



Noise Assessment

S Wokingham Parcels R7 & R13
Land South of Waterloo Crescent

December 2025

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Document Control:

Project no.	Project
13253	S Wokingham Parcels R7 & R13, Land South of Waterloo Crescent

Report No.	Ver/rev	Written By:	Checked by:	Authorised by:	Date
13253(NV)	V0	R Peirce	B. McAllister	B. McAllister	23.09.2025
	V1				12.12.2025

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1. Introduction

Client & Project

- 1.1 Phlorum Limited have been commissioned by Miller Homes to undertake a noise and vibration assessment to discharge condition 40 for a residential development at South Wokingham, Parcels R7 & R13, Land South of Waterloo Crescent. The proposal is for 38 residential units on Parcel R7 and 177 residential units on Parcel R13.
- 1.2 Condition 40 states that:

"The reserved matters for any phase of the development which includes noise sensitive premises shall be accompanied by a Noise Mitigation Plan demonstrating how appropriate internal and external noise levels will be achieved."

- 1.3 The existing noise and vibration climate at the site has been established by direct measurements from previous noise assessments at the site and from future noise impact by noise modelling. The suitability of the site for the proposed development has been considered against national and local planning policy, and guidelines on noise and vibration. Where necessary, mitigation measures have been recommended so that a noise climate suitable for the proposed development can be achieved.
- 1.4 Whilst reasonable efforts have been made to produce a report that is easy to understand, it is technical in nature. To assist the reader, an introduction to noise, and an explanation of the terminology used in this report are contained in Appendix A.

2. Site Description

Existing Site Conditions

- 2.1 The existing site for Parcel R7 has Easthampstead Road on the western boundary and green space on all other boundaries. There is a small industrial estate/farm to the south of the site and a railway line with residential properties located behind the railway to the north of the site.
- 2.2 The existing site for Parcel R13 has Easthampstead Road on the south west boundary and green space on all other boundaries. The railway line with residential properties behind the railway is located to the north of Parcel R13.
- 2.3 The existing noise at the site includes a contribution from local traffic, trains and aircraft.
- 2.4 The noise and vibration from the railway line was considered in the application for Parcel R10. The source vibration measurement location for Parcel R10, which is 10m from the railway has also been used in the predictions for the vibration assessment for Parcels R7 and R13 and is shown on Figure 1.

Proposed Site

- 2.5 The locations of Parcels R7 and R13 are shown on Figure 2. The SWDP runs directly to the north of both parcels of land.

3. Guidance

Local Authority

- 3.1 The Wokingham Borough Council (WBC) Borough Design Guide, Supplementary Planning Document, June 2012 discusses noise for residential development in general terms but does not specify any local guidance or target levels for noise from residential developments and so the guidance and noise targets provided in ProPG: Planning & Noise and BS8233:2014 have been used to assess the noise impact of the development and to determine appropriate noise mitigation measures. The following noise criteria applies:
-  Bedrooms - 30dB $L_{Aeq,8hr}$ (23:00 to 07:00 hours);
 -  Living rooms - 35dB $L_{Aeq,16hr}$ (07:00 to 23:00 hours); and
 -  All habitable rooms - 45dB L_{Amax} (not to be exceeded more than ten times per night).
- 3.2 Policy CC06: Noise of the Wokingham Managing Development Delivery Local Plan (2014) provides the following policies relating to noise:

Proposals must demonstrate how they have addressed noise impacts to protect noise sensitive receptors (both existing and proposed) from noise impacts in line with Appendix 1 of the Management Development Delivery Local Plan (MDD).

Noise impact of the development must be assessed. Where there is no adverse impact (No Observed Effect Level) then noise will be a material consideration.

Where there is an adverse effect (Lowest Observed Adverse Effect Level to Significant Observed Adverse Effect level), then

The development layout must be reviewed. Where this results in there no longer being an adverse impact then design and mitigation measures should be incorporated accordingly.

Where there is still an adverse impact then internal layout must be reviewed. Where this results in there no longer being an adverse impact then design and measures should be incorporated accordingly.

Where there is still an adverse impact then physical mitigation measures such as barriers/mechanical ventilation must be reviewed. Where this results in there no longer

being an adverse impact then design and measures should be incorporated accordingly.

Where there is still an adverse impact and the development falls within significant observed adverse effect level then planning permission will normally be refused.

- 3.3 The MDD also states that Policy CC06: Noise should be read alongside policy CP1 – Sustainable Development (specifically criterion 8) of the Core strategy, which states that:

8) Avoid areas where pollution (including noise may impact upon the amenity of future occupiers.

National Planning Policy Framework

- 3.4 The Department for Communities and Local Government published the *National Planning Policy Framework* (NPPF) on 27th March 2012 and upon its publication, the majority of planning policy statements and guidance notes were withdrawn, including Planning Policy Guidance (PPG) 24 *Planning and Noise*, which until the emergence of the NPPF, set out the Government's position on how noise should be dealt with in the planning system.
- 3.5 The NPPF was revised on 24th July 2018, with the earlier 2012 version immediately withdrawn. The latest update was published in February 2025.
- 3.6 The general guiding principle in the NPPF is contained in Section 15 under the heading Conserving and enhancing the natural environment. Paragraph 187 states:

"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;"

- 3.7 The noise planning policy is contained in paragraph 198, which also appears in Section 15 of the NPPF:

"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 impact 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;”*

- 3.8 A footnote to paragraph 198 refers to the Explanatory Note of the Noise Policy Statement for England (Department for Environment, Food & Rural Affairs, 2010), which defines both “*significant adverse impacts on health and quality of life*” and “*adverse impacts on health and quality of life*”.

Noise Policy Statement for England

- 3.9 The Department for Environment, Food and Rural Affairs published the *Noise Policy Statement for England* (NPSE) in March 2010. The explanatory note of the NPSE defines the terms used in the NPPF:

“2.20 There are two established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation. They 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 health and quality of life due to the noise.

LOAEL – Lowest Observed Adverse Effect Level

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

2.21 Extending these concepts for the purpose of this NPSE leads to the concept of a significant observed adverse effect level.

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur.”

3.10 The NPSE does not define the SOAEL numerically, stating at paragraph 2.22:

"2.22 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."

3.11 There is no local or national guidance on how the three terms should be defined numerically.

3.12 There are three aims in the NPSE, two of which expand upon the first bullet point in paragraph 180 of the NPPF:

"The first aim of the Noise Policy Statement for England

Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

2.23 The first aim of the NPSE states that significant adverse effects on health and quality of life should be avoided while also taking into account the guiding principles of sustainable development (paragraph 1.8).

The second aim of the Noise Policy Statement for England

Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

2.24 The second aim of the NPSE refers to the situation where the impact lies somewhere between LOAEL and SOAEL. It requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development (paragraph 1.8). This does not mean that such adverse effects cannot occur.

The third aim of the Noise Policy Statement for England

Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and

neighbourhood noise within the context of Government policy on sustainable development.

2.25 This aim seeks, where possible, positively to improve health and quality of life through the pro-active management of noise while also taking into account the guiding principles of sustainable development (paragraph 1.8), recognising that there will be opportunities for such measures to be taken and that they will deliver potential benefits to society. The protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim."

Planning Practice Guidance

3.13 In March 2014, the Government released Planning Practice Guidance (PPG) on noise, entitled 'Noise'. This document sets out a number of principles in the form of questions and answers, and reinforces the guidance set out in the NPPF and the NPSE. The noise PPG was last updated in December 2014.

3.14 The noise PPG notes that:

"Noise needs to be considered when new development may create additional noise and when new developments would be sensitive to the prevailing acoustic environment."

3.15 It goes on to note that:

"Local planning authorities' plan-making and decision taking should take account of the acoustic environment and in doing so consider:

 *whether or not a significant adverse effect is occurring or likely to occur;*

 *whether or not an adverse effect is occurring or likely to occur; and*

 *whether or not a good standard of amenity can be achieved."*

3.16 The noise PPG broadly repeats the NPSE definitions of the NOEL, LOAEL and SOAEL and it provides a summary table to explain how the terms relate to each other and to typical human reactions to sound. The table is replicated below in Table 3.1.

Table 3.1 Planning Practice Guidance summary of noise exposure hierarchy

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			
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			
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 the windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting back 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

- 3.17 It is noted that the text in paragraph 005 of the PPG for noise reiterates the point illustrated in Table 3.1, that there are degrees of adverse effect above the SOAEL. Table 3.1 defines two degrees of significant adverse effect: a significant observed adverse effect, which is deemed noticeable and disruptive, and an unacceptable adverse effect, which is deemed noticeable and very disruptive.
- 3.18 The distinction between these two degrees of significant adverse effect is expanded upon in the text in paragraph 005 of the PPG for noise:

“005 Increasing noise exposure will at some point cause the significant observed adverse effect level boundary to be crossed. Above this level the noise causes a material change in behaviour such as keeping windows closed for most of the time or avoiding certain activities during periods when the noise is present. If the exposure is above this level the planning process should be used to avoid this effect occurring, by use of appropriate mitigation such as by altering the design and layout. Such decisions must be made taking account of the economic and social benefit of the activity causing the noise, but it is undesirable for such exposure to be caused.

At the highest extreme, noise exposure would cause extensive and sustained changes in behaviour without an ability to mitigate the effect of noise. The impacts on health and quality of life are such that regardless of the benefits of the activity causing the noise, this situation should be prevented from occurring.”

- 3.19 The PPG, which is the most recent manifestation of Government advice on how noise should be treated within the planning system, as opposed to a policy position as stated in the more recent NPPF, is clear that a significant adverse effect, which lies above the SOAEL but below an unacceptable adverse effect, can be addressed (or ‘avoided’ in the terms of the PPG) through the provision of mitigation, including noise insulation; it is not until an unacceptable adverse effect is reached that the cause of the effect should be prevented.
- 3.20 The noise PPG provides advice on how to mitigate the effects of noise, noting that there are options to reduce noise at source, to optimise site layouts, to use planning conditions, and provide insulation within affected properties.
- 3.21 The noise PPG also notes that:

“The noise impact may be partially offset if the residents of those dwellings have access to:

-  *a relatively quiet façade (containing windows to habitable rooms) as part of their dwelling, and/or*
-  *a relatively quiet external amenity space for their sole use, (e.g. a garden or balcony). Although the existence of a garden or balcony is generally desirable,*

the intended benefits will be reduced with increasing noise exposure and could be such that significant adverse effects occur, and/or

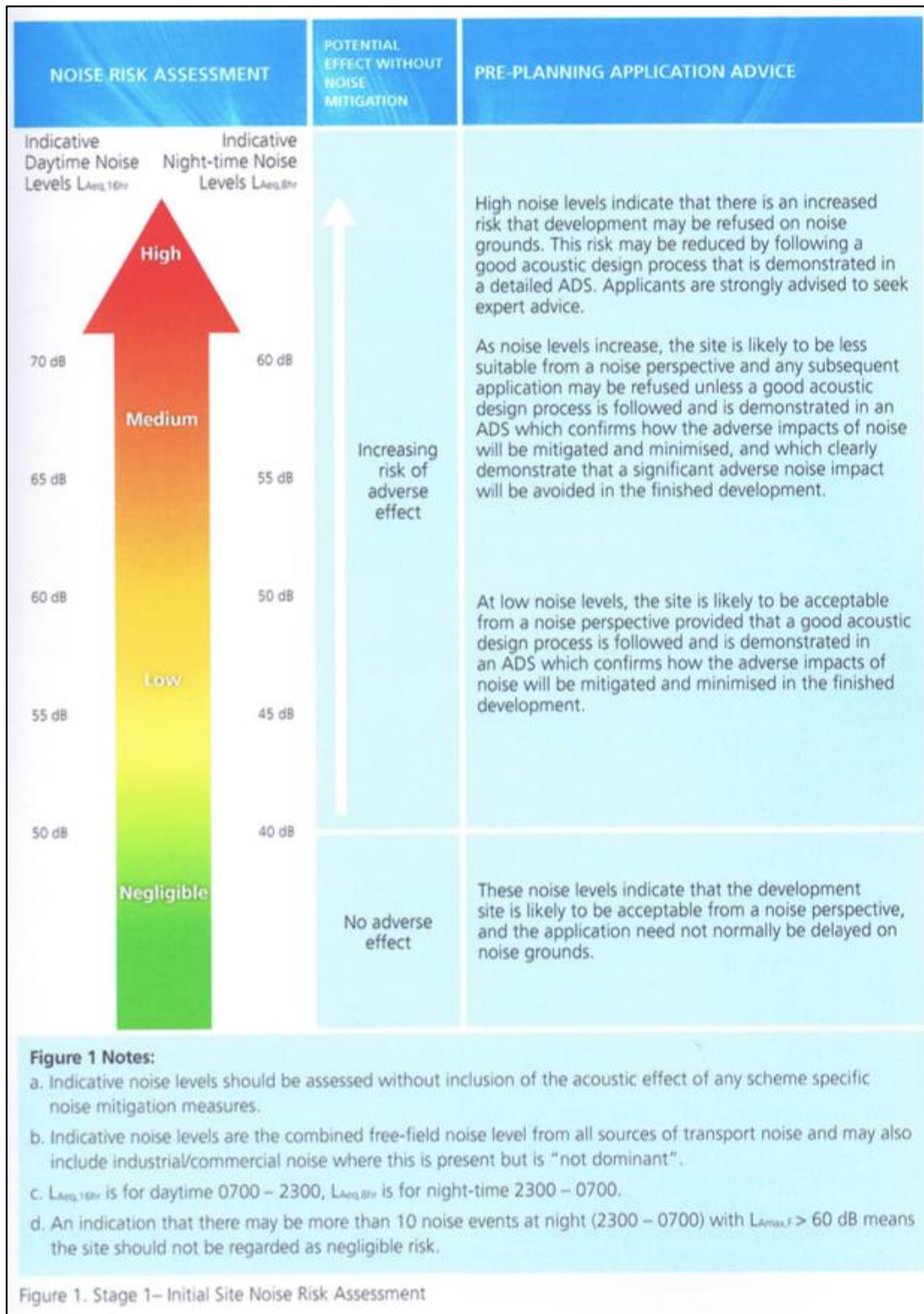
- 🌿 *a relatively quiet, protected, nearby external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings, and/or*
- 🌿 *a relatively quiet, protected, external publically accessible amenity space (e.g. a public park or a local green space designated because of its tranquillity) that is nearby (e.g. within a 5 minutes walking distance)."*

ProPG

- 3.22 *Professional Practice Guidance on Planning and Noise* (ProPG) was released in May 2017. A joint publication by the Chartered Institute of Environmental Health, the Institute of Acoustics, and the Association of Noise Consultants, the document sets out a recommended approach for the management of noise within the planning system in England.
- 3.23 ProPG sets out a two-stage risk based approach for new residential development:
- 🌿 **Stage 1:** initial noise risk assessment of the proposed development;
 - 🌿 **Stage 2:** a systematic consideration of four key elements:
 - Element 1: demonstrating a 'Good Acoustic Design Process';
 - Element 2: observing internal 'Noise Level Guidelines';
 - Element 3: undertaking an 'External Amenity Area Noise Assessment'; and
 - Element 4: consideration of 'Other Relevant Issues'.
- 3.24 The Stage 1 initial noise risk assessment should provide an indication of the likely risk of adverse effects from noise should no mitigation be included as part of the development proposals.
- 3.25 ProPG provides an illustrative noise risk scale, derived from current guidelines values and experience. The scale suggests that the risks are negligible where noise levels are below 50dB LAeq during the daytime and 40dB LAeq during the night-time. The scale suggests that a site would start to tend from a medium to a high risk when noise levels are above approximately 70dB LAeq during the daytime and above approximately 60dB LAeq during the night-time. Between these values, the level of risk increases through low to medium as noise levels increase. These values are all stated as indicative in the ProPG.
- 3.26 The ProPG states that this initial noise risk assessment is intended to support wider Government planning and noise policies and guidance, i.e. the NPPF, NPSE and PPG-Noise.

