Hampton Park – Littlehampton Phase 6b

784-B071906

Noise and Vibration Assessment

Persimmon Homes Ltd

November 2025

TETRA TECH

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Acronyms/Abbreviations

Acronyms/Abbreviations	Definition
CADNA	Computer Aided Noise Abatement
DMRB	Design Manual for Roads and Bridges
HGV	Heavy Goods Vehicle
PPG	Planning Practice Guidance
UDP	Unitary Development Plan
UKAS	United Kingdom Accreditation Service

1.0 Introduction

1.1 Purpose of this Report

This report presents the findings of a noise and vibration assessment to support a planning Application for Phase 6b of the wider Littlehampton development which is understood to consist of the following:

- New residential dwellings adjacent to the southern rail line.
- New outdoor fitness area.

The proposed development is located on a new site at Hampton Park, Littlehampton.

A description of the existing noise environment in and around the site is provided. Noise and vibration surveys have been undertaken and the results used to verify the predicted effects on the proposed residential dwellings.

This report assesses both the existing noise environment and effects vibration from the adjacent rail line on the proposed residential dwellings.

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

1.2 Legislative Context

This report is intended to provide information relevant to the local planning authority and their consultees in support of a planning application for the above proposed development. Policy guidance with respect to noise is found in the National Planning Policy Framework (NPPF), published in December 2024. With regard to noise and planning, the NPPF contains the following statement at Paragraph 198:

> "198. Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:
>
> (a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;

(b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason […]

"200. Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.

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

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

A summary of the effects of noise exposure associated with both noise generating developments and noise sensitive developments is presented within the PPG and repeated below in

Table 1.1.

Table 1.1: PPG Noise Exposure Hierarchy

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

The NPPF, NPSE and PPG do not, however, present absolute noise level criteria which define SOAEL, LOAEL and NOEL which is applicable to all sources of noise in all situations. Therefore, within the context of the Proposed Development, national planning policy and appropriate guidance documents including 'BS 8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings' (2014) have been used. Section 2.0 presents the noise level criteria used as a basis of this assessment.

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

Furthermore, the PPG: Noise identifies at Paragraph: 011 Reference ID: 30-011-20190722 the requirement for developments proposals to incorporate measures to mitigating the impact of noise on residential developments. In particular:

"*Noise impacts may be partially offset if residents have access to one or more of:*

- *a relatively quiet facade (containing windows to habitable rooms) as part of their dwelling;*
- *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 if this area is exposed to noise levels that result in significant adverse effects;*
- *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 publicly 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 minute walking distance).*

1.3 Local & Regional Policy Context

The 'Quality of the environment' section of the adopted Arun Local Plan 2011-2031 (July 2018) provides further context for noise assessments in the area. Relevant policies are reproduced below:

Policy QE DM1

Noise Pollution

1. ***New Noise Sensitive Development***

Residential development likely to experience noise from road, rail or air, in particular development in close proximity to:

- *A284/A259 Wick roundabout*
- *Stretches of the A27 around Arundel and Fontwell*

- *Sections of the A29 and A259 in Bognor Regis*
- *A284 in Littlehampton and*
- *The stretch of railway line that runs through Barnham station*

Must:

a. *Be supported by a noise exposure category (NEC) assessment and designed to ensure that residents will not be adversely affected by noise.*
b. *Consider both the likely level of exposure at the time of application and any increase that might be reasonably expected in the foreseeable future.*

To safeguard the continued use of existing industrial and commercial uses and to protect amenity, noise sensitive development should not normally be permitted where:

c. *High levels of noise will continue throughout the night, especially during the hours when people are normally sleeping.*
d. *There is a likelihood of complaints about noise from industrial development.*

The noise exposure category (NEC) criteria have been reproduced in Section 2.3.

1.4 Acoustic Consultants' Qualifications and Professional Memberships

The lead project Acoustic Consultant is Kanvin Chen. The report has been checked by Joe Nott and verified by Dawit Abraham. Relevant qualifications, membership and experience are summarised in **Table 1.2**.

Table 1.2: Acoustic Consultants' Qualifications & Experience

Name	Education	Experience in Undertaking Noise Assessments (Start date of working in noise & acoustics)	Attained Associate Membership of the Institute of Acoustics (date)	Attained Membership of the Institute of Acoustics (date)
Kanvin Chen	BEng 2018	June 2017		
Joe Archer	BSc (Hons) 2015 PGDip 2022	June 2016	April 2018	-
Dawit Abraham	BSc 2008 MSc 2010	October 2010	January 2011	January 2015

2.0 Assessment Criteria

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

- BS 8233:2014 'Guidance on sound insulation and noise reduction for buildings – Code of practice'
- World Health Organisations (1999) 'Guidelines for Community Noise'
- BS 6472-1: 2008: 'Guide to Evaluation of Human Exposure to Vibration in Buildings Part 1: Vibration Sources Other Than Blasting'

A full bibliography of documents referenced within this report is provided within Appendix B.

2.1 Noise Level Criteria and Actions

Table 2.1: Noise Level Criteria and Actions

Noise Sources	Noise Level Criteria	Justification for Effect Level-Action Required
No Observed Adverse Effect Level (NOAEL)		
Absolute internal noise criteria:	Noise levels are below: Living Rooms: - 35 dB$L_{Aeq,16hours}$ Kitchens, Dining Rooms, and Studies: - 40 dB$L_{Aeq,16hours}$ Bedrooms: - 35 dB$L_{Aeq,16hours}$ - 30dB $L_{Aeq,8hr}$ - L_{AFmax} noise levels do not regularly exceed 45dB L_{AFmax} (based on 10th highest $L_{AFmax,2min}$ sample)	**Justification for Effect Level:** Less than threshold values in Table 4 in BS8233:2014 and Table 1 in World Health Organisation (1999) Guidelines on Community Noise **Action Required:** None
Absolute external noise criteria:	Noise levels in private gardens are below 50dB$L_{Aeq,16hours}$	**Justification for Effect Level:** Less than 'desirable' values in BS8233:2014 Paragraph 7.7.3.2. **Action Required:** None
Lowest Observed Adverse Effect Level (LOAEL)		
Absolute internal noise criteria:	Noise levels are between: Living Rooms: - 35-40 dB$L_{Aeq,16hours}$ Kitchens, Dining Rooms, and Studies: - 40-45 dB$L_{Aeq,16hours}$ Bedrooms: - 35-40 dB$L_{Aeq,16hours}$	**Justification for Effect Level:** Exceed threshold guidelines in Table 4 of BS8233:2014 and World Health Organisation (1999) Guidelines on Community Noise by no greater than 5dB to achieve reasonable internal

