



45 Tilehurst
Road,
Reading, RG1
7TT

Noise and Vibration Impact Assessment

September
2021



Ref: 21-8519

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1. Executive Summary

An assessment has been carried out of the present noise and vibration climate at **45 Tilehurst Road, Reading, RG1 7TT** and the impact of that noise and vibration on the proposed development. The proposed scheme involves the construction of 8 residential units in 2 blocks on a plot of land which is currently disused residential.

The site is located on Tilehurst Road in a predominantly residential area. Located to the immediate west, in a cutting approximately 10m below ground level, is a railway line that serves Reading West station (approximately 350m to the north). The railway runs south from on a single line (with a second line running north) from Reading West station and splits approximately 1km south of the site to serve stations to the south and west of Reading. The line was noted as carrying passenger and freight traffic. To the north, across Tilehurst Road, is Amors Auto Solutions, a vehicle repair workshop. The surrounding areas to the east and south of the site are primarily residential properties with a single small retail premises further to the east.

The assessment is based on the results of a noise and vibration measurement survey that has been carried out over a 24-hr period at the proposed development site and has considered the advice of local and national planning policy and best practice guidance.

The initial site risk assessment identified that the site has a *medium* risk in terms of noise during the day and a *high* risk at night.

It has been identified that the requirements of the Local Authority in respect of internal noise levels can only be achieved through careful consideration of the building envelope. The construction assumptions that have led to this conclusion are:

- **The façade build-up will be a standard brick and block construction (or equivalent) to achieve an R_w of approximately 55 dB.**
- **A typical double glazing system in a 4/12/6 configuration (or equivalent) will be installed to give a Sound Reduction Index (SRI) of 34 dB R_w .**
- **Appropriately specified acoustic trickle vents, with a $D_{n,e,w}$ of at least 40 dB, or an alternative means of ventilation will be installed to allow adequate ventilation without the requirement to open windows.**

The assessment has also shown that the external noise level criteria would be achieved within most of the proposed amenity areas, but not for the rear terraces of the block closest to the railway line and balconies close to the railway line and Tilehurst Road. Access to nearby public amenity areas can off-set the relatively loud noise environment on those proposed balconies.

Vibration has been shown to be at a level where *adverse comment is probable* at night and therefore it has been recommended that vibration mitigation measures are designed into the foundation structure in order to minimise the impact of this vibration. The mitigation measures would only be necessary for the closest of the proposed blocks to the railway line and not for the further block.

Overall, it has been shown that, through careful consideration of the building envelope and foundation construction, the proposed development should avoid future residents being exposed

to harmful levels of noise and vibration. It can therefore be concluded that significant adverse impacts on the health or quality of life of those future residents would be avoided, in line with the aims of the NPPF, NPSE and PPG-Noise.

2. Introduction

This report has been prepared to support the planning application for the proposed development at **45 Tilehurst Road, Reading, RG1 7TT**. The proposed scheme involves the construction of 8 residential units in 2 blocks on a plot of land which is currently disused residential.

The report assesses, through on-site noise and vibration measurements, the impact of the existing noise and vibration climate on the proposed development.

A glossary of acoustic terminology is provided in **Appendix 1**.

The site is located on Tilehurst Road in a predominantly residential area. Located to the immediate west, in a cutting approximately 10m below ground level, is a railway line that serves Reading West station (approximately 350m to the north). The railway runs south from on a single line (with a second line running north) from Reading West station and splits approximately 1km south of the site to serve stations to the south and west of Reading. The line was noted as carrying passenger and freight traffic. To the north, across Tilehurst Road, is Amors Auto Solutions, a vehicle repair workshop. The surrounding areas to the east and south of the site are primarily residential properties with a single small retail premises further to the east.

The location of the proposed development site is provided in **Figure 2.1** and the proposed site layout is provided in **Figure 2.2**.