3.27 Figure 1 of the ProPG, which is replicated here as Figure 3, presents the risk hierarchy, with indicative noise levels that broadly equate to the different risk categories.

Figure 3: ProPG Stage 1 Risk Assessment



- 3.28 The Stage 2 full assessment should consider good acoustic design, internal noise levels, external amenity area noise levels, and assessment of any other issues.
- 3.29 The ProPG states that good acoustic design should consider factors such as reducing noise at source, site layouts, and building orientation. Solely relying on the sound insulation of building fabric to achieve acceptable acoustic conditions is not considered good acoustic design. Noise control measures should be considered against other requirements, such as ventilation, fire regulation and cost.
- 3.30 The ProPG refers to the criteria set out in BS8233: 2014 and the World Health Organisation's *Guidelines for Community Noise* for internal noise levels and noise levels in external amenity areas. The ProPG notes that internal noise levels should always be considered alongside requirements for ventilation and overheating. Note 5 under Figure 2 in the ProPG, which sets out the internal noise level guidelines replicated from BS8233: 2014 and the WHO guidelines, states:

"Designing the site layout and the dwellings so that the internal target levels can be achieved with open windows in as many properties as possible demonstrates good acoustic design. Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however any façade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the "open" position and, in this scenario, the internal LAeq target levels should not normally be exceeded, subject to the further advice in Note 7."

- 3.31 It is clear that the internal noise guidelines should be met for 'whole dwelling ventilation' conditions, which are effectively background ventilation. 'Whole dwelling ventilation' is defined in Approved Document F of the Building Regulations 2010.
- 3.32 Note 7 under Figure 2 of the ProPG states:

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

- 3.33 The ProPG allows for the relaxation of the internal guideline noise levels by up to 5dB and the internal noise levels would still be regarded as reasonable.
- 3.34 For 'purge ventilation' conditions, the ProPG does not specify internal noise criteria, stating at paragraph 2.35:

"It should also be noted that the internal noise level guidelines are generally not applicable under "purge ventilation" conditions as defined by Building Regulations Approved Document F, as this should only occur occasionally (e.g. to remove odour from painting and decorating or from burnt food)."

- 3.35 For thermal control, i.e. overheating conditions, ProPG states that the potential noise levels should be assessed, stating at paragraph 2.38:

"Where mechanical services are used as part of the ventilation or thermal comfort strategy for the scheme, the impact of noise generated by these systems on occupants should also be assessed."

- 3.36 The ProPG goes on to state in paragraph 2.72(h):

"Reasonable steps should be taken to minimise overheating during summer months through good design. Where openable windows / ventilators are proposed to mitigate overheating and where the internal noise level guidelines are likely to be exceeded when they are open a more detailed assessment of the potential impact on occupants during the overheating condition should be provided in the ADS. This more detailed assessment may include: (i) the alternative design measures considered / applied to reduce noise impact on occupants, (ii) the expected internal noise levels when windows / ventilators are opened to provide relief from overheating, and (iii) an estimate of the amount of time that windows are likely to be open to provide relief from overheating."

- 3.37 Consideration of overheating issues is outside the scope of this noise assessment. However, it is clear that while the ProPG does require internal noise levels to be considered under thermal control conditions, no internal noise criteria are applied.
- 3.38 The ProPG states that other relevant issues include compliance with relevant national and local policies, magnitude of compliance with the ProPG itself, the likely occupants of the development, acoustic design against unintended adverse consequences and acoustic design against wider planning objectives.

British Standard 8233

- 3.39 The scope of British Standard (BS) 8233: 2014 *Guidance on sound insulation and noise reduction for buildings* is the provision of recommendations for the control of noise in and around buildings. It suggests appropriate criteria and limits for different situations, which are primarily intended to guide the design of new or refurbished buildings undergoing a change of use rather than to assess the effect of changes in the external noise climate.
- 3.40 BS8233: 2014 suggests suitable internal noise levels within different types of buildings, including residential dwellings, as shown in Table 3.2.

Table 3.2: BS8233 recommended internal noise levels, dB

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

3.41 BS8233 contains the following relevant guidance in footnotes to the above information:

Note 4: "Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or LAmax,F, depending on the character and number of events per night. Sporadic noise events could require separate values."

Note 5: If relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level."

Note 7: Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved."

3.42 Although Note 4 above refers to setting a guideline value for maximum noise levels, BS8233: 2014 does not provide any guidance on a suitable criterion.

3.43 Placing the BS8233: 2014 guidance into the context required by the NPPF and the NPSE, it is considered that where the internal noise levels meet the guideline values set out in Table 3.2, there is considered to be no observed effect.

3.44 Since BS8233: 2014 allows for a 5dB relaxation in the guideline values in Table 3.2 (Note 7 above), it is considered that internal noise levels up to 5dB above the guideline values in Table 3.2 may still be acceptable.

3.45 Section 7.7.3.2 of BS8233, titled Design criteria for external noise states:

"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 50dB LAeq,T, with an upper guideline value of 55dB LAeq,T which would be acceptable in noisier environments."

- 3.46 BS8233: 2014 goes on to note that the upper guideline value may be exceeded in certain circumstances:

“However, it is also recognized 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.”

- 3.47 Achieving the lowest practicable noise levels in gardens is deemed acceptable in BS8233: 2014 in circumstances where development is needed in areas where the upper 55dB limit cannot be achieved.
- 3.48 As BS8233: 2014 states that it is desirable that garden noise levels do not exceed 50dB $L_{Aeq,T}$, this implies some adverse effect above this level. Therefore, an external daytime noise level of 50dB $L_{Aeq,16hrs}$ can be defined as the LOAEL.
- 3.49 However, it would not be appropriate to equate the 55dB criterion with the SOAEL, since it is clear from BS8233: 2014 that 55dB is not a threshold that should never be exceeded. Equating the 55dB criterion to the SOAEL would mean that, in national policy terms, exceeding this threshold should be avoided, which is not what the standard requires.

World Health Organisation

- 3.50 The World Health Organisation (WHO) *Guidelines for Community Noise* (1999) also sets out guidance on suitable internal and external noise levels in and around residential properties. The guidance on internal and external noise levels is the same as set out in BS8233: 2014 in terms of L_{Aeq} values, but the WHO guidelines also provide guidance on night-time maximum noise levels, stating:

“For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB LAFmax more than 10-15 times per night.”

- 3.51 The WHO guidelines suggest the possibility of sleep disturbance if continuous noise in bedrooms exceeds 30dB $L_{Aeq,8hrs}$ during the night-time, and therefore internal noise levels above this value can be considered to be above the LOAEL. This internal value can be translated to an external value by the addition of 10dB, to account for the typical reduction through an open window. Therefore, external night-time noise levels of 40dB $L_{Aeq,8hrs}$ can be defined as the LOAEL.

- 3.52 The WHO published their *Night Noise Guidelines for Europe* in 2009. This document sets an external 'night noise guideline' (NNG) of 40dB. This is consistent with the LOAEL value determined above. The NNG also sets an interim target of 55dB in situation where the 40dB value cannot be met. Above 55dB the NNG notes that the situation is considered increasingly dangerous for public health. On the basis of the above, a free-field external value of 55dB $L_{Aeq,8hrs}$ is considered to be the night-time SOAEL.

Noise Insulation Regulations

- 3.53 The Noise Insulation Regulations 1975 (as amended 1988) set out conditions, which if satisfied, require the promoter of a new road to offer affected residents sound insulation or a grant in respect of sound insulation.
- 3.54 Although legislation framed with reference to new roads is not directly relevant to the proposed development considered here, the noise levels at which sound insulation must be offered provide an indication of what constitutes a significant level of noise from these sources; these values may be used to define the level at which significant adverse effects occur, i.e. the SOAEL.
- 3.55 The Noise Insulation Regulations indicate that sound insulation should be offered when, inter alia, road traffic noise exceeds a façade noise level of 68dB $L_{A10,18hrs}$. This value can be converted to a 16 hour L_{Aeq} to match the form of the guidance recommended in BS8233 by subtracting 5dB. This correction includes a -3dB correction to remove the façade correction, a further -3dB correction to convert the 18 hour L_{A10} noise level to an 18 hour L_{Aeq} noise level, and a +1dB correction to convert the 18 hour L_{Aeq} to a 16 hour L_{Aeq} . The resulting value of 63dB $L_{Aeq,16hrs}$ is considered to be the daytime SOAEL.
- 3.56 Since noise levels of 63dB $L_{Aeq,16hrs}$ can be controlled through the provision of appropriate ventilation, as required by the Noise Insulation Regulations, it is reasonable to suggest that the point at which an unacceptable adverse effect occurs is higher than this value.
- 3.57 The sound insulation package specified in the Noise Insulation Regulations is known to give a sound reduction of approximately 35dB. At external noise levels in excess of 70dB at night the internal noise levels will exceed the reasonable criterion in BS8233 of 35dB. A noise level 1dB below this value is therefore taken to be the upper limit of acceptability for residential properties at night.
- 3.58 This 69dB $L_{Aeq,8hrs}$ limit has been converted to a free-field value of 66dB to be consistent with the free-field values used elsewhere in this report.
- 3.59 On this basis, and in the absence of any local definition, the point at which night-time noise levels result in an unacceptable adverse effect is considered to be 66dB $L_{Aeq,8hrs}$.

BRE Research Paper

- 3.60 A Building Research Establishment (BRE) survey titled *The effectiveness and acceptability of measures for insulating dwellings against traffic noise* (Utley W et al, Journal of Sound and Vibration (1986) Vol 109(1), pages 1-18) found that the insulation package supplied under the Noise Insulation Regulations is inadequate for road traffic noise levels of 78dB $L_{A10,18hrs}$ and above at a façade.
- 3.61 This figure is equivalent to a free-field level of 75dB $L_{A10,18hrs}$; which in turn is equivalent to 73dB $L_{Aeq,16hrs}$. If mitigation specified under the Noise Insulation Regulations becomes ineffectual at 73dB $L_{Aeq,16hrs}$, it can be concluded that 72dB $L_{Aeq,16hrs}$ is the highest noise level at which the mitigation remains effective.
- 3.62 On this basis, and in the absence of any local definition, the point at which daytime noise levels result in an unacceptable adverse effect is considered to be 72dB $L_{Aeq,16hrs}$.

Summary

- 3.63 The suitability of the site has been assessed in the following ways:
- 👁 Determining the external noise levels across the site, to compare with the LOAEL and SOAEL, as defined above. For clarity, the LOAEL and SOAEL adopted for this site are shown in Table 3.3; and
 - 👁 Calculating the sound reduction performances required of the external building fabric, particularly the glazing units, so that suitable internal noise levels are achieved;

Table 3.3: LOAEL and SOAEL for this site

Effect	Daytime L _{Aeq,16hrs} (dB)	Night-time L _{Aeq,8hrs} (dB)	Comments
No Observed Effect	<50	<40	The parts of the site that have noise levels below these values are considered acceptable for residential development without the need for further mitigation
LOAEL	50	40	
Observed Adverse Effect	50-55	40-45	Although the parts of the site that have noise levels between these values are above the LOAEL, BS8233 suggests that they would be acceptable.
	55-63	45-55	The parts of the site that have noise levels between these values are above the LOAEL, and are considered acceptable for residential development, although mitigation may be required.
SOAEL	63	55	
Significant Observed Adverse Effect	63-72	55-66	The parts of the site that have noise levels between these values are above the SOAEL but below the point at which an unacceptable adverse effect occurs. Planning policy states that Significant Adverse Effects should be avoided and the Noise PPG states that the planning process should be used to do this by use of appropriate mitigation.
Unacceptable Adverse Effect	>72	>66	The noise PPG states that this situation should be prevented; however, no indication is given of how to do this.
Notes: (1): Below these ranges adverse comment is not expected. (2): Above these ranges adverse comment is very likely.			

3.64 It is considered that the above values can also be related to the levels of risk described in the ProPG:

- noise levels below the LOAEL, i.e. below 50dB L_{Aeq,16hrs} during the daytime and below 40dB L_{Aeq,8hrs} during the night-time, are considered to be a negligible risk;

- noise levels above the LOAEL but below the SOAEL, i.e. between 50dB $L_{Aeq,16hrs}$ and 63dB $L_{Aeq,16hrs}$ during the daytime and between 40dB $L_{Aeq,8hrs}$ and 55dB $L_{Aeq,8hrs}$ during the night-time, are considered to range from a low to medium risk;
- noise levels above 63dB $L_{Aeq,16hrs}$ i.e. the SOAEL, but below 72dB $L_{Aeq,16hrs}$ during the daytime, and above 55dB $L_{Aeq,8hrs}$, i.e. the SOAEL, but below 66dB $L_{Aeq,8hrs}$ during the night-time, are considered to range from a medium to high risk; and
- noise levels that result in an unacceptable adverse effect, i.e. above 72dB $L_{Aeq,16hrs}$ during the daytime and above 66dB $L_{Aeq,8hrs}$ during the night-time, are considered to be a high risk.

3.65 The lower and upper ends of these ranges, representing negligible and high risks respectively, accord with the advice set out the ProPG.