	- 30-35dB $L_{Aeq,8hr}$ - L_{AFmax} noise levels do not regularly exceed 45dB L_{AFmax} (based on 15th highest $L_{AFmax,2min}$ sample)	conditions as defined by Note 7 to Table 1 in BS8233:2014 **Action Required:** Mitigate and reduce to a minimum the exceedance over the threshold
Absolute external noise criteria:	Noise levels in private gardens are between 50-55 $dBL_{Aeq,16hours}$	**Justification for Effect Level:** Exceed 'desirable' threshold guidelines but within upper threshold guidelines in Paragraph 7.7.3.2 of BS8233:2014
Significant Observed Adverse Effect Level (SOAEL)		
Absolute internal noise criteria:	Noise levels are between: Living Rooms: - 40-45 $dBL_{Aeq,16hours}$ Kitchens, Dining Rooms, and Studies: - 45-50 $dBL_{Aeq,16hours}$ Bedrooms: - 40-45 $dBL_{Aeq,16hours}$ - 35-40dB $L_{Aeq,8hr}$ - 45-55dB L_{AFmax} (based on 15th highest $L_{AFmax,2min}$ sample)	**Justification for Effect Level:** Exceeds BS8233:2014 $L_{Aeq,T}$ reasonable criteria by 5dB or exceeds $L_{AFmax,2min}$ (15th highest sample) **Action Required:** Additional mitigation required to achieve effect of LOAEL or less.
Absolute external noise criteria:	Noise levels in private gardens exceed 55 $dBL_{Aeq,16hours}$	**Justification for Effect Level:** Exceeds BS8233:2014 $L_{Aeq,16hours}$ upper guideline levels. **Action Required:** Development should be designed to achieve the lowest practicable levels in these external amenity spaces.
Unacceptable Observed Adverse Effect Level (UOAEL)		
Absolute internal noise criteria:	Noise levels exceed: Living Rooms: - 45 $dBL_{Aeq,16hours}$ Kitchens, Dining Rooms, and Studies: - 50 $dBL_{Aeq,16hours}$ Bedrooms: - 45 $dBL_{Aeq,16hours}$ - 40dB $L_{Aeq,8hr}$ - L_{AFmax} noise levels exceeds 55dB L_{AFmax} (based on 15th highest L_{AFmax} sample)	**Justification for Effect Level:** Exceeds BS8233:2014 $L_{Aeq,T}$ reasonable criteria by 10dB or exceeds $L_{AFmax,2min}$ (15th highest sample) by 10dB or more. **Action Required:** Additional mitigation required to achieve effect of LOAEL or less.
Absolute external noise criteria:	Noise levels exceed 60 $dBL_{Aeq,16hours}$	**Justification for Effect Level:** Exceeds BS8233:2014 $L_{Aeq,16hours}$ upper guideline levels by 5dB or more. **Action Required:** Development should be designed to achieve the lowest practicable levels in these external amenity spaces.

2.2 Part O: Overheating - Night-time Noise Assessment Criteria

Building Regulations Part O: Overheating, also referred to as Approved Document O (ADO) applies to new residential buildings (either where the planning application is submitted after 15th June 2022, or where the building work hasn't been started by 15th June 2023). Therefore, the requirements of ADO apply to the residential aspects of the proposed development.

The intention of ADO is summarised within the document as follows:

> *"The aim of requirement O1 is to protect the health and welfare of occupants of the building by reducing the occurrence of high indoor temperatures. In the Secretary of State's view, requirement O1 is met by designing and constructing the building to achieve both of the following.*
>
> *a. Limiting unwanted solar gains in summer.*
>
> *b. Providing an adequate means of removing excess heat from the indoor environment."*

As can be seen from the above, the main intention of this document is to avoid unwanted solar gains and overheating within dwellings. The acoustic requirements of a development are presented within the overheating mitigation section of the document. The overarching requirements of the overheating strategy are identified as the following:

> *"O1 Overheating mitigation:*
>
> *(1) Reasonable provision must be made in respect of a dwelling, institution or any other building containing one or more rooms for residential purposes, other than a room in a hotel ("residences") to—*
>
> *(a) limit unwanted solar gains in summer;*
>
> *(b) provide an adequate means to remove heat from the indoor environment.*
>
> *(2) In meeting the obligations in paragraph (1)—*
>
> *(a) account must be taken of the safety of any occupant, and their reasonable enjoyment of the residence; and*
>
> *(b) mechanical cooling may only be used where insufficient heat is capable of being removed from the indoor environment without it."*

The obligation specified within requirement 2a outlines the need that dwellings need to be able to provide both a safe space and one that could be reasonably enjoyed by the residence. It is in the satisfying of this part of the requirement where noise at night-time needs to be considered. Paragraphs 3.2 to 3.4 present the guidance on ensuring the overheating mitigation strategy for the proposed development is suitable. The pertinent section of the guidance has been reproduced below:

> *"In locations where external noise may be an issue (for example, where the local planning authority considered external noise to be an issue at the planning stage), the overheating mitigation strategy should take account of the likelihood that windows will be closed during sleeping hours (11pm to 7am).*
>
> *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 7am).*
>
> *b. 55dB L_{AFmax}, more than 10 times a night (between 11pm and 7am)."*

The Association of Noise Consultants (ANC) and the Institute of Acoustics (IOA) *Approved Document O Noise Guide V1.1* (Nov 2024) goes on to state that a 10 dB reduction is the approximate outside-to-inside level difference for window openings necessary to satisfy the simplified method of ADO in this location (medium risk location as defined by ADO). This ADO noise guide goes on to specify the external noise level above which the simplified method of ADO should not be used. These levels are reproduced in **Table 2.2**.

Table 2.2: External Noise Levels Above Which the Simplified Overheating Assessment Method Cannot Be Used

Parameter	Level
$L_{Aeq,8hr}$, averaged over 8 hours (between 11pm and 7am)	50 dB
L_{AFmax}, more than 10 times a night (between 11pm and 7am)	65 dB

Based on the guidance and criteria provided with ADO and the guidance on ADO produced by the ANC and IOA, an assessment has been undertaken to determine which areas of the proposed development (if any) are in exceedance of the night-time noise level criteria stated above.

