



**Noise Assessment for Proposed Residential Development at  
Terriers Farm, High Wycombe  
For Persimmon Homes and Redrow Homes**



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# Quality Management

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# 1 Introduction

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- 1.1 The Acoustics Team at the Brighton office of RPS Planning and Development (RPS) has been appointed by Persimmon Homes (PH) and Redrow Homes (RH) to carry out a noise assessment to inform a development brief for a proposed residential development of up to 500 homes at Terriers Farm, High Wycombe. The site lies within the administrative area of Wycombe District Council (WDC).
- 1.2 The proposal site is located approximately 2.5 km north-east of High Wycombe town centre and is currently in farming use as arable land. There is existing residential development to the south and west of the proposal site, with open fields to the north-east. The A404 main road lies approximately 300 m to the east of the proposal site.
- 1.3 The assessment has been undertaken based upon appropriate information provided by the project team. RPS is a member of the Association of Noise Consultants (ANC), the representative body for acoustics consultancies, having demonstrated the necessary professional and technical competence. The assessment has been undertaken with integrity, objectivity and honesty in accordance with the Code of Conduct of the Institute of Acoustics and ethically, professionally and lawfully in accordance with the Code of Ethics of the ANC.
- 1.4 The technical content of this assessment has been provided by RPS personnel, all of whom are corporate (MIOA) or non-corporate, associate members (AMIOA) of the Institute of Acoustics (the UK's professional body for those working in acoustics, noise and vibration). Personnel and individual qualifications are provided within the Quality Management table at the start of this report. This report has been peer reviewed within the RPS team to ensure that the wealth of experience within the team is reflected in the assessment.
- 1.5 This report contains: a description of the baseline surveys which were undertaken in order to determine the existing sound environment at the site and a presentation of the results thereof; the assessment methodology used to assess internal and external sound levels; a summary of the standards, guidance & policy upon which the assessments are based; the results of the assessments undertaken; and a summary and conclusions section which summarises the findings of the report.

## 2 Assessment Methodology

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### Planning Guidance

- 2.1 This assessment has been carried out with reference to the National Planning Policy Framework (NPPF) [1], Noise policy Statement for England (NPSE) [2] and Planning Practice Guidance (Noise) (PPGN) [3] and other appropriate guidance. Full details of the legislation and guidance that has been considered in this assessment is provided in Appendix A.
- 2.2 The NPSE, published in March 2010 by Defra, aims to provide clarity regarding current policies and practices, to enable noise management decisions to be made within the wider context, at the most appropriate level, in a cost-effective manner and in a timely fashion. The NPSE was the first planning guidance document to introduce categorisation of adverse noise effects in terms of effect levels. These have then been continued into the PPGN which is described below.
- 2.3 The NPPF, published in March 2012, sets out the Government's planning policies for England. The document does not contain any specific noise policy or noise limits but it provides a framework for local people and local authorities to produce their own local and neighbourhood plans, which reflect the needs and priorities of their communities.

### PPGN

- 2.4 The guidance contained within the PPGN (paragraph Reference ID: 30-001-20140306) provides advice on how to deliver the policies of the NPPF. The PPGN reiterates general guidance on noise policy and assessment methods provided in the NPPF, NPSE and British Standards (BSs) and contains examples of acoustic environments commensurate with various effect levels. Paragraph 005 (Reference ID: 30-005-20140306) of the PPGN describes the different effect levels which are defined and briefly outlined below:
- No Observable Effect Level (NOEL);
  - Lowest Observable Adverse Effect Level (LOAEL); and
  - Significant Observed Adverse Effect Level (SOAEL).
- 2.5 The PPGN describes noise that is not noticeable to be at levels below the NOEL. Noise exposures in this range are below the LOAEL and need no mitigation. The PPGN suggests that noise exposures above the LOAEL cause small changes in behaviour. Examples of noise exposures above the LOAEL provided in the PPGN are having to turn up the volume on the television; needing to speak more loudly to be heard; or, where there is no alternative ventilation, closing windows for some of the time because of the noise. In line with the NPPF and NPSE, the PPGN states that consideration needs to be given to mitigating and minimising effects above the LOAEL but also to taking account of the economic and social benefits being derived from the activity causing the noise. The PPGN suggests that noise exposures above the SOAEL cause material changes in behaviour. Examples of noise exposures above the SOAEL provided in the

PPGN are, where there is no alternative ventilation, keeping windows closed for most of the time or avoiding certain activities during periods when the noise is present. In line with the NPPF and NPSE, the PPGN states that effects above the SOAEL should be avoided and that whilst the economic and social benefits derived from the activity causing the noise must be taken into account, such exposures are undesirable.

2.6 The non-numeric guidance contained within the PPGN, based upon the starting point in the NPSE, is summarised in Table 2.1 below.

