification

With regard to noise levels from the electrical substation, the noise models have been validated against the measured noise levels based on measurements at and near the boundary of the substation. The comparison between the monitoring and modelling results are shown in the tables below.

Table 3.6 Daytime Modelled vs. Monitored Results $L_{Aeq,T}$

Monitoring Position	Monitored L_{Aeq}	Modelled L_{Aeq}	Difference between modelled and measured noise level (dB)
Substation (Northern boundary)	54.0	55.8	1.8
Substation 2 (Western boundary)	57.4	58.2	0.8
Substation 3 (On-site – approx. 19m from sub station))	46.0	44.1	-1.9

In addition, verification across the frequency range has been undertaken based on the measurements collected at the boundary of the sub station with the results presented in the table below.

Table 3.7 Daytime Modelled vs. Monitored Results $L_{Aeq,T}$

Monitoring Position		1/3 Octave Band Frequency (dB)							dB(A)
		63	125	500	1000	2000	4000	8000	
Substation 1	Measured	66.1	67.3	57.3	50.2	48.8	41.2	39.0	54.0
	Modelled	65.9	64.1	56.1	50.1	48.7	40.6	33.0	55.8
	Difference	0.2	3.2	1.2	0.0	0.1	0.6	6.0	1.8
Substation 2	Measured	67.2	71.0	60.0	49.4	48.2	42.9	43.5	57.4
	Modelled	67.2	71.0	60.0	49.9	48.1	43.2	43.6	58.2
	Difference	0.0	0.0	0.0	-0.5	0.1	-0.3	-0.1	0.8

The verification points show a divergence between monitored and modelled results of around 3 dB or less. Therefore, models are considered suitably verified.

Road Traffic Noise Verification

With regards to road traffic noise, the models have been validated against the closest long term measurement positions to the Wakefield Road. At the other monitoring locations road traffic verification was not possible due to the level of birdsong and other sources influencing the measured levels. The comparison between the monitoring and modelling results are shown in the tables below.

Table 3.8 Daytime Modelled vs. Monitored Results $L_{Aeq,T}$

Monitoring Position	Monitored L_{Aeq}	Modelled L_{Aeq}	Difference between modelled and measured noise level (dB)
LT1	49.7	49.7	0.0
LT5	58.5	59.0	0.5

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

Table 3.9 Night-time Modelled vs. Monitored Results $L_{Aeq,T}$

Monitoring Position	Monitored L_{Aeq}	Modelled L_{Aeq}	Difference between modelled and measured noise level (dB)
LT1	45.5	44.6	-0.9
LT5	53.9	53.9	0.0

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

As all of the verification points show a divergence between monitored and modelled results of no more than 3 dB, the models are considered suitably verified.

3.3 Sensitive Receptors

The locations of the proposed receptors are presented in Figures 3.2 (facades – daytime height 1.5m, night-time 4.0m) and 3.3 (Gardens – daytime height 1.5m).

Figure 3.2 Sensitive Receptor Locations (Facades)

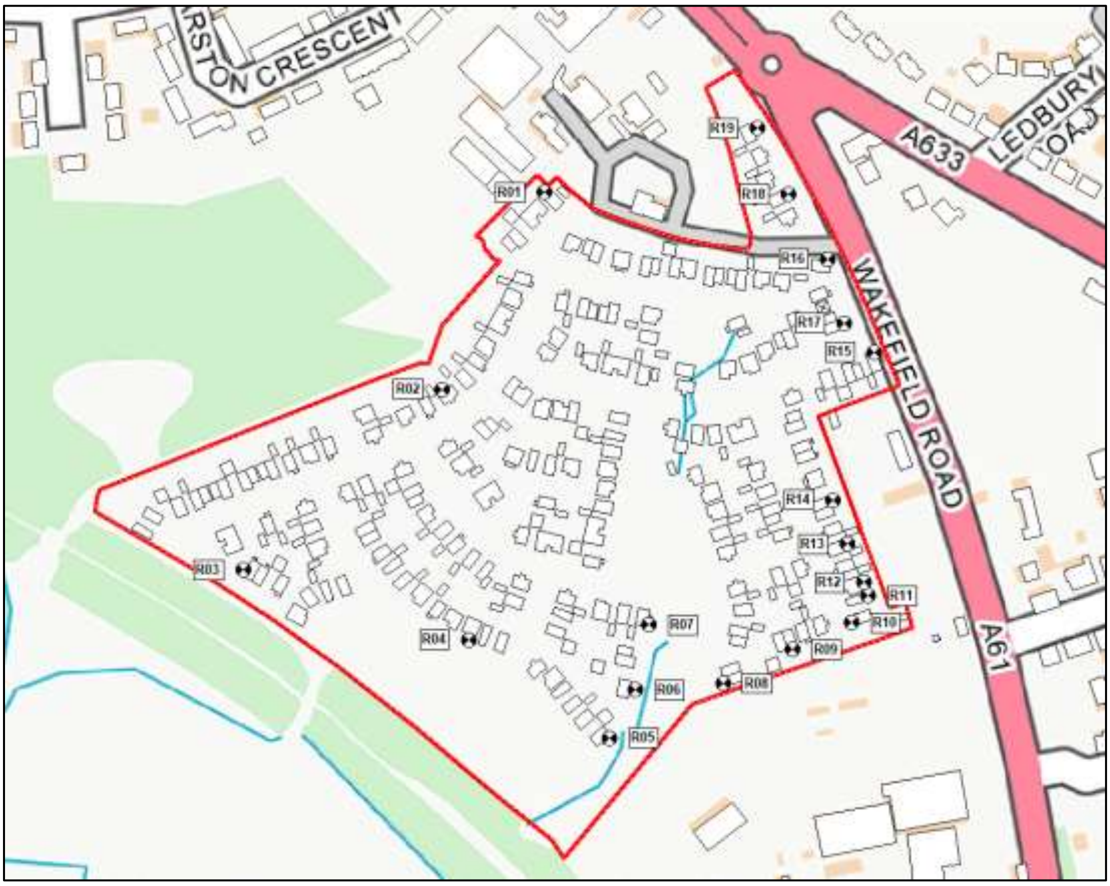
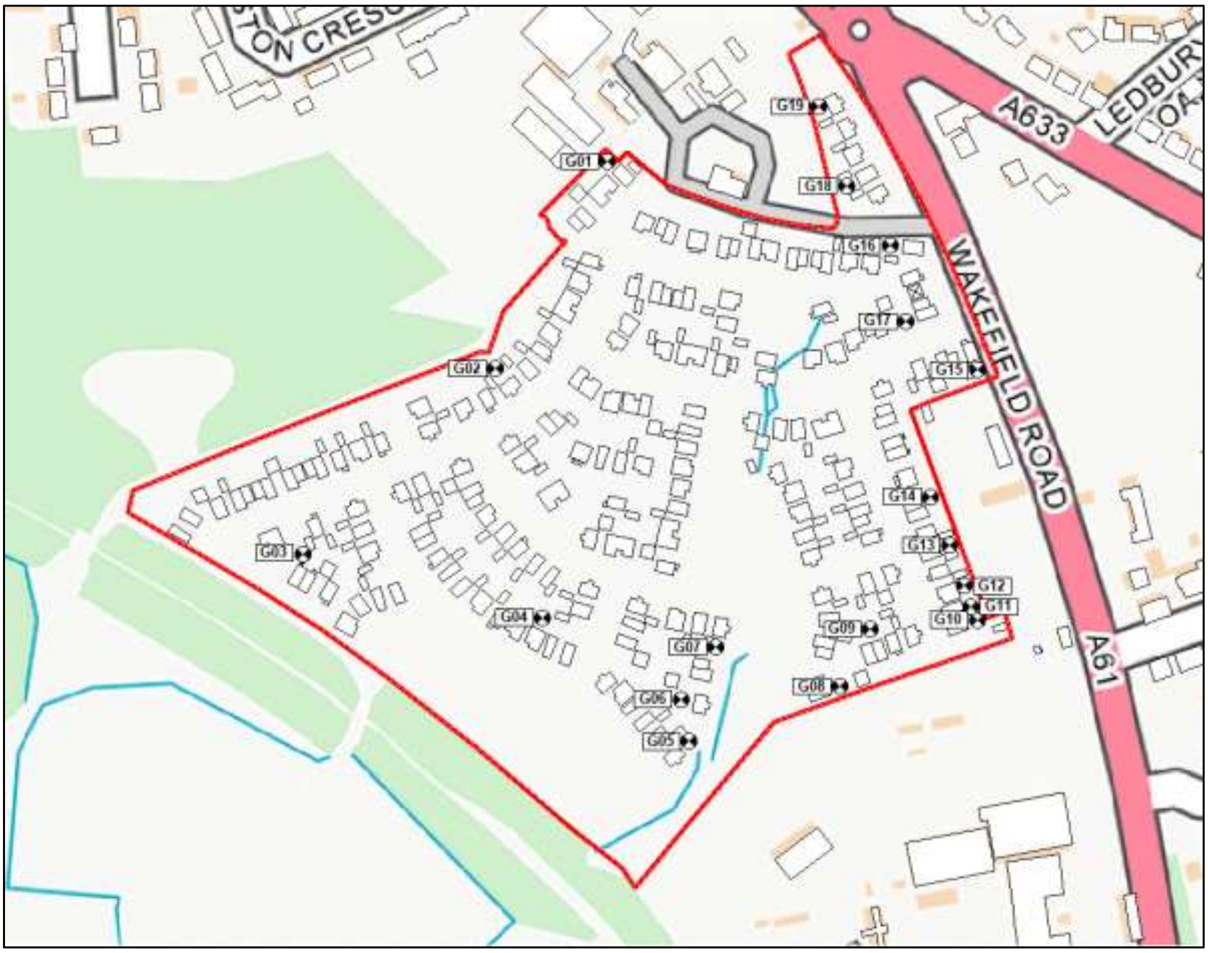