2.3 Adopted Local Plan Noise Exposure Categories

In the 'Quality of the environment' section of the adopted Arun Local Plan 2011-2031 (July 2018), item 21.2.6 states:

"*Residential development proposed within First Priority Areas, or in close proximity to noise sources from road, rail and air, should be assessed to determine the noise exposure category (NEC) which the site falls into. This assessment must be carried out at an early stage in order to identify the suitability of the site. Where the NEC assessment has shown that habitable rooms will be exposed to noise levels in excess of NEC A, noise mitigation will be required as part of the design of the development…*"

The relevant tables from the local plan have been reproduced below:

Table 2.3: Noise Exposure Categories for Residential Development (Table 21.1)

NEC	
A	Noise need not be considered as a determining factor in granting planning permission, although the noise level at the high end of the category should not be regarded as a desirable level.
B	Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection against noise.
C	Planning permission should not normally be granted. Where it is considered that permission should be given, for example because there are no alternative quieter sites available, conditions should be imposed to ensure a commensurate level of protection against noise.
D	Planning permission should normally be refused.

Table 2.4: Noise levels Corresponding to the Noise Exposure Categories for New Dwellings $L_{Aeq,T\ dB}$ (Table 21.2)

	Noise Exposure Categories			
Noise Source	**A**	**B**	**C**	**D**
Road Traffic				
07.00-23.00	<55	55-63	63-72	>72
23.00-7.00*	<45	45-57	57-66	>66
Rail Traffic				
07.00-23.00	<55	55-66	66-74	>74
23.00-7.00*	<45	45-59	59-66	>66
Air Traffic				
07.00-23.00	<57	57-66	66-72	>72
23.00-7.00	<48	48-57	57-66	>66
Mixed Sources				
07.00-23.00	<55	55-63	63-72	>72
23.00-7.00	<45	45-57	57-66	>66

*Night-time noise levels (23.00-07.00): sites where individual noise events regularly exceed 82dB L_{Amax} (S time weighting) several times in any hour should be treated as being in NEC C, regardless of the $L_{Aeq,8h}$ (except where the LAeq, 8h already puts the site in NEC D).

2.4 Vibration Criteria

Tactile vibration is that which is perceived as mechanical motion. BS 6472-1: 2008: '*Guide to Evaluation of Human Exposure to Vibration in Buildings Part 1: Vibration Sources Other Than Blasting*' provides procedures for assessing the potential human response to vibration.

Vibration is assessed in terms of the equivalent 'vibration dose value' (VDV in $m/s^{1.75}$), which relates to the level and duration of vibration, and effectively accumulates the vibration energy received over the daytime or night-time period in question. Present knowledge indicates the VDV indices to correspond most closely to the response of people to vibration inside a building. It is important to note, however, that people exhibit wide variations of vibration tolerance. Specific values are dependent upon social and cultural factors, psychological attitudes and expected degree of intrusion.

The guide VDVs set out in BS 6472-1 for evaluating the various probabilities of adverse comment within residential buildings relevant to the proposed Development are presented in **Table 2.5**. The criteria are presented as ranges to reflect the differing susceptibility to vibration evident among members of the population.

Table 2.5: BS 6472-1:2008 Probability of Adverse Comment Due to Vibration

Vibration dose values (VDV in m/s1.75) above which might result in various degrees of adverse comment within residential buildings			
Place and Time	**Low Probability of Adverse Comment**	**Adverse Comment Possible**	**Adverse Comment Probable**
Bedrooms 16hr day[1]	0.2[2] - 0.4	0.4 - 0.8	0.8 - 1.6[3]
Bedrooms 8hr night	0.1[2] - 0.2	0.2 - 0.4	0.4 – 0.8[3]

Notes:
[1] For offices and workshops, respective multiplying factors of 2 and 4 should be applied to the above vibration dose value ranges for a 16-hour day;
[2] BS 6472-1:2008 states that adverse comment is not expected for VDVs below the ranges in Table 2;
[3] Above these range values adverse comment is very likely.

VDVs in the different room spaces of the Development shall not exceed the minimum low probability of adverse comment value presented in the table above, when assessed in accordance with BS 6472:2008.

3.0 Site Description

We understand this phase involves the development of 17 residential dwellings with gardens and an outdoor fitness area / park to the north of the existing West Coastline rail line. The proposed site layout and identified noise sensitive receptors are shown in the **Figure 3.1** and **Table 3.1**.