**Table 2.1 Summary of Guidance from NPSE and PPGN**

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
		Lowest Observed Adverse Effect Level (LOAEL)	
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, 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 perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
		Significant Observed Adverse Effect Level (SOAEL)	
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, 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
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

### Summary of Relevant Guidance Documents

2.7 The key policy documents and standards used to inform this assessment are listed below with further information provided in Appendix B:

- NPSE;

- NPPF;
- PPGN;
- BS 8233:2014 'Guidance on sound insulation and noise reduction for buildings' [4]; and
- WDC Local Plan Adopted January 2004 (Saved and Extended 2007 and partially replaced by the adopted Core Strategy July 2008). [5]

### Consultation

2.8 On Friday 13<sup>th</sup> March 2015, prior to carrying out the assessment, Peter Barling, Assistant Acoustic Consultant for RPS, contacted WDC via telephone and spoke with Mark Bumpstead, an Environmental Health Officer (EHO) with WDC to seek agreement on the proposed assessment methodology and criteria. It was agreed that the dominant source of sound in the area will be from road traffic movements on the A404 'Amersham Road' and that the assessment should be based on the guidance contained within Table 4 of BS 8233:2014, specifically that:

- internal levels of 35 dB  $L_{Aeq,16h}$  during the daytime (BS 8233:2014 Table 4);
- internal levels of 30 dB  $L_{Aeq,8h}$  during the night-time (BS 8233:2014 Table 4); and
- external levels in amenity areas of 55 dB  $L_{Aeq,16h}$  during the daytime (BS 8233:2014 paragraph 7.7.3.2);
- Appropriate levels of mitigation will be determined in accordance with best practice, local planning policy and the NPPF.

2.9 It is considered that, if proposed façades of the residential properties can be designed to ensure that appropriate internal noise levels are achieved, then a commensurate level of protection will be provided against maximum levels from individual sound events (i.e. the protection provided to ensure  $L_{Aeq,T}$  levels will not be exceeded will ensure that appropriate  $L_{Amax}$  levels will also not be exceeded).

### Establishing Baseline Conditions

2.10 To establish the baseline conditions at the proposal site, an unattended sound level survey was setup on site in order to monitor existing sound levels. Baseline surveys are discussed in detail in the following section. The reporting of the environmental conditions during the survey period were undertaken with reference to BS 7445-1:2003 and BS 7445-2:1991 [6 & 7].

## 3 Baseline Survey

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### Site Description

- 3.1 The development site is located approximately 2.5 km north-east of High Wycombe town centre and is currently in farming use as arable land. There is existing residential development to the south and west of the site, with open fields to the north-east. The A404 'Amersham Road' lies approximately 300 m to the east of the site. The main source of sound affecting the site is road traffic.

### Baseline Sound Level Survey

- 3.2 One long term unattended sound level survey (LT\_1) was set up to monitor sound levels from road traffic on the A404 on Friday 6th March 2015 at 12:20 hours and collected on Tuesday 10th March 2015 at 13:16 hours. Three short-term attended sound level surveys (ST\_1, ST\_2 and ST\_3) were also carried out across the site at distances representative of the closest proposed building façades to the A404. The survey locations are identified on the plan provided in Figure 1.
- 3.3 The unattended long term survey (LT\_1) was carried out using a Rion NL-32 sound level meter (SLM) and the attended short-term measurements (ST\_1, ST\_2 and ST\_3) were carried out using a Rion NL-52 SLM; these are both Type 1 SLMs with one of the best performing environmental windshields. BS 7445 2:1991 recommends that sound level meters used for the acquisition of data pertinent to land use be preferably Type 1. Data were logged of the A-weighted sound pressure level in 100 ms periods as the A-weighting is used for environmental sound assessment and 100 ms periods enable the data to be post-processed into any suitable time period.
- 3.4 LT\_1 was positioned to the south of the site at a distance of approximately 100 m west from the edge of the A404, with the microphone mounted on a pole 1.5 m above local ground level in a free-field location (e.g. at least 3.5 m away from any reflecting surfaces, excluding the ground). The land between the microphone and the A404 was primarily soft grassland with some hard road surface. At the time of setting up and collecting the surveys, the main sound source was observed to be traffic on the A404. In addition, other sound sources included birds singing and aircraft passing overhead. The A404 road was at approximately the same elevation as LT\_1 and in-between there was some limited screening provided by houses, hedges and other foliage.
- 3.5 ST\_1 was positioned in the south west part of the site on the site boundary at a distance of approximately 50 m west from the edge of the A404 and 1 m north from the edge of Kingshill Road, with the microphone mounted on a tripod 1.3 m above local ground level in a free-field location. The main sound source from this location was road traffic from A404 and Kingshill Road.
- 3.6 ST\_2 was positioned in the east part of the site at a distance of approximately 250 m west from the edge of the A404, although the road was partially screened by trees and foliage. The main sound source from this location was road traffic from A404.