Figure 2.1: Site Location

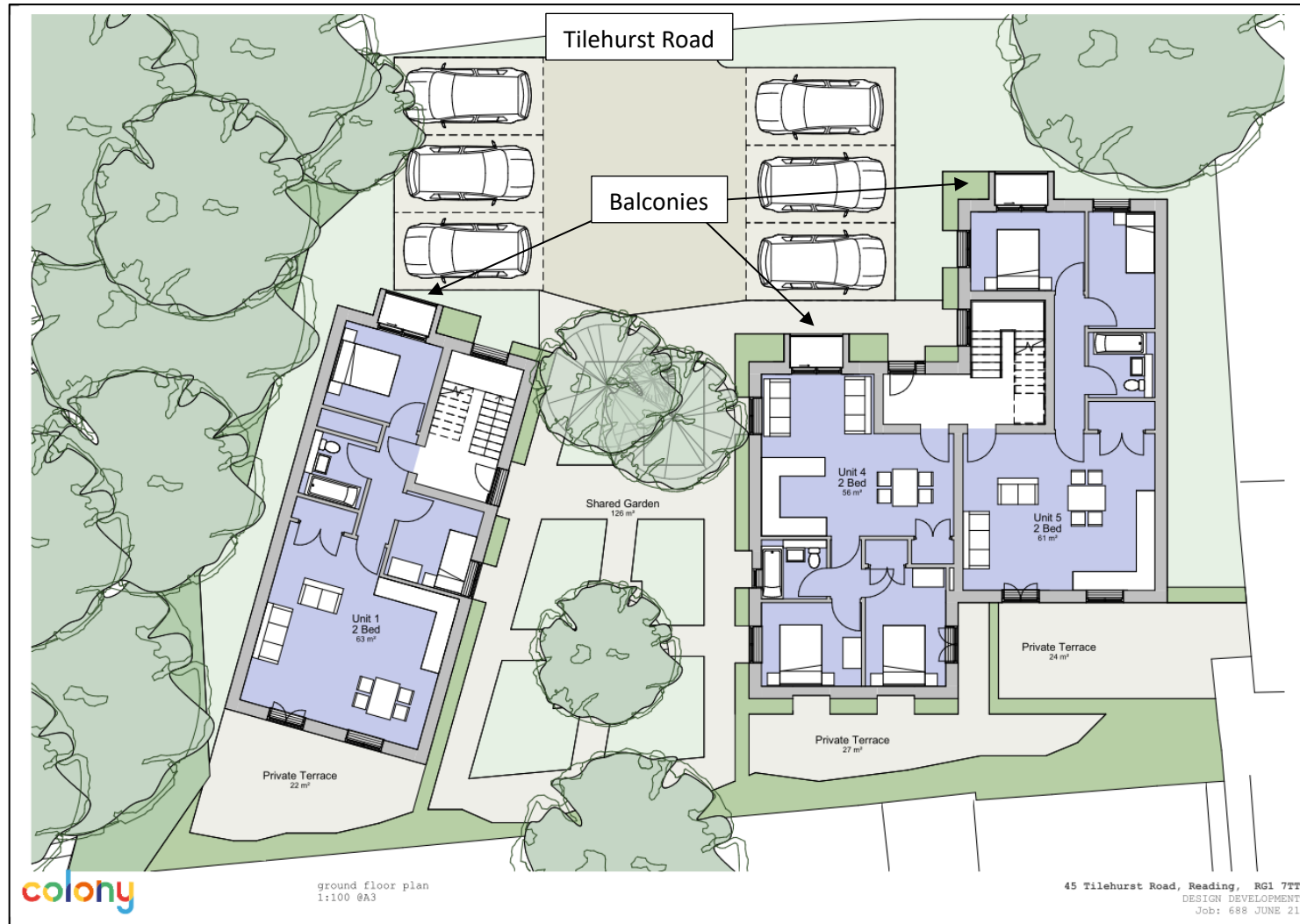


Figure 2.2: Proposed Site Layout

3. Planning Policy

3.1. National Planning Policy Framework

The National Planning Policy Framework (NPPF) was released in March 2012 and last updated in July 2021. The purpose of the planning system is to contribute to the achievement of sustainable development and to encourage good design. There are three dimensions to sustainable development: economic, social and environmental.

Central to the NPPF, paragraph 10 states: *'At the heart of the National Planning Policy Framework is a presumption in favour of [permitting] sustainable development'*. This is expanded upon in paragraph 11, where it is stated:

'...For decision-taking this means:

- *approving development proposals that accord with an up-to-date development plan without delay; or*
- *where there are no relevant development plan policies, or the policies which are most important for determining the application are out-of-date, granting permission unless:*
 - *the application of policies in this Framework that protect areas or assets of particular importance provides a clear reason for refusing the development proposed; or*
 - *any adverse impacts of doing so would significantly and demonstrably outweigh the benefits, when assessed against the policies in this Framework taken as a whole'*

Paragraph 174 states *'Planning policies and decisions should contribute to and enhance the natural and local environment by... preventing new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by, unacceptable levels of... noise pollution...'*

Paragraph 185 states: *'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:*

- *mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life (see Explanatory Note to the Noise Policy Statement for England (DEFRA)).*
- *identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and*
- *limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.'*

3.2. Noise Policy Statement for England

The Noise Policy Statement for England (NPSE) aims to *'through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:*

- *avoid significant adverse impacts on health and quality of life;*

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

3.3. Local Planning Policy

The site is located within the administrative boundary of Reading Borough Council. Policy EN16 from the Reading Borough Local Plan (adopted November 2019) is relevant to noise impact on the proposed development, and states:

“EN16: POLLUTION AND WATER RESOURCES

Development will only be permitted where it would not be damaging to the environment and sensitive receptors through land, noise or light pollution; where it would result in no deterioration in, or ideally enhance, ground and surface water quality; and where adequate water resources, sewerage and wastewater treatment infrastructure will be in place to support the proposed development prior to occupation.

Proposals for development that are sensitive to the effects of noise or light pollution will only be permitted in areas where they will not be subject to high levels of such pollution, unless adequate mitigation measures are provided to minimise the impact of such pollution.

Development will only be permitted on land affected by contamination where it is demonstrated that the contamination and land gas can be satisfactorily managed or remediated so that it is suitable for the proposed end use and will not impact on the groundwater environment, human health, buildings and the wider environment, during demolition and construction phases as well as during the future use of the site.”

The Local Plan provides further guidance on noise within the same section as Policy EN16 as below:

“Exposure to high levels of noise can have a significant effect on human health. This policy deals with noise issues in general, whilst policy EN17 deals particularly with noise-generating equipment. It is worth noting that there is a Professional Practice Guide on Planning and Noise available which provides guidance on design of residential developments to take account of noise, and taking account of this from the early design stage will help to reduce noise effects on future residents.”