Figure 3.1: Proposed Site Layout and Sensitive Receptors

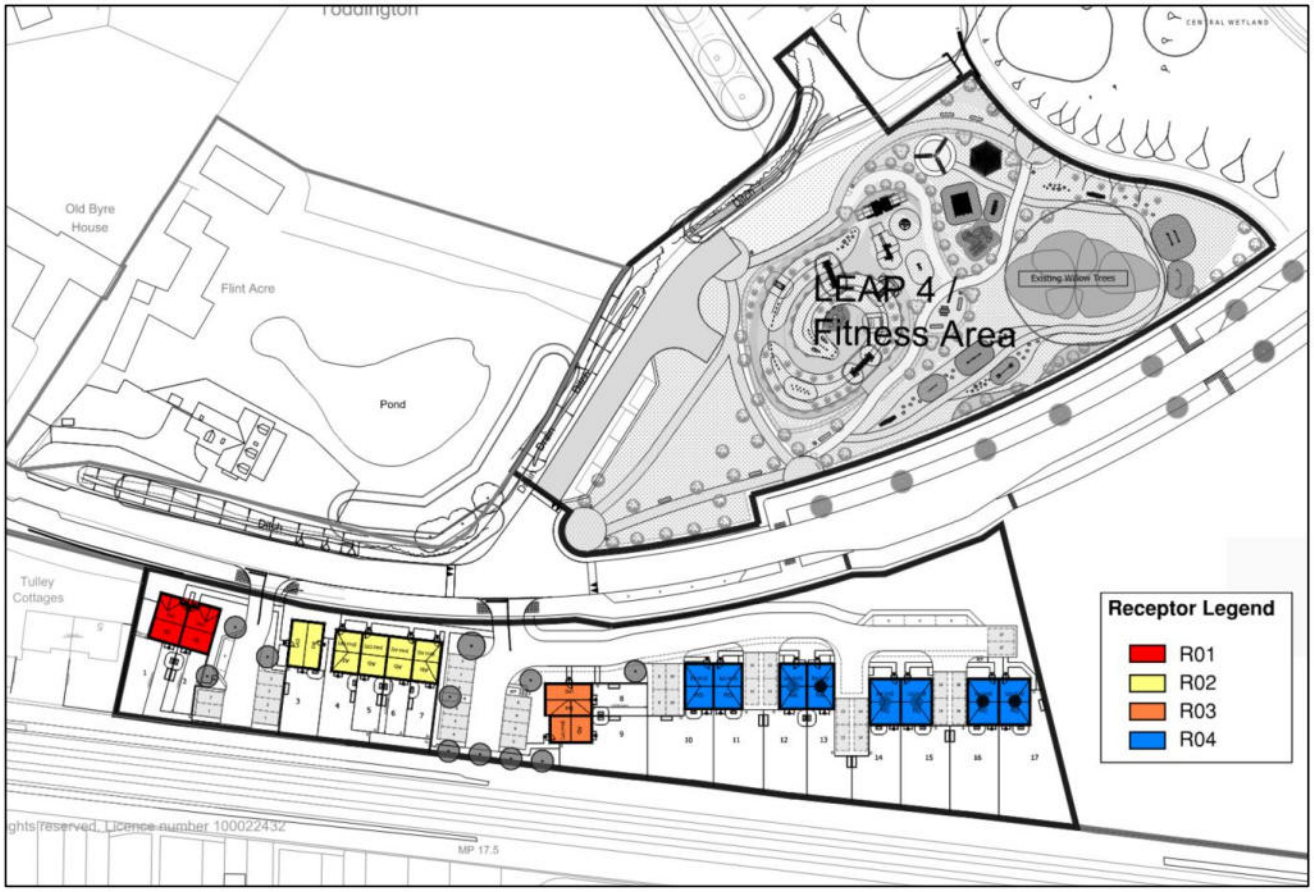


Table 3.1: Sensitive Receptors

Reference	Description	Type of Use	Height (m) Daytime / Night-time
R01	Units 1 - 2	Residential	4.0
R02	Units 3 – 8		
R03	Units 9 -10		
R04	Units 11 - 18		

4.0 Noise Survey

4.1 Noise Survey Details

A monitoring survey was undertaken to characterise baseline ambient noise levels currently experienced on the site and to establish the relative local background and traffic noise levels. Equipment used during the survey included:

Equipment used during the survey included:

Rion NL – 52	Environmental Noise Analyser (LT)	s/n 00732146
Rion NL – 52	Environmental Noise Analyser (ST)	s/n 00219904
Rion NL – 52	Environmental Noise Analyser (LT)	s/n 00810559
Rion NC – 75	Sound Calibrator	s/n 35270131

The measurement equipment was checked against the appropriate calibrator at the beginning and end of the measurements, in accordance with recommended practice. The accuracy of the calibrators can be traced to National Physical Laboratory Standards, calibration certificates for which are available on request.

A baseline monitoring survey was undertaken at 4 locations (as specified in **Table 4.1** and shown in **Figure 4.1**) from 14 May to 20 May 2025, where short-term (ST) and long-term (LT) unattended monitoring was undertaken over multiple day and night-time periods. The raw data collected from the long-term monitoring is available upon request.

Measurements were taken in general accordance with BS 7445-1:2003 The Description and Measurement of Environmental Noise: Guide to quantities and procedures. Weather conditions during the survey results presented were observed as generally being dry Weather conditions during the survey period were observed as being dry. Readings from an external source (Time and Date) confirmed that wind speeds and direction varied between 0-6m/s South throughout the survey. The weather throughout the survey was dry, averaging around 16 degrees Celsius with some cloud.

Table 4.1: Noise Monitoring Locations

Ref	Description
LT1	Empty plot next to Nightingale Way. (1.5m high, free field measurement)
LT2	Empty plot next to Anderson Way. (2.2m high, free field measurement)
LT4	Empty plot near A259 freeway and West Coastline (BLI1) rail line. (1.5m high, free field measurement)
ST1	Empty plot off Toddington Lane and adjacent to the West Coastline (BLI1) rail line. (1.5m high, free field measurement)

Figure 4.1: Noise Monitoring Locations

4.2 Noise Survey Results

The dominant noise sources found in the area include road traffic noise from Nightingale Way, the West Coastline (BLI1) rail line and the A259 freeway.

Ambient and background noise levels are usually described using the L_{Aeq} index (a form of energy average) and the L_{A90} index (i.e. the level exceeded for 90% of the measurement period) respectively. Road traffic noise is generally described using the L_{A10} index (i.e. the level exceeded for 10% of the measurement period). For the long-term (LT) locations, the presented $L_{Aeq,T}$ and $L_{A10,T}$ are average noise levels whilst the L_{A90} is the modal noise level of each 5-minute measurement over the stated survey period.

Table 4.2: Results of Baseline Noise Monitoring Survey (Summary)

Period	Duration (T)	Monitoring Date and Times	Location	$L_{Aeq,T}$ (dB)	$L_{Amax,T}$ (dB)	$L_{Amin,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)
Weekday Daytime 07:00 - 23:00	62 Hours	14:25 14/05/2025 – 12:00 20/05/2025	LT1	56	75	34	58	51
Weekday Night-time 23:00 – 07:00	31.5 Hours	23:05 14/05/2025 – 06:55 20/05/2025		50	67	21	51	30
Weekend Daytime 07:00 - 23:00	32 Hours	07:00 17/05/2025 - 23:00 18/05/2025		55	75	30	57	50
Weekend Night-time 23:00 – 07:00	16 Hours	23:05 17/05/2025 – 06:55 19/05/2025		50	70	22	50	30
Weekday Daytime 07:00 - 23:00	62 Hours	13:45 14/05/2025 – 10:30 20/05/2025	LT2	57	86	26	54	40
Weekday Night-time 23:00 – 07:00	31.5 Hours	23:15 14/05/2025 – 06:45 20/05/2025		49	78	20	42	29
Weekend Daytime 07:00 - 23:00	32 Hours	07:00 17/05/2025 - 23:00 18/05/2025		52	80	24	52	40
Weekend Night-time 23:00 – 07:00	16 Hours	23:15 17/05/2025 – 06:45 19/05/2025		50	78	20	43	34
Weekday Daytime 07:00 - 23:00	62 Hours	12:30 14/05/2025 – 10:15 20/05/2025	LT3	49	66	27	49	44
Weekday Night-time 23:00 – 07:00	31.5 Hours	23:05 14/05/2025 – 06:55 20/05/2025		46	68	24	44	30

