14. Noise and Vibration

Introduction

14.1 This chapter assesses the potential effects of noise and vibration impacts associated with the construction and operation phases of the proposed development and to be addressed as "the Site" thereafter within this chapter.

14.2 The Site refers to land that falls within the application boundaries A and B as identified in the Site Location Plans (**Figure 1.1** and **Figure 1.2**).

14.3 This ES Chapter assesses both Application A and Application B together. If Application B is not brought forward, then the environmental effects associated with Application A only, will not be significantly different to those that are likely to arise in relation to Application A and Application B together.

14.4 The chapter written by Ensafe, describes the methods used to assess the likely significant potential direct and indirect effects of the development arising from noise and vibration during construction and operational, and if necessary, provide the mitigation measures required to prevent, reduce, or offset the identified significant effects and the residual effects.

14.5 Due to the COVID 19 lockdown and atypical public transport and private vehicles frequency and numbers the assessment is based on noise and vibration surveys carried out in 2018 which is believed, would be representative of the normal baseline conditions at the site and surroundings.

14.6 The noise impact from traffic flow is based on the data provided by VECTOS, including the sensitive study of the dualling of Penwortham Way.

Planning Policy Context

14.7 This ES chapter has been undertaken within the context of relevant planning policies, guidance documents and legislative instruments, which are summarised as follows:

International / National Legislation

14.8 The Control of Pollution Act 1974 (CoPA) requires that "Best Practicable Means" (as defined in Section 72) are adopted to control construction noise on any given site. The CoPA refers to the BS5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites. Noise and the BS5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites. Vibration, as the best practicable assessment methodology.

National Planning Policy

National Planning Policy Framework

14.9 The National Planning Framework (NPPF), revised on 20 July 2021, sets out the Government's planning policies for England and how these should be implemented.

14.10 Paragraph 182 of the NPPF provides additional policy information applicable where an "Agent of Change" is concerned (i.e., a new development is proposed close to existing sources of noise with potential for adverse impact) as follows:

> *"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."*

14.11 The 'Agent of Change' principle re-iterates, in Policy D13 Agent of Change and D14 Noise, that the responsibility for mitigation impacts for existing noise generating activities should be placed on the proposed new noise-sensitive development.

14.12 Planning policies should support and enhance the local environment and prevent noise pollution and protect areas prized for their amenity value.

14.13 To prevent unacceptable risks from pollution, planning policies and decisions should ensure that new development is appropriate for its location. The effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be considered.

14.14 The document includes the following relevant to noise and vibration:

- *preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability*, (Paragraph 170 (e));

14.15 Planning policies and decisions should also ensure that new development is appropriate for its location considering 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 impact resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life*, (Paragraph 180 (a)).

Noise Policy Statement for England

14.16 The Noise Policy Vision is to "promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development".

14.17 Through effective management and control or environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development, there are the following aims:

- 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.

Planning Practice Guidance[1]

14.18 Noise needs to be considered when new developments may create additional noise and when new developments would be sensitive to the prevailing acoustic environment. When preparing local or neighbourhood plans, or taking decisions about new development, there may also be opportunities to consider improvements to the acoustic environment.

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

- Whether or not a significant adverse effect is occurring or likely to occur;
- Whether or not an adverse effect is occurring or likely to occur; and
- Whether or not a good standard or amenity can be achieved.

14.20 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.

- Significant Observed Adverse Effect Level (SOAEL): This is the level of noise exposure above which adverse effects on health and quality of life occur.

14.21 Table 14.1 summarises the observed effect levels and hierarchy, based on the likely average response.

[1] Ministry of Housing, Communities & Local Government (2014) Planning Practice Guidance: Noise. HMSO. London

Table 14.1: Noise Exposure Hierarchy

Perception	Examples of Outcomes	Increasing Effect Level	Action
No Observed Effect Level **NOEL**: This is the level of noise exposure below which no effect at all on health or quality of life can be detected.			
Not noticeable	No effect	No observed effect	No specific measures required
Noticeable and not intrusive	Noise can be heard but does not cause any changes in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No observed adverse effect	No specific measures required
Lowest observed adverse effect level **LOAEL**: This is the level of noise exposure above which adverse effects on health and quality of life can be detected.			
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed adverse effect	Mitigate and reduce to a minimum
Significant observed adverse effect level **SOAEL**: This is the level of noise exposure above which adverse effects on health and quality of life occur.			
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant observed effect	
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable adverse effect	Prevent

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

14.23 The factors include:

- The source and absolute level of the noise together with the time of day it occurs. Some types and level of noise will cause greater adverse effect at night if they occurred during the day – this is because people tend to be more sensitive to noise at night as they are trying to sleep. The adverse effect can also be greater simply because there is less background noise at night;
- For non-continuous sources of noise, the number of noise events, and the frequency and pattern of occurrence of the noise; and
- The spectral content of the noise and the general character of the noise. The local topology and topography should also be considered along with the existing and, where appropriate, the planned character of the area.