Figure 3.3 Sensitive Receptor Locations (Gardens)



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:

Norsonic 140	Environmental Noise Analyser	s/n	1402987
Norsonic 1251	Sound Calibrator	s/n	31043
Rion NL-52	Environmental Noise Analyser	s/n	1221575
Rion NL-52	Environmental Noise Analyser	s/n	1221576
Rion NL-52	Environmental Noise Analyser	s/n	253702
Rion NL-52	Environmental Noise Analyser	s/n	732146

The measurement equipment was checked against the appropriate calibrator at the beginning and end of the measurements, in accordance with recommended practice and no drift 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 five locations (as specified in the following table and shown in Figure 4.1) from Friday 2nd June 2015 to Wednesday 14th June 2017. Attended short term measurements were undertaken at seven locations during the early morning, daytime, evening, peak and night-time periods with four additional locations being measured unattended over a 140-hour period. The raw data collected from the long-term monitoring is available upon request.

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

Table 4.1 Noise Monitoring Locations

Ref	Description	Grid Reference	
		X	Y
LT1	Eastern boundary of the site	434833.27	408749.38
LT2	Positioned along south eastern edge of site perimeter opposite the bus depot	434824.46	408647.93
LT3	Positioned along south eastern edge of site perimeter, opposite the HSS depot	434779.91	408614.91
LT4	Positioned on northern boundary of site	434643.76	408870.34
LT5	Positioned 20m from Wakefield Road: direct line of site onto carriageway	434859.79	408810.38
ST1	Located next to LT1 position	434836.21	408742.15
ST2	Southern part of the site opposite bus depot	434827.66	408653.26

Ref	Description	Grid Reference	
		X	Y
ST3	Southern Part of the site opposite HSS	434778.71	408609.44
ST4	Northern boundary of the site	434702.94	408891.20
ST5	Northern part of the site	434640.83	408872.21
ST6	South western part of the site	434699.75	408566.90
ST7	5m from Wakefield Road	434876.49	408820.06
Sub 1	Northern boundary of electricity substation	434905.38	408668.56
Sub 2	Western boundary of electricity substation	434901.09	408656.18
Sub 3	Approximately 19m from the boundary of the substation	434881.16	408662.05
Wash 1	Opposite northern part of car wash	434899.67	408743.12
Wash 2	Opposite external jet wash area (during jet washing)	434884.09	408764.09

4.2 Noise Survey Results

The noise climate across the site consisted mainly of road traffic noise from the A61 Wakefield Road and surrounding local road network. In addition, noise was observed from the adjacent Stagecoach bus service depot and noise from plant movements within the HSS service yard. Occasional distant rail movement was just audible from the Darton to Barnsley Rail line. During the evening and early morning periods bird song was also a prominent source of noise, in particular at positions LT2, LT3.

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).

Table 4.2 Meteorological Conditions during the Survey

Survey Location/	Date & Time	Temperature	Wind Speed	Wind Direction	Cloud Cover (Oktas)	Dominant Noise Source
ST1	13/06/2017 – 15:21	24 ºC	1 m/s	W	1	Traffic along Wakefield Road, low level hum from substation, noise from plant movement in HSS depot
ST2	09/06/2017 – 14:31	24 ºC	1 m/s	W	1	Traffic along Wakefield Road, prominent hum from substation, noise from plant movement in HSS depot
ST3	13/06/2017 - 15:57	24 ºC	1 m/s	W	1	Noise from plant movement in HSS depot, engine idling and distant road and rail traffic noise just perceptible
ST4	13/06/2017 – 13:04	24 ºC	1 m/s	W	1	Traffic along Wakefield Road, spoken voice from factory
ST5	13/06/2017 – 14:10	24 ºC	1 m/s	W	1	Traffic along Wakefield Road
ST6	13/06/2017 – 16:19	24 ºC	1 m/s	W	1	Noise from plant movement in HSS depot, engine idling and distant road and rail traffic noise
ST7	13/06/2017 – 20:30	21 ºC	1 m/s	W	1	Traffic along Wakefield Road, Birdsong

Survey Location/	Date & Time	Temperature	Wind Speed	Wind Direction	Cloud Cover (Oktas)	Dominant Noise Source
ST2	13/06/2017 – 21:00	20 ºC	1 m/s	W	1	Traffic along Wakefield Road, prominent hum from substation, Birdsong
ST3	13/06/2017 – 21:17	20 ºC	1 m/s	W	1	Traffic along Wakefield Road and local network, occasional distant rail movements, birdsong
ST4	13/06/2017 – 19:48	20 ºC	1 m/s	W	1	Traffic along Wakefield Road and local network, occasional distant rail movements just perceptible, birdsong
ST5	13/06/2017 – 20:07	20 ºC	1 m/s	W	1	Traffic along Wakefield Road and local network, occasional distant rail movements just perceptible, birdsong
ST2	14/06/2017 – 05:45	19 ºC	1 m/s	W	1	Traffic along Wakefield Road, vehicle movement within bus depot, hum from substation, Birdsong prominent

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). 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 4.3 Results of Baseline Noise Monitoring Survey

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)
Day 07:00 - 23:00	113 hours	02/06/2017 – 14/06/2017 07:00 - 23:00	LT1	49.7	88.4	33.2	50.2	42
Night 23:00 – 07:00	56 hours	02/06/2017 – 14/06/2017 23:00 - 07:00		45.5	74.5	27.6	46.5	42
Day 07:00 - 23:00	80 hours	09/06/2017 - 14/06/2017 07:00 - 23:00	LT2	53.3	85.6	31.9	51.7	44
Night 23:00 – 07:00	40 hours	09/06/2017 - 14/06/2017 23:00 - 07:00		48.3	77.5	26.8	46.5	36
Day 07:00 - 23:00	144 hours	02/06/2017 – 14/06/2017 07:00 - 23:00	LT3	51.8	97.4	30.2	50.3	38
Night 23:00 – 07:00	63 hours	02/06/2017 – 14/06/2017 23:00 - 07:00		50.4	95.9	25.4	45.3	41
Day 07:00 - 23:00	141 hours	02/06/2017 – 14/06/2017 07:00 - 23:00	LT4	55.9	89.1	30.4	53.8	40
Night 23:00 – 07:00	64 hours	02/06/2017 – 14/06/2017 23:00 - 07:00		50.0	86.6	24.8	46.7	40
Day 07:00 - 23:00	15 hours	13/06/2017 – 14/06/2017 07:00 - 23:00	LT5	58.5	94.1	37.5	61.1	48
Night 23:00 – 07:00	8 hours	13/06/2017 – 14/06/2017 23:00 - 07:00		53.9	81.0	26.3	54.2	34
Day 07:00 - 19:00	15 Mins	09/06/2017 – 14:12	ST1	48.5	62.7	41.9	50.0	45.0
		13/06/2017 – 15:21		44.8	61.0	38.6	46.9	41.8