Period	Duration (T)	Monitoring Date and Times	Location	$L_{Aeq,T}$ (dB)	$L_{Amax,T}$ (dB)	$L_{Amin,T}$ (dB)	$L_{A10,T}$ (dB)	$L_{A90,T}$ (dB)
Weekend Daytime 07:00 - 23:00	32 Hours	07:00 17/05/2025 - 23:00 18/05/2025	ST1	49	65	22	50	47
Weekend Night-time 23:00 – 07:00	16 Hours	23:05 17/05/2025 – 06:55 19/05/2025		46	64	20	45	30
Weekday Daytime 07:00 - 23:00	2.4 Hours	13:00 – 15:20 14/05/2025		54	75	31	51	42

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

5.0 Assessment Methodology

5.1 Noise Modelling Methodology

Three-dimensional noise modelling has been undertaken based on the monitoring data to predict noise levels at a number of locations both horizontally and vertically. CADNA noise modelling software has been used. This model is based on ISO 9613-2 noise propagation methodology and allows for detailed prediction of noise levels to be undertaken for large numbers of receptor points and different noise emission scenarios both horizontally and vertically. The modelling software calculates noise levels based on the emission parameters and spatial settings that are entered. Input data and model settings as given in **Table 5.1** below have been used.

Table 5.1: Modelling Parameters Sources and Input Data

Parameter	Source	Details
Horizontal distances – around site	Ordnance Survey	Ordnance Survey
Ground levels – around site	DEFRA	LiDAR topographical survey data
Building heights – around site	Tetra Tech Observations	Typically: • 4.0m height for one-storey properties • 8.0 m height for two storey properties • 3.0m per additional storey
Receptor positions*	Tetra Tech	Typically: • 1.5 m for ground floor • 4.0m height for first-floor • 1.5m height for monitoring validation locations.
Modelling Parameters	Tetra Tech	• Ground Absorption: 0.5 • Order of Reflections: 3 • Noise Contour Plot Grid Receiver Spacing: 10x10
Proposed Plans	Persimmon Homes	Drawing: 519_PL_Ph6b_100, Site Layout – LEAP 4 / Fitness Area / Phase 6b – 19 units (dated Jan 2025)
*All receptors modelled 0.05m from building façade unless otherwise stated.		

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

5.2 Model Input Data

- The noise model was calibrated to the noise survey data for the surrounding roads and rail line.
    - **New road adjacent to dwellings**: 58 $dB_{,LA10}$ day and 50.5 $dB_{,LA10}$ night, calibrated against LT2.
    - **West Coastline rail line**: Sound pressure level of 58.5 dBA @ 25m during the day and 50.0 dBA @ 25m during the night. Night-time rail noise levels have been estimated from daytime measurements, applying a correction factor derived from the typical day and night recorded train counts.
    - **Rail line L_{max}**: Sound power level of 122 dBA derived from the 90th percentile of single train pass-by L_{max} sound pressure levels during the day.
- A 1.8m tall garden fence has been included in our assessment. This is noted to be imperforate and with a minimum surface mass of 12kg/m^2.

5.3 Modelling Results

Figure 5.1: Noise Modelling Results - Grid at 4.0m high (daytime)

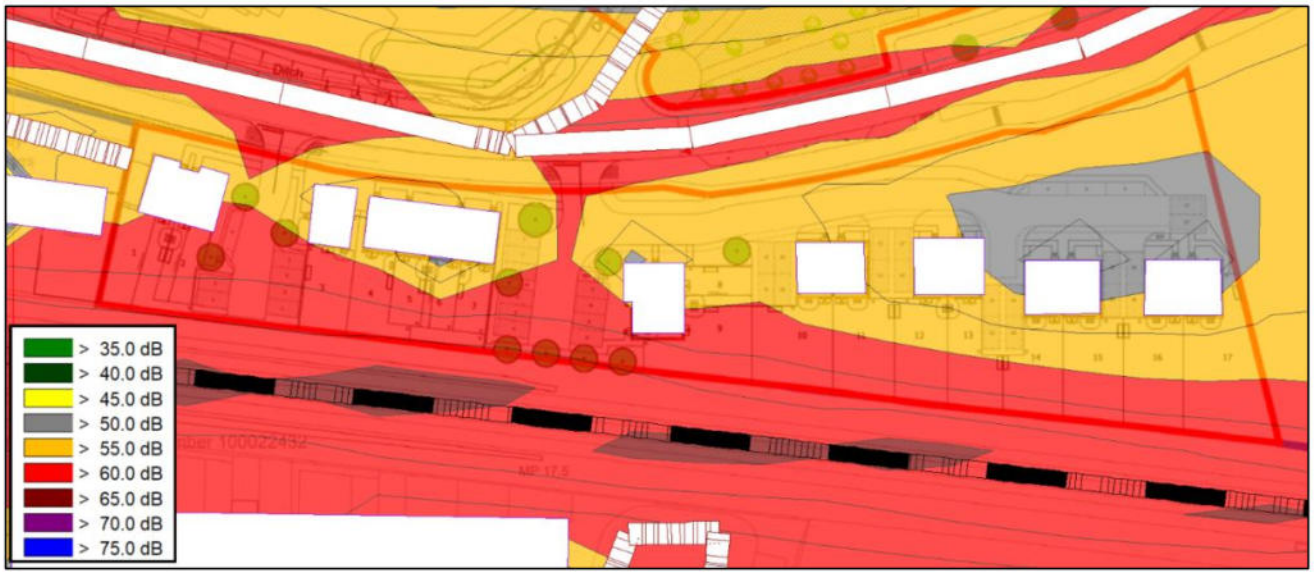


Figure 5.2: Noise Modelling Results - Grid at 4.0m high (night-time)

6.0 Residential Noise Assessment

6.1 Noise Assessment – Internal Noise Levels

Internal noise levels have been calculated for the habitable rooms of the proposed residential dwellings. This includes all noise sources in the area including the existing noise environment as measured during the noise survey.