14.24 More specific factors to consider when relevant:

- Where applicable, the cumulative impacts of more than one source should be taken into account along with the extent to which the source of noise is intermittent and of limited duration;
- Consideration should also be given to whether adverse internal effects can be completely removed by closing windows and, in the case of new residential development, if the proposed mitigation relies on windows being kept closed most of the time. In both cases a suitable alternative means of ventilation is likely to be necessary. Further information on ventilation can be found in the Building Regulations; and
- 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 Noise Policy Statement for England

14.25 The Noise Policy Statement for England (NPSE) clarifies the primary principles and aims to provide the necessary information to support existing policy documents, legislation and guidance related to noise.

National Planning Practice Guidance - Noise

14.26 The National Planning Practice Guidance (PPG) provides a guide as to how to assess whether noise needs to be mitigated or a development might be refused planning permission because of potential adverse impact.

14.27 The PPG further develops the context for the significant observed adverse effect level, and states that if the exposure is above the set precautionary level, then, appropriate mitigation measures should be implemented.

Local Planning Policy

South Ribble Local Plan 2012 – 2026 (adopted in July 2015)

Development Policies

Policy G17 – Design Criteria for New Development

14.28 Noise can have a detrimental effect on the quality of the environment. Much of the development required for the creation of jobs and the construction and improvement of essential infrastructure will generate noise. The Council will only permit development that does not cause an unacceptable degree of disturbance.

Other Relevant Policy, Standards and Guidance

14.29 Relevant British Standards and other guidance documents include:

- British Standard 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound. The standard describes methods to assess the likely effect of sound of an industrial and commercial nature on nearby noise sensitive receptors;
- British Standard 7385-2:1993 Evaluation and measurement for vibration in buildings. Guide to damage levels from ground-borne vibration. Presents guide values and limits above which there is a possibility of nearby building's cosmetic damage;
- British Standard 6472-1:2008 Guide to evaluation of human exposure to vibration in buildings. Vibration sources other than blasting. It states vibration dose values above which adverse which adverse comment is likely to occur;
- British Standard 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise. Provides the best practice guide for noise and vibration control, includes sound power level data for individual plant and a calculation method to evaluate the likely impact from construction activities. Part 1 is related to noise and Part 2 to vibration;
- British Standard 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration; and
- British Standard 8233:2014 Guidance on sound insulation and noise reduction for buildings. Provides criteria for the assessment of internal noise levels for various uses including commercial properties.
- World Health Organisation (WHO), Guidelines for community noise, 1999. Seta out the guidelines for suitable indoor and outdoor noise levels;
- Calculation of Road Traffic Noise[2] (CRTN). Describes the procedure for traffic noise calculation;
- Design Manual for Roads and Bridges (DMRB). Provides guidance on the noise and vibration impacts arising from road related projects, including new construction, improvements and maintenance;

[2] Department of Transport, Welsh Office, HMSO, 1988.

- CALTRANS transportation and construction induced vibration guidance manual, September 2013; and
- Institute of Environmental Management & Assessment (IEMA), Guidelines for environmental noise assessment, October 2014. The guidelines state the significance to the change of additional noise to the ambient baseline level.

Assessment Methodology and Significance Criteria

Professional Practice Guidance on Planning & Noise 2017[3]

14.30 Professional Practice Guidance (ProPG) on Planning and Noise has been produced to provide practitioners with guidance on a recommended approach to the management of noise within the planning system in England. The guidance encourages better acoustic design for new residential development and aims to protect people from the harmful effects of noise. It aims to complement Government planning and noise policy and guidance. In particular, it strives to:

- Advocate full consideration of the acoustic environment from the earliest possible stage of the development control process;
- Encourage the process of good acoustic design in and around new residential developments;
- Outline what should be taken into account in deciding planning applications for new noise-sensitive developments;
- Improve understanding of how to determine the extent of potential noise impact and effect; and
- Assist the delivery of sustainable development.