Accordingly, Syntegra will utilise the guidance set out in **Section 4** of this report, which includes the Professional Practice Guidance on Planning and Noise (ProPG) as indicated.

4. Guidance Documents

4.1. Planning Practice Guidance for Noise

The Planning Practice Guidance for Noise (PPG-Noise) was published in March 2014 and last updated in July 2019. The PPG provides advice on how to determine the noise impact on development:

'Plan-making and decision making need to 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.*

In line with the Explanatory Note of the Noise Policy Statement for England, this would include identifying whether the overall effect of the noise exposure (including the impact during the construction phase wherever applicable) is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation. As noise is a complex technical issue, it may be appropriate to seek experienced specialist assistance when applying this policy.'

The document goes on to provide a definition for the levels of noise exposure at which an effect may occur:

'Significant observed adverse effect level: *this is the level of noise exposure above which significant adverse effects on health and quality of life occur.*

Lowest observed adverse effect level: *this is the level of noise exposure above which adverse effects on health and quality of life can be detected.*

No observed effect level: *this is the level of noise exposure below which no effect at all on health and quality of life can be detected.'*

It is important to understand that as the PPG-Noise does not provide any advice with respect to specific noise levels/ limits for different sources of noise, it is appropriate to consider other sources of advice and guidance documents when considering whether new developments would be sensitive to the prevailing acoustic environment.

4.2. Professional Practice Guidance on Planning & Noise.

The Professional Practice Guidance (ProPG) on Planning and Noise for New Residential Development was published in May 2017 by the Association of Noise Consultants (ANC), Institute of Acoustics (IOA) and Chartered Institute of Environmental Health (CIEH). The document has been produced to provide practitioners with guidance on a recommended approach to the management of noise within the planning system in England and provides numerical acoustic standards in line with the objectives of the Government's planning and noise policy. As a collaboration between the ANC, IOA and CIEH the document has been designed to encourage a good acoustic design process and aims to protect people from the harmful effects of noise.

The ProPG notes that it ‘does not constitute an official government code of practice and neither replaces nor provides an authoritative interpretation of the law or government policy on which users should take their own advice as appropriate’.

The ProPG advocates a two-stage approach, first providing an initial noise risk assessment of the proposed development site before undertaking a systematic approach to the noise impact assessment. The results of the initial noise risk assessment are an indication as to how detailed the noise impact assessment will need to be in order to satisfactorily assess all acoustic challenges.

4.2.1. Stage 1: Initial Site Noise Risk Assessment

The initial noise risk assessment compares the site noise levels (which can be obtained by measurement or prediction, or a combination of the two, as appropriate) against a risk scale and determines the risk of adverse effects from noise at the site. The purpose of the initial noise risk assessment is to provide an indication of the level of acoustic challenges at the site. In general, the higher the level of risk identified, the greater the level of detail that will be required within the noise impact assessment in order to satisfactorily demonstrate that adverse impacts will be minimised to an acceptable level.

The initial risk assessment and associated notes are provided in Figure 1 of the ProPG and reproduced in **Table 4.1**.

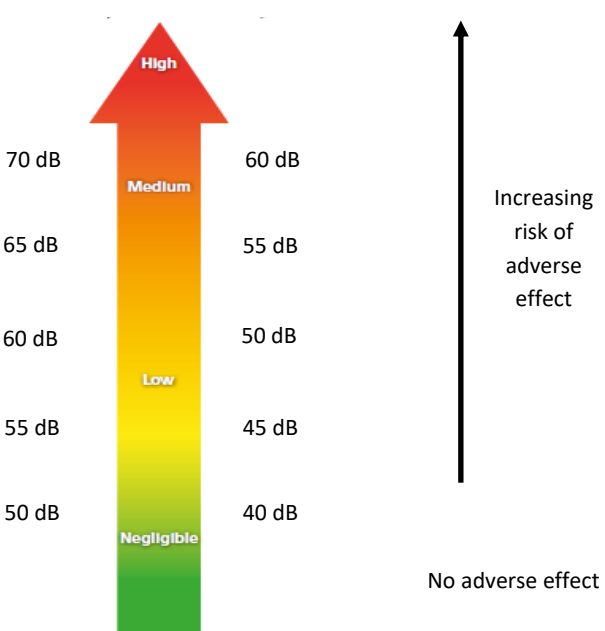
Noise Risk Assessment		Potential Effect	Pre-Planning Application Advice
Indicative Daytime Noise Levels, $L_{Aeq,16hr}$	Indicative Night-time Noise Levels, $L_{Aeq,8hr}$	Without Noise Mitigation	
		High noise levels indicate that there is an increased risk that development may be refused on noise grounds. This risk may be reduced by following a good acoustic design process that is demonstrated in a detailed Acoustic Design Statement (ADS). Applicants are strongly advised to seek expert advice. As noise levels increase, the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised, and which clearly demonstrate that a significant adverse noise impact will be avoided in the finished development. At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development. These noise levels indicate that the development site is likely to be acceptable from a noise perspective, and the application need not normally be delayed on noise grounds.	
		No adverse effect	
Notes: - Indicative noise levels should be assessed without inclusion of the acoustic effect of any scheme specific noise mitigation measures. - Indicative noise levels are the combined free-field noise level from all sources of transport noise and may also include industrial/commercial noise where this is present but is “not dominant”. $L_{Aeq,16hr}$ is for daytime 0700 hrs – 2300 hrs, $L_{Aeq,8hr}$ is for night-time 2300 hrs – 0700 hrs. - An indication that there may be more than 10 noise events at night (2300 hrs – 0700 hrs) with $L_{Amax,F} > 60$ dB means that the site should not be regarded as negligible risk.			