Vibration

- 3.66 The vibration effects of the adjacent railway line have been assessed against the criteria provided in BS6472-1:2008.
- 3.67 BS6472-1:2008 Evaluation of human exposure to vibration in buildings. Part 1 contains a methodology for assessing the human response to vibration in terms of either the vibration dose value, or in terms of the acceleration or the peak velocity of the vibration, which is also referred to as peak particle velocity.
- 3.68 The advice contained in BS6472 states that when the vibration is intermittent, as is the case at this site, the vibration dose value, or VDV, may be used to assess the potential for impacts. The vibration dose value is a single figure descriptor that represents the cumulative dose of transient vibrations, taking into account the frequency spectrum and duration of each event.
- 3.69 The vibration dose value is determined over a 16 hour daytime period or 8 hour night-time period, and the guidance in BS6472 is set out as follows:

Table 3.4 - Vibration Dose Values (ms-1.75) Above which Various Degrees of Adverse Comment may be Expected in Residential Buildings

Place and time	Low Probability of Adverse Comment	Adverse Comment Possible	Adverse Comment Probable
Residential Buildings 16 h day	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential Buildings 8 h night	0.1 to 0.2	0.2 to 0.4	0.4 to 0.8

- 3.70 The above guidance relates to vibration measured at the point of entry into the human body, which is usually taken to mean the ground surface or at a point mid-span of an upper storey floor, rather than the point of entry into the building, for example a foundation element. Where the vibration is measured at another location, BS6472 states that a transfer function should be applied; however, BS6472 does not contain any guidance on suitable transfer functions.
- 3.71 Transfer functions, after a correction for geometric spreading is applied, take into account the vibrational energy losses that occur with ground and foundations together with an amplification factor as the energy travels through the building to the mid-span of an upper storey floor. The value of the transfer functions will therefore depend on the soil, the type of foundations and the type of building (e.g. wooden or metal framed, masonry etc.) and the type of flooring.
- 3.72 Transfer functions have been referenced from the following sources:
- 🌱 Handbook of Urban Rail Noise and Vibration Control (HURNVC), published by the Federal Transit Administration, USA, written by H J Saurenkam, J T Nelson and G P Wilson (also reproduced in the Transportation Noise Reference Book (1987);
 - 🌱 Methods For Predicting Groundborne Noise & Vibration From Trains In Tunnels, LARIF 1999 by Richard Greer; and
 - 🌱 Transmission of Ground-borne Vibration in Buildings by Jorgen Jakobsen, Journal of Low Frequency Noise and Vibration, Vol. 8 No. 3, 1989.
- 3.73 In assessing the effect that the foundations may have, guidance has been sought from HURNVC. The HURNVC sets out attenuation factors that can be applied to calculate the transfer function between vibrations measured on unloaded ground and vibration at a foundation. It is noted that the multiplication factor for strip deep trench foundation is approximately -6 dB and for a piled foundation approximately -8dB (both based on the 31.5 Hz frequency band). For a conservative worst case scenario, -6 dB has been applied for foundation losses.
- 3.74 Greer advocates +10.2 dB and Jakobsen suggests a value of +15.5 dB for amplification on an upper storey suspended floor. For a conservative worst case scenario, +15.5 dB has been applied for amplification at the upper storey mid span floor level.
- 3.75 Taking the above into account gives an overall multiplication factor of 2.98 for a worst case scenario (a best case scenario would be 1.29).

4. Environmental Surveys

Noise

- 4.1 A noise survey was undertaken for the Environmental Statement (ES) for 'Land at phase 2b of the South Wokingham SDL Project EIA, Environmental Statement Vol 1: Noise & Vibration' at the approximate centre of the South Wokingham development site. The noise measurements were taken between 1800 hours on Monday 15th July and 1300 hours on 18th July 2018. These measurements are considered to be representative of the baseline noise climate at the development site, especially as it is understood that any baseline noise levels measured in 2025 would include a significant noise contribution from ongoing construction activities.

- 4.2 The ES stated in paragraph 10.75 that the noise measurements were:

Located in the approximate centre of the overall site, with no significant noise sources close by. The microphone of the sound level meter was located at a height of 1.5m above ground level and in free-field conditions. Sound sources at this location consisted of distant road traffic, distant train pass-bys, occasional birdcalls and aircraft.

- 4.3 A summary of the range of measured noise levels from the baseline survey are shown in Table 10.11 of the ES and reproduced in Table 4.1 below.

Table 4.1: Summary of Measured Background Noise Levels

Period	Median Measured Sound Pressure level, free-field, dB	
	L _{A90,T}	L _{Aeq,T}
Daytime (0700-2300)	39.8	44.8
Night-time (2300-0700)	37.9	39.4

Vibration

- 4.4 Baseline vibration measurements were undertaken for the noise assessment for Parcel R10 between 28th to 30th October 2024. These vibration levels were measured at Position 1, as shown on Figure 1 over a 24-hour period with the geophone located approx. 10m from the nearside rail. This location is closer than the nearest proposed residential dwellings to the rail lines but was selected for reasons of equipment security and provides 'worst case' vibration levels. The vibration measurement location is shown on Figure 1. It is considered that the vibration levels measured at Position 1 are also representative of the vibration levels at a distance of 10m from the nearside rail where it passes Parcels R7 and R13.
- 4.5 The tri-axial vibration transducer was set up on the ground such that the Y-direction was parallel with the railway lines, the X-direction was perpendicular to the railway lines and the Z-direction was vertical.
- 4.6 The noise equipment comprised a Vibrock 901 Digital Seismograph with a Tri-axial Geophone. All equipment is within current manufacturer's periods of calibration. The V901 is a self-calibrating meter capable of simultaneously measuring vibration in the three orthogonal axes. The equipment, which has a frequency range of 1Hz to 200Hz, was set to record vibration dose values over the day and night-time periods in each orthogonal direction.
- 4.7 The transducers was firmly coupled to the ground and positioned such that there was no movement of the geophone. A summary of the measured VDV levels for the day and night-time periods is shown in Table 4.2, below.

Table 4.2 – Baseline Vibration Levels

Date	Period	Vibration Dose Value (VDV) ms ^{-1.75}		
	Hours	X	Y	Z
28 & 29 Oct 2024	2300-0700	0.026	0.018	0.049
29 Oct 2024	0700-2300	0.027	0.022	0.080

- 4.8 Subjectively, the vibration from passing passenger trains was observed to be imperceptible at the vibration measurement location. The passenger trains speeds were observed to be around 50 mph and the trains were observed to consist of 8 carriages.

5. Noise & Vibration Assessment

Existing Noise

- 5.1 The noise assessment has considered the existing baseline noise climate from the ES against guidance and noise targets in ProPG: Planning and Noise.
- 5.2 At the centre of the development site daytime value of 45 dB $L_{Aeq,16h}$ and the night-time value of 39 dB $L_{Aeq,8hr}$ are below the adopted LOAEL and the noise levels are considered acceptable for residential properties without the need for further mitigation.
- 5.3 In terms of the level of noise risk, as described in ProPG, it is considered that overall, the site is a negligible risk. On the basis of the baseline noise climate the site is considered acceptable for residential use.

Future Traffic Noise

- 5.4 The proposals include the SWDR to the north of Parcels R7 & R13 as shown on Figure 2. The noise impact of the surrounding road network has been considered using IMMI noise modelling software, which takes the site topography and any intervening noise barriers into account. The model utilises the methodology outlined in ISO 9613 and takes into account the effects of geometric divergence, ground and atmospheric absorption and acoustic screening. The following assumptions have been used for the noise predictions:
 - 🌿 Traffic data has been provided by the projects traffic consultants for the future year 2036 including day and night flows, signed speeds and %HGVs.
 - 🌿 Hard ground cover, 10 Degrees C; 70% RH.
 - 🌿 Site topography is a combination of client supplied data and EA lidar data.
 - 🌿 All sources are ISO 9613 with a downwind noise propagation.
 - 🌿 One degree of reflections off hard surfaces has been included in the noise model.
- 5.5 The traffic data for the future year of 2036 with the development has been provided by the transport consultants, Pegasus to provide a 'worst case' scenario for noise and the relevant traffic data for the noise model is shown in Table 5.1, below.

Table 5.1: Traffic Noise Data for 2036 with Development

Road Link	18 hr Daytime AAWT (0600- 0000 hrs)	Daytime % HGV	6 hr Night Flows	Night % HGV	Signed Speed Limits
					Mph
Link 1 - SWDR along northern boundary of Parcel R7	15749	0.4%	227	0.5%	30.0
Link 2 - Croudace Link road along eastern boundary of Parcel R13	7466	3.5%	106	6.3%	30.0

- 5.6 The 2036 traffic flows are considered by the traffic consultants to provide the highest noise impact on parcels R7 and R13. For this scenario, Easthampstead Road will be closed and a nominal flow has been applied to Easthampstead Road for the purpose of the noise model and consideration of noise mitigation measures.
- 5.7 The predicted day and night-time noise contours, based on future traffic flows and including noise from the railway lines to the north of the development site are shown in Appendix B, Figure B1 and B2 respectively.
- 5.8 The noise model indicates that noise mitigation measures will be required at elevations overlooking both the roads and the railway to reduce the internal noise levels within the residential units to with acceptable levels. Furthermore, the noise model results indicate that external noise levels in amenity areas will be within the targets provided by BS8233:2014. Appropriate noise mitigation measures are discussed in Section 6.

Vibration

- 5.9 The below-ground structure of a building or hard surface will affect the levels of vibration present due to a remote source. Different types of foundation will affect the amount of vibration that is transferred from the ground to either the building or the hard surface.
- 5.10 The vibration measurements were taken 10m from the nearside railway line. The nearest proposed buildings on Parcels R7 and R13 are located approximately 70m from the nearside rail line and significantly further away from the railway line than the measurement position and will therefore be subject to lower levels of vibration.
- 5.11 As discussed above, it is necessary to use a transfer function that would represent the likely effect that a different foundation would have on the transfer of vibration from the ground into the proposed dwellings.

- 5.12 The table below shows the likely vibration level within a habitable room located on the upper storey of a residential property at the measurement position. The figures presented below equate to the measured values amplified by a transfer function of 2.98. The estimated VDV's are shown in Table 5.2, below.

Table 5.2 – Estimated Vibration Dose Values at 10m from the railway

Location	Period	Range of VDV's	Transfer Function	Resulting eVDV	Probability of Adverse Comments on Vibration
Position 1 Boundary with railway lines	Daytime	0.080	2.98	0.238	Low probability of adverse comment
	Night-time	0.049	2.98	0.146	Low probability of adverse comment

- 5.13 The estimated VDV's at the representative measurement location with the transfer function of 2.98 applied provide vibration levels that BS6472 considers are less than a low probability of adverse comment in both the day and night-time periods.
- 5.14 It was observed that the vibration from train pass-bys was imperceptible at the site boundary with the railway lines.
- 5.15 Based on both the baseline vibration measurements, which were significantly closer to the railway (10m) than the nearest proposed residential properties (70m) and observation on the site it is considered that no additional mitigation measures are required to reduce the vibration effects of passing trains at the development site.

6. Noise Mitigation Plan

Internal Noise Targets

- 6.1 Condition 40 requires a Noise Mitigation Plan demonstrating how appropriate internal and external noise levels will be achieved. The external noise levels have been predicted in the day and night-time periods at each elevation and floor level of each property at the development and these predicted noise levels are shown in Appendix C.
- 6.2 Based on the internal noise targets provided in BS8233:2014 in the day and night-time periods, the required sound insulation for each elevation and floor level has also been calculated and is shown in Appendix C.
- 6.3 A plan showing the highest predicted free-field external noise levels on each elevation of each building at 1st floor level is shown in Figure 5.

Figure 5: Highest Predicted Free-Field Noise Levels on each elevation at 1st Floor



- 6.4 It should be noted that a façade noise correction of 2.5 dB has been added to the noise levels shown in Appendix C to determine appropriate sound insulation targets to meet the internal noise targets.

- 6.5 The calculated sound reduction performance requirements apply to the whole external building fabric. However, since windows are typically the weakest link in the external building fabric, in terms of acoustic performance, the values below will particularly apply to the windows.
- 6.6 Windows do not reduce noise equally across the entire frequency spectrum, so the frequency content of the sound will influence the overall sound reduction performance of a given window, and by extension, the resulting noise levels within the property.
- 6.7 However, many glazing manufacturers test their products under laboratory conditions using a typical road traffic noise frequency spectrum source. The resultant measured noise attenuation, in dB, gives a very useful guide to in-situ sound reduction performance of the window for situations where road traffic noise dominates, known as $R_w + C_{tr}$ or R_{TRA} .
- 6.8 As shown in Appendix C the highest predicted façade noise levels are on Parcel R13 and located on the north-east elevation of plots 4043-4066 with a noise level of $L_{Aeq,16\text{ hr}}$ 66 dB, which requires the glazing to provide $R_w + C_{tr}$ 31 dB. Acoustic double glazing such as 10mm/6-16mm/6mm construction provides $R_w + C_{tr}$ 32 dB and R_w 35 dB and is predicted to meet the internal noise target provided by BS8233:2014. Glazing requiring this acoustic specification is only required on the closest elevations facing towards the roads.
- 6.9 On Parcel R7 the highest predicted façade noise levels are on the north-west elevation of plots 4086 and the north elevation of plots 4087-4088 with a noise level of $L_{Aeq,16\text{ hr}}$ 63 dB, which requires the glazing to provide $R_w + C_{tr}$ 28 dB. Acoustic double glazing such as 10mm/6-16mm/4mm construction provides $R_w + C_{tr}$ 30 dB and R_w 35 dB and is predicted to meet the internal noise target provided by BS8233:2014. Glazing requiring this acoustic specification is only required on the closest elevations facing towards the SWDP.
- 6.10 As shown in Appendix C, the noise levels at the majority of the elevations that are shielded from the SWDP and the Croudace Link Road are below a façade noise level of $L_{Aeq,16\text{ hr}}$ 60 dB. At these properties, standard thermal glazing such as 4mm/6-16mm/4mm construction will provide sound insulation of $R_w + C_{tr}$ 25 dB and will meet the internal noise targets in BS8233:2014.

- 6.11 The 10th highest predicted maximum noise level at night due to traffic on the SWDP at the nearest elevations on Plots R7 and R13 is a corrected façade level of L_{Amax} 71 dB based on the previous noise measurements of traffic noise adjacent to Waterloo Road for Parcel R10. The required sound insulation to meet the internal noise target is R_w 26 dB, which is achieved using the glazing proposed for the elevations facing the SWDP. For the future year 2036 it is assumed that the sound insulation measures will be determined by the predicted daytime noise level rather than the maximum noise levels. This approach is verified by the previous noise measurements of road traffic for Parcel R10, which was dominated by traffic noise from Waterloo Road where the required sound insulation would be lower for maximum noise levels than for the 16 hour daytime noise level.
- 6.12 It is noted that the sound reduction performances stated as achievable by the identified glazing units are based on laboratory tests. In practice, the actual on-site performance may be lower, depending on the quality of the fitting. The sound reduction performances in Appendix C should be interpreted as in-situ sound reduction performances.
- 6.13 Glazing units other than those suggested may be suitable and it is the responsibility of the glazing manufacturer to recommend and provide appropriate systems. The above analysis demonstrates that a design solution is feasible at the site for the purposes of a planning application. Further detailed calculations may be necessary to inform glazing procurement decisions.
- 6.14 Internal noise levels should be considered in the context of room ventilation and overheating requirements. As the sound reduction performance requirements are greater than 10dB, to achieve the internal noise criteria the windows will need to be closed. However, the windows should be openable so that the choice of opening or closing windows is with the occupants. Therefore, an alternative form of ventilation and/or cooling will be required so that occupants can retain access to fresh air and retain thermal comfort without compromising their noise climate. The ventilation and/or cooling system chosen should be designed so that it does not compromise the sound insulation performance of the building fabric.
- 6.15 The acoustic specification for ventilation is provided as a weighted normalised level difference, shown as $D_{n,e,w}$ dB. The noise target for ventilation is 10 to 15 dB higher than the sound insulation (R_w) target for glazing. For individual elevations and floor levels the required ventilation specification can be derived by adding 10 to 15 dB to the sound insulation values that are shown in Appendix C.
- 6.16 On the noisiest elevations overlooking the SWDP and the Croudace Link Road the acoustic specification is likely to require mechanical ventilation. On the quieter elevations acoustically treated trickle vents will meet the acoustic specification for vents.