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)
	15 Mins	09/06/2017 – 14:31	ST2	48.4	69.3	42.2	50.4	44.7
		09/06/2017 – 14:46		46.6	62.7	40.2	49.1	43.0
		13/06/2017 – 15:39		45.1	62.7	36.6	47.8	40.8
	15 Mins	09/06/2017 – 15:04	ST3	50.3	64.7	41.1	53.6	43.4
		09/06/2017 – 15:19		47.3	63.4	40.2	50.1	42.2
		09/06/2017 – 15:34		52.2	65.6	41.1	56.1	46.2
		09/06/2017 – 15:49		49.8	64.3	42.7	54.0	44.0
		13/06/2017 - 15:57		51.8	67.6	37.0	55.7	41.5
		14/06/2017 – 07:07		48.3	62.2	40.0	51.1	42.3
		14/06/2017 – 07:22		50.8	68.1	38.8	53.8	41.2
		14/06/2017 – 07:37		52.1	65.3	37.1	57.1	39.6
		14/06/2017 – 11:42		49.5	64.6	36.3	52.1	39.6
		14/06/2017 – 11:57		40.9	61.5	32.6	42.7	36.1
	15 Mins	13/06/2017 – 13:04	ST4	43.2	63.8	38.5	44.4	40.2
		13/06/2017 – 13:19		44.4	56.2	38.0	47.0	40.3
		13/06/2017 – 13:34		46.1	63.3	39.1	48.4	42.1
		13/06/2017 – 13:49		46.6	71.0	38.8	47.8	41.8
		14/06/2017 – 09:47		46.0	68.8	41.1	47.8	43.4
		14/06/2017 – 10:02		45.7	58.6	39.9	47.7	42.2
	15 Mins	13/06/2017 – 14:10	ST5	41.4	71.9	35.2	42.3	37.1
		13/06/2017 – 14:25		42.1	67.9	34.1	44.0	37.9
		13/06/2017 – 14:40		43.0	60.6	35.2	44.4	37.2
		13/06/2017 – 14:55		41.9	59.0	34.5	42.9	36.6
		14/06/2017 – 10:21		43.8	62.7	36.9	44.6	39.3
		14/06/2017 – 10:36		44.7	70.0	37.0	45.9	40.0
	15 Mins	13/06/2017 – 16:19	ST6	49.5	76.1	38.3	51.5	41.5
Evening 19:00 - 23:00	15 Mins	13/06/2017 – 21:00	ST2	48.0	68.3	33.3	48.6	36.4
	15 Mins	13/06/2017 – 21:17	ST3	42.7	60.7	30.7	46.3	35.2
	15 Mins	13/06/2017 – 19:48	ST4	44.1	65.0	36.9	46.4	39.6
	15 Mins	13/06/2017 – 20:07	ST5	44.0	71.5	33.2	44.9	36.5
	15 Mins	13/06/2017 – 20:30	ST7	67.4	86.0	42.5	71.5	48.4
Early Morning 05:30 - 07:00	15 Mins	14/06/2017 – 05:45	ST2	48.0	64.6	37.6	50.1	43.4
		14/06/2017 – 06:00		46.5	67.7	38.1	49.2	40.8
		14/06/2017 – 06:15		46.8	66.6	38.7	49.6	41.9
		14/06/2017 – 06:30		48.2	62.8	39.2	50.8	43.1
		14/06/2017 – 06:45		47.7	63.5	39.8	49.9	43.0

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

In addition to the above, measurements of the existing electricity substation have been undertaken. The measurements were taken at the current fence line of the substation positioned in the south-eastern corner of the development site. The results are presented in Table 4.4.

Table 4.4 Results of Electricity Substation Noise Monitoring Survey

Date	Ref	L_{Aeq}	L_{AFmax}	L_{Amin}	L_{A10}	L_{A90}	L_{eq}		
							80 Hz	100 Hz	125 Hz
20:51 13/06/2017	S1	54.0	66.4	49.8	56.9	50.1	64.5	63.8	49.7
20:53 13/06/2017	S2	57.4	73.4	54.8	57.9	55.4	55.0	70.8	55.6
20:57 13/06/2017	S3	46.0	53.1	41.6	48.4	42.7	47.3	52.9	40.9

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

5.0 ASSESSMENT OF EFFECTS

5.1 ProPG Stage 1 Risk Assessment

Based on the daytime $L_{Aeq,16hours}$ and night-time $L_{Aeq,8hours}$ noise models, Figure 5.1 and 5.2 present the ProPG noise contour plots during the day and night-time periods which provides a representation of the range of noise levels across the site.

Figure 5.1 ProPG Stage 1 Daytime $L_{Aeq,16hours}$ Noise Contour Plot – Grid height 1.5m

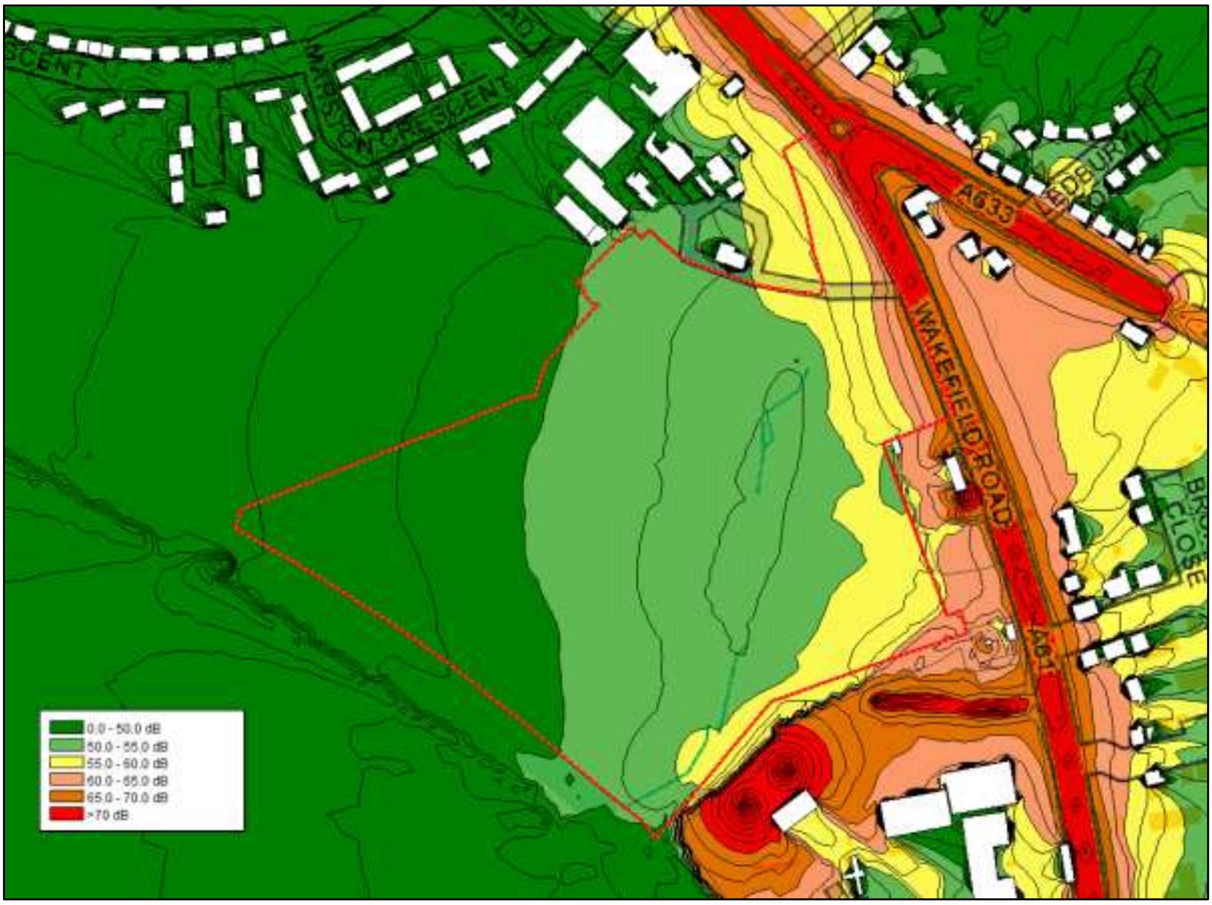


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Figure 5.2 ProPG Stage 1 Night-time $L_{Aeq,8hours}$ Noise Contour Plot – Grid height 4.0m