Table 4.1: Stage 1: Initial Site Risk Assessment

Where sites are exposed to industrial or commercial noise that is considered to be “dominant” then an assessment in line with BS 4142:2014 ‘*Methods for rating and assessing industrial and commercial sound*’ should be carried out.

4.2.2. Stage 2: Full Assessment

4.2.2.1. Stage 2: Element 1 – Good Acoustic Design Process

Following a good acoustic design process is an implicit part of achieving good design as required by Government planning and noise policy. It is imperative that acoustic design is considered at an early stage of the development process and the aim should be to avoid “unreasonable” acoustic conditions and prevent “unacceptable” acoustic conditions.

Good acoustic design does not simply mean compliance with the recommended internal and external noise criteria. Instead, an integrated solution should be provided whereby the optimal acoustic outcome is achieved, without design compromises that will adversely affect living conditions and the quality of life of residents or other sustainable design objectives and requirements.

A good acoustic design should consider (in this order):

- ‘*Maximising the spatial separation of noise sources and receptors.*
- ‘*Investigating the necessity and feasibility of reducing existing noise levels and relocating existing noise sources.*
- ‘*Using topography and existing structures (that are likely to last the expected life of the noise-sensitive scheme) to screen the proposed development site from significant sources of noise.*
- ‘*Incorporating noise barriers as part of the scheme to screen the proposed development site from significant sources of noise.*
- ‘*Using the layout of the scheme to reduce noise propagation across the site.*
- ‘*Using the orientation of buildings to reduce the noise exposure of noise-sensitive rooms.*
- ‘*Using the building envelope to mitigate noise to acceptable levels.*’

4.2.2.2. Stage 2: Element 2 – Internal Noise Level Guidelines

The ProPG contains Figure 2, which is a table with associated notes drawing on the advice contained within BS 8233:2014 ‘*Guidance on sound insulation and noise reduction for buildings*’, the World Health Organization’s Guidelines for Community Noise 1999 (WHO guidelines) and current best practice. This table is reproduced in **Table 4.2**.

Activity	Location	07:00 – 23:00	23:00 – 07:00
Resting	Living room	35 dB $L_{Aeq,16hour}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16hour}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$ 45 dB $L_{Amax,F}$ (Note 4)

NOTE 1 The Table provides recommended internal L_{Aeq} target levels for overall noise in the design of a building. These are the sum total of structure-borne and airborne noise sources. Ground-borne noise is assessed separately and is not included as part of these targets, as human response to ground-borne noise varies with many factors such as level, character, timing, occupant expectation and sensitivity.

NOTE 2 The internal L_{Aeq} target levels shown in the Table are based on the existing guidelines issued by the WHO and assume normal diurnal fluctuations in external noise. In cases where local conditions do not follow a typical diurnal pattern, for example on a road serving a port with high levels of traffic at certain times of the night, an appropriate alternative period, e.g. 1 hour, may be used, but the level should be selected to ensure consistency with the internal L_{Aeq} target levels recommended in the Table.

NOTE 3 These internal L_{Aeq} target levels are based on annual average data and do not have to be achieved in all circumstances. For example, it is normal to exclude occasional events, such as fireworks night or New Year's Eve.

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 $L_{Amax,F}$, depending on the character and number of events per night. Sporadic noise events could require separate values. In most circumstances in noise-sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45 dB $L_{Amax,F}$ more than 10 times a night. However, where it is not reasonably practicable to achieve this guideline then the judgement of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number, distribution, predictability and regularity of noise events.

NOTE 5 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 L_{Aeq} target levels should not normally be exceeded, subject to the further advice in Note 7.

NOTE 6 Attention is drawn to the requirements of the Building Regulations.

NOTE 7 Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal L_{Aeq} target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved. The more often internal L_{Aeq} levels start to exceed the internal L_{Aeq} target levels by more than 5 dB, the more that most people are likely to regard them as "unreasonable". Where such exceedances are predicted, applicants should be required to show how the relevant number of rooms affected has been kept to a minimum. Once internal L_{Aeq} levels exceed the target levels by more than 10 dB, they are highly likely to be regarded as "unacceptable" by most people, particularly if such levels occur more than occasionally. Every effort should be made to avoid relevant rooms experiencing "unacceptable" noise levels at all and where such levels are likely to occur frequently, the development should be prevented in its proposed form.