Amenity Areas

- 6.17 BS8233:2014 states that 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 50dB $L_{Aeq,T}$, with an upper guideline value of 55dB $L_{Aeq,T}$ which would be acceptable in noisier environments.
- 6.18 WBC have requested that each apartment should have a balcony so that residents have a choice of use and on this basis, balconies have been added at the Case Officers request.
- 6.19 The proposed site layout is shown in Figure 2 and has taken the noise limit for gardens into account in the design such that the predicted noise levels in all gardens are at or below the upper guideline value of 55dB $L_{Aeq,T}$

Vibration

- 6.20 It was observed that the vibration from train pass-bys was imperceptible at the site boundary, 10m from the railway lines. The nearest proposed residential development buildings are approx. 70m from the railway lines and based on both the baseline vibration measurements and observation on the site it is considered that no additional mitigation measures are required to reduce the vibration effects of passing trains at the development site.

7. Acoustics and Overheating

- 7.1 The proposed residential properties for Parcels R7 and R13 have been assessed against the noise criteria provided by The Building Regulations 2010, Overheating Approved Document O (ADO) guidelines and a plan has been 'marked up' to show any exceedances of the ADO night noise criteria.
- 7.2 The ADO states in para 3.2 that 'In locations where external noise may be an issue the overheating mitigation strategy should take account of the likelihood that windows will be closed during sleeping hours (11pm to 7am)' and para 3.3 of ADO provides the following noise criteria:
- 3.3 Windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits:*
- a. 40dB $L_{Aeq,T}$, averaged over 8 hours (between 11pm and 7pm)*
- b. 55dB L_{AFmax} , more than 10 times a night (between 11pm and 7pm)*
- 7.3 The façade noise levels on each elevation and floor of the development have been predicted using IMMI noise modelling software, which take the site topography and any intervening noise barriers into account. The noise model has been developed using the 2036 traffic data to determine the facade noise levels on each elevation. The predicted night-time ambient noise levels across Parcels R7 and R13 are shown in Appendix C.
- 7.4 The 10th highest predicted maximum noise level at night due to traffic on the SWDP at the nearest elevations on Plots R7 and R13 is a corrected façade level of L_{Amax} 71 dB based on the previous noise measurements of traffic noise adjacent to Waterloo Road for Parcel R10. This indicates that at the elevations overlooking the SWDP and the Croudace Link Road, an alternative means of mitigating overheating may be required to meet AVO night noise criteria.
- 7.5 For the future year 2036 it is assumed that the overheating requirements at properties overlooking the roads will be determined by the predicted ambient night-time noise level rather than the maximum noise levels. This approach is verified by the previous noise measurements of road traffic for Parcel R10, which was dominated by traffic noise from Waterloo Road. At this location the measured noise levels indicate that the overheating requirements are similar for maximum noise levels as for the 8 hour night-time ambient noise level.

ADO Noise Target

- 7.6 The sound attenuation from outside to inside is based on the 13 dB level difference for partially open windows from Table B-5 of the ANC Acoustics Ventilation and Overheating (AVO) Residential Design Guide, dated January 2020 to determine the internal noise levels as shown below:

Table B-5 Examples of passive ventilation solutions providing enhanced sound insulation

Design option	Description and references	Approximate Level Difference (external free field level – internal reverberant level)	Improvement relative to a window providing a similar amount of ventilation
Standard opening windows	Window(s) open sufficiently to provide a ventilation free-area equivalent to 2% of the floor area. ^[42]	13 dB	0 dB

- 7.7 Based on the IMMI noise model results the elevations of plots where bedroom windows are likely to be closed during sleeping hours to meet the noise targets and therefore exceed the ADO noise criteria are identified in Figure 4.
- 7.8 For the façades shown in red on Figure 4, openable windows are not permitted to be used for bedrooms as a method to prevent overheating. The ventilation strategy will therefore need to consider a reduced window opening angle or the use of an attenuated ventilation path or mechanical means to reduce excess heat.

8. Conclusion

- 8.1 Phlorum Limited have been commissioned by Miller Homes to undertake a noise and vibration assessment to discharge condition 40 for a residential development at South Wokingham, Parcels R7 & R13, Land South of Waterloo Crescent. The proposal is for 38 residential units on Parcel R7 and 177 residential units on Parcel R13.
- 8.2 As required by condition 40 a 'Noise Mitigation Plan' showing predicted noise levels at each elevation and floor level of each individual residential property along with the required sound insulation levels that are required to meet the internal noise targets has been provided.
- 8.3 The design of the proposed site layout has taken the noise limit for gardens into account and the garden noise levels are at or below the upper guideline value if 55dB $L_{Aeq,T}$.
- 8.4 Vibration from train pass-bys was observed to be imperceptible at the site boundary, 10m from the railway lines. The nearest proposed residential development buildings are approx. 70m from the railway lines and based on both the baseline vibration measurements and site observations it is considered that no additional mitigation measures are required to reduce the vibration effects of passing trains at the development site.
- 8.5 The Approved Document O assessment shows elevations where openable windows are not permitted to be used for bedrooms as a method to prevent overheating. The ventilation strategy will therefore need to consider a reduced window opening angle or the use of an attenuated ventilation path or mechanical means to reduce excess heat at these elevations.
- 8.6 On the basis of this noise assessment, it is considered that with appropriate noise mitigation measures, as specified in this report, noise and vibration does not pose a constraint to the proposed development and the report discharges condition 40.

Figures



Location Plan showing Vibration Measurement
Position in relation to Parcels R7 and R13

Job No. 13253

Figure No. 1



Figure No. 2



Appendix A

Introduction to Noise & Glossary of Terminology

Noise is defined as unwanted sound. The human ear is able to respond to sound in the frequency range 18Hz (deep bass) to 18,000Hz (high treble) and over the audible range of 0dB (the threshold of perception) to 140dB (the onset of pain). The ear does not respond equally to different frequencies of the same magnitude, but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates the response of the human ear, a weighting (filtering) mechanism is used. This reduces the importance of lower and higher frequencies, approximating the response of the human ear.

Furthermore, the perception of noise may be determined by a number of other factors, which may not necessarily be acoustic. Noise can be perceived to be louder or more noticeable if the source of the noise is observed; e.g. roads, trains, factories, building sites etc. In general, the impact of noise depends upon its level, the margin by which it exceeds the background level, its character and its variation over a given period of time. In some cases, the time of day and other acoustic features such as tonality may be important, as may the disposition of the affected individual. Any assessment of noise should give due consideration to all of these factors when assessing the significance of a noise source. Various noise indices have been derived to describe the fluctuation of noise levels that vary over time. Usually, these noise indices relate to specific types of noise, and as such different noise indices are used to describe road traffic noise, background noise, construction noise, etc.

The weighting mechanism that best corresponds to the response of the human ear is the 'A'-weighting scale. This is widely used for environmental noise measurement and the levels are denoted as dB(A) or L_{Aeq} , L_{A10} , etc, according to the parameter being measured.

Noise is measured on the decibel scale, which is logarithmic rather than linear. As a result of this, a 3dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective, but as a general guide a 10dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3dB(A) is generally regarded as the minimum difference needed to perceive a change. Table A.1 sets out examples of noise levels typically experienced during everyday activities. Table A.2 sets out an explanation of the terminology used in this report.

Table A1: Typical sound levels found in the environment.

Sound Level	Location
0 to 10dB(A)	Threshold of hearing
10 to 20dB(A)	Broadcasting studio
20 to 30dB(A)	Quiet bedroom at night
30 to 40dB(A)	Living room during the day
40 to 50dB(A)	Typical office
50 to 60dB(A)	Inside a car
60 to 70dB(A)	Typical high street
70 to 90dB(A)	Inside a factory or noisy pub
100 to 110dB(A)	Burglar Alarm at 1m
110 to 130dB(A)	Pneumatic drill at 1m away
140dB(A)	Threshold of Pain

Table A2: Terminology relating to noise

Term	Description
Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of $20\mu\text{Pa}$ (20×10^{-6} Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s_1 and s_2 is given by $20 \log_{10} (s_1/s_2)$. The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is $20\mu\text{Pa}$.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
$L_{Aeq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level during the period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{90,T}$ or Background Noise Level	A noise level index. The noise level exceeded for 90% of the time over the period T. L_{90} can be considered to be the "average minimum" noise level and is often used to describe the background noise.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.
Free-field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5 metres
Façade	At a distance of 1 metre in front of a large sound reflecting object such as a building façade.
Fast Time Weighting	An averaging time used in sound level meters. Defined in BS EN 61672.

Appendix B

Noise Model Results

Figure B1: Daytime free-field noise contours, 2036

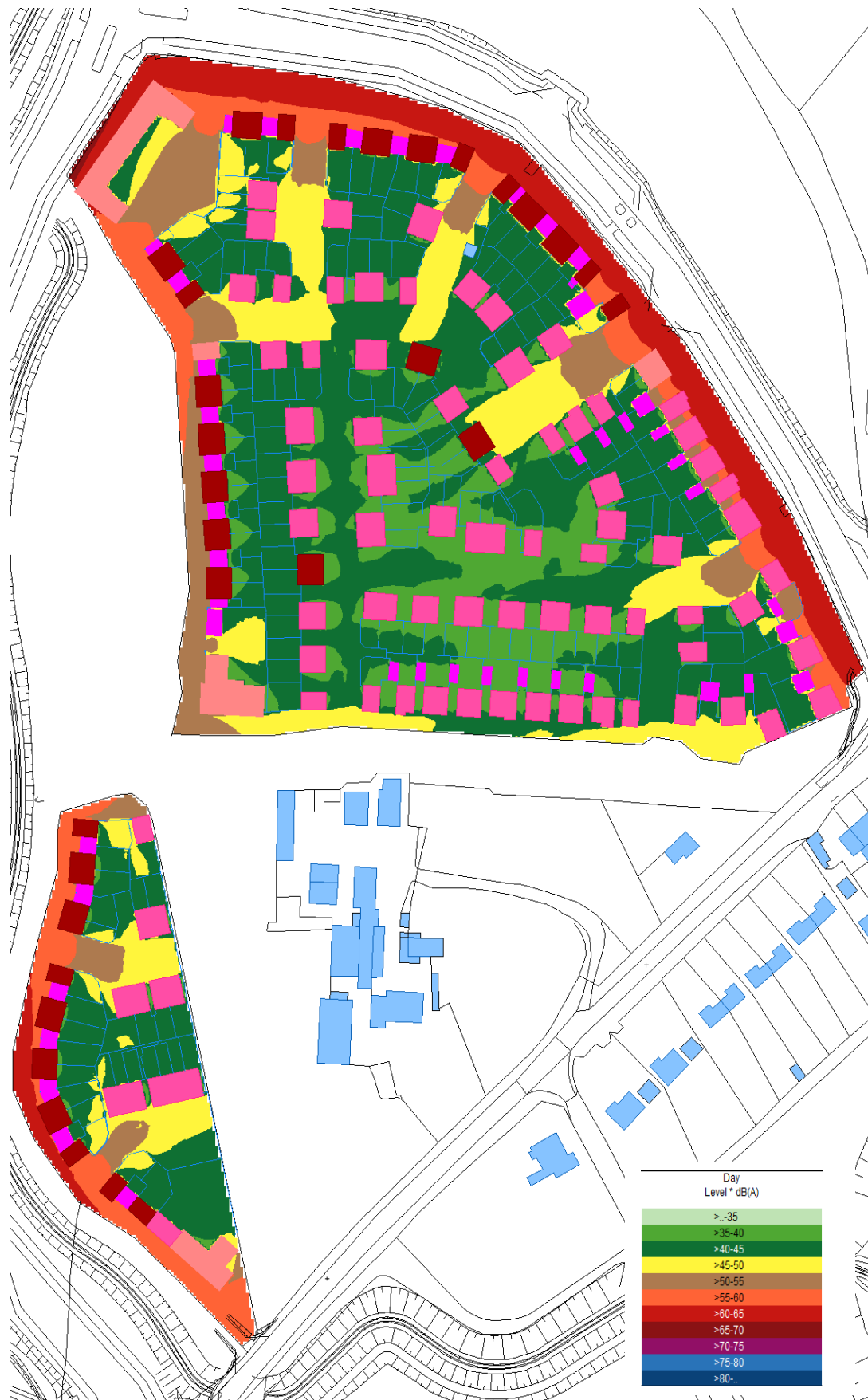


Figure B2: Night-time free-field noise contours, 2036



Appendix C

Predicted Noise Levels on Each Elevation and Floor Level

Table C1: Predicted noise levels at each floor and elevation of development and associated required sound insulation values