- 3.7 ST\_3 was positioned in the north east part of the site at a distance of approximately 390 m west from the edge of the A404 and approximately 50 m south of the northern boundary, although the road was partially screened by trees and foliage. The main sound source from this location was road traffic from the A404.
- 3.8 All instrumentation was field calibrated prior to and following the measurements using a Rion NC-74 calibrator and no significant drift was observed between the start and end of the survey. All equipment had been calibrated within the previous two years at the time of the measurements. Calibration certificates are available on request.
- 3.9 Wind conditions during the survey period were determined from a nearby meteorology station approximately 4.5 km north west of the site. Weather conditions during the survey period were largely dry with only a few short periods of measured rainfall. Wind speeds were low (ranging between 0.0 and 2.5 m/s) and did not appear to influence the measurements. Therefore, no data have been excluded from the dataset due to wind or rainfall.
- 3.10 The  $L_{Aeq,T}$ ,  $L_{A90,T}$  and  $L_{A10,T}$  indices have been derived from the 100 ms data for each full period (i.e. 16 hours during the daytime (07:00 – 23:00) and 8 hours during the night-time (23:00 – 07:00)).
- 3.11 A summary of the baseline survey results is presented in Table 3.1 below, with a chart showing the time history for LT\_1 provided in Figure 2. Full survey details are provided in Appendix B at the end of this report.

**Table 3.1 Baseline Sound Level Survey Results**

Location	Period	Duration (hrs:mins)	$L_{Aeq,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)
LT_1	Daytime (07:00 – 23:00 hours)	16:00	51	52	45
	Night-time (23:00 – 07:00 hours)	08:00	43	47	29
ST_1	11:14 – 11:29 and 12:40 – 12:55 hours	00:15	71	75	55
ST_2	11:47 – 12:02 hours	00:15	46	46	38
ST_3	12:13 – 12:28 hours	00:15	41	43	34

## 4 Assessment

### Representative Sound Levels in the Context of the Locality

- 4.1 The main sound source on site was observed to be road traffic, in particular on the A404. Based on the current plans, properties on the southern boundary that have line-of-sight to the A404 are, at the closest point, approximately 120 m from the road.
- 4.2 Based on the current plans, properties on the southern boundary that will have line-of-sight to the A404 are, at the closest point, approximately 120 m from the road. Survey LT\_1 (see Figure 1) was positioned 100 m away from the road. This was the most appropriate location in respect to line of sight to the A404 and security. Short-term surveys were also carried out to gain a more representative level at the proposed houses north of the site.

### Façade Attenuation

- 4.3 It is generally accepted that the windows of any dwelling are the weakest point of the building fabric with regards to sound transmission, especially when windows are opened to provide natural, rapid ventilation. The assessment of internal noise levels has therefore been undertaken with respect to establishing the minimum required sound insulation performance for all proposed windows and ventilation units, where required. Estimates of the total façade sound attenuation for example façade configurations have been calculated and the results are provided in Table 4.1 below. For the purposes of the assessment, it is assumed that a partially open window provides 15 dB of attenuation; see Appendix A for details regarding the attenuation performance of various windows.

**Table 4.1 Calculated Façade Reduction with various Façade Elements**

Level of Mitigation Required	External Wall	Window	Ventilation	Total Façade Sound Attenuation
	$R_w + C_{tr}$ dB	$R_w + C_{tr}$ dB	$D_{n,ew}$ dB	$R_w + C_{tr}$ dB
Treatment 1 (windows closed)	45 <sup>1</sup>	31 <sup>3</sup>	27 <sup>4</sup>	26
No Treatment (partially open windows)	-	15 <sup>2</sup>	-	15

Notes:

<sup>1</sup> Standard wall construction (based on BS 8233).

<sup>2</sup> See Appendix C for details.

<sup>3</sup> Standard thermal double glazed window unit (based on BS EN 12758:2011 [8]).

<sup>4</sup> Acoustic trickle vents (based on manufacturer's data).

Calculations have been carried out following the guidance contained within BS 8233 and are based on a typical receiver room.

### Assessment of Required Façade Attenuation

- 4.4 The assessment of required façade attenuation has been carried out in accordance with BS 8233:2014. The assessment uses the representative baseline noise levels provided in Table 3.1. For façades on the southern boundary opposite Kingshill Road the 15-minute  $L_{Aeq}$  sound levels measured at ST\_1 have been corrected to provide an estimate for the 16-hour and 8-hour  $L_{Aeq}$  sound levels at the location of residential façades (assumed to be 35 m north of Kingshill Road).
- 4.5 The results of the assessment of the minimum required façade attenuation, based on the representative external noise levels provided in Table 3.1, are presented in Table 4.2 below.

**Table 4.2 Assessment of Required Façade Sound Insulation**

Location	Assessment Period	Predicted Sound Level $L_{Aeq,16h}$ (dB)	Daytime Sound Level Criteria $L_{Aeq,16h}$ (dB)	Minimum Required Façade Sound Insulation $R_w$ (dB)*
LT_1	Daytime (07:00 – 23:00 hours)	50	35	15
	Night-time (23:00 – 07:00 hours)	43	30	13
Proposed façades opposite Kingshill Road	Daytime (07:00 – 23:00 hours)	58	35	23
	Night-time (23:00 – 07:00 hours)	53	30	23