Table 4.2: ProPG Internal Noise Level Guidelines

4.2.2.3. Stage 2: Element 3 – External Amenity Area Noise Assessment

The ProPG considers the advice provided within BS 8233:2014 and the PPG-Noise in respect of external amenity areas, and presents the following advice, which is selected from both documents, in order to carry out a full assessment of noise levels:

- 'If external amenity spaces are an intrinsic part of the overall design, the acoustic environment of those spaces should be considered so that they can be enjoyed as intended.'*
- 'The acoustic environment of external amenity areas that are an intrinsic part of the overall design should always be assessed and noise levels should ideally not be above the range 50 – 55 dB $L_{Aeq,16hr}$.'*

- iii. *‘These guideline values may not be achievable in all circumstances where development might be desirable. In such a situation, development should be designed to achieve the lowest practicable noise levels in these external amenity spaces.’*
- iv. *‘Whether or not external amenity spaces are an intrinsic part of the overall design, consideration of the need to provide access to a quiet or relatively quiet external amenity space forms part of a good acoustic design process’*
- v. *‘Where, despite following a good acoustic design process, significant adverse noise impacts remain on any private external amenity space (e.g. garden or balcony) then that impact may be partially off-set if the residents are provided, through the design of the development or the planning process, with access to:*
 - *A relatively quiet façade (containing openable windows to habitable rooms) or a relatively quiet externally ventilated space (i.e. an enclosed balcony) as part of their dwelling; and/or*
 - *a relatively quiet alternative or additional external amenity space for sole use by a household, (e.g. a garden, roof garden or large open balcony in a different, protected, location); 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, publically accessible, external 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 minute walking distance). The local planning authority could link such provision to the definition and management of Quiet Areas under the Environmental Noise Regulations.’*

4.2.2.4. Stage 2: Element 4 – Assessment of Other Relevant Issues

The final element of Stage 2 is an assessment of ‘other relevant issues’ and the ProPG suggests that the following issues are considered before making any final conclusions with respect to noise impacts:

- i. *‘compliance with relevant national and local policy’*
- ii. *‘magnitude and extent of compliance with ProPG’*
- iii. *‘likely occupants of the development’*
- iv. *‘acoustic design v. unintended adverse consequences’*
- v. *‘acoustic design v. wider planning objectives’.*

The ProPG notes that ‘not all of the issues listed above will arise in every planning application and some may already have been addressed as an inherent part of good acoustic design. In addition, LPAs [Local Planning Authorities] may wish to add other relevant issues depending on local circumstances and priorities.’

4.3. British Standard BS 6472:2008 Part 1

British Standard BS 6472-1:2008 *Guide to evaluation of human exposure to vibration in buildings, Part 1 Vibration sources other than blasting*. This is the British Standard methodology used for measuring and evaluating human exposure to vibration from sources such as railways. The Vibration Dose Value (VDV) is used as a metric to define the level of exposure of the human population to vibration. It is

energetically summed over the day and night-time periods. The day and night-time periods are defined as 0700 hrs – 2300 hrs and 2300 hrs – 0700 hrs respectively.

Table 4.3 summarises the levels of VDV and the corresponding probability of adverse comments.

Place and Time	Low probability of adverse comment (m/s ^{1.75})	Adverse comment possible (m/s ^{1.75})	Adverse comment probable (m/s ^{1.75})
Residential buildings - 16hr day	0.2 - 0.4	0.4 - 0.8	0.8 - 1.6
Residential buildings - 8hr night	0.1 - 0.2	0.2 - 0.4	0.4 - 0.8

Table 4.3: BS 6472 – Vibration Dose Values which might result in various probabilities of adverse comment within residential buildings

Accordingly, the design aim is to minimise the possibility of adverse comment such that the probability is low.

5. Baseline Measurement Survey

5.1. Noise Measurements

In order to determine the extent to which the site is currently affected by noise, a detailed measurement study has been carried out at the site. Measurements have been carried out in order to characterise the existing noise climate over a 24-hour period. The noise climate of the area was dominated by road traffic noise along Tilehurst Road, as well as the surrounding road network. Passing passenger and freight trains were also considered a significant source of noise.

The noise measurements utilised a Svantek 958 Type 1 Precision Sound Level Meter with a current certificate of calibration, the full list of equipment is detailed in **Appendix 3**. Before and after the measurement period the equipment was calibrated in order to ensure that the equipment had remained within reasonable calibration limits (+/- 0.5 dB). Noise Measurements were carried out in consecutive 5 minutes periods with a 1 second resolution.

Measurements were carried out between 1005 hrs on Wednesday 15th September 2021 and 1030 hrs on Thursday 16th September 2021.

During the noise measurement survey the weather conditions ranged from a high of 19°C during the daytime to a low of 9°C overnight. The wind speeds were moderate (approximately 2 – 4 m/s), with occasional stronger gusts, predominantly north-westerly in direction. Cloud cover was noted to be 90% at the start of the survey and 100% at the end with no precipitation noted throughout.

Noise measurements were carried out over a 24-hr period at Measurement Position 1 (MP1) in a free-field location on the boundary with the railway line, approximately 2m above ground level. Noise at this position was dominated by road traffic along Tilehurst Road as well as noise from passenger and freight trains and is considered representative of the closest proposed façades to both the railway line and Tilehurst Road.

The noise monitoring position is shown in **Figure 5.1**.



Figure 5.1: Noise Monitoring Location

Table 5.1 below displays a summary of the measured noise levels and detailed measurement results are presented in **Appendix 4**.

Measurement Position	Period (hours)	$L_{Aeq,T}$ (dB)	L_{Amax} (dB)
MP1	Daytime (0700 – 2300)	66	74
	Night-time (2300 – 0700)	63	79

Table 5.1: Summary of Free Field Semi-Permanent Noise Levels

Note: The average noise levels stated are logarithmic for L_{Aeq} . The $L_{Amax,F}$ noise levels stated are the arithmetic average of the hourly noise levels during the daytime (0700 hrs – 2300 hrs) and the 10th highest $L_{Amax,F,5min}$ noise level at night (2300 hrs – 0700 hrs), as noted in Table 4.2.