Plot No	Floor	Elevation	Façade		Window Req		Window Req Overall	Plot No	Floor	Elevation	Façade		Window Req		Window Req Overall
			Day Laeq	Night Laeq	Day	Night					Day	Night			
													Rw+Ctr	Rw+Ctr	
3012_3013	Ground	North	41.6	33.6	7.0	4.0	7.0	3060_3061	Ground	West	41.8	33.4	7.0	3.0	7.0
3012_3013	First	North	44.4	36.4	9.0	6.0	9.0	3060_3061	First	West	46.1	37.7	11.0	8.0	11.0
3012_3013	Ground	East	45.0	37.2	10.0	7.0	10.0	3062_3063	Ground	North	43.7	35.3	9.0	5.0	9.0
3012_3013	First	East	49.2	41.4	14.0	11.0	14.0	3062_3063	First	North	47.6	39.2	13.0	9.0	13.0
3012_3013	Ground	South	46.0	38.2	11.0	8.0	11.0	3062_3063	Ground	East	43.3	35.1	8.0	5.0	8.0
3012_3013	First	South	50.7	43.0	16.0	13.0	16.0	3062_3063	First	East	47.2	39.0	12.0	9.0	12.0
3012_3013	Ground	West	42.3	34.3	7.0	4.0	7.0	3062_3063	Ground	South	40.2	32.3	5.0	2.0	5.0
3012_3013	First	West	45.1	37.1	10.0	7.0	10.0	3062_3063	First	South	43.3	35.3	8.0	5.0	8.0
4076	Ground	N/W	60.7	52.2	26.0	22.0	26.0	3062_3063	Ground	West	41.8	33.5	7.0	3.0	7.0
4076	First	N/W	61.0	52.5	26.0	22.0	26.0	3062_3063	First	West	46.2	37.8	11.0	8.0	11.0
4076	Ground	S/E	43.4	35.1	8.0	5.0	8.0	3065_3066	Ground	North	45.1	36.6	10.0	7.0	10.0
4076	First	S/E	47.6	39.3	13.0	9.0	13.0	3065_3066	First	North	50.7	42.2	16.0	12.0	16.0
4083_4085	Ground	North	47.7	39.2	13.0	9.0	13.0	3065_3066	Ground	East	50.1	41.6	15.0	12.0	15.0
4083_4085	First	North	53.6	45.1	19.0	15.0	19.0	3065_3066	First	East	50.6	42.2	16.0	12.0	16.0
4083_4085	Ground	East	45.7	37.2	11.0	7.0	11.0	3065_3066	Ground	South	43.9	36.1	9.0	6.0	9.0
4083_4085	First	East	50.1	41.6	15.0	12.0	15.0	3065_3066	First	South	45.9	38.0	11.0	8.0	11.0
4083_4085	Ground	South	39.5	31.1	5.0	1.0	5.0	3065_3066	Ground	West	42.8	34.4	8.0	4.0	8.0
4083_4085	First	South	44.3	35.9	9.0	6.0	9.0	3065_3066	First	West	47.1	38.7	12.0	9.0	12.0
4083_4085	Ground	West	51.5	43.0	17.0	13.0	17.0	3064	Ground	North	43.5	35.5	9.0	6.0	9.0
4083_4085	First	West	53.8	45.3	19.0	15.0	19.0	3064	First	North	46.1	38.0	11.0	8.0	11.0
4079_4082	Ground	North	42.2	33.7	7.0	4.0	7.0	3064	Ground	East	49.2	41.0	14.0	11.0	14.0
4079_4082	First	North	47.0	38.5	12.0	8.0	12.0	3064	First	East	50.3	42.1	15.0	12.0	15.0
4079_4082	Ground	East	45.0	36.6	10.0	7.0	10.0	3064	Ground	South	44.5	36.7	10.0	7.0	10.0
4079_4082	First	East	48.4	39.9	13.0	10.0	13.0	3064	First	South	46.0	38.1	11.0	8.0	11.0
4079_4082	Ground	South	41.4	33.2	6.0	3.0	6.0	3064	Ground	West	42.3	34.0	7.0	4.0	7.0
4079_4082	First	South	47.4	39.2	12.0	9.0	12.0	3064	First	West	46.0	37.7	11.0	8.0	11.0
4079_4082	Ground	West	49.5	41.0	14.0	11.0	14.0	4038_4039	Ground	North	49.3	40.8	14.0	11.0	14.0
4079_4082	First	West	51.8	43.4	17.0	13.0	17.0	4038_4039	First	North	51.8	43.4	17.0	13.0	17.0
4094_4095	Ground	North	47.7	39.2	13.0	9.0	13.0	4038_4039	Ground	East	43.7	35.7	9.0	6.0	9.0
4094_4095	First	North	52.5	44.0	18.0	14.0	18.0	4038_4039	First	East	46.8	38.8	12.0	9.0	12.0
4094_4095	Ground	East	51.9	43.4	17.0	13.0	17.0	4038_4039	Ground	South	41.4	33.5	6.0	3.0	6.0
4094_4095	First	East	53.0	44.5	18.0	15.0	18.0	4038_4039	First	South	45.6	37.7	11.0	8.0	11.0
4094_4095	Ground	South	40.8	32.3	6.0	2.0	6.0	4038_4039	Ground	West	50.9	42.4	16.0	12.0	16.0
4094_4095	First	South	45.4	36.9	10.0	7.0	10.0	4038_4039	First	West	51.6	43.1	17.0	13.0	17.0
4094_4095	Ground	West	44.4	36.0	9.0	6.0	9.0	4037	Ground	North	42.0	33.8	7.0	4.0	7.0
4094_4095	First	West	48.0	39.5	13.0	10.0	13.0	4037	First	North	45.7	37.4	11.0	7.0	11.0
4096_4097	Ground	North	41.3	32.8	6.0	3.0	6.0	4037	Ground	East	44.8	36.9	10.0	7.0	10.0
4096_4097	First	North	45.9	37.4	11.0	7.0	11.0	4037	First	East	48.5	40.6	14.0	11.0	14.0
4096_4097	Ground	East	50.1	41.6	15.0	12.0	15.0	4037	Ground	South	46.3	38.6	11.0	9.0	11.0
4096_4097	First	East	51.1	42.6	16.0	13.0	16.0	4037	First	South	47.6	39.8	13.0	10.0	13.0
4096_4097	Ground	South	40.7	32.5	6.0	2.0	6.0	4037	Ground	West	48.8	40.3	14.0	10.0	14.0
4096_4097	First	South	46.1	37.8	11.0	8.0	11.0	4037	First	West	49.8	41.3	15.0	11.0	15.0
4096_4097	Ground	West	43.9	35.5	9.0	5.0	9.0	4035_4036	Ground	North	47.1	38.8	12.0	9.0	12.0
4096_4097	First	West	47.4	39.0	12.0	9.0	12.0	4035_4036	First	North	51.9	43.7	17.0	14.0	17.0
4098_4099	Ground	North	47.6	39.1	13.0	9.0	13.0	4035_4036	Ground	East	39.8	31.6	5.0	2.0	5.0
4098_4099	First	North	52.4	43.9	17.0	14.0	17.0	4035_4036	First	East	44.0	35.9	9.0	6.0	9.0
4098_4099	Ground	East	46.4	38.0	11.0	8.0	11.0	4035_4036	Ground	South	48.3	40.6	13.0	11.0	13.0
4098_4099	First	East	51.0	42.5	16.0	12.0	16.0	4035_4036	First	South	49.6	41.8	15.0	12.0	15.0
4098_4099	Ground	South	40.9	32.6	6.0	3.0	6.0	4035_4036	Ground	West	44.5	36.1	9.0	6.0	9.0
4098_4099	First	South	45.6	37.2	11.0	7.0	11.0	4035_4036	First	West	49.3	40.9	14.0	11.0	14.0
4098_4099	Ground	West	46.9	38.4	12.0	8.0	12.0	4033_4034	Ground	North	47.4	39.1	12.0	9.0	12.0
4098_4099	First	West	48.4	39.9	13.0	10.0	13.0	4033_4034	First	North	52.7	44.5	18.0	14.0	18.0
4105	Ground	North	48.9	40.4	14.0	10.0	14.0	4033_4034	Ground	East	45.7	37.8	11.0	8.0	11.0
4105	First	North	55.9	47.3	21.0	17.0	21.0	4033_4034	First	East	51.5	43.6	17.0	14.0	17.0
4105	Ground	East	55.7	47.1	21.0	17.0	21.0	4033_4034	Ground	South	48.2	40.4	13.0	10.0	13.0
4105	First	East	56.4	47.8	21.0	18.0	21.0	4033_4034	First	South	50.9	43.1	16.0	13.0	16.0
4105	Ground	South	45.7	37.3	11.0	7.0	11.0	4033_4034	Ground	West	39.7	31.6	5.0	2.0	5.0
4105	First	South	47.9	39.5	13.0	9.0	13.0	4033_4034	First	West	44.0	35.9	9.0	6.0	9.0
4105	Ground	West	43.1	34.6	8.0	5.0	8.0	4027	Ground	North	46.7	38.7	12.0	9.0	12.0
4105	First	West	46.8	38.3	12.0	8.0	12.0	4027	First	North	48.1	40.1	13.0	10.0	13.0
3051	Ground	North	44.7	36.2	10.0	6.0	10.0	4027	Ground	East	43.2	35.2	8.0	5.0	8.0
3051	First	North	48.4	39.9	13.0	10.0	13.0	4027	First	East	45.7	37.7	11.0	8.0	11.0
3051	Ground	East	42.9	34.5	8.0	5.0	8.0	4027	Ground	South	40.4	32.5	5.0	3.0	5.0
3051	First	East	47.1	38.7	12.0	9.0	12.0	4027	First	South	44.1	36.2	9.0	6.0	9.0
3051	Ground	South	41.7	33.6	7.0	4.0	7.0	4027	Ground	West	47.0	38.6	12.0	9.0	12.0
3051	First	South	43.8	35.6	9.0	6.0	9.0	4027	First	West	48.4	40.0	13.0	10.0	13.0
3051	Ground	West	48.2	39.7	13.0	10.0	13.0	4028_4029	Ground	North	50.5	42.7	15.0	13.0	15.0
3051	First	West	48.9	40.5	14.0	10.0	14.0	4028_4029	First	North	51.2	43.4	16.0	13.0	16.0
3052_3053	Ground	North	45.3	36.8	10.0	7.0	10.0	4028_4029	Ground	East	45.9	38.1	11.0	8.0	11.0
3052_3053	First	North	49.2	40.7	14.0	11.0	14.0	4028_4029	First	East	51.1	43.3	16.0	13.0	16.0
3052_3053	Ground	East	44.0	35.6	9.0	6.0	9.0	4028_4029	Ground	South	44.0	36.3	9.0	6.0	9.0
3052_3053	First	East	48.7	40.3	14.0	10.0	14.0	4028_4029	First	South	47.6	39.8	13.0	10.0	13.0
3052_3053	Ground	South	39.9	32.0	5.0	2.0	5.0	4028_4029	Ground	West	42.5	34.2	7.0	4.0	7.0
3052_3053	First	South	42.8	34.7	8.0	5.0	8.0	4028_4029	First						