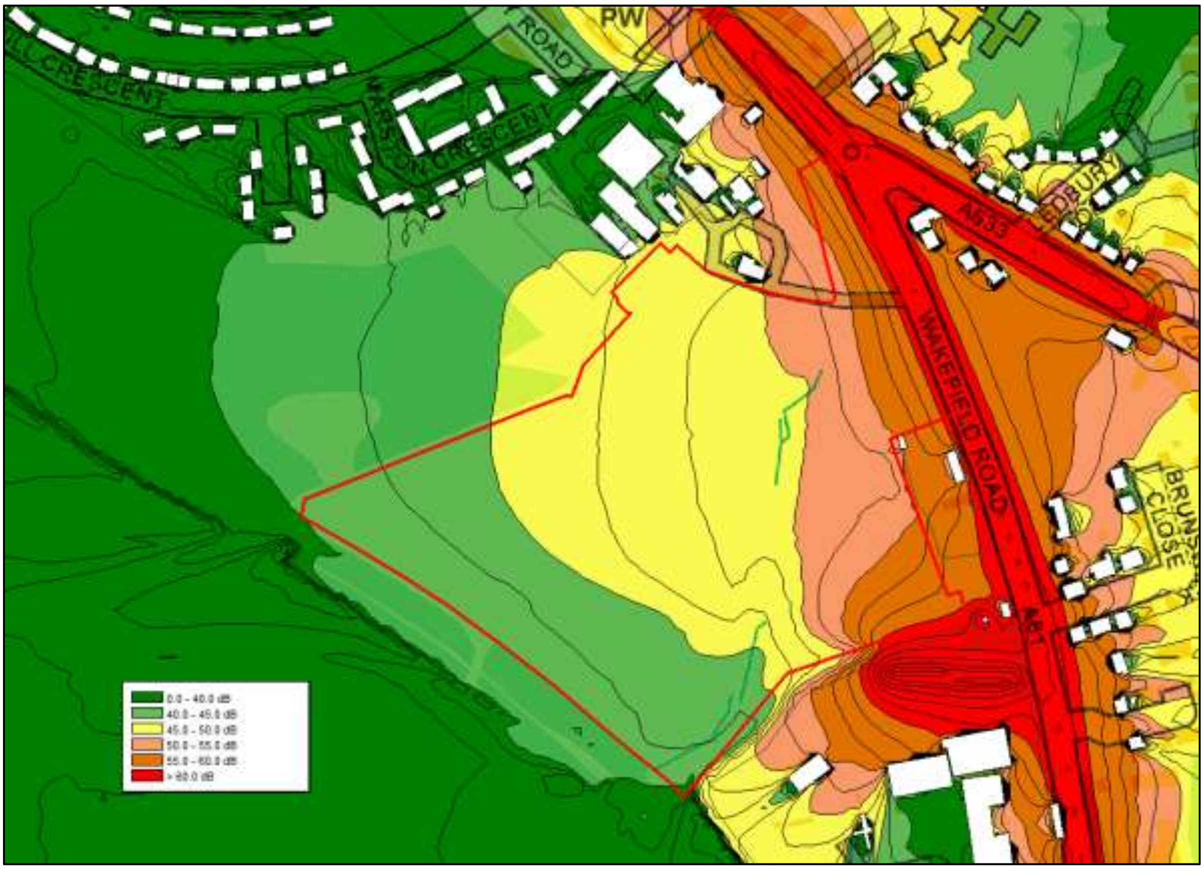

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Table 5.1 Results of Modelling (Average Levels)

Period	ProPg Stage 1 Risk Assessment Noise levels
Daytime $L_{Aeq,16hr}$	Low
Night-time $L_{Aeq,8hr}$	Low - Medium

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

The Stage 1 risk assessment shows that the acoustic challenges at the site are generally Low to Medium, a good acoustic design process will be required to be followed.

With regard to the ProPG stage 2 requirements, assessments of noise from all sources with regard to noise levels in proposed internal sensitive rooms and private external areas have been undertaken in the sections below. In addition to transportation noise, noise from the substation and commercial premises as outlined in Section 3 have been included within the assessment.

5.2 Assessment of Electricity Substation

Substation Noise Intrusion Assessment

An assessment of predicted internal noise levels at the closest assessed dwelling (R10) during the night-time period has been undertaken with regard to noise from the electricity substation with windows open and closed. Tables 5.2 and 5.3 below present a comparison of the predicted internal noise levels associated with the substation with windows open and closed against an internal noise level criteria of NR20. A standard double-glazing specification of 4mm/16mm/6m has been assessed with windows open providing 15 dB attenuation.

Table 5.2 Predicted Internal Noise Level Comparison with NR 20 (Night-time: Windows Open)

Parameter	Sound pressure Level (dB)/ Frequency (Hz)						
	63	125	250	500	1000	2000	4000
External noise level	57.3	60.1	49.4	40.6	39.5	32.9	31.7
Glazing Sound Insulation Performance (4mm/16mm/6mm)	15	15	15	15	15	15	15
Interior noise level	42.3	45.1	34.4	25.6	24.5	17.9	16.7
NR 20	51.3	39.4	30.6	24.3	20.0	16.8	14.4
Noise level difference	-9.0	5.7	3.8	1.3	4.5	1.1	2.3

Table 5.3 Predicted Internal Noise Level Comparison with NR 20 (Night-time: Windows Closed)

Parameter	Sound pressure Level (dB)/ Frequency (Hz)						
	63	125	250	500	1000	2000	4000
External noise level	57.3	60.1	49.4	40.6	39.5	32.9	31.7
Glazing Sound Insulation Performance (4mm/16mm/6mm)	17	23	22	27	38	40	41
Interior noise level	40.3	37.1	27.4	13.6	1.5	-7.1	-9.3
NR 20	51.3	39.4	30.6	24.3	20	16.8	14.4
Noise level difference	-11.0	-2.3	-3.2	-10.7	-18.5	-23.9	-23.7

As can be seen, internal noise levels are predicted to be above the NR 20 criteria with windows open and below with windows closed at the closest receptor.

In addition to the above, as noted previously, a dominant tone was identified at 100Hz. The assessment of low frequency noise and disruption caused by such noise is limited, however guidance is available in the form of 'NANR 45: Proposed criteria for the assessment of low frequency noise disturbance', February 2005, University of Salford. This guidance was produced on behalf of DEFRA and provides a method to follow when complaints have been received about low frequency noise. Whilst this document is not intended for planning purposes, in the absence of other applicable guidance, the criteria outlined within the guidance is considered to be suitable for use as part of this assessment. The guidance presents noise values above which disturbance could occur which are presented in the table below:

Table 5.4 Low Frequency Reference Curve (linear): Internal Noise Level Criteria

Hz	100 (Fluctuating Noise)	100 (Steady Noise)
dB, L_{Leq} (Night)	38	43

When comparing the level of noise against the predicted internal noise level at R10 of 45.1 at 125Hz, which is dominated by noise level at 100Hz, with windows open, the predicted noise level is slightly greater than the fluctuating and steady noise criteria specified in Table 5.4. With windows closed, the predicted internal noise level is 37.1 dB. Therefore, the criteria is met with standard double glazing. Alternative ventilation will be required for the closest properties to the substation. Alternative ventilation can be provided in several ways from acoustic trickle vents (which should have a comparable acoustic performance as the glazing), other passive ventilation systems or mechanical ventilations systems.

BS 4142 Noise Assessment (External Amenity)

The assessment compares the predicted noise levels from the substation with the existing measured background noise L_{A90} representative of proposed residential receptors in the absence of noise from the substation. The representative existing measured background noise level for each receptor has been established from a review of the ST data and a statistical analysis of the LT1 and LT3 noise survey data. Noise from the substation was clearly audible in the south-eastern area of the site. Subjectively there was a perceptible dominant tone at 100Hz and this has been verified following a review of the 1/3 octave data. Whilst this was less dominant within the site (as can be seen in table 4.4), a character correction of +4dB has been included within the assessment.