14.31 This ProPG advocates a systematic, proportionate, risk based, 2-stage, approach. The approach encourages early consideration of noise issues, facilitates straightforward accelerated decision making for lower risk sites, and assists proper consideration of noise issues where the acoustic environment is challenging.

14.32 The two sequential stages of the overall approach are:

- Stage 1 – an initial noise risk assessment of the proposed development site

14.33 It is important that the assessment of noise risk at a proposed residential development site is not the basis for the eventual recommendation to the decision maker in terms of noise. The recommended approach is intended to give an early indication of the likely initial suitability of the site for new residential development from a noise perspective and the extent of the acoustic issues that would be faced. This assessment is undertaken alongside the EIA process in this Chapter.

- Stage 2 – a systematic consideration of four key elements:

[3] Working Group (Association of Noise Consultants, Institute of Acoustics and Chartered Institute of Environmental Health) (2017) Professional Practice Guidance on Planning & Noise: New Residential Development. ANC. London

Element 1 – demonstrating a "Good Acoustic Design Process"

14.34 It is imperative that acoustic design is considered at an early stage of the development control process. A good acoustic design process takes a multi-faceted and integrated approach to achieve optimal acoustic conditions, both internally and externally. Good acoustic design should avoid "unreasonable" acoustic conditions and prevent "unacceptable" acoustic conditions.

Element 2 – observing internal "Noise Level Guidelines"

Table 14.2: ProPG Internal Noise Level Guidelines

Activity	Location	07:00 – 23:00 Hours	23:00 – 07:00 Hours
Resting	Living Room	35dB LAeq,16hr	-
Dining	Dining Room/area	40dB LAeq,16hr	-
Sleeping (daytime resting)	Bedrooms	35dB LAeq,16hr	30dB LAeq,8hr 45dB LAmax,fast4
NOTE 1 The Table provides recommended internal LAeq 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 LAeq 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 LAeq target levels recommended in the Table. NOTE 3 These internal LAeq 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 LAmax,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 45dB LAmax,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 LAeq 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 LAeq target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved. The more often internal LAeq levels start to exceed the internal LAeq 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 LAeq 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.

Element 3 – undertaking an "External Amenity Area Noise Assessment"

14.35 Advice in BS8233:2014 provides the following:

> *"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 $L_{Aeq,16hr}$. 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."*

14.36 Where, despite following a good acoustic design process, significant adverse noise impacts remain on any private external amenity space 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 facade or a relatively quiet externally ventilated as part of their dwelling; and/or
- A relatively quiet alternative or additional external amenity space for sole use by a household; 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, publicly accessible, external amenity space that is nearby.

Element 4 – consideration of "Other Relevant Issues"

- Compliance with relevant national and local policy;
- Magnitude and extent of compliance with ProPG;
- Likely occupants of the development;

- Acoustic design v unintended adverse consequences; and
- Acoustic design v wider planning objectives.

14.37 Following the above stages, including the initial site risk assessment and full assessment, a recommendation to the decision maker is determined as follows:

- Grant without noise conditions; or
- Grant with noise conditions; or
- Avoid (significant adverse effects); or
- Prevent (unacceptable adverse effects).

British Standard BS 8233:2014: Guidance on sound insulation and noise reduction for buildings[4]

Noise Criteria Limits

14.38 The scope of this standard is the provision of recommendations for the control of noise in and around buildings including residential dwellings. It suggests appropriate criteria and limits for different situations, which are primarily intended to guide the design of new buildings or refurbished buildings undergoing a change of use, rather than to assess the effect of changes in the external noise climate.

14.39 The standard suggests suitable internal noise levels within different types of buildings, including residential dwellings, as shown in Table 14.3:

Table 14.3: BS8233:2014 Recommended Internal Noise Levels

Criterion	Typical Situation	Design, LAeq,T (dB)
Suitable resting/sleeping conditions	Living Room	35
	Bedroom	30

14.40 BS8233 goes on to recommend noise levels for gardens. According to BS8233;

"It is desirable that the external noise level does not exceed 50dB $L_{Aeq,T}$, with an upper guideline value of 55dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognised that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors might be warranted".

14.41 BS8233 goes on to say:

[4] British Standards Institution (2014) British Standard 8233: Guidance on sound insulation and noise reduction for buildings. BSI Standards Ltd. London

"In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces but should not be prohibited".