Noise Assessment

S Wokingham Parcel R10, Land South of Waterloo Crescent



Plot No	Floor	Elevation	Façade		Window Req		Window Req
			Day	Night	Rw+Ctr	Overall	Rw+Ctr
			LAeq	LAeq			
3095_3097	Ground	North	41.6	33.3	7.0	3.0	7.0
3095_3097	First	North	44.8	36.5	10.0	6.0	10.0
3095_3097	Ground	East	41.7	33.6	7.0	4.0	7.0
3095_3097	First	East	45.5	37.4	11.0	7.0	11.0
3095_3097	Ground	South	40.9	33.0	6.0	3.0	6.0
3095_3097	First	South	44.1	36.2	9.0	6.0	9.0
3095_3097	Ground	West	40.3	32.1	5.0	2.0	5.0
3095_3097	First	West	44.3	36.0	9.0	6.0	9.0
3093_3094	Ground	North	41.9	33.6	7.0	4.0	7.0
3093_3094	First	North	45.0	36.7	10.0	7.0	10.0
3093_3094	Ground	East	42.8	34.8	8.0	5.0	8.0
3093_3094	First	East	46.2	38.2	11.0	8.0	11.0
3093_3094	Ground	South	40.9	33.1	6.0	3.0	6.0
3093_3094	First	South	43.7	35.7	9.0	6.0	9.0
3093_3094	Ground	West	41.3	33.0	6.0	3.0	6.0
3093_3094	First	West	44.8	36.5	10.0	6.0	10.0
3091_3092	Ground	North	42.3	34.0	7.0	4.0	7.0
3091_3092	First	North	45.4	37.1	10.0	7.0	10.0
3091_3092	Ground	East	45.7	37.4	11.0	7.0	11.0
3091_3092	First	East	47.6	39.3	13.0	9.0	13.0
3091_3092	Ground	South	43.3	35.5	8.0	6.0	8.0
3091_3092	First	South	45.2	37.4	10.0	7.0	10.0
3091_3092	Ground	West	41.8	33.5	7.0	3.0	7.0
3091_3092	First	West	45.1	36.8	10.0	7.0	10.0
4025_4026	Ground	North	41.2	33.1	6.0	3.0	6.0
4025_4026	First	North	44.8	36.7	10.0	7.0	10.0
4025_4026	Ground	East	43.9	36.0	9.0	6.0	9.0
4025_4026	First	East	46.5	38.5	11.0	9.0	11.0
4025_4026	Ground	South	41.5	33.7	7.0	4.0	7.0
4025_4026	First	South	44.9	37.0	10.0	7.0	10.0
4025_4026	Ground	West	46.1	37.7	11.0	8.0	11.0
4025_4026	First	West	47.6	39.2	13.0	9.0	13.0
4024	Ground	North	42.0	33.9	7.0	4.0	7.0
4024	First	North	45.4	37.4	10.0	7.0	10.0
4024	Ground	East	44.9	37.1	10.0	7.0	10.0
4024	First	East	48.7	40.8	14.0	11.0	14.0
4024	Ground	South	48.2	40.4	13.0	10.0	13.0
4024	First	South	49.1	41.4	14.0	11.0	14.0
4024	Ground	West	45.3	36.9	10.0	7.0	10.0
4024	First	West	47.1	38.8	12.0	9.0	12.0
4022_4023	Ground	North	43.8	35.8	9.0	6.0	9.0
4022_4023	First	North	46.9	38.9	12.0	9.0	12.0
4022_4023	Ground	East	46.9	39.2	12.0	9.0	12.0
4022_4023	First	East	52.6	44.8	18.0	15.0	18.0
4022_4023	Ground	South	51.9	44.1	17.0	14.0	17.0
4022_4023	First	South	52.4	44.7	17.0	15.0	17.0
4022_4023	Ground	West	42.0	33.8	7.0	4.0	7.0
4022_4023	First	West	45.2	37.1	10.0	7.0	10.0
3109_3110	Ground	N/W	41.3	33.0	6.0	3.0	6.0
3109_3110	First	N/W	44.3	36.0	9.0	6.0	9.0
3109_3110	Ground	N/E	43.0	35.0	8.0	5.0	8.0
3109_3110	First	N/E	45.7	37.6	11.0	8.0	11.0
3109_3110	Ground	S/E	42.0	34.2	7.0	4.0	7.0
3109_3110	First	S/E	44.4	36.6	9.0	7.0	9.0
3109_3110	Ground	S/W	45.8	37.9	11.0	8.0	11.0
3109_3110	First	S/W	47.0	39.1	12.0	9.0	12.0
3106	Ground	N/W	40.6	32.3	6.0	2.0	6.0
3106	First	N/W	43.6	35.4	9.0	5.0	9.0
3106	Ground	N/E	47.1	39.3	12.0	9.0	12.0
3106	First	N/E	48.0	40.1	13.0	10.0	13.0
3106	Ground	S/E	45.1	37.3	10.0	7.0	10.0
3106	First	S/E	46.4	38.6	11.0	9.0	11.0
3106	Ground	S/W	40.9	32.9	6.0	3.0	6.0
3106	First	S/W	43.7	35.7	9.0	6.0	9.0
4008_4009	Ground	N/W	43.2	34.8	8.0	5.0	8.0
4008_4009	First	N/W	45.8	37.6	11.0	8.0	11.0
4008_4009	Ground	N/E	44.9	37.0	10.0	7.0	10.0
4008_4009	First	N/E	49.5	41.6	14.0	12.0	14.0
4008_4009	Ground	S/E	44.6	36.8	10.0	7.0	10.0
4008_4009	First	S/E	49.3	41.6	14.0	12.0	14.0
4008_4009	Ground	S/W	41.3	33.5	6.0	3.0	6.0
4008_4009	First	S/W	45.3	37.4	10.0	7.0	10.0
4006_4007	Ground	N/W	43.0	34.7	8.0	5.0	8.0
4006_4007	First	N/W	46.1	37.8	11.0	8.0	11.0
4006_4007	Ground	N/E	41.4	33.5	6.0	4.0	6.0
4006_4007	First	N/E	45.2	37.4	10.0	7.0	10.0
4006_4007	Ground	S/E	45.5	37.7	10.0	8.0	10.0
4006_4007	First	S/E	49.4	41.6	14.0	12.0	14.0
4006_4007	Ground	S/W	43.4	35.5	8.0	6.0	8.0
4006_4007	First	S/W	47.1	39.3	12.0	9.0	12.0
4004_4005	Ground	N/W	41.1	33.0	6.0	3.0	6.0
4004_4005	First	N/W	44.3	36.2	9.0	6.0	9.0
4004_4005	Ground	N/E	43.6	35.7	9.0	6.0	9.0
4004_4005	First	N/E	46.9	39.0	12.0	9.0	12.0
4004_4005	Ground	S/E	42.3	34.5	7.0	4.0	7.0
4004_4005	First	S/E	45.5	37.6	10.0	8.0	10.0
4004_4005	Ground	S/W	49.9	42.1	15.0	12.0	15.0
4004_4005	First	S/W	50.5	42.7	16.0	13.0	16.0
3100_3101	Ground	North	41.2	32.9	6.0	3.0	6.0
3100_3101	First	North	44.0	35.7	9.0	6.0	9.0
3100_3101	Ground	East	42.0	34.0	7.0	4.0	7.0
3100_3101	First	East	44.8	36.7	10.0	7.0	10.0
3100_3101	Ground	South	40.1	32.2	5.0	2.0	5.0
3100_3101	First	South	43.1	35.1	8.0	5.0	8.0
3100_3101	Ground	West	40.4	32.1	5.0	2.0	5.0
3100_3101	First	West	43.7	35.4	9.0	5.0	9.0
3102_3104	Ground	North	40.6	32.3	6.0	2.0	6.0
3102_3104	First	North	43.7	35.4	9.0	5.0	9.0
3102_3104	Ground	East	41.7	33.7	7.0	4.0	7.0
3102_3104	First	East	44.2	36.2	9.0	6.0	9.0
3102_3104	Ground	South	40.4	32.5	5.0	3.0	5.0
3102_3104	First	South	43.4	35.5	8.0	5.0	8.0
3102_3104	Ground	West	40.8	32.6	6.0	3.0	6.0
3102_3104	First	West	43.8	35.6	9.0	6.0	9.0
3105	Ground	North	39.9	31.7	5.0	2.0	5.0
3105	First	North	43.2	35.1	8.0	5.0	8.0
3105	Ground	East	42.1	34.1	7.0	4.0	7.0
3105	First	East	44.3	36.4	9.0	6.0	9.0
3105	Ground	South	40.7	32.9	6.0	3.0	6.0
3105	First	South	43.4	35.5	8.0	5.0	8.0
3105	Ground	West	40.7	32.6	6.0	3.0	6.0
3105	First	West	43.6	35.5	9.0	5.0	9.0
3043	Ground	North	40.3	31.9	5.0	2.0	5.0
3043	First	North	43.6	35.3	9.0	5.0	9.0
3043	Ground	East	41.5	33.3	6.0	3.0	6.0
3043	First	East	44.0	35.8	9.0	6.0	9.0
3043	Ground	South	39.9	31.8	5.0	2.0	5.0
3043	First	South	42.7	34.6	8.0	5.0	8.0
3043	Ground	West	47.7	39.3	13.0	9.0	13.0
3043	First	West	48.5	40.1	13.0	10.0	13.0
3044	Ground	North	38.3	30.1	3.0	0.0	3.0
3044	First	North	42.5	34.2	7.0	4.0	7.0
3044	Ground	East	41.4	33.3	6.0	3.0	6.0
3044	First	East	43.9	35.7	9.0	6.0	9.0
3044	Ground	South	40.5	32.5	5.0	2.0	5.0
3044	First	South	43.1	35.1	8.0	5.0	8.0
3044	Ground	West	47.4	39.0	12.0	9.0	12.0
3044	First	West	48.2	39.9	13.0	10.0	13.0
3038_3039	Ground	North	40.1	31.8	5.0	2.0	5.0
3038_3039	First	North	43.4	35.1	8.0	5.0	8.0
3038_3039	Ground	East	41.8	33.7	7.0	4.0	7.0
3038_3039	First	East	44.1	35.9	9.0	6.0	9.0
3038_3039	Ground	South	38.5	30.6	4.0	1.0	4.0
3038_3039	First	South	42.2	34.2	7.0	4.0	7.0
3038_3039	Ground	West	41.1	32.7	6.0	3.0	6.0
3038_3039	First	West	44.2	35.9	9.0	6.0	9.0
3036_3037	Ground	North	39.6	31.4	5.0	1.0	5.0
3036_3037	First	North	43.2	35.0	8.0	5.0	8.0
3036_3037	Ground	East	42.2	34.2	7.0	4.0	7.0
3036_3037	First	East	44.2	36.2	9.0	6.0	9.0
3036_3037	Ground	South	38.9	31.0	4.0	1.0	4.0
3036_3037	First	South	42.4	34.5	7.0	4.0	7.0
3036_3037	Ground	West	40.6	32.3	6.0	2.0	6.0
3036_3037	First	West	43.9	35.6	9.0	6.0	9.0
3045	Ground	North	39.0	30.9	4.0	1.0	4.0
3045	First	North	42.4	34.2	7.0	4.0	7.0
3045	Ground	East	41.2	33.1	6.0	3.0	6.0
3045	First	East	43.7	35.6	9.0	6.0	9.0
3045	Ground	South	41.4	33.4	6.0	3.0	6.0
3045	First	South	43.8	35.7	9.0	6.0	9.0
3045	Ground	West	46.6	38.3	12.0	8.0	12.0
3045	First	West	48.0	39.7	13.0	10.0	13.0
3046	Ground	North	39.2	31.0	4.0	1.0	4.0
3046	First	North	42.8	34.7	8.0	5.0	8.0
3046	Ground	East	41.3	33.2	6.0	3.0	6.0
3046	First	East	43.7	35.5	9.0	6.0	9.0
3046	Ground	South	41.6	33.7	7.0	4.0	7.0
3046	First	South	43.8	35.8	9.0	6.0	9.0
3046	Ground	S/W	46.6	38.4	12.0	8.0	12.0
3046	First	S/W	48.1	39.9	13.0	10.0	13.0
3034_3035	Ground	North	39.1	30.9	4.0	1.0	4.0
3034_3035	First	North	42.7	34.5	8.0	5.0	8.0
3034_3035	Ground	East	42.6	34.6	8.0	5.0	8.0
3034_3035	First	East	44.7	36.7	10.0	7.0	10.0
3034_3035	Ground	South	39.1	31.2	4.0	1.0	4.0
3034_3035	First	South	42.5	34.6	8.0	5.0	8.0
3034_3035	Ground	West	40.5	32.2	6.0	2.0	6.0
3034_3035	First	West	43.6	35.4	9.0	5.0	9.0
3047	Ground	North					

Noise Assessment

S Wokingham Parcel R10, Land South of Waterloo Crescent



Plot No	Floor	Elevation	Façade		Window Req		Window Req
			Day	Night	Rw+Ctr	Night	Rw+Ctr
			LAeq	LAeq			Overall
3049	Ground	South	42.4	34.4	7.0	4.0	7.0
3049	First	South	44.3	36.3	9.0	6.0	9.0
3049	Ground	West	47.7	39.6	13.0	10.0	13.0
3049	First	West	48.9	40.8	14.0	11.0	14.0
3030_3031	Ground	North	39.3	31.3	4.0	1.0	4.0
3030_3031	First	North	42.9	34.8	8.0	5.0	8.0
3030_3031	Ground	East	46.0	38.1	11.0	8.0	11.0
3030_3031	First	East	47.0	39.2	12.0	9.0	12.0
3030_3031	Ground	South	40.2	32.4	5.0	2.0	5.0
3030_3031	First	South	43.7	35.8	9.0	6.0	9.0
3030_3031	Ground	West	40.5	32.3	6.0	2.0	6.0
3030_3031	First	West	43.9	35.7	9.0	6.0	9.0
3050	Ground	North	43.2	35.2	8.0	5.0	8.0
3050	First	North	45.5	37.4	11.0	7.0	11.0
3050	Ground	East	42.4	34.5	7.0	4.0	7.0
3050	First	East	44.8	36.9	10.0	7.0	10.0
3050	Ground	South	46.1	38.2	11.0	8.0	11.0
3050	First	South	47.3	39.4	12.0	9.0	12.0
3050	Ground	West	47.7	39.6	13.0	10.0	13.0
3050	First	West	49.1	41.0	14.0	11.0	14.0
3029	Ground	North	39.7	31.7	5.0	2.0	5.0
3029	First	North	43.4	35.4	8.0	5.0	8.0
3029	Ground	East	48.1	40.3	13.0	10.0	13.0
3029	First	East	49.1	41.4	14.0	11.0	14.0
3029	Ground	South	47.8	40.0	13.0	10.0	13.0
3029	First	South	48.7	40.9	14.0	11.0	14.0
3029	Ground	West	41.2	33.1	6.0	3.0	6.0
3029	First	West	44.7	36.6	10.0	7.0	10.0
3011	Ground	North	41.1	32.9	6.0	3.0	6.0
3011	First	North	43.8	35.7	9.0	6.0	9.0
3011	Ground	East	40.7	32.8	6.0	3.0	6.0
3011	First	East	43.9	35.9	9.0	6.0	9.0
3011	Ground	South	41.5	33.7	6.0	4.0	6.0
3011	First	South	44.8	37.0	10.0	7.0	10.0
3011	Ground	West	40.8	32.7	6.0	3.0	6.0
3011	First	West	43.7	35.6	9.0	6.0	9.0
3009_3010	Ground	North	40.9	32.7	6.0	3.0	6.0
3009_3010	First	North	43.8	35.7	9.0	6.0	9.0
3009_3010	Ground	East	41.6	33.8	7.0	4.0	7.0
3009_3010	First	East	44.9	37.0	10.0	7.0	10.0
3009_3010	Ground	South	43.5	35.7	9.0	6.0	9.0
3009_3010	First	South	46.7	38.9	12.0	9.0	12.0
3009_3010	Ground	West	39.5	31.5	4.0	2.0	4.0
3009_3010	First	West	43.5	35.5	8.0	6.0	8.0
3007_3008	Ground	North	40.9	32.7	6.0	3.0	6.0
3007_3008	First	North	43.8	35.7	9.0	6.0	9.0
3007_3008	Ground	East	43.6	35.7	9.0	6.0	9.0
3007_3008	First	East	47.2	39.3	12.0	9.0	12.0
3007_3008	Ground	South	44.0	36.3	9.0	6.0	9.0
3007_3008	First	South	47.1	39.3	12.0	9.0	12.0
3007_3008	Ground	West	41.2	33.3	6.0	3.0	6.0
3007_3008	First	West	44.7	36.8	10.0	7.0	10.0
3006	Ground	N/W	40.5	32.3	5.0	2.0	5.0
3006	First	N/W	43.7	35.6	9.0	6.0	9.0
3006	Ground	N/E	49.7	42.0	15.0	12.0	15.0
3006	First	N/E	50.6	42.8	16.0	13.0	16.0
3006	Ground	S/E	40.3	32.4	5.0	2.0	5.0
3006	First	S/E	44.0	36.1	9.0	6.0	9.0
3006	Ground	S/W	41.5	33.6	7.0	4.0	7.0
3006	First	S/W	44.5	36.5	9.0	7.0	9.0
3005	Ground	N/W	38.8	30.9	4.0	1.0	4.0
3005	First	N/W	43.1	35.1	8.0	5.0	8.0
3005	Ground	East	51.4	43.6	16.0	14.0	16.0
3005	First	East	52.2	44.4	17.0	14.0	17.0
3005	Ground	S/E	40.6	32.8	6.0	3.0	6.0
3005	First	S/E	44.6	36.7	10.0	7.0	10.0
3005	Ground	S/W	43.0	35.1	8.0	5.0	8.0
3005	First	S/W	46.5	38.6	11.0	9.0	11.0
3004	Ground	N/W	39.3	31.4	4.0	1.0	4.0
3004	First	N/W	43.6	35.7	9.0	6.0	9.0
3004	Ground	N/E	52.6	44.9	18.0	15.0	18.0
3004	First	N/E	53.3	45.5	18.0	15.0	18.0
3004	Ground	S/E	46.5	38.8	12.0	9.0	12.0
3004	First	S/E	52.8	45.1	18.0	15.0	18.0
3004	Ground	S/W	43.7	35.8	9.0	6.0	9.0
3004	First	S/W	48.5	40.7	13.0	11.0	13.0
4002_4003	Ground	N/W	40.4	32.4	5.0	2.0	5.0
4002_4003	First	N/W	44.2	36.2	9.0	6.0	9.0
4002_4003	Ground	N/E	44.9	37.1	10.0	7.0	10.0
4002_4003	First	N/E	49.4	41.6	14.0	12.0	14.0
4002_4003	Ground	S/E	50.7	42.9	16.0	13.0	16.0
4002_4003	First	S/E	54.4	46.7	19.0	17.0	19.0
4002_4003	Ground	S/W	52.7	45.0	18.0	15.0	18.0
4002_4003	First	S/W	53.3	45.5	18.0	16.0	18.0
3003	Ground	N/W	42.0	34.0	7.0	4.0	7.0
3003	First	N/W	45.7	37.8	11.0	8.0	11.0
3003	Ground	N/E	58.8	51.0	24.0	21.0	24.0
3003	First	N/E	59.0	51.3	24.0	21.0	24.0
3003	Ground	S/E	64.2	56.5	29.0	26.0	29.0
3003	First	S/E	64.4	56.6	29.0	27.0	29.0
3003	Ground	S/W	56.5	48.8	21.0	19.0	21.0
3003	First	S/W	57.0	49.3	22.0	19.0	22.0
3018	Ground	N/W	42.1	34.1	7.0	4.0	7.0
3018	First	N/W	45.8	37.9	11.0	8.0	11.0
3018	Ground	N/E	56.1	48.4	21.0	18.0	21.0
3018	First	N/E	56.7	49.0	22.0	19.0	22.0
3018	Ground	S/E	63.8	56.1	29.0	26.0	29.0
3018	First	S/E	64.0	56.2	29.0	26.0	29.0
3018	Ground	S/W	56.1	48.4	21.0	18.0	21.0
3018	First	S/W	56.6	48.8	22.0	19.0	22.0
3017	Ground	N/W	41.9	33.9	7.0	4.0	7.0
3017	First	N/W	45.7	37.8	11.0	8.0	11.0
3017	Ground	N/E	56.1	48.4	21.0	18.0	21.0
3017	First	N/E	56.6	48.8	22.0	19.0	22.0
3017	Ground	S/E	63.8	56.1	29.0	26.0	29.0
3017	First	S/E	63.9	56.1	29.0	26.0	29.0
3017	Ground	S/W	55.7	47.9	21.0	18.0	21.0
3017	First	S/W	55.9	48.1	21.0	18.0	21.0
3016	Ground	N/W	41.9	33.9	7.0	4.0	7.0
3016	First	N/W	45.8	37.9	11.0	8.0	11.0
3016	Ground	N/E	57.4	49.7	22.0	20.0	22.0
3016	First	N/E	57.6	49.9	23.0	20.0	23.0
3016	Ground	S/E	64.2	56.5	29.0	26.0	29.0
3016	First	S/E	64.2	56.5	29.0	27.0	29.0
3016	Ground	S/W	56.6	48.9	22.0	19.0	22.0
3016	First	S/W	56.7	49.0	22.0	19.0	22.0
3014_3015	Ground	N/W	41.8	33.8	7.0	4.0	7.0
3014_3015	First	N/W	45.7	37.8	11.0	8.0	11.0
3014_3015	Ground	N/E	56.3	48.5	21.0	19.0	21.0
3014_3015	First	N/E	56.4	48.7	21.0	19.0	21.0
3014_3015	Ground	S/E	63.8	56.0	29.0	26.0	29.0
3014_3015	First	S/E	63.8	56.1	29.0	26.0	29.0
3014_3015	Ground	S/W	59.3	51.5	24.0	22.0	24.0
3014_3015	First	S/W	59.6	51.8	25.0	22.0	25.0
3024	Ground	North	42.2	34.2	7.0	4.0	7.0
3024	First	North	44.6	36.6	10.0	7.0	10.0
3024	Ground	East	50.5	42.7	15.0	13.0	15.0
3024	First	East	51.1	43.3	16.0	13.0	16.0
3024	Ground	South	45.6	37.8	11.0	8.0	11.0
3024	First	South	50.9	43.1	16.0	13.0	16.0
3024	Ground	West	41.1	33.1	6.0	3.0	6.0
3024	First	West	44.7	36.8	10.0	7.0	10.0
3025	Ground	North	43.0	34.9	8.0	5.0	8.0
3025	First	North	45.2	37.1	10.0	7.0	10.0
3025	Ground	East	44.7	36.9	10.0	7.0	10.0
3025	First	East	49.6	41.8	15.0	12.0	15.0
3025	Ground	South	44.8	37.0	10.0	7.0	10.0
3025	First	South	48.6	40.8	14.0	11.0	14.0
3025	Ground	West	41.6	33.5	7.0	4.0	7.0
3025	First	West	46.3	38.2	11.0	8.0	11.0
3026	Ground	North	44.4	36.3	9.0	6.0	9.0
3026	First	North	46.6	38.5	12.0	8.0	12.0
3026	Ground	East	43.2	35.4	8.0	5.0	8.0
3026	First	East	47.1	39.2	12.0	9.0	12.0
3026	Ground	South	42.8	34.9	8.0	5.0	8.0
3026	First	South	48.3	40.4	13.0	10.0	13.0
3026	Ground	West	48.0	40.0	13.0	10.0	13.0
3026	First	West	49.4	41.3	14.0	11.0	14.0
3027	Ground	North	41.6	33.5	7.0	3.0	7.0
3027	First	North	47.0	38.9	12.0	9.0	12.0
3027	Ground	East	44.3	36.5	9.0	7.0	9.0
3027	First	East	49.0	41.2	14.0	11.0	14.0
3027	Ground	South	46.9	39.0	12.0	9.0	12.0
3027	First	South	49.6	41.8	15.0	12.0	15.0
3027	Ground	West	48.5	40.5	14.0	10.0	14.0
3027	First	West	49.9	41.9	15.0	12.0	15.0
3028	Ground	North	47.9	39.8	13.0	10.0	13.0
3028	First	North	49.1	41.0	14.0	11.0	14.0
3028	Ground	East	44.7	36.9	10.0	7.0	10.0
3028	First	East	49.8	42.0	15.0	12.0	15.0
3028	Ground	South	44.7	36.9	10.0	7.0	10.0
3028	First	South	51.0	43.1	16.0	13.0	16.0
3028	Ground	West	52.9	44.9	18.0	15.0	18.0
3028	First	West	53.4	45.4	18.0	15.0	18.0
3022_3023	Ground	N/W	40.9	32.9	6.0	3.0	6.0
3022_3023	First	N/W	44.8	36.8	10.0	7.0	10.0
3022_3023	Ground	N/E	52.3	44.6	17.0	15.0	17.0
3022_3023	First	N/E	52.8	45.1	18.0	15.0	18.0
3022_3023	Ground	S/E	46.8	39.0	12.0	9.0	12.0
3022_3023	First	S/E	55.9	48.2	21.0	18.0	21.0
3022_3023	Ground	S/W	45.1	37.3	10.0	7.0	10.0
30							