Table 5.5 presents the difference between the background noise level and noise rating level associated with the electrical substation at the external amenity receptor locations.

Table 5.5 Electricity Substation BS 4142 assessment

Ref	Measured Typical Pre-Installation Background L_{A90}	Noise Rating Level ($L_{Aeq,T}$)	BS 4142 Score
	Daytime	Daytime	Daytime
G01	40	12	-28
G02	40	13	-28
G03	40	13	-27
G04	40	20	-20
G05	38	30	-8
G06	38	27	-11
G07	38	27	-11
G08	44	35	-9
G09	44	26	-18
G10	42	45	3
G11	42	43	1
G12	42	40	-2
G13	42	36	-6

Ref	Measured Typical Pre-Installation Background L_{A90}	Noise Rating Level ($L_{Aeq,T}$)	BS 4142 Score
	Daytime	Daytime	Daytime
G14	42	34	-8
G15	48	31	-17
G16	48	21	-27
G17	48	26	-22
G18	48	19	-29
G19	48	18	-30

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

The results presented above show that the noise rating level at the nearest sensitive external amenity receptors are up to +3dB above the existing background noise level, which falls within the Lowest Observed Adverse Effect Level (LOAEL)

5.3 Noise Intrusion Assessment (Combined Sources)

Internal noise levels at the proposed development, based on the existing ambient noise climate, have been assessed both with windows open, where a reduction from a partially open window of 15 dB has been used, and with windows closed where an assumption of standard double glazing (4mm / 16mm / 6mm) with a sound reduction of 30 dB R_{tr} has been used. The predicted noise levels at the assessed receptors locations (as presented in Figure 3.2) are presented in Tables 5.6 to 5.9 below. The night-time L_{Aeq} noise contour plot is presented in Figure 5.3. The night-time L_{Amax} noise level is based on mitigating against maximum events associated with the bus depot and the bus depot car park. Following a review of the long term noise data, by addressing the L_{Aeq} in bedrooms, the required glazing and ventilation specification is sufficient to address the majority of peak (L_{Amax}) noise levels from road traffic noise.

Table 5.6 Daytime Noise Intrusion Levels $L_{Aeq,16hr}$

Ref	External $L_{Aeq,16hr}$ Daytime	Internal $L_{Aeq,16hr}$ Daytime (Windows Open)	Internal $L_{Aeq,16hr}$ Daytime (Windows Closed)	BS 8233 Target Criteria L_{Aeq}	Below SOAEL	Mitigation Required
R1	45.2	30.2	15.2	35	Yes	None
R2	33.9	18.9	3.9	35	Yes	None
R3	31.1	16.1	1.1	35	Yes	None
R4	46.4	31.4	16.4	35	Yes	None
R5	54.9	39.9	24.9	35	No (windows open)	**30 dB R_w and Alternative Ventilation**
R6	52.3	37.3	22.3	35	No (windows open)	**30 dB R_w and Alternative Ventilation**

Ref	External $L_{Aeq,16hr}$ Daytime	Internal $L_{Aeq,16hr}$ Daytime (Windows Open)	Internal $L_{Aeq,16hr}$ Daytime (Windows Closed)	BS 8233 Target Criteria L_{Aeq}	Below SOAEL	Mitigation Required
R7	51.6	36.6	21.6	35	No (windows open)	**30 dB R_w and Alternative Ventilation**
R8	52.9	37.9	22.9	35	No (windows open)	**30 dB R_w and Alternative Ventilation**
R9	56.0	41.0	26.0	35	No (windows open)	**30 dB R_w and Alternative Ventilation**
R10	56.7	41.7	26.7	35	No (windows open)	**30 dB R_w and Alternative Ventilation**
R11	54.8	39.8	24.8	35	No (windows open)	**30 dB R_w and Alternative Ventilation**
R12	54.3	39.3	24.3	35	No (windows open)	**30 dB R_w and Alternative Ventilation**
R13	51.1	36.1	21.1	35	No (windows open)	**30 dB R_w and Alternative Ventilation**
R14	50.5	35.5	20.5	35	No (windows open)	**30 dB R_w and Alternative Ventilation**
R15	64.0	49.0	34.0	35	No (windows open)	**30 dB R_w and Alternative Ventilation**
R16	62.0	47.0	32.0	35	No (windows open)	**30 dB R_w and Alternative Ventilation**
R17	62.1	47.1	32.1	35	No (windows open)	**30 dB R_w and Alternative Ventilation**
R18	58.8	43.8	28.8	35	No (windows open)	**30 dB R_w and Alternative Ventilation**
R19	59.3	44.3	29.3	35	No (windows open)	**30 dB R_w and Alternative Ventilation**

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

Table 5.7 Night-time Noise Intrusion Levels $L_{Aeq,8hr}$

Ref	External $L_{Aeq,8hr}$ Night-time	Internal $L_{Aeq,8hr}$ Night-time (Windows Open)	Internal $L_{Aeq,8hr}$ Night-time (Windows Closed)	BS 8233 Target Criteria L_{Aeq}	Below SOAEL	Mitigation Required
R1	34.3	19.3	4.3	30	Yes	None
R2	30.0	15.0	0.0	30	Yes	None
R3	26.4	11.4	0.0	30	Yes	None
R4	31.6	16.6	1.6	30	Yes	None
R5	41.0	26.0	11.0	30	Yes	None
R6	40.8	25.8	10.8	30	Yes	None

Ref	External $L_{Aeq,8hr}$ Night-time	Internal $L_{Aeq,8hr}$ Night-time (Windows Open)	Internal $L_{Aeq,8hr}$ Night-time (Windows Closed)	BS 8233 Target Criteria L_{Aeq}	Below SOAEL	Mitigation Required
R7	44.0	29.0	14.0	30	Yes	None
R8	37.5	22.5	7.5	30	Yes	None
R9	57.3	42.3	27.3	30	No (windows open)	**30 dB R_w and Alternative Ventilation**
R10	57.4	42.4	27.4	30	No (windows open)	**30 dB R_w and Alternative Ventilation**
R11	55.8	40.8	25.8	30	No (windows open)	**30 dB R_w and Alternative Ventilation**
R12	55.1	40.1	25.1	30	No (windows open)	**30 dB R_w and Alternative Ventilation**
R13	51.7	36.7	21.7	30	No (windows open)	**30 dB R_w and Alternative Ventilation**
R14	49.1	34.1	19.1	30	No (windows open)	**30 dB R_w and Alternative Ventilation**
R15	59.7	44.7	29.7	30	No (windows open)	**30 dB R_w and Alternative Ventilation**
R16	59.0	44.0	29.0	30	No (windows open)	**30 dB R_w and Alternative Ventilation**
R17	58.1	43.1	28.1	30	No (windows open)	**30 dB R_w and Alternative Ventilation**
R18	57.9	42.9	27.9	30	No (windows open)	**30 dB R_w and Alternative Ventilation**
R19	58.7	43.7	28.7	30	No (windows open)	**30 dB R_w and Alternative Ventilation**