5.2. Vibration Measurements

Vibration measurements to obtain the VDV were carried out between 1005 hrs on Wednesday 15th September 2021 and 1030 hrs on Thursday 16th September 2021. A Svantek 958 vibration meter was utilised with an SV84 tri-axial accelerometer.

Vibration measurements were carried out utilising a vibration monitoring position which was located at MP1 adjacent to the noise monitoring position. The accelerometer was mounted on a metal plate on the ground in accordance with ISO 14837-1:2005 “*Mechanical vibration – Ground-borne noise and vibration arising from rail systems – Part 1: General guidance*”. The mounting plate (DIN plate) meets the requirements identified in the DIN standard 45669-2:2005. The x-axis of the accelerometer was positioned horizontally and parallel to the railway line and the y-axis was horizontal and perpendicular to the railway line. The z-axis of the accelerometer recorded the vertical vibration levels. The monitoring position (MP1) is shown in **Figure 5.1** above and is considered representative of the closest point of the nearest building to the railway line.

The total VDV levels for each direction of motion (x, y and z) over the measurement period are presented in **Table 5.2**. Detailed results are provided in **Appendix 4**.

Period (hrs)	Measured Vibration Dose Value (VDV) $m/s^{1.75}$		
	X	Y	Z
Daytime (0700 – 2300)	0.01	0.01	0.11
Night-time (2300 – 0700)	0.01	0.01	0.13

Table 5.2: VDV for the daytime and night-time periods

6. Initial Site Risk Assessment

The initial site risk assessment has been carried out by comparing the results of the noise measurement survey against the criteria presented in **Table 4.1**. The outcome of the initial site risk assessment is presented in **Table 6.1**.

Measurement Position	Daytime Ambient Noise Level $L_{Aeq,16hr}$ (dB)	Initial Noise Risk Assessment (Daytime)	Night-time Ambient Noise Level $L_{Aeq,8hr}$ (dB)	Initial Noise Risk Assessment (Night-time)
MP1	66	Medium	63	High

Table 6.1: Initial Site Risk Assessment

The results of the initial site risk assessment based on the measured noise levels indicate that the site has a *medium* risk in terms of noise during the day and *high* risk during the night. The pre-application advice associated with this risk category is:

High: ‘High noise levels indicate that there is an increased risk that development may be refused on noise grounds. This risk may be reduced by following a good acoustic design process that is demonstrated in a detailed Acoustic Design Statement (ADS). Applicants are strongly advised to seek expert advice.’

Medium: ‘As noise levels increase, the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised, and which clearly demonstrate that a significant adverse noise impact will be avoided in the finished development.’

7. Full Assessment

7.1. Internal Noise Level Assessment

Note 5 of **Table 4.2** suggests that internal noise levels should ideally be achieved in as many properties as possible with windows open. Due to the relatively high noise levels present at the site, those habitable rooms within the block closest to the railway line and those facing Tilehurst Road will not be able to achieve the requirement with windows open, and therefore the sound insulation of the building façade will be required to mitigate noise levels. In carrying out our assessment, Syntegra have therefore made the following assumptions:

- The façade build-up will be a standard brick and block construction (or equivalent) to achieve an R_w of approximately 55 dB.
- A typical double glazing system in a 6/12/6.4 configuration (or equivalent) will be installed to give a Sound Reduction Index (SRI) of 34 dB R_w .
- Appropriately specified acoustic trickle vents, with a $D_{n,e,w}$ of at least 40 dB, or an alternative means of ventilation will be installed to allow adequate ventilation without the requirement to open windows.

Table 7.1 identifies the likely L_{Aeq} and L_{Amax} internal noise levels, assuming windows closed, utilising the *Simple Calculation Method* described in BS 8233:2014 for the worst affected façade. It can be seen that habitable rooms within the block closest to the railway line and those facing Tilehurst Road will achieve the requirements of the ProPG with closed windows.

Assessment Location	Period (hrs)	External Noise Levels (dB) (ref. Table 5.1)	Sound Insulation of Glazing (dBA)	Internal Noise Levels (dB)	Compliance with ProPG Criteria
Ambient Noise Level L_{Aeq} (dB)					
Unit 1 Bedroom 1	Daytime (0700 – 2300)	66	34	32	✓
Unit 1 Bedroom 1	Night-time (2300 – 0700)	63	34	29	✓
Maximum Noise Level L_{AFmax} (dB)					
Unit 1 Bedroom 1	Night-time (2300 – 0700)	79	34	45	✓

Table 7.1: Internal Noise Levels

7.2. External Noise Level Assessment

The site layout in **Figure 2.2** above indicates the location of private terraces at the rear of the building as well as balconies on façades facing Tilehurst Road.

The noise levels from **Table 5.1** indicate a daytime noise level of 66 dB $L_{Aeq,16hr}$ at the front of the block closest to the railway line, which would be expected to be reduced by approximately 5-10 dB in the rear private terraces assuming the installation of a standard close boarded timber fence as a boundary

fence surrounding the terrace. Accordingly, noise levels would not be expected to exceed 56 dB $L_{Aeq,16hr}$ in the rear private terraces of the block closest to the railway line.

Similarly in balconies on the block closest to the railway and those closest to Tilehurst Road, a reduction of 5-10 dB assuming a solid balustrade surrounding the balconies, noise levels would not be expected to exceed 56 dB $L_{Aeq,16hr}$.