Ventilation Requirements

14.42 Where a partially open window cannot be relied upon to provide an adequate level of facade sound insulation performance, it is necessary to consider alternative ventilation for habitable rooms. Section 8.4.5.4 within BS8233 states:

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

Alternatively, acoustic ventilation units (see 7.7.2 below) are available for insertion in external walls. These can provide sound reduction comparable with double glazed windows. However, ducted systems with intakes on the quiet side of the building might be required in very noisy situations, or where appearance rules out through-the-wall fans."

14.43 Section 7.7.2 states:

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

World Health Organisation's (WHO) 'Guidelines for Community Noise'[5]

14.44 The WHO gives guidance on desirable levels of environmental noise. The levels presented in the WHO Community Guidelines are those at which adverse effects become measurable. The 1980 WHO document suggested that *"general daytime outdoor noise levels of less than 55dB(A) $L_{eq,16hr}$ are desirable to prevent any significant community annoyance"* This level is an external free-field noise level. The 1980 document also stated in relation to internal levels *"that night-time noise levels of 35dB(A) $L_{eq,8hr}$ or less will not interfere with the restorative process of sleep"*.

14.45 A report was submitted to the WHO in 1995 for consideration as a revision to the 1980 document and revised community guidelines were issued in 2000. In the 2000 guidelines, it is considered that the sleep disturbance criteria should be taken as an internal noise level of 30dB $L_{Aeq,8hr}$ or an external level of 45dB $L_{Aeq,8hr}$. It also recommends that internal L_{Amax} levels of 45dB and external L_{Amax} levels of 60dB should be limited where possible.

14.46 The 2000 WHO document also states that "To protect the majority of people from being seriously annoyed during the daytime, the sound pressure level on balconies, terraces and outdoor living areas should not exceed 55dB $L_{Aeq,16hr}$ for a steady continuous noise." i.e. the daytime levels effectively remain unchanged.

[5] World Health Organisation (1999) Guidelines for Community Noise. WHO. Denmark

Institute of Environmental Management and Assessment 'Guidelines for Environmental Noise Impact Assessment'[6]

14.47 The guidelines address the key principles of noise impact assessment and are applicable to all development proposals where noise effects are likely to occur. The guidelines provide specific support on how noise impact assessment fits within the Environmental Impact Assessment (EIA) process. They cover:

- How to scope a Noise Assessment;
- Issues to be considered when defining the baseline noise environment;
- Prediction of changes in noise levels as a result of implementing development proposals; and
- Definition and evaluation of the significance of the effect of changes in noise levels (for use only where the assessment is undertaken within an EIA).

Table 14.4: Effect Descriptors for Residential Dwellings

Effect	Change in Ambient Noise Level (dB)
Major	>10
Moderate	5.0 - 9.9
Minor	3.0 – 4.9
Negligible	<2.9

British Standard BS6472-1: 2008: Guide to evaluation of Human Exposure to Vibration in Buildings[7]

14.48 With respect to human exposure to building vibration, BS6472 provides guideline values of the Vibration Dose Value (VDV) above which various degrees of adverse comment may be expected from the occupants of residential buildings. The VDV is defined mathematically as the fourth root of the time integral of the fourth power of the vibration acceleration, after it has been frequency weighted. The guideline values recommended by BS6472 are shown in Table 14.5 below.

[6] Institute of Environmental Management & Assessment (2014) Guidelines for Environmental Noise Impact Assessment. IEMA. London.
[7] British Standards Institution (2008) British Standard 6472-1: Guide to evaluation of human exposure to vibration in buildings. Part 1: Vibration sources other than blasting. BSI Standards Ltd. London

Table 14.5: BS6472 Guideline Values

Place	Low Probability of Adverse Comment	Adverse Comment Possible	Adverse Comment Probable
	VDV (m/s)		
Residential Buildings (16-hour Day)	0.2 – 0.4	0.4 – 0.8	0.8 – 1.6
Residential Buildings (8-hour Night)	0.1 – 0.2	0.2 – 0.4	0.4 – 0.8

14.49 Where the vibration is intermittent rather than continuous in nature, BS6472 defines procedures for calculating the estimated Vibration Dose Value (eVDV), based on the number and duration of vibration events and the recorded value of the root mean square frequency weighted vibration acceleration. The frequency weighting takes into account the response of the human body to vibrations of different frequency and whether the person is lying down or standing. The eVDV can then be taken as the VDV for use in the assessment of human exposure to vibration in buildings.

14.50 The above guidance relates to vibration measured at the point of entry into the human body, which is usually taken to mean the ground surface or at a point mid-span of an upper storey floor, rather than the point of entry into the building (a foundation element).