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

Table 5.8 Night-time Noise Intrusion Levels L_{Amax}

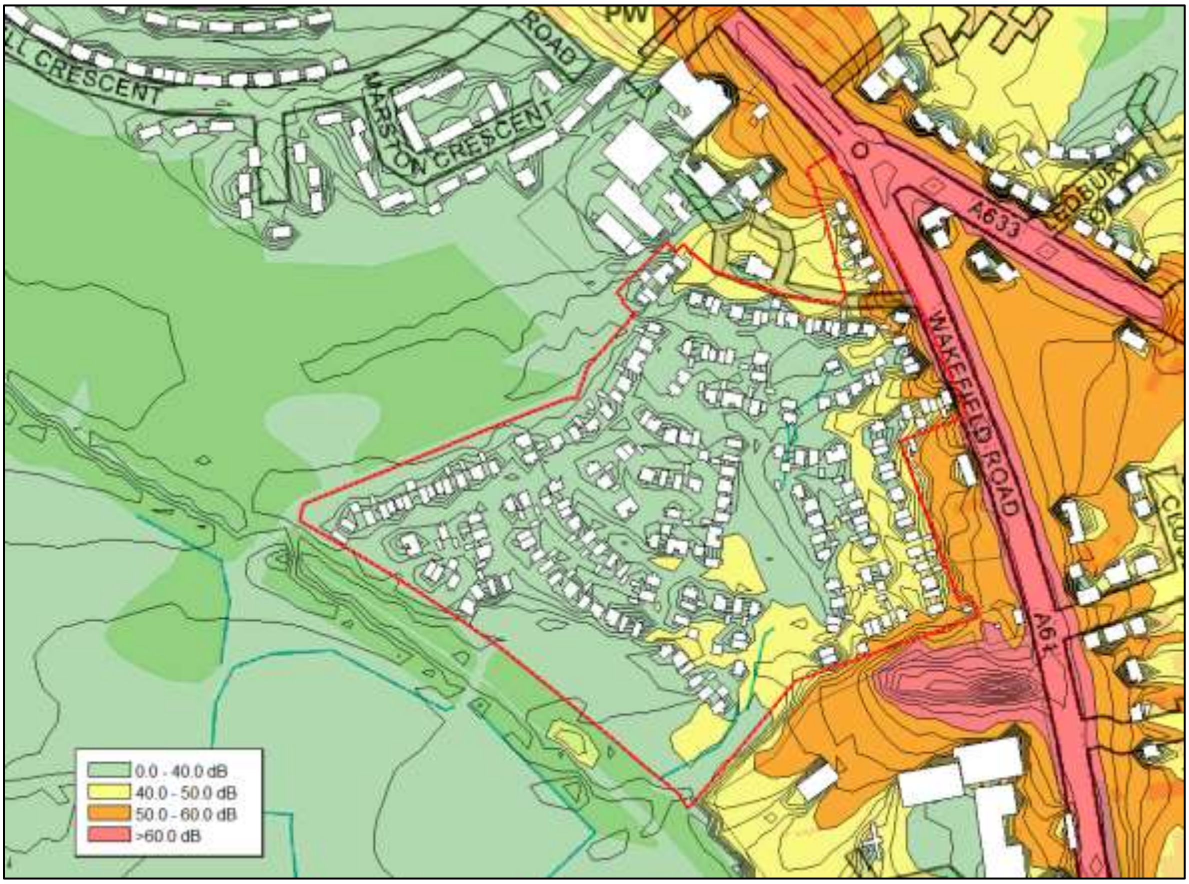
Ref	External L_{Amax} Night-time	Internal L_{Amax} Night-time (Windows Open)	Internal L_{Amax} Night-time (Windows Closed)	Target Criteria L_{Amax}	Below SOAEL	Mitigation Required
R1	35.9	20.9	5.9	45	Yes	None
R2	39	24.0	9.0	45	Yes	None
R3	36	21.0	6.0	45	Yes	None
R4	44.7	29.7	14.7	45	Yes	None
R5	57.2	42.2	27.2	45	Yes	None
R6	57.8	42.8	27.8	45	Yes	None

Ref	External L_{Amax} Night-time	Internal L_{Amax} Night-time (Windows Open)	Internal L_{Amax} Night-time (Windows Closed)	Target Criteria L_{Amax}	Below SOAEL	Mitigation Required
R7	56.3	41.3	26.3	45	Yes	None
R8	56.2	41.2	26.2	45	Yes	None
R9	72.2	57.2	42.2	45	No (windows open)	**30 dB R_w and Alternative Ventilation**
R10	73.9	58.9	43.9	45	No (windows open)	**30 dB R_w and Alternative Ventilation**
R11	69.3	54.3	39.3	45	No (windows open)	**30 dB R_w and Alternative Ventilation**
R12	71.9	56.9	41.9	45	No (windows open)	**30 dB R_w and Alternative Ventilation**
R13	67.1	52.1	37.1	45	No (windows open)	**30 dB R_w and Alternative Ventilation**
R14	63.9	48.9	33.9	45	No (windows open)	**30 dB R_w and Alternative Ventilation**
R15	44	29.0	14.0	45	Yes	None
R16	40.9	25.9	10.9	45	Yes	None
R17	44.3	29.3	14.3	45	Yes	None
R18	39.1	24.1	9.1	45	Yes	None
R19	41	26.0	11.0	45	Yes	None

As shown in the tables above, with windows closed, generally standard double glazing will result in the target criteria being met throughout the site.

With windows open, internal noise levels in the southern and eastern extremities of the site are predicted to exceed the criteria. Therefore, alternative means of ventilation will be required for these receptors with whole building ventilation provided. Alternative ventilation can be provided in several ways from acoustic trickle vents (which should have a comparable acoustic performance as the glazing), other passive ventilation systems or mechanical ventilation systems. Mitigation measures are outlined further in Section 6.0 of this report.

Figure 5.3 Night-time $L_{Aeq,8hours}$ Noise Contour Plot



Not to scale
OS Licence No. AL553611
Contour Plot at 4.0m height

5.4 External Amenity Assessment (Combined Sources)

Table 5.9 presents predicted noise levels within selected gardens based on the illustrative layout. The receptor locations are presented in Figure 3.3.

Table 5.9 External Noise Levels $L_{Aeq,16hours}$

Ref	External L_{Aeq}	Target Criteria L_{Aeq}	Within Criteria
G01	47.3	55	Yes
G02	36.9	55	Yes
G03	39.7	55	Yes
G04	46.3	55	Yes
G05	53.8	55	Yes
G06	50.0	55	Yes
G07	51.8	55	Yes
G08	54.0	55	Yes
G09	48.4	55	Yes
G10	58.7	55	No
G11	55.7	55	No

Ref	External L_{Aeq}	Target Criteria L_{Aeq}	Within Criteria
G12	55.3	55	No
G13	51.9	55	Yes
G14	50.3	55	Yes
G15	64.1	55	No
G16	54.0	55	Yes
G17	50.1	55	Yes
G18	45.9	55	Yes
G19	51.3	55	Yes

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

As can be seen in Table 5.9 noise levels are predicted to achieve the target criteria of 55 $dBL_{Aeq,16hours}$ in most of the proposed external amenity spaces. Mitigation in the form of close double boarded garden fences is considered in Section 6.0 of this report.

5.5 Tranquillity Assessment

An assessment of the existing tranquillity level of the site has been based on the mapping data published by Campaign to Protect Rural England (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 Zones 1 and of low tranquillity value. There are no public rights of way within or adjacent to the site. As the proposed development, will not disrupt current public rights of way the development is considered to have a negligible effect on local access to areas of greater tranquillity.

6.0 MITIGATION

6.1 Glazing and Ventilation Strategy

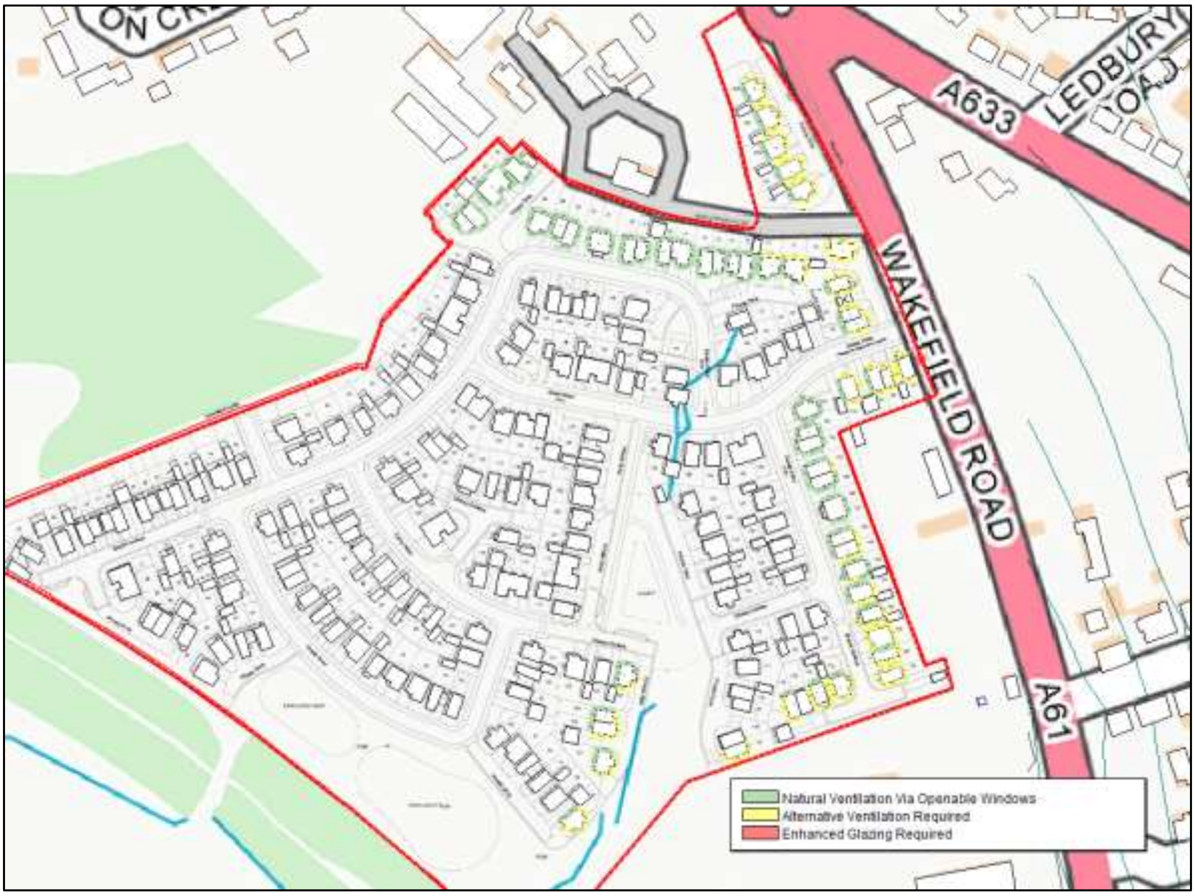
With regard to internal areas of the proposed development, the glazing and ventilation strategies provided in Figures 6.1 – 6.2 below, have been designed to achieve internal daytime L_{Aeq} of 35 dB, and internal night-time L_{Aeq} of 30 dB in habitable rooms of the proposed development.