The noise level inside the habitable rooms of the development will be based on the external noise breaking in through the façade elements (e.g. wall, window, ventilator).

It is understood that the external walls will be constructed with a typical brick and block (masonry) construction. The walls will therefore have a sound reduction of around 50 dB R_w, which is significantly higher than the sound reduction of the window and ventilation. Consequently, the internal noise levels will be dictated by the acoustic performance of the glazing and ventilation.

Calculations have therefore been carried out to determine the minimum acoustic performance requirements of the glazing and ventilation, to achieve the internal noise criteria stipulated in **Table 2.1**.

The calculations are based on the following assumptions:

- Bedrooms have a volume of 29m^3, an external wall area of 9m^2, a 2m^2 window and 1x ventilator,
- Living / dining rooms have a volume of 40m^3, an external wall area of 15m^2, 5m^2 of window(s) and 2x ventilators,
- The reverberation time in bedrooms will be ~0.5 seconds and in living / dining rooms will be ~1.0 seconds

If any rooms have different dimensions or details from the above, then they will need to be assessed in more detail once the details are available to confirm the exact requirements for each room.

6.1.1 Predicted Internal Noise levels

Noise levels have been predicted at each façade of the proposed dwellings nearest to and assessed with windows open, where a reduction from a partially open window of 10 dB has been used.

Results of the noise intrusion assessments for average daytime and night-time noise levels are presented within **Table 6.1** and **Table 6.2** respectively.

Table 6.1: Daytime Noise Intrusion Levels $L_{Aeq,16hour}$

Location	External L_{Aeq}	Internal L_{Aeq} with windows open	Internal L_{Aeq} with windows closed	Criteria L_{Aeq}
R01	60	50	26	35
R02	60	50	26	
R03	61	51	27	
R04	56	46	22	

Table 6.2: Night-time Noise Intrusion Levels $L_{Aeq,8hour}$

Location	External L_{Aeq}	Internal L_{Aeq} with windows open	Internal L_{Aeq} with windows closed	Criteria L_{Aeq}
R01	52	42	17	30
R02	52	42	17	
R03	52	42	17	
R04	48	38	13	

Results of the noise intrusion assessment for maximum (L_{Amax}) night-time noise levels are presented within **Table 6.3**.

Table 6.3 Night-time Noise Intrusion Levels L_{Amax}

Location	External L_{Amax}	Internal L_{Amax} with windows open	Internal L_{Amax} with windows closed	Criteria L_{Amax}
R01	83	70	44	45
R02	84	71	45	
R03	85	75	45	
R04	79	69	44	

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

The results of the calculations show that the internal noise criteria are exceeded for both the day and night-time periods with partially open windows. However, we predict that the internal noise level criteria can be met with an acoustic glazing and ventilation strategy. The required glazing and ventilator specifications are summarised below.

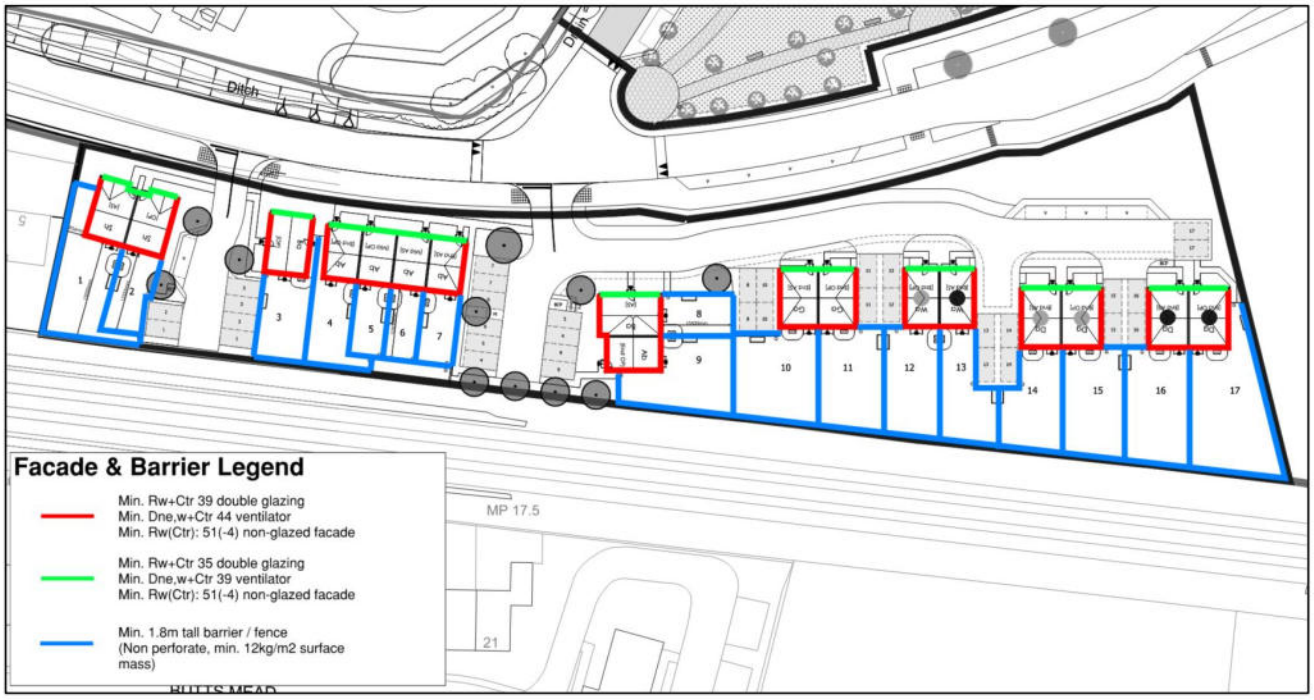
Table 6.4: Glazing and Ventilator Specification Summary

Ref	Colour	Location	Glazing System Acoustic Requirements*, dB R_w + Ctr	Ventilator Acoustic Requirements, dB $D_{ne,w}$ + Ctr
FS01		Facades facing railway	39	44
FS02		Facades facing road	35	39

* The requirements apply to the entire system, not just the glazing. Test data should be provided by the manufacturer, including the glazing and the frames, for review.