Noise Assessment
S Wokingham Parcel R10, Land South of Waterloo Crescent



Plot No	Floor	Elevation	Façade		Window Req		Window Req
			Day	Night	Rw+Ctr	Overall	Rw+Ctr
			LAeq	LAeq			
4077	Ground	N/W	60.8	52.3	26.0	26.0	26.0
4077	First	N/W	61.1	52.6	26.0	23.0	26.0
4077	Second	Thir d	61.1	52.6	26.0	23.0	26.0
4077	Second	Thir d	57.4	48.9	22.0	19.0	22.0
4077	Ground	S/E	42.5	34.2	8.0	4.0	8.0
4077	First	S/E	46.9	38.6	12.0	9.0	12.0
4077	Second	Thir d	48.3	40.0	13.0	10.0	13.0
4077	Second	Thir d	48.7	40.2	14.0	10.0	14.0
4078	Ground	N/W	61.6	53.1	27.0	23.0	27.0
4078	First	N/W	61.8	53.2	27.0	23.0	27.0
4078	Second	Thir d	61.8	53.3	27.0	23.0	27.0
4078	Ground	N/E	58.3	49.8	23.0	20.0	23.0
4078	First	N/E	58.5	49.9	23.0	20.0	23.0
4078	Second	Thir d	58.6	50.0	24.0	20.0	24.0
4078	Ground	S/E	42.8	34.4	8.0	4.0	8.0
4078	First	S/E	46.8	38.5	12.0	9.0	12.0
4078	Second	Thir d	48.3	39.9	13.0	10.0	13.0
4078	Second	Thir d	58.1	49.5	23.0	20.0	23.0
4086	Ground	N/W	62.7	54.1	28.0	24.0	28.0
4086	First	N/W	62.8	54.3	28.0	24.0	28.0
4086	Second	Thir d	62.8	54.3	28.0	24.0	28.0
4086	Second	Thir d	58.8	50.3	24.0	20.0	24.0
4086	Ground	S/E	42.0	33.6	7.0	4.0	7.0
4086	First	S/E	46.2	37.8	11.0	8.0	11.0
4086	Second	Thir d	48.1	39.7	13.0	10.0	13.0
4086	Ground	S/W	58.9	50.4	24.0	20.0	24.0
4086	First	S/W	59.2	50.7	24.0	21.0	24.0
4086	Second	Thir d	59.3	50.8	24.0	21.0	24.0
4087 4088	Ground	N/W	63.1	54.5	28.0	25.0	28.0
4087 4088	First	N/W	63.2	54.7	28.0	25.0	28.0
4087 4088	Second	Thir d	63.2	54.7	28.0	25.0	28.0
4087 4088	Second	Thir d	59.5	51.0	25.0	21.0	25.0
4087 4088	Ground	S/E	41.1	32.7	6.0	3.0	6.0
4087 4088	First	S/E	45.4	36.9	10.0	7.0	10.0
4087 4088	Second	Thir d	47.5	39.1	13.0	9.0	13.0
4087 4088	Second	Thir d	58.6	50.1	24.0	20.0	24.0
4089 4090	Ground	North	62.9	54.3	28.0	24.0	28.0
4089 4090	First	North	63.1	54.6	28.0	25.0	28.0
4089 4090	Second	Thir d	63.1	54.6	28.0	25.0	28.0
4089 4090	Second	Thir d	58.5	50.0	23.0	20.0	23.0
4089 4090	Ground	South	41.2	32.8	6.0	3.0	6.0
4089 4090	First	South	45.1	36.7	10.0	7.0	10.0
4089 4090	Second	Thir d	47.2	38.7	12.0	9.0	12.0
4089 4090	Second	Thir d	59.6	51.1	25.0	21.0	25.0
4091 4092	Ground	North	62.2	53.6	27.0	24.0	27.0
4091 4092	First	North	62.5	54.0	27.0	24.0	27.0
4091 4092	Second	Thir d	62.5	54.0	28.0	24.0	28.0
4091 4092	Second	Thir d	57.5	49.0	23.0	19.0	23.0
4091 4092	Ground	South	41.7	33.3	7.0	3.0	7.0
4091 4092	First	South	45.8	37.4	11.0	7.0	11.0
4091 4092	Second	Thir d	47.5	39.1	13.0	9.0	13.0
4091 4092	Second	Thir d	58.7	50.2	24.0	20.0	24.0
4093	Ground	North	61.7	53.2	27.0	23.0	27.0
4093	First	North	62.1	53.6	27.0	24.0	27.0
4093	Second	Thir d	62.2	53.7	27.0	24.0	27.0
4093	Ground	East	57.9	49.3	23.0	19.0	23.0
4093	First	East	58.4	49.9	23.0	20.0	23.0
4093	Second	Thir d	58.5	50.0	24.0	20.0	24.0
4093	Ground	South	42.0	33.6	7.0	4.0	7.0
4093	First	South	45.6	37.1	11.0	7.0	11.0
4093	Second	Thir d	47.3	38.8	12.0	9.0	12.0
4093	Second	Thir d	57.6	49.1	23.0	19.0	23.0
4100 4101	Ground	North	61.3	52.8	26.0	23.0	26.0
4100 4101	First	North	61.8	53.2	27.0	23.0	27.0
4100 4101	Second	Thir d	61.8	53.3	27.0	23.0	27.0
4100 4101	Second	Thir d	57.1	48.5	22.0	19.0	22.0
4100 4101	Ground	South	41.3	33.0	6.0	3.0	6.0
4100 4101	First	South	45.0	36.6	10.0	7.0	10.0
4100 4101	Second	Thir d	46.7	38.3	12.0	8.0	12.0
4100 4101	Ground	West	58.1	49.5	23.0	20.0	23.0
4100 4101	First	West	58.3	49.8	23.0	20.0	23.0
4100 4101	Second	Thir d	58.4	49.9	23.0	20.0	23.0
4102 4103	Ground	North	61.1	52.6	26.0	23.0	26.0
4102 4103	First	North	61.6	53.1	27.0	23.0	27.0
4102 4103	Second	Thir d	61.7	53.1	27.0	23.0	27.0
4102 4103	Second	Thir d	57.2	48.7	22.0	19.0	22.0
4102 4103	Ground	South	41.2	32.9	6.0	3.0	6.0
4102 4103	First	South	44.5	36.1	9.0	6.0	9.0
4102 4103	Second	Thir d	46.3	37.9	11.0	8.0	11.0
4102 4103	Second	Thir d	56.9	48.4	22.0	18.0	22.0
4104	Ground	North	61.0	52.4	26.0	22.0	26.0
4104	First	North	61.5	53.0	27.0	23.0	27.0
4104	Second	Thir d	61.6	53.1	27.0	23.0	27.0
4104	Ground	East	57.3	48.8	22.0	19.0	22.0
4104	First	East	58.1	49.5	23.0	20.0	23.0
4104	Second	Thir d	58.2	49.7	23.0	20.0	23.0
4104	Ground	South	41.4	33.0	6.0	3.0	6.0
4104	First	South	45.2	36.8	10.0	7.0	10.0
4104	Second	Thir d	46.8	38.3	12.0	8.0	12.0
4104	Second	Thir d	57.3	48.8	22.0	19.0	22.0
3076 3077	Ground	North	56.6	48.0	22.0	18.0	22.0
3076 3077	First	North	57.0	48.5	22.0	18.0	22.0
3076 3077	Second	Thir d	57.1	48.6	22.0	19.0	22.0
3076 3077	Second	Thir d	53.2	44.7	18.0	15.0	18.0
3076 3077	Ground	South	39.5	31.4	4.0	1.0	4.0
3076 3077	First	South	42.4	34.3	7.0	4.0	7.0
3076 3077	Second	Thir d	44.0	35.8	9.0	6.0	9.0
3076 3077	Second	Thir d	54.1	45.5	19.0	16.0	19.0
3074 3075	Ground	North	56.8	48.2	22.0	18.0	22.0
3074 3075	First	North	57.2	48.7	22.0	19.0	22.0
3074 3075	Second	Thir d	57.3	48.8	22.0	19.0	22.0
3074 3075	Second	Thir d	53.7	45.1	19.0	15.0	19.0
3074 3075	Ground	South	39.8	31.8	5.0	2.0	5.0
3074 3075	First	South	42.6	34.5	8.0	5.0	8.0
3074 3075	Second	Thir d	44.2	36.0	9.0	6.0	9.0
3074 3075	Second	Thir d	53.5	45.0	18.0	15.0	18.0
3072 3073	Ground	North	56.9	48.4	22.0	18.0	22.0
3072 3073	First	North	57.4	48.8	22.0	19.0	22.0
3072 3073	Second	Thir d	57.5	48.9	22.0	19.0	22.0
3072 3073	Second	Thir d	53.8	45.3	19.0	15.0	19.0
3072 3073	Ground	South	40.1	32.2	5.0	2.0	5.0
3072 3073	First	South	43.1	35.0	8.0	5.0	8.0
3072 3073	Second	Thir d	44.6	36.5	10.0	6.0	10.0
3072 3073	Second	Thir d	53.4	44.9	18.0	15.0	18.0
3070 3071	Ground	North	57.2	48.7	22.0	19.0	22.0
3070 3071	First	North	57.6	49.0	23.0	19.0	23.0
3070 3071	Second	Thir d	57.6	49.1	23.0	19.0	23.0
3070 3071	Second	Thir d	54.1	45.6	19.0	16.0	19.0
3070 3071	Ground	South	40.7	32.7	6.0	3.0	6.0
3070 3071	First	South	43.6	35.6	9.0	6.0	9.0
3070 3071	Second	Thir d	45.1	37.0	10.0	7.0	10.0
3070 3071	Second	Thir d	53.5	45.0	19.0	15.0	19.0
3068 3069	Ground	North	57.4	48.8	22.0	19.0	22.0
3068 3069	First	North	57.7	49.2	23.0	19.0	23.0
3068 3069	Second	Thir d	57.8	49.3	23.0	19.0	23.0
3068 3069	Second	Thir d	54.4	45.9	19.0	16.0	19.0
3068 3069	Ground	South	41.0	33.0	6.0	3.0	6.0
3068 3069	First	South	44.1	36.1	9.0	6.0	9.0
3068 3069	Second	Thir d	45.5	37.5	11.0	7.0	11.0
3068 3069	Second	Thir d	53.6	45.1	19.0	15.0	19.0
4040	Ground	N/W	57.8	49.3	23.0	19.0	23.0
4040	First	N/W	58.3	49.8	23.0	20.0	23.0
4040	Second	Thir d	58.4	49.9	23.0	20.0	23.0
4040	Second	Thir d	55.8	47.4	21.0	17.0	21.0
4040	Ground	S/E	42.9	35.0	8.0	5.0	8.0
4040	First	S/E	46.9	39.0	12.0	9.0	12.0
4040	Second	Thir d	48.0	40.0	13.0	10.0	13.0
4040	Ground	S/W	52.6	44.1	18.0	14.0	18.0
4040	First	S/W	53.1	44.6	18.0	15.0	18.0
4040	Second	Thir d	53.3	44.8	18.0	15.0	18.0
4041 4042	Ground	N/W	58.8	50.3	24.0	20.0	24.0
4041 4042	First	N/W	59.2	50.7	24.0	21.0	24.0
4041 4042	Second	Thir d	59.3	50.7	24.0	21.0	24.0
4041 4042	Second	Thir d	58.1	49.6	23.0	20.0	23.0
4041 4042	Ground	S/E	44.1	36.2	9.0	6.0	9.0
4041 4042	First	S/E	48.1	40.2	13.0	10.0	13.0
4041 4042	Second	Thir d	48.9	40.9	14.0	11.0	14.0
4041 4042	Second	Thir d	53.9	45.4	19.0	15.0	19.0
3056 3057	Ground	North	44.9	36.4	10.0	6.0	10.0
3056 3057	First	North	49.3	40.8	14.0	11.0	14.0
3056 3057	Second	Thir d	50.2	41.7	15.0	12.0	15.0
3056 3057	Ground	East	42.1	33.8	7.0	4.0	7.0
3056 3057	First	East	45.9	37.6	11.0	8.0	11.0
3056 3057	Second	Thir d	47.2	38.8	12.0	9.0	12.0
3056 3057	Ground	South	39.8	31.9	5.0	2.0	5.0
3056 3057	First	South	42.3	34.3	7.0	4.0	7.0
3056 3057	Second	Thir d	43.7	35.6	9.0	6.0	9.0
3056 3057	Ground	West	43.1	34.6	8.0	5.0	8.0
3056 3057	First	West	47.7	39.2	13.0	9.0	13.0
3056 3057	Second	Thir d	48.6	40.2	14.0	10.0	14.0
4030 4031	Second	Thir d	58.4	50.4	23.0	20.0	23.0
4030 4031	Ground	East	61.4	53.7	26.0	24.0	26.0
4030 4031	First	East	61.8	54.0	27.0	24.0	27.0
4030 4031	Second	Thir d	6				