The glazing and ventilation strategies highlight which areas will feature enhanced glazing and an alternative means of ventilation in order to meet both ventilation and internal ambient noise criteria. 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), or MVHR.

All dwellings will feature standard double glazing with a minimum reduction of $R_w + C_{tr}$ 30dB. Further details of the glazing and ventilation specifications can be found in Section 5.3.

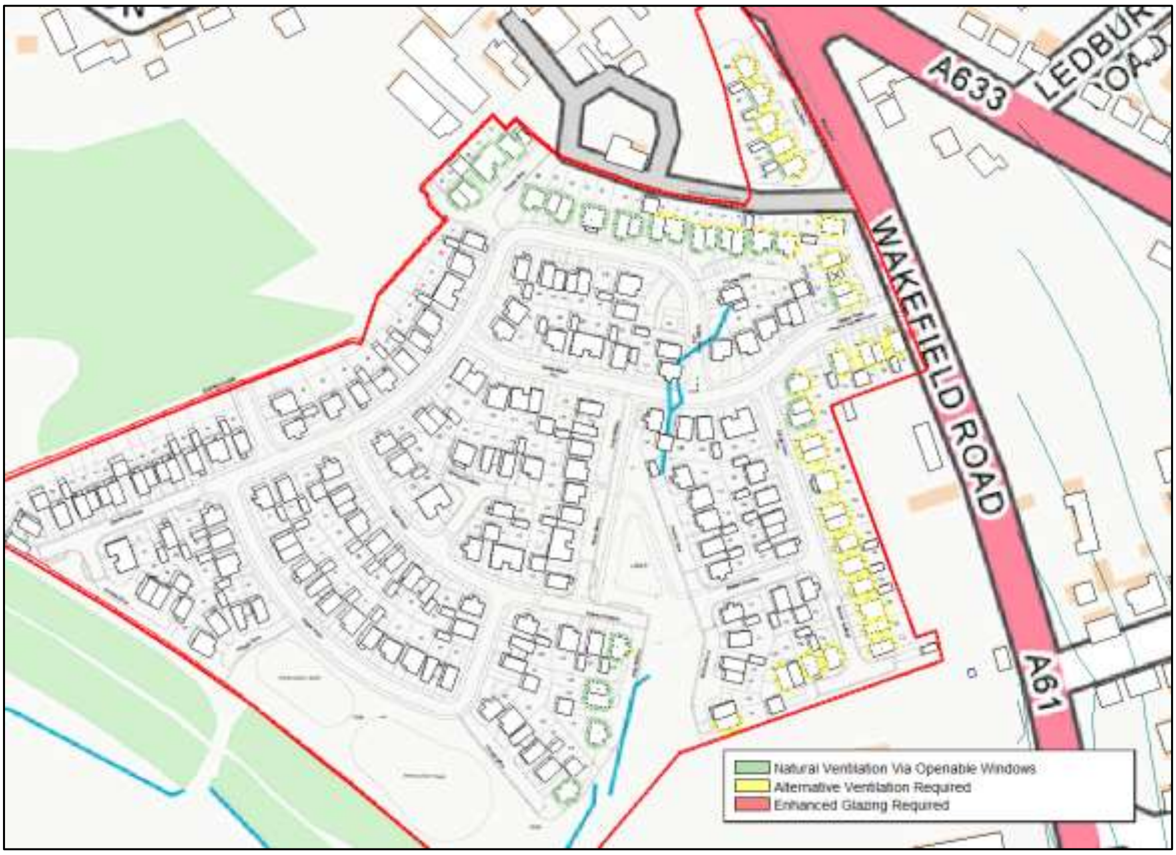
Residential properties on the southern and eastern extremities of the proposed site would require alternative means of ventilation with a minimum sound reduction which is equal to or greater than the associated glazing.

Figure 6.1 Glazing and Ventilation Strategy (Living Rooms)



Not to scale

Figure 6.2 Glazing and Ventilation Strategy (Bedrooms)