Noise levels in both the rear terraces of the block closest to the railway and balconies close to the railway line or Tilehurst Road, are higher than the upper guideline criteria set out in the ProPG (55 dB $L_{Aeq,16hr}$). Residents would have access to nearby public amenity areas, such as Prospect Park (less than 1 km from the site), which should partially off-set the relatively high noise levels on the balcony, in line with the advice provided in the ProPG.

Within the rear terraces and balconies of the block further from the railway, noise levels would be expected to be lower and are likely to achieve the upper guideline criteria.

7.3. Vibration Assessment

As the vibration levels were measured externally on the ground, it is necessary to take into account the amplification factors of the proposed building. It has been assumed that an amplification factor of between 2 and 4, due to the height of the building and floor resonances, will occur from the ground vibration measurements obtained on site. The measured vibration data, when adjusted using the worst-case amplification factor of 4 has been compared against the criteria presented in BS 6472. The results of the comparison are presented in **Table 7.2**.

Direction	VDV ($m/s^{-1.75}$)		BS6472: Residential Criterion	
	Daytime	Night-time	Daytime	Night-time
X	0.1	0.1	Below 'Low probability of adverse comment'	'Low probability of adverse comment'
Y	0.1	0.1	Below 'Low probability of adverse comment'	'Low probability of adverse comment'
Z	0.4	0.5	'Adverse comment probable'	'Adverse comment probable'

Table 7.2: Internal Vibration Levels

With reference to **Table 7.2**, it can be seen that the derived internal VDV values have been compared against the assessment criteria within BS 6472. The assessment concludes that, in the worst-case Z-axis, VDV values are within the range where "adverse comment is probable" during both the daytime and night-time periods.

Due to the potential for noticeable vibration within the completed building, vibration isolation measures should be incorporated into the building design. A common approach is to include elastomeric bearing pads into the foundation design in order to minimise the transfer of train-induced vibration into the building structure. The mitigation measures would only be necessary for the closest of the proposed blocks to the railway line and not for the further block.

7.4. Assessment of Other Relevant Issues

The assessment has shown that a reasonable internal noise environment can be achieved, in line with the requirements of the Local Authority, BS 8233 and the ProPG through careful consideration of the building envelope and ventilation requirements. Whilst it would be ideal to achieve the internal level criteria with open windows, it is common to achieve the criteria relying on closed windows in noisier areas. Such as an approach is advocated in the PPG-Noise.

The assessment has also shown that the external noise level criteria would be achieved within most of the proposed amenity areas, but not for the rear terraces of the block closest to the railway line and balconies close to the railway line and Tilehurst Road. Access to nearby public amenity areas can off-set the relatively loud noise environment on those proposed balconies.

Vibration has been shown to be at a level where *adverse comment is probable* at night and therefore it has been recommended that vibration mitigation measures are designed into the foundation structure in order to minimise the impact of this vibration. The mitigation measures would only be necessary for the closest of the proposed blocks to the railway line and not for the further block.

Overall, it has been shown that, through careful consideration of the building envelope and foundation construction, the proposed development should avoid future residents being exposed to harmful levels of noise and vibration. It can therefore be concluded that significant adverse impacts on the health or quality of life of those future residents would be avoided, in line with the aims of the NPPF, NPSE and PPG-Noise.

8. Conclusion

An assessment has been carried out of the present noise and vibration climate at **45 Tilehurst Road, Reading, RG1 7TT** and the impact of that noise on the proposed development.

The assessment is based on the results of a noise and vibration measurement survey that has been carried out over a 24-hr period at the proposed development site and has considered the advice of local and national planning policy and best practice guidance.

The initial site risk assessment identified that the site has a *medium* risk in terms of noise during the day and a *high* risk at night.

It has been identified that the requirements of the Local Authority in respect of internal noise levels can only be achieved through careful consideration of the building envelope. The construction assumptions that have led to this conclusion are:

- **The façade build-up will be a standard brick and block construction (or equivalent) to achieve an R_w of approximately 55 dB.**
- **A typical double glazing system in a 4/12/6 configuration (or equivalent) will be installed to give a Sound Reduction Index (SRI) of 34 dB R_w .**
- **Appropriately specified acoustic trickle vents, with a $D_{n,e,w}$ of at least 40 dB, or an alternative means of ventilation will be installed to allow adequate ventilation without the requirement to open windows.**

The assessment has also shown that the external noise level criteria would be achieved within most of the proposed amenity areas, but not for the rear terraces of the block closest to the railway line and balconies close to the railway line and Tilehurst Road. Access to nearby public amenity areas can off-set the relatively loud noise environment on those proposed balconies.

Vibration has been shown to be at a level where *adverse comment is probable* at night and therefore it has been recommended that vibration mitigation measures are designed into the foundation structure in order to minimise the impact of this vibration. The mitigation measures would only be necessary for the closest of the proposed blocks to the railway line and not for the further block.

Overall, it has been shown that, through careful consideration of the building envelope and foundation construction, the proposed development should avoid future residents being exposed to harmful levels of noise and vibration. It can therefore be concluded that significant adverse impacts on the health or quality of life of those future residents would be avoided, in line with the aims of the NPPF, NPSE and PPG-Noise.