- 4.6 The results in Table 4.2 indicate that, the façades of properties built on the eastern boundary of the site, and facing the Kingshill Road and the façades of properties built on the southern boundary of the site facing the A404, should be designed to achieve an  $R_w$  value of at least 23 dB and 16 dB respectively. As detailed in Table 4.1, this could be achieved using Treatment 1 which consists of a standard wall construction, standard double glazing and an alternative ventilation system achieving an  $R_w$  of at least 27 dB  $R_w$ .
- 4.7 Notwithstanding the above, there is no reason why windows should not be openable, at the residents' discretion, in order to provide rapid natural ventilation as long as the openable windows, when closed, provide the required attenuation. It should also be noted that these requirements are for habitable rooms only i.e. kitchens (unless part of a lounge/diner/living room), bathrooms, hallways, landings, utility rooms etc. have no specific requirements with respect to internal noise levels.
- 4.8 It should also be noted that noise levels going into site, beyond the first row of houses, will be reduced due to the attenuation provided by those properties closer to the road. Noise levels may be up to 10 dB lower as a result and therefore, for those properties where noise levels are at least 10 dB lower, partially open windows will be suitable to provide the ventilation requirements.

- 4.9 It is therefore recommended that those dwellings adjacent to the southern boundary be provided with an alternative means of ventilation to negate the need to open windows. Figure 3 provides an indication of façade treatments.

### **External Amenity Areas**

- 4.10 The representative predicted daytime sound level at the most sensitive location, opposite Kingshill Road, is 53 dB  $L_{Aeq,16h}$  which, from BS 8233:2014, is below the upper guideline value of 55 dB  $L_{Aeq,T}$  and below the maximum level as sought by WDC.
- 4.11 It is also worth noting that in practice external amenity areas will be separated with fencing etc. which will provide screening and attenuation, reducing received sound levels. Taking into account the screening that will be provided by fencing and attenuation provided by the proposed houses, it is considered likely that the noise levels in the most exposed external amenity areas would be below the BS 8233:2014 desirable limit of 50 dB  $L_{Aeq,T}$  for the majority of the time.

### **Assessment Summary**

- 4.12 The results of the noise assessment show that, with the basic mitigation outlined, acceptable internal and external sound environments will be achieved in accordance with the guidance contained within BS 8233:2014. The basic mitigation requirement is the provision of an alternative means of ventilation for the first rows of houses on facades of properties facing the southern boundary. Therefore, with the basic mitigation outlined, the proposal is acceptable in terms of accepted national and local standards.
- 4.13 The results of the baseline noise survey indicate that the measured levels are such that the proposed development accords with WDC Policy G8, in that the proposed development would not be likely to be adversely affected by existing or potential sources of noise. The proposal is therefore acceptable in terms of local planning policy. With regard to national planning policy, namely the NPSE, NPPF and the PPGN, it is considered that, with the basic mitigation outlined, residual impacts on proposed receptors will be below the LOAEL and hence it is considered that the proposal is acceptable with regard to national planning policy.