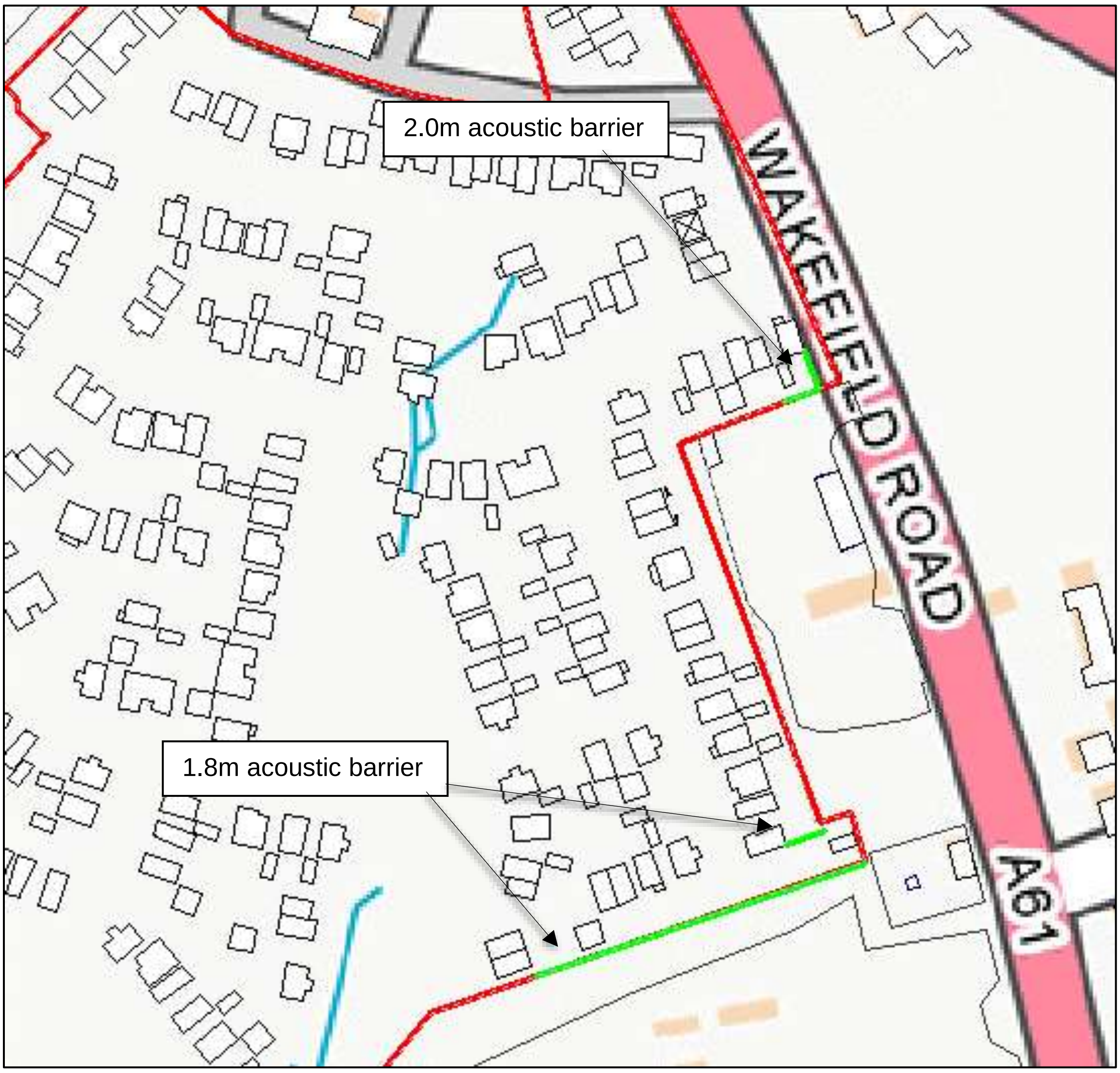


Not to scale

6.2 External Amenity Mitigation

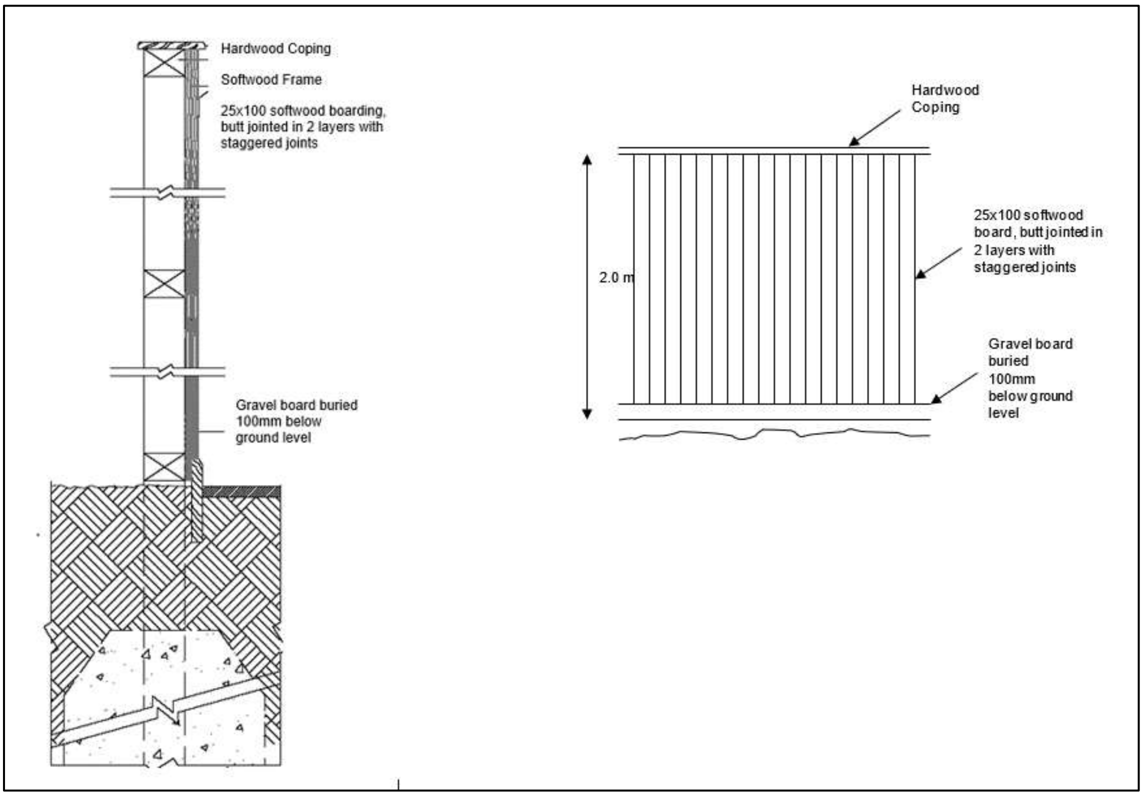
As stated in Section 5.4, acoustic barriers are required in order to meet the WHO external amenity guidance of 55 dB. Figure 6.3 shows the indicative location of the acoustic barriers.

Figure 6.3 Indicative Acoustic Barrier Locations



Not to scale

Figure 6.4 Example 2.0m Acoustic Barrier Detail



6.3 External Amenity Assessment (Combined Sources) – Including Mitigation

Table 6.1 presents predicted noise levels within selected gardens based on the illustrative layout including the mitigation described above.

Table 6.1 External Noise Levels $L_{Aeq,16hours}$ – Including Mitigation

Ref	External L_{Aeq}	Target Criteria L_{Aeq}	Within Criteria
G01	47.3	55	Yes
G02	36.9	55	Yes
G03	39.7	55	Yes
G04	46.3	55	Yes
G05	53.8	55	Yes
G06	50.0	55	Yes
G07	51.7	55	Yes
G08	53.5	55	Yes
G09	47.4	55	Yes
G10	54.7	55	Yes
G11	53.9	55	Yes
G12	52.9	55	Yes
G13	51.8	55	Yes
G14	50.2	55	Yes
G15	54.6	55	Yes

Ref	External L_{Aeq}	Target Criteria L_{Aeq}	Within Criteria
G16	54.0	55	Yes
G17	50.0	55	Yes
G18	45.9	55	Yes
G19	51.3	55	Yes

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

As can be seen in Table 6.1 noise levels are predicted to achieve the target criteria of 55 $dBL_{Aeq,16hours}$ in all of the proposed external amenity spaces.

7.0 CONCLUSIONS OF NOISE ASSESSMENT

This report presents the findings of a noise assessment to support a reserved matters planning application for a proposed residential development on land off Wakefield Road, Athersley. The assessment has been assessed against test points within paragraph 174 and 185 of the NPPF with the findings outlined below. Reference has been given to relevant guidance documents, including the Planning Practice Guidance: Noise, BS 8233, WHO and BS 4142 with the assessment demonstrating the suitability of the site for residential development.

NPPF 174 and 185

In considering the NPPF test in section 174, the Proposed Development is not expected to have an 'adverse impact' on health or quality of life. Similarly, with regard to NPPF section 185, it is considered that all 'adverse impacts on health and quality of life' (relating to noise) can be mitigated by the use of the following mitigation:

- Some facades across the site will feature alternative (acoustic) ventilation. Alternative ventilation can be provided in the form of acoustic trickle vents (which need to have a minimum sound reduction equal to or greater than the glazing), other passive ventilation systems (such as in-wall passive ventilation) or mechanical ventilation systems may also be specified.
- Glazing specifications have been recommended based upon the required sound attenuation with a minimum sound reduction of R_w 30 dB which can be achieved by standard double glazing.
- 2.0m acoustic barrier to mitigate the impact of road traffic noise in the garden of receptor R15 and 1.8m acoustic barrier along part of the southern perimeter of the Development to reduce the impact of industrial/commercial noise on external amenity at proposed properties to the south of the Development.

Planning Practice Guidance: Noise

The noise mitigation in Section 6.0 of this report is sufficient to reduce the effects of identified sources of noise being currently emitted from the surrounding environment to prevent the adopted thresholds (within the context of BS 8233) being exceeded and avoid the Significant Observed Adverse Effect Level (SOAEL) at all areas across the site.

Taking the above factors into account and the proposed mitigation detailed in this assessment, it is considered that the requirements of condition 7 of outline planning (ref. 2017/1451) has been met.

APPENDICES

APPENDIX A – ACOUSTIC TERMINOLOGY AND ABBREVIATIONS

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

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

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

L_{Aeq} — Since almost all sounds vary or fluctuate with time it is helpful, instead of having an instantaneous value to describe the noise event, to have an average of the total acoustic energy experienced over its duration. The $L_{Aeq,\ 07:00-23:00}$ for example, describes the equivalent continuous noise level over the 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.

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

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

APPENDIX B – REPORT CONDITIONS

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