The location of the facades requiring the acoustic upgrades are shown on the site layout below.

Figure 6.1: Recommended Facade Treatment Locations



As the internal noise levels are predicted to exceed the recommended criteria when windows are partially opened, openable windows will generally not be a suitable primary means of background ventilation. Therefore, to maintain reasonable internal acoustic conditions, alternative background ventilation is required within the habitable rooms of the proposed dwellings.

6.2 Overheating Assessment

In addition to the above, a preliminary assessment has been undertaken of locations at which internal night-time noise criteria identified within Building Regulations Approved Document O: 'Overheating' (ADO) are likely to be exceeded, in accordance with the external noise limits presented in the ANC and IOA guidance on ADO (as reproduced within **Table 2.2** of this report).

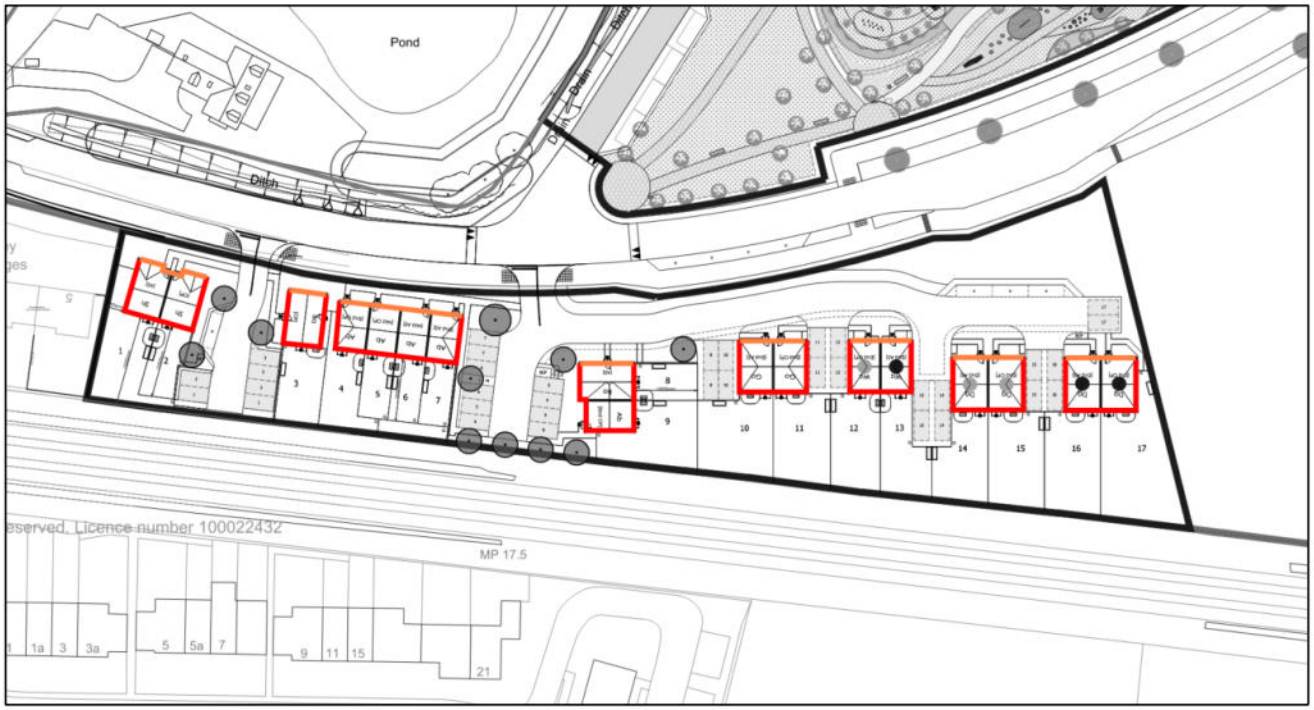
Using the 3D noise model, noise levels have been calculated at each of the proposed dwellings for both L_{Aeq} and L_{AFmax}. Based on the results of the models, open windows cannot be relied on as overheating mitigation due to the night-time noise levels, for all of the proposed dwellings. Therefore, if the dwellings are predicted to overheat, they will require alternative means of overheating mitigation. This is further clarified within **Table 6.5**.

Table 6.5: Overheating Mitigation Strategy Category - Noise at Night

Category	Internal Noise Level Criteria	External Noise Level Criteria	Action	Reason
Green	≤ 40 dB $L_{Aeq,8hr}$ and ≤ 55 dB L_{AFmax} (more than 10 times per night)	≤ 50 dB $L_{Aeq,8hr}$ and ≤ 65 dB L_{AFmax} (more than 10 times per night)	No further action required	Dwellings can be ventilated during the summer months using openable windows and achieve the ADO internal ambient noise level criteria.
Orange	~40 dB $L_{Aeq,8hr}$ or ~55 dB L_{AFmax} (more than 10 times per night)	50 - 53 dB $L_{Aeq,8hr}$ or; 65 - 68 dB L_{AFmax} (more than 10 times per night)	Further information required for a detailed overheating and noise assessment (e.g. the number of hours required to have windows open during the summer months, the window opening type, and the specific opening depth / angle required to pass a TM59 assessment), or the same action as the red category below could be used for simplicity	Dwellings may be able to be ventilated during the summer months using openable windows and achieve the ADO internal ambient noise level criteria, although this depends on the specific details (e.g. window type, opening angle, number of hours required to have windows open, etc.)
Red	> 40 dB $L_{Aeq,8hr}$ or > 55 dB L_{AFmax} (more than 10 times per night)	> 53 dB $L_{Aeq,8hr}$ or; > 68 dB L_{AFmax} (more than 10 times per night)	Alternative ventilation/cooling strategy to mitigate summertime overheating may be required, if the dwellings are predicted to overheat.	Dwellings cannot rely upon openable windows to achieve the ADO criteria.

Based upon the predicted noise levels on the facades of the dwellings, the overheating categories have been plotted in the figure below.

Figure 6.2: Overheating Mitigation Strategy



Therefore, it is understood the dwellings categorised as Orange or Red have undergone a TM59 overheating assessment with closed windows, and alternative cooling or ventilation strategies have been explored to maintain the acoustic and overheating comfort of these dwellings.