## 5 Summary & Conclusions

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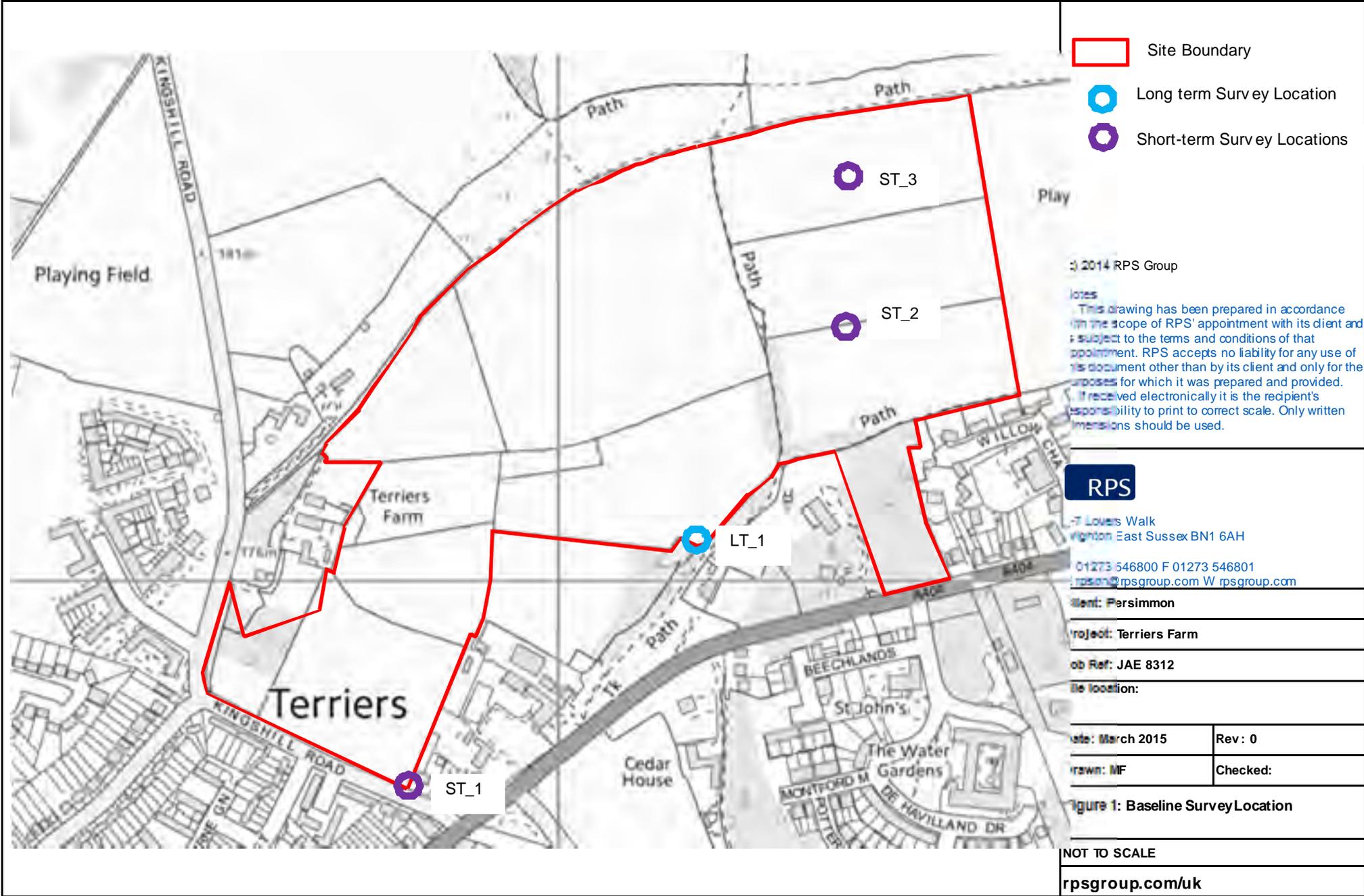
- 5.1 The Acoustics Team at the Brighton office of RPS has been appointed by Persimmon Homes and Redrow Homes to carry out a noise assessment for a proposed residential development at Terriers Farm, High Wycombe, which lies within the administrative area of Wycombe District Council (WDC). This assessment has been undertaken to ascertain the suitability of the site for the development and to determine any mitigation measures that may be required to ensure suitable internal and external environments.
- 5.2 The results of the noise assessment show that, with the basic mitigation outlined, acceptable internal and external sound environments will be achieved in accordance with the guidance contained within British Standard 8233:2014. The basic mitigation requirement is provision of an alternative means of ventilation for the first rows of houses on the eastern and southern boundaries of the development.
- 5.3 Based on the above, the proposed development is in accordance with the WDC local planning policy G8. It has also been demonstrated that the proposal is acceptable with regards to the National Planning Policy Framework, the related Planning Practice Guidance (Noise) and the Noise Policy Statement for England.
- 5.4 It is therefore considered that the proposed development, with the inclusion of the basic mitigation detailed herein, is acceptable and hence planning permission should be acceptable in relation to noise.

## Figures

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Proposed Residential Development at Terriers Farm



- Site Boundary
- Long term Survey Location
- Short-term Survey Locations

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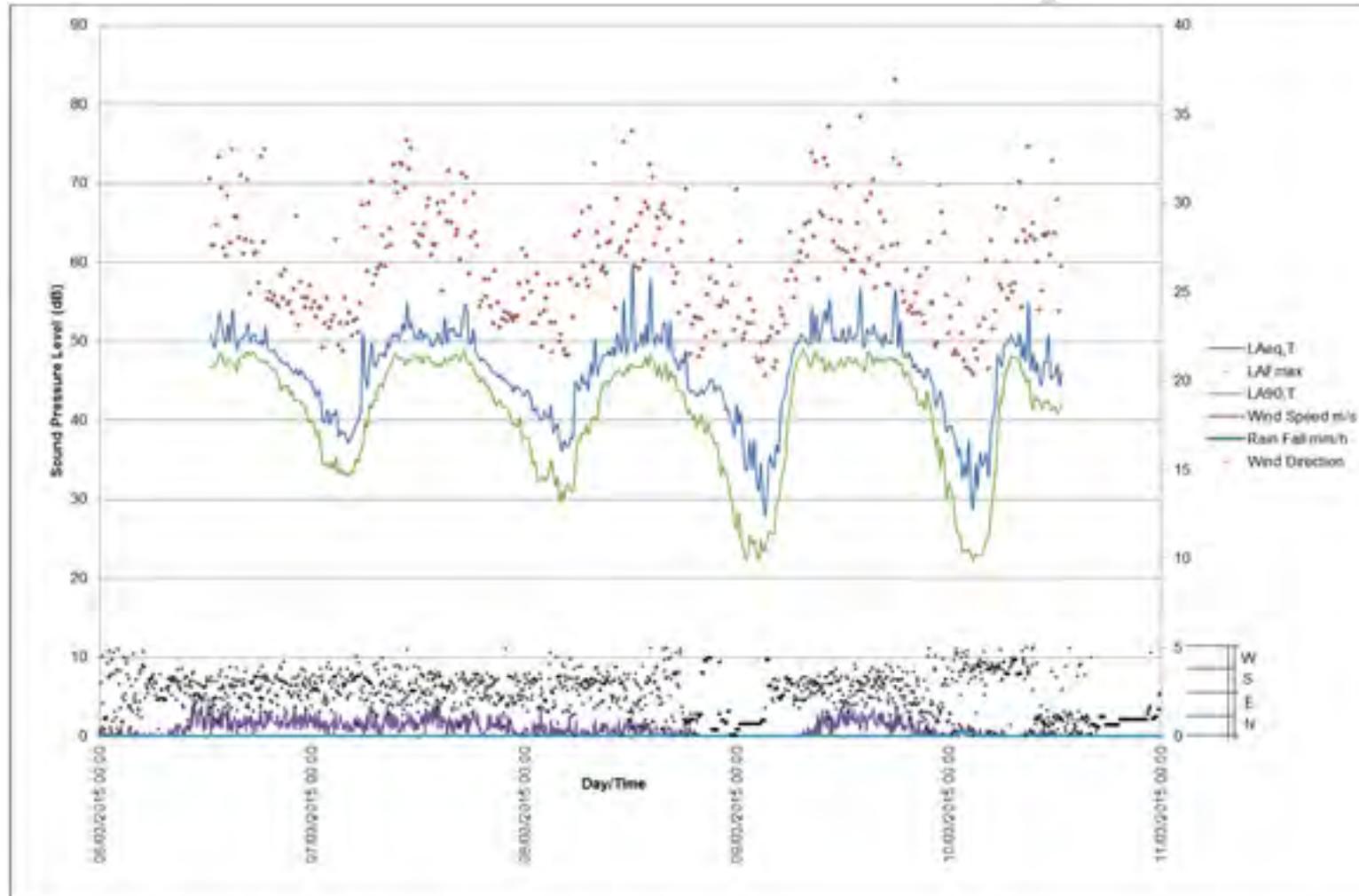
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Figure 1: Baseline Survey Location