9. Appendix 1: Glossary of Acoustic Terminology

Term	Description
'A'-Weighting	<i>This is the main way of adjusting measured sound pressure levels to take into account human hearing, and our uneven frequency response.</i>
Decibel (dB)	<i>This is a tenth (deci) of a bel. The decibel can be a measure of the magnitude of sound, changes in sound level and a measure of sound insulation. Decibels are not an absolute unit of measurement but are an expression of ratio between two quantities expressed in logarithmic form.</i>
$L_{Aeq,T}$	<i>The equivalent steady sound level in dB containing the same acoustic energy as the actual fluctuating sound level over the given period, T. T may be as short as 1 second when used to describe a single event, or as long as 24 hours when used to describe the noise climate at a specified location. $L_{Aeq,T}$ can be measured directly with an integrating sound level meter.</i>
L_{A10}	<i>The 'A'-weighted sound pressure level of the residual noise in decibels exceeded for 10 per cent of a given time and is the L_{A10T}. The L_{A10} is used to describe the levels of road traffic noise at a particular location.</i>
L_{A50}	<i>The 'A'-weighted sound pressure level of the residual noise in decibels exceeded for 50 per cent of a given time and is the L_{A50T}.</i>
L_{A90}	<i>The 'A'-weighted sound pressure level of the residual noise in decibels exceeded for 90 per cent of a given time and is the L_{A90T}. The L_{A90} is used to describe the background noise levels at a particular location.</i>
L_{Amax}	<i>The 'A'-weighted maximum sound pressure level measured over a measurement period.</i>

10. Appendix 2: Professional Statement

David Yates

David Yates is a full member of the Institute of Acoustics (MIOA) and has over ten years' experience in acoustic consultancy. David has particular expertise in environmental noise providing acoustic consultancy for residential and mixed use planning applications, plant noise and vibration, construction noise and the design of acoustic, noise and vibration control. David is also experienced in providing sound insulation testing and design advice. David is familiar with the application of all relevant standards associated with his work, including but not limited to, BS 4142, BS 8233, BS 7445, BS 6472, BS 5228, BS 140 series, BS 16283 series and BS 717 series. David manages the acoustic department and is responsible for maintaining Syntegra's ANC membership.

11. Appendix 3: List of Equipment

Equipment Type	Manufacturer	Serial Number	Calibration Certification Number	Date of Last Calibration Check
SVAN 958	Svantek	92843	No certificate number provided	February 2021
MK 255 Microphone	Microtech Gefell	20197	No certificate number provided	February 2021
SV12L Preamplifier	Svantek	106885	No certificate number provided	February 2021
SV84 Tri-Axial Accelerometer	Svantek	L6688	No certificate number provided	December 2020

12. Appendix 4: Detailed Noise Measurement Results

Measured Noise levels – MP1

Time	L _{Aeq,T} (dB)	L _{AF(max)} (dB)	L _{A10} (dB)	L _{A90} (dB)
10:00-11:00	69	77	72	64
11:00-12:00	72	75	71	62
12:00-13:00	66	74	68	63
13:00-14:00	65	72	67	63
14:00-15:00	66	76	69	63
15:00-16:00	65	73	65	62
16:00-17:00	65	72	67	62
17:00-18:00	65	75	66	62
18:00-19:00	65	74	67	63
19:00-20:00	65	73	65	63
20:00-21:00	65	74	67	62
21:00-22:00	62	70	64	61
22:00-23:00	63	70	65	60
23:00-00:00	63	73	66	59
00:00-01:00	64	72	66	56
01:00-02:00	62	72	66	54
02:00-03:00	61	66	66	49
03:00-04:00	57	69	61	53
04:00-05:00	63	73	66	55
05:00-06:00	62	73	63	59
06:00-07:00	66	77	68	62
07:00-08:00	65	75	66	64
08:00-09:00	65	75	68	63
09:00-10:00	65	76	67	63
07:00-23:00	66	74	67	62
23:00-07:00	63	72	66	53

Measured Vibration Levels – MP1

Time	Measured Vibration Dose Value (VDV) m/s ^{1.75}		
	X	Y	Z
10:00-11:00	0.01	0.01	0.04
11:00-12:00	0.01	0.01	0.04
12:00-13:00	0.01	0.01	0.05
13:00-14:00	0.01	0.01	0.05
14:00-15:00	0.01	0.01	0.05
15:00-16:00	0.01	0.01	0.05
16:00-17:00	0.01	0.01	0.04
17:00-18:00	0.01	0.01	0.05
18:00-19:00	0.01	0.01	0.05
19:00-20:00	0.01	0.01	0.06
20:00-21:00	0.00	0.00	0.04
21:00-22:00	0.01	0.01	0.07
22:00-23:00	0.00	0.00	0.05
23:00-00:00	0.00	0.00	0.03
00:00-01:00	0.01	0.01	0.12
01:00-02:00	0.00	0.00	0.04
02:00-03:00	0.00	0.01	0.02
03:00-04:00	0.00	0.00	0.02
04:00-05:00	0.00	0.00	0.02
05:00-06:00	0.01	0.01	0.10
06:00-07:00	0.00	0.01	0.05
07:00-08:00	0.01	0.01	0.05
08:00-09:00	0.01	0.01	0.06
09:00-10:00	0.01	0.01	0.05
07:00-23:00	0.01	0.01	0.10
23:00-07:00	0.01	0.01	0.13

MP1 Measured Noise Levels from 1005 hrs on 15/09/2021 to 1030 hrs on 16/09/2021