6.3 Predicted Noise Exposure Category

As per the local policy, the noise exposure category has been predicted for the residential dwellings of the development. From the modelling results shown in **Table 6.1**, **Table 6.2**, and **Table 6.3** the predicted noise exposure categories for the proposed dwellings are as follows.

Table 6.6: Predicted Noise Exposure Categories

Location	Noise Exposure Category
R01	C
R02	C
R03	C
R04	C

Majority of the site falls within NEC C due to the night-time L_{max} values predicted on the proposed building facades. Therefore, to satisfy the policy requirements, the acoustic mitigation methods nominated in this report are recommended to be implemented to ensure there is an adequate level of protection against noise

6.4 External Amenity Areas

Using the noise modelling results, we have calculated the noise level in all external amenity areas of the development (i.e. private gardens).

BS8233 states the following:

> *For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also 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.*

The results of the 3D noise modelling show that noise levels in most gardens will have noise levels below the upper guideline value of 55 dB $L_{Aeq,T}$ in the daytime, with some of the development being above 55 dB $L_{Aeq,T}$ by up to 5 dB.

It is therefore recommended that all gardens are surrounded by garden fencing to reduce the noise levels as far as practicable. Note that garden fences will need to be imperforate, at least 12 kg/m^2 surface mass, and a minimum of 1.8 m high to be effective at reducing the noise levels to gardens. The recommended fence locations are marked up in **Figure 6.1** above.

With these garden fences, it is considered that the guidance in BS8233 has been followed, and lowest practicable levels will be achieved in these external amenity spaces. Therefore, the noise levels in external amenity spaces will have been designed in accordance with the requirements of BS8233.

7.0 Vibration

Based on the maximum and average vibration values taken of single train passes (from WYG Vibration Assessment report, dated February 2020) and utilising the train timetables and site observations to estimate the number of train passes for the daytime and night-time periods on each of the closest two-way tracks, an overall worst-case (based on the maximum event level) and typical (based on the mean event level) VDV for the 16-hour daytime period ($VDV_{,day}$) and 8 hour night-time ($VDV_{,night}$) period has been calculated as presented in **Table 7.1**.

Table 7.1: Predicted Vibration Dose Values and Corresponding Semantic Rating

Period	Scenario	Maximum Vibration Dose Value ($m/s^{1.75}$)		
		X-axis	Y-axis	Z-axis
Daytime	Worst-case	0.02	0.03	0.04
Semantic Rating		Adverse Comment Not Expected	Adverse Comment Not Expected	Adverse Comment Not Expected
Night-time	Worst-case	0.02	0.03	0.03
Semantic Rating		Adverse Comment Not Expected	Adverse Comment Not Expected	Adverse Comment Not Expected

Vibration levels as detailed in **Table 7.1** would result in a maximum VDV of 0.04 $m/s^{1.75}$ (z-axis) during the daytime period and a maximum VDV of 0.03 $m/s^{1.75}$ (z-axis) during the night-time period, which fall below the threshold criteria for 'low probability of adverse comment' set out in BS 6472:2008.

8.0 Conclusion

This report presents the findings of a noise assessment to support a planning application for Phase 6b of the wider Littlehampton development.

Phase 6b consists of the development of 18 residential dwellings with gardens and an outdoor fitness area / park to the north of the existing West Coastline rail line

A noise and vibration assessment has been undertaken to assess the potential impact of noise from the existing and proposed transport links.

The proposed residential dwellings adjacent the West Coastline rail line will require acoustic upgrades to the façade (i.e. glazing and ventilation) to achieve suitable internal noise levels. An acoustic façade specification has been outlined in this report.

All of the proposed dwellings are expected to exceed the noise levels at which open windows will be suitable for mitigating overheating, as such, alternative means of overheating mitigation may be required where the dwellings are predicted to overheat.

Appendices

Appendix A – Acoustic Terminology

Acoustic Terminology

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

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

L_{Aeq} Since almost all sounds vary or fluctuate with time it is helpful, instead of having an instantaneous value to describe the noise event, to have an average of the total acoustic energy experienced over its duration. The $L_{Aeq,\ 07:00\ –\ 23:00}$ for example, describes the equivalent continuous noise level over the 16-hour period between 7 am and 11 pm. During this time period the L_{pA} at any particular time is likely to have been either greater or lower that the $L_{Aeq,\ 07:00\ –\ 23:00}$.

L_{Amin} The L_{Amin} is the quietest instantaneous noise level. This is usually the quietest 125 milliseconds measured during any given period of time.

L_{Amax} The L_{Amax} is the loudest instantaneous noise level. This is usually the loudest 125 milliseconds measured during any given period of time.

L_n Another method of describing, with a single value, a noise level which varies over a given time period is, instead of considering the average amount of acoustic energy, to consider the length of time for which a particular noise level is exceeded. If a level of x dBA is exceeded for say. 6 minutes within one hour, then that level can be described as being exceeded for 10% of the total measurement period. This is denoted as the $L_{A10,\ 1\ hr}$ = x dB.

The L_{A10} index is often used in the description of road traffic noise, whilst the L_{A90}, the noise level exceeded for 90% of the measurement period, is the usual descriptor for underlying background noise. L_{A1} and L_{Amax} are common descriptors of construction noise.

R_w The *weighted sound reduction index* determined using the above *measurement* procedure, but weighted in accordance with the procedures set down in BS EN ISO 717-1. Partitioning and building board manufacturers commonly use this index to describe the inherent sound insulation performance of their products.

Appendix B – References

British Standards Institute (BSI). (2003). BS 7445-1:2003. *Description and Measurement of Environmental Noise - Part 1: Guide to Quantities and Procedures*. United Kingdom.

British Standards Institute (BSI). (2014). BS 8233:2014. *Guidance on Sound Insulation and Noise Reduction for Buildings*. United Kingdom.

Department for Environment, Food and Rural Affairs (DEFRA). (2010). *Noise Policy Statement for England (NPSE)*. United Kingdom.

Ministry of Housing, Communities & Local Government. (2014). *Planning Practice Guidance (PPG): Noise*. United Kingdom.

Ministry of Housing, Communities & Local Government. (2024). *National Planning Policy Framework (NPPF)*. United Kingdom.

World Health Organization. (1999). *Guidelines for Community Noise.*