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**Figure 2: Baseline Sound Level Survey**

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## Appendices

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## Appendix A: Policy, Standards and Guidance

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### National Planning Policy Framework

A.1 The National Planning Policy Framework (NPPF), published in March 2012, sets out the Government's planning policies for England. The document does not contain any specific noise policy, or noise limits but it provides a framework for local people and local authorities to produce their own local and neighbourhood plans, which reflect the needs and priorities of their communities.

A.2 In Section 11, 'Conserving and enhancing the natural environment', paragraph 123 relates to noise and states:

*'123. Planning policies and decisions should aim to:*

- *avoid noise from giving rise to significant adverse impacts<sup>27</sup> on health and quality of life as a result of new development;*
- *mitigate and reduce to a minimum other adverse impact<sup>28</sup> on health and quality of life arising from noise from new development, including through the use of conditions;*
- *recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established,<sup>28</sup> and*
- *identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.'*

<sup>27</sup> See Explanatory Note to the Noise Policy Statement for England (Department for the Environment, Food and Rural Affairs).

<sup>28</sup> Subject to the provisions of the Environmental Protection Act 1990 and other relevant law.'

A.3 The first bullet point refers to 'significant adverse impacts' which relates to the 'significant observed adverse effect level' (SOAEL) in the Noise Policy Statement for England (NPSE), though the term 'effect' is used instead of the term 'impact' although these have been deemed to be interchangeable in this context. Therefore, given the comments above on the NPSE with regard to assessment methods and criteria, the current content of the NPPF does not require any change in previously adopted approaches.

### Noise Policy Statement for England

A.4 The NPSE, published in March 2010 by Defra, aims to provide clarity regarding current policies and practices to enable noise management decisions to be made within the wider context, at the most appropriate level, in a cost-effective manner and in a timely fashion.

A.5 Paragraph 1.6 of the NPSE sets out the long-term vision and aims of Government noise policy:

*"Noise Policy Vision*

*Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.”*

“Noise Policy Aims

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

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

A.6 The aims require that all reasonable steps should be taken to avoid, mitigate and minimise adverse effects on health and quality of life whilst also taking into account the guiding principles of sustainable development, which include social, economic, environmental and health considerations.

A.7 With regard to the terms ‘significant adverse’ and ‘adverse’ included in the ‘Noise Policy Aims’, these are explained further in the ‘Explanatory Note’ as relating to established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation which are:

‘NOEL – No Observed Effect Level

*This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on human health and quality of life due to noise.*

LOAEL – Lowest Observed Adverse Effect Level

*This is the level above which adverse effects on health and quality of life can be detected.’*

Defra has then extended these concepts for the purpose of the NPSE to introduce the concept of:

‘SOAEL – Significant Observed Adverse Effect Level’

A.8 This is the level above which significant adverse effects on health and quality of life occur. The accompanying explanation states:

*‘It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise. However, not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available’.*

A.9 With regard to ‘further evidence’, Defra has commissioned research to try and identify the levels at which the above effects occur but this is not yet in the public domain. However, early

indications are that this research has been largely inconclusive. On this basis, and until further guidance becomes available, and given that there is no specific guidance in the NPPF on noise, there is no justification to vary assessment methods and criteria from those previously adopted from British Standards etc.