Noise Assessment

S Wokingham Parcel R10, Land South of Waterloo Crescent



Plot No	Floor	Elevation	Façade		Window Req		Window Req
			Day	Night	Rw+Ctr	Rw+Ctr	Overall
			LAeq	LAeq			
4019 4020	Second	Third	57.0	49.3	22.0	19.0	22.0
4019 4020	Ground	East	62.1	54.4	27.0	24.0	27.0
4019 4020	First	East	62.4	54.6	27.0	25.0	27.0
4019 4020	Second	Thirid	62.4	54.7	27.0	25.0	27.0
4019 4020	Second	Thirid	58.1	50.4	23.0	20.0	23.0
4019 4020	Ground	West	42.6	34.5	8.0	4.0	8.0
4019 4020	First	West	45.5	37.5	11.0	8.0	11.0
4019 4020	Second	Thirid	47.1	39.1	12.0	9.0	12.0
4021	Second	Thirid	58.7	50.9	24.0	21.0	24.0
4021	Ground	S/E	63.5	55.8	28.0	26.0	28.0
4021	First	S/E	63.6	55.9	29.0	26.0	29.0
4021	Second	Thirid	63.6	55.9	29.0	26.0	29.0
4021	Ground	S/W	60.0	52.2	25.0	22.0	25.0
4021	First	S/W	60.1	52.4	25.0	22.0	25.0
4021	Second	Thirid	60.2	52.5	25.0	22.0	25.0
4021	Ground	N/W	42.2	34.2	7.0	4.0	7.0
4021	First	N/W	45.7	37.7	11.0	8.0	11.0
4021	Second	Thirid	47.4	39.4	12.0	9.0	12.0
3089 3090	Ground	North	43.5	35.6	9.0	6.0	9.0
3089 3090	First	North	45.5	37.5	11.0	7.0	11.0
3089 3090	Second	Thirid	46.5	38.5	12.0	8.0	12.0
3089 3090	Ground	East	46.0	38.3	11.0	8.0	11.0
3089 3090	First	East	47.2	39.4	12.0	9.0	12.0
3089 3090	Second	Thirid	47.8	39.9	13.0	10.0	13.0
3089 3090	Ground	South	43.3	35.5	8.0	5.0	8.0
3089 3090	First	South	45.2	37.3	10.0	7.0	10.0
3089 3090	Second	Thirid	46.1	38.3	11.0	8.0	11.0
3089 3090	Ground	West	41.4	33.1	6.0	3.0	6.0
3089 3090	First	West	44.4	36.2	9.0	6.0	9.0
3089 3090	Second	Thirid	45.6	37.4	11.0	7.0	11.0
3107 3108	Ground	N/W	41.0	32.6	6.0	3.0	6.0
3107 3108	First	N/W	43.6	35.3	9.0	5.0	9.0
3107 3108	Second	Thirid	44.7	36.5	10.0	6.0	10.0
3107 3108	Ground	N/E	45.8	38.0	11.0	8.0	11.0
3107 3108	First	N/E	47.1	39.2	12.0	9.0	12.0
3107 3108	Second	Thirid	47.7	39.7	13.0	10.0	13.0
3107 3108	Ground	S/E	47.7	39.9	13.0	10.0	13.0
3107 3108	First	S/E	48.3	40.6	13.0	11.0	13.0
3107 3108	Second	Thirid	48.7	40.9	14.0	11.0	14.0
3107 3108	Ground	S/W	45.5	37.7	11.0	8.0	11.0
3107 3108	First	S/W	46.6	38.8	12.0	9.0	12.0
3107 3108	Second	Thirid	47.2	39.4	12.0	9.0	12.0
4001	Ground	N/W	41.9	33.9	7.0	4.0	7.0
4001	First	N/W	45.3	37.3	10.0	7.0	10.0
4001	Second	Thirid	47.0	39.1	12.0	9.0	12.0
4001	Ground	N/E	60.0	52.2	25.0	22.0	25.0
4001	First	N/E	60.1	52.3	25.0	22.0	25.0
4001	Second	Thirid	60.1	52.4	25.0	22.0	25.0
4001	Ground	S/E	64.3	56.5	29.0	27.0	29.0
4001	First	S/E	64.4	56.7	29.0	27.0	29.0
4001	Second	Thirid	64.4	56.7	29.0	27.0	29.0
4001	Ground	S/W	59.9	52.2	25.0	22.0	25.0
4001	First	S/W	60.2	52.4	25.0	22.0	25.0
4001	Second	Thirid	60.2	52.5	25.0	23.0	25.0
4015	Ground	N/W	41.5	33.6	7.0	4.0	7.0
4015	First	N/W	45.4	37.4	10.0	7.0	10.0
4015	Second	Thirid	47.1	39.2	12.0	9.0	12.0
4015	Second	Thirid	58.2	50.5	23.0	20.0	23.0
4015	Ground	S/E	64.0	56.3	29.0	26.0	29.0
4015	First	S/E	64.1	56.4	29.0	26.0	29.0
4015	Second	Thirid	64.1	56.4	29.0	26.0	29.0
4015	Ground	S/W	59.6	51.8	25.0	22.0	25.0
4015	First	S/W	59.7	52.0	25.0	22.0	25.0
4015	Second	Thirid	59.8	52.1	25.0	22.0	25.0
4013 4014	Ground	N/W	42.2	34.2	7.0	4.0	7.0
4013 4014	First	N/W	45.4	37.4	10.0	7.0	10.0
4013 4014	Second	Thirid	47.0	39.1	12.0	9.0	12.0
4013 4014	Second	Thirid	58.0	50.2	23.0	20.0	23.0
4013 4014	Ground	S/E	63.7	56.0	29.0	26.0	29.0
4013 4014	First	S/E	63.8	56.1	29.0	26.0	29.0
4013 4014	Second	Thirid	63.8	56.1	29.0	26.0	29.0
4013 4014	Second	Thirid	58.3	50.6	23.0	21.0	23.0
4011 4012	Ground	N/W	42.3	34.2	7.0	4.0	7.0
4011 4012	First	N/W	45.5	37.5	10.0	7.0	10.0
4011 4012	Second	Thirid	47.1	39.2	12.0	9.0	12.0
4011 4012	Second	Thirid	56.2	48.5	21.0	18.0	21.0
4011 4012	Ground	S/E	63.6	55.9	29.0	26.0	29.0
4011 4012	First	S/E	63.7	56.0	29.0	26.0	29.0
4011 4012	Second	Thirid	63.7	56.0	29.0	26.0	29.0
4011 4012	Second	Thirid	58.2	50.5	23.0	20.0	23.0
4010	Ground	N/W	42.3	34.3	7.0	4.0	7.0
4010	First	N/W	45.6	37.7	11.0	8.0	11.0
4010	Second	Thirid	47.3	39.4	12.0	9.0	12.0
4010	Ground	N/E	59.7	52.0	25.0	22.0	25.0
4010	First	N/E	59.9	52.1	25.0	22.0	25.0
4010	Second	Thirid	59.9	52.2	25.0	22.0	25.0
4010	Ground	S/E	63.9	56.1	29.0	26.0	29.0
4010	First	S/E	63.9	56.2	29.0	26.0	29.0
4010	Second	Thirid	63.9	56.2	29.0	26.0	29.0
4010	Second	Thirid	56.6	48.9	22.0	19.0	22.0
4067 4075	Ground	N/W	60.6	52.1	26.0	22.0	26.0
4067 4075	First	N/W	60.7	52.2	26.0	22.0	26.0
4067 4075	Second	Thirid	60.7	52.2	26.0	22.0	26.0
4067 4075	Ground	N/E	41.7	33.2	7.0	3.0	7.0
4067 4075	First	N/E	46.8	38.3	12.0	8.0	12.0
4067 4075	Second	Thirid	55.0	46.5	20.0	16.0	20.0
4067 4075	Ground	S/E	48.9	40.8	14.0	11.0	14.0
4067 4075	First	S/E	49.8	41.7	15.0	12.0	15.0
4067 4075	Second	Thirid	50.7	42.6	16.0	13.0	16.0
4067 4075	Ground	S/W	57.1	48.8	22.0	19.0	22.0
4067 4075	First	S/W	57.3	49.0	22.0	19.0	22.0
4067 4075	Second	Thirid	57.5	49.1	22.0	19.0	22.0
3078 3088	Ground	West	51.3	42.8	16.0	13.0	16.0
3078 3088	First	West	51.9	43.4	17.0	13.0	17.0
3078 3088	Second	Thirid	52.4	43.9	17.0	14.0	17.0
3078 3088	Ground	South	38.5	30.5	4.0	0.0	4.0
3078 3088	First	South	41.4	33.4	6.0	3.0	6.0
3078 3088	Second	Thirid	44.4	36.2	9.0	6.0	9.0
3078 3088	Ground	East	51.8	43.3	17.0	13.0	17.0
3078 3088	First	East	54.2	45.6	19.0	16.0	19.0
3078 3088	Second	Thirid	54.5	46.0	20.0	16.0	20.0
3078 3088	Ground	North	56.1	47.6	21.0	18.0	21.0
3078 3088	First	North	56.6	48.1	22.0	18.0	22.0
3078 3088	Second	Thirid	56.9	48.4	22.0	18.0	22.0
3067	Ground	North	57.6	49.1	23.0	19.0	23.0
3067	First	North	57.9	49.3	23.0	19.0	23.0
3067	Second	Thirid	58.0	49.5	23.0	20.0	23.0
3067	Ground	East	54.6	46.1	20.0	16.0	20.0
3067	First	East	55.0	46.5	20.0	17.0	20.0
3067	Second	Thirid	55.3	46.9	20.0	17.0	20.0
3067	Ground	South	40.8	32.9	6.0	3.0	6.0
3067	First	South	43.9	36.0	9.0	6.0	9.0
3067	Second	Thirid	46.6	38.6	12.0	9.0	12.0
3067	Second	Thirid	54.2	45.7	19.0	16.0	19.0
4043 4066	Ground	N/W	62.6	54.1	28.0	24.0	28.0
4043 4066	First	N/W	62.7	54.1	28.0	24.0	28.0
4043 4066	Second	Thirid	62.7	54.1	28.0	24.0	28.0
4043 4066	Ground	N/E	66.1	57.6	31.0	28.0	31.0
4043 4066	First	N/E	66.2	57.7	31.0	28.0	31.0
4043 4066	Second	Thirid	66.0	57.5	31.0	28.0	31.0
4043 4066	Ground	S/E	61.7	53.9	27.0	24.0	27.0
4043 4066	First	S/E	62.2	54.3	27.0	24.0	27.0
4043 4066	Second	Thirid	62.2	54.4	27.0	24.0	27.0
4043 4066	Ground	S/E	56.1	48.2	21.0	18.0	21.0
4043 4066	First	S/E	56.7	48.9	22.0	19.0	22.0
4043 4066	Second	Thirid	57.1	49.3	22.0	19.0	22.0
4043 4066	Ground	S/W	43.1	35.0	8.0	5.0	8.0
4043 4066	First	S/W	45.7	37.6	11.0	8.0	11.0
4043 4066	Second	Thirid	49.1	40.8	14.0	11.0	14.0
4043 4066	Ground	West	53.4	45.0	18.0	15.0	18.0
4043 4066	First	West	54.4	46.0	19.0	16.0	19.0
4043 4066	Second	Thirid	54.9	46.6	20.0	17.0	20.0
3001 3002	Ground	N/W	41.0	32.9	6.0	3.0	6.0
3001 3002	First	N/W	43.7	35.6	9.0	6.0	9.0
3001 3002	Second	Thirid	47.1	39.2	12.0	9.0	12.0
3001 3002	Ground	N/E	59.6	51.8	25.0	22.0	25.0
3001 3002	First	N/E	59.8	52.0	25.0	22.0	25.0
3001 3002	Second	Thirid	59.9	52.1	25.0	22.0	25.0
3001 3002	Ground	S/E	64.0	56.3	29.0	26.0	29.0
3001 3002	First	S/E	64.2	56.5	29.0	27.0	29.0
3001 3002	Second	Thirid	64.2	56.4	29.0	26.0	29.0
3001 3002	Ground	S/W	58.6	50.8	24.0	21.0	24.0
3001 3002	First	S/W	58.8	51.0	24.0	21.0	24.0
3001 3002	Second	Thirid	59.1	51.4	24.0	21.0	24.0



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