### Planning Practice Guidance (PPGN)

A.10 The Government has published Planning Practice Guidance on a range of subjects including noise. The guidance forms part of the NPPF and provides advice on how to deliver its policies. The PPGN reiterates general guidance on noise policy and assessment methods provided in the NPPF, NPSE and British Standards (BSs) and contains examples of acoustic environments commensurate with various effect levels. Paragraph 006 of the PPGN explains that:

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

A.11 According to the PPGN, factors that can influence whether noise could be of concern include:

- the source and absolute level of the noise together with the time of day it occurs;
- for non-continuous sources of noise, the number of noise events, and the frequency and pattern of occurrence of the noise;
- the spectral content and the general character of the noise;
- the local topology and topography along with the existing and, where appropriate, the planned character of the area.
- where applicable, the cumulative impacts of more than one source should be taken into account along with the extent to which the source of noise is intermittent and of limited duration;
- whether adverse internal effects can be completely removed by closing windows and, in the case of new residential development, if the proposed mitigation relies on windows being kept closed most of the time;
- in cases where existing noise sensitive locations already experience high noise levels, a development that is expected to cause even a small increase in the overall noise level may result in a significant adverse effect occurring even though little to no change in behaviour would be likely to occur;
- where relevant, Noise Action Plans, and, in particular the Important Areas identified through the process associated with the Environmental Noise Directive and corresponding regulations;
- the effect of noise on wildlife;
- if external amenity spaces are an intrinsic part of the overall design, the acoustic environment of those spaces; and

- the potential effect on an existing business of a new residential development being located close to it as the existing noise levels from the business may be regarded as unacceptable by the new residents and subject to enforcement action.

A.12 The PPGN provides a relationship between various perceptions of noise, effect level and required action in accordance with the NPPF. This is reproduced in Table 2, below.

**Table 2: Noise Exposure Hierarchy Based On the Likely Average Response**

Perception	Increasing Effect Level	Action
Not noticeable	No Observed Effect	No specific measures required
Noticeable and not intrusive	No Observed Adverse Effect	No specific measures required
LOAEL		
Noticeable and intrusive	Observed Adverse Effect	Mitigate and reduce to a minimum
SOAEL		
Noticeable and disruptive	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Unacceptable Adverse Effect	Prevent

- A.13 The PPGN describes noise that is not noticeable to be at levels below the NOEL. It describes a range of noise exposure that is noticeable but not to the extent there is a perceived change in quality of life. Noise exposures in this range are below the LOAEL and need no mitigation. On this basis, the audibility of noise from a development is not, in itself, a criterion to judge noise effects that is commensurate with national planning policy.
- A.14 The PPGN suggests that noise exposures above the LOAEL cause small changes in behaviour. Examples of noise exposures above the LOAEL provided in the PPGN is having to turn up the volume on the television; needing to speak more loudly to be heard; where there is no alternative ventilation, closing windows for some of the time because of the noise; or, a potential for some reported sleep disturbance. In line with the NPPF and NPSE, the PPGN states that consideration needs to be given to mitigating and minimising effects above the LOAEL but taking account of the economic and social benefits being derived from the activity causing the noise.
- A.15 The PPGN suggests that noise exposures above the SOAEL cause material changes in behaviour. Examples of noise exposures above the SOAEL provided in the PPGN are, where there is no alternative ventilation, keeping windows closed for most of the time or avoiding certain activities during periods when the noise is present; and/or there is a potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. In line with the NPPF and NPSE, the PPGN states that effects above the SOAEL should be avoided and that whilst the economic and social benefits being derived from the activity causing the noise must be taken into account, such exposures are undesirable.
- A.16 The PPGN suggests that a noise impact may be partially offset if the residents of affected dwellings have access to a relatively quiet part of their dwelling, private external amenity area and/or external public or private amenity space nearby.

## British Standard 8233 ‘Guidance on sound insulation and noise reduction for buildings’, 2014

- A.17 British Standard (BS) 8233 ‘Guidance on sound insulation and noise reduction for buildings’ draws on the results of research and experience to provide information on the design of buildings to provide internal acoustic environments appropriate to their functions. It deals with control of noise from outside the building, noise from plant and services within it, and room acoustics in non-critical situations.
- A.18 BS 8233:2014 defines a range of indoor ambient noise levels for spaces when they are unoccupied. A summary of the levels recommended in BS 8233:2014 Table 4 for rooms used for resting and sleeping is provided in Table B.1 below. The levels are for sources without a specific acoustic character.
- A.19 The noise levels defined within BS 8233:2014 are based on guidance published by the World Health Organisation (WHO).

**Table A.1: BS 8233:2014 Indoor Ambient Noise Levels in Unoccupied Spaces**

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

- A.20 BS 8233:2014 provides the following guidance with regard to acceptable noise levels in external amenity areas:

### *7.7.3.2 Design criteria for external noise*

*For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB  $L_{Aeq,T}$ , with an upper guideline value of 55 dB  $L_{Aeq,T}$  which would be acceptable in noisier environments. However, it is also recognised that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.*

## **Local Planning Policy – Wycombe District Council – Local Plan Saved Policies**

- A.21 The WDC Local Plan (LP) was adopted on 19 January 2004. As a result of the 2004 Planning and Compulsory Purchase Act, the Adopted Local Plan was saved for three years as part of the

transition arrangements for the new Local Development Framework system. From 27 September 2007, and following the adoption of the Core Strategy in July 2008 and of the Delivery and Site Allocations Plan in July 2013, only some of the policies contained within the Adopted Local Plan have been saved.

- A.22 Saved Policy G8, within the 'Detailed Design Guidance And Local Amenity' section of the LP refers directly to noise and states:

*"POLICY G8*

*1. Detailed proposals for development will be required to safeguard the future amenity of residents and other occupants and also those of surrounding land and buildings with particular reference to the following aspects of design:*

*A. Daylight and sunlight;*

*B. Privacy and overlooking;*

*C. Visual intrusion and overshadowing;*

*D. Traffic noise and disturbance; and*

*E. Parking and manoeuvring of vehicles."*

## **Sound Insulation through Ventilated Domestic Windows**

- A.23 The relationship between sound insulation provided by a façade of a dwelling and the ventilation provided to the occupants thereof may be an important consideration for planning applications in areas of significant noise exposure. For example, paragraph 006 (Reference ID: 30-006-20140306) of the PPGN] refers to windows and ventilation as follows:

*"... consideration should also be given to whether adverse internal effects can be completely removed by closing windows and, in the case of new residential development, if the proposed mitigation relies on windows being kept closed most of the time. In both cases a suitable alternative means of ventilation is likely to be necessary. Further information on ventilation can be found in the Building Regulations."*

- A.24 BS 8233:2014 'Guidance on sound insulation and noise reduction for buildings' states:

*"8.4.5.4 Ventilation*

*The Building Regulations' supporting documents on ventilation [48, 49, 50] recommend that habitable rooms in dwellings have background ventilation. Where openable windows cannot be relied upon for this ventilation, trickle ventilators can be used and sound attenuating types are available. However, windows may remain openable for rapid or purge ventilation, or at the occupant's choice."*

- A.25 Report NANR 116 [9] provides details of a programme of laboratory measurements that were undertaken by the Building Performance Centre at Napier University on behalf of the Department

for Environment, Food and Rural Affairs (Defra), in order to quantify the sound insulation provided by a variety of window types, opening styles, areas of opening and ventilator devices set within a facade. The authors of NANR 116 consider that the most appropriate open window area for background ventilation is  $0.05 \text{ m}^2$ .

- A.26 Section 5.5 of NANR 116 describes tests to measure the level difference between external and internal environments through a partially open window ( $0.05 \text{ m}^2$  open area) for typical sources of environmental noise. The tests used a loudspeaker to generate external sounds with spectra for transportation sources derived from BS 8233:1999 [10]. The sound level differences were derived from measurements made 2 m from the external façade and spatially averaged internal measurements.
- A.27 There is a significant range of level differences that corresponds to the range of styles of window opening (e.g. top opening; side opening; sliding sash etc. within the facade). It is considered that window types C, E and F are representative of the currently commonly occurring window types in new-build houses in the UK. Other window types may be more common in existing houses and/or non-residential buildings. Illustrations of these window types are reproduced from NANR 116 in Figure A.1, below.

**Figure A.1 – Typical Window Types**



- A.28 The test data for these window types translates to the following conservative level difference for each source noise characteristic:
- Road Traffic Noise: 15 dB;
  - Railway Noise: 15 dB; and
  - Aircraft Noise: 17 dB.

N.B. Lower or higher values may be appropriate for other window types.

- A.29 Typical closed window weighted level differences with a  $4000 \text{ mm}^2$  slot ventilator were  $32 \text{ dB } D_w$  with the vent open and  $38 \text{ dB } D_w$  with the vent closed.

## Appendix B: Baseline Noise Survey Data

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## References

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- 1 Department for Communities and Local Government. National Planning Policy Framework HMSO. March 2012.
- 2 Department for Environment, Food and Rural Affairs. Noise Policy Statement for England. Defra. 2010.
- 3 Department for Communities and Local Government (2014) National Planning Practice Guidance
- 4 British Standards Institution. British Standard 8233: Guidance on sound insulation and noise reduction for buildings. 2014.
- 5 Wycombe District Council Local Plan Adopted January 2004 (Saved and Extended 2007 and partially replaced by the adopted Core Strategy July 2008)
- 6 British Standards Institution. British Standard 7445: Description and measurement of environmental noise. Part 1: Guide to environmental quantities and procedures. 2003.
- 7 British Standards Institution. British Standard 7445: Description and measurement of environmental noise. Part 2: Guide to the acquisition of data pertinent to land use. 1991.
- 8 British Standards Institution. BS EN 12578:2011 'Glass in building – Glazing and airborne sound insulation – Product descriptions and determination of properties'. 2011.
- 9 Defra Report NANR116. Open/Closed Window Research – Sound Insulation through Ventilated Domestic open Windows. The Building Performance Centre, School of the Built Environment, Napier University. 2007.
- 10 British Standards Institution. British Standard 8233: Sound insulation and noise reduction for buildings - Code of practice. 1999.