Design Manual for Roads & Bridges Volume 11[8]

14.51 The Highways Agency's document Design Manual for Roads and Bridges (DMRB) provides a method for evaluating both the immediate and long-term noise effects on receptors of changes in traffic flows on public highways, assessed using 18-hour traffic flow (06:00 – 24:00) data.

According to the DMRB, a change in road traffic noise of 1 dB LA90,18h in the short term (e.g. when a projects is opened) is the smallest that is considered perceptible. A description of the classification of the magnitude of effects for short-term traffic noise is presented in **Error! Reference source not found.**14.6.

Table 14.6: Criteria for determining magnitude of impact of noise changes in traffic (Source: Table 3.1 of DMRB)

Magnitude	**Criteria** **$L_{A10,18hr}$ noise change from existing traffic levels**
Large	5 dB or more
Medium	3 – 4.9 dB
Small	1 – 2.9 dB

[8] The Highways Agency (2011) Design Manual for Roads and Bridges, Volume 11: Environmental Assessment, Section 3: Environmental Assessments Techniques, Part 7, HD213/11 – Noise and Vibration. HMSO. London.

Magnitude	Criteria $L_{A10,18hr}$ noise change from existing traffic levels
Negligible	0.1 – 0.9 dB
No change	0 dB

British Standard 5228: Noise and Vibration Control on Construction and Open Sites – Part 1: Noise: 2009+A1 2014 (BS 5228-1)[9]

14.52 This British Standard sets out techniques required to predict and assess the likely noise effects from construction works, based on detailed information on the type and number of plant items being used, their location, and the length of time they are in operation.

14.53 The noise prediction method is used to establish likely noise levels in terms of the $L_{Aeq,T}$ over the core working day.

14.54 This British Standard also documents a database of information, comprising previously measured sound power levels for a variety of different construction plant undertaking various common activities.

14.55 Example criteria are presented for the assessment of the significance of noise effects. Such criteria maybe concerned with fixed noise limits and/or ambient noise level changes. With respect to fixed noise limits, BS 5228-1 presents the following noise limits which are taken as an average over a 10-hour working day:

- 70.0dB(A) in rural, suburban, and urban areas away from main road traffic and industrial noise; and,
- 75.0dB(A) in urban areas near main roads and heavy industrial areas.

BS 5228: Noise and Vibration Control on Construction and Open Sites - Part 2: Vibration: 2009+A1 2014 (BS 5228-2)[10]

14.56 This standard provides recommendations for basic methods of vibration control relating to construction and open sites. The legislative background to vibration control is described and guidance is provided concerning methods of measuring vibration and assessing its effects on the environment.

14.57 Guidance criteria are suggested for the assessment of the significance of vibration effects, such criteria are provided in terms of Peak Particle Velocities (PPV) and are concerned with both human and structural responses to vibration. Those applicable to human perception and disturbance are presented within Table 14.7.

[9] British Standards Institution (2014) British Standard 5228-1:2009+A1: Code of practice for noise and vibration control on construction and open sites – Part 1: Noise. BSI Standards Ltd. London
[10] British Standards Institution (2014) British Standard 5228-2:2009+A1: Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration. BSI Standards Ltd. London

Table 14.7: PPV Criteria – Human Exposure

Vibration Level	Effect
0.14mm/s	Vibration might just be perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.3mm/s	Vibration might be just perceptible in residential environments
1.0mm/s	It is likely that vibration of this level in residential environments will cause complaint but can be tolerated if prior warning and explanation has been given to residents.
10mm/s	Vibration is likely to be intolerable for any more than a very brief exposure to this level.

14.58 The Standard goes on to present guidance criteria applicable to the vibration response limits of buildings in terms of the component PPV, these are presented within Table 14.8.

Table 14.8: PPV Criteria – Buildings

Type of Building	Peak Component Particle Velocity in Frequency Range of Predominant Pulse	
	4Hz to 15Hz	15Hz and above
Reinforced or framed structures Industrial and heavy commercial buildings	50mm/s at 4Hz and above	50mm/s at 4Hz and above
Unreinforced or light framed structures Residential or light commercial buildings	15mm/s at 4Hz increasing to 20mm/s at 15Hz	20mm/s at 15Hz increasing to 50mm/s at 40Hz and above
Note 1: Values referred to are at base of the building Note 2: At frequencies below 4Hz, a maximum displacement of 0.6mm (zero to peak) is not to be exceeded.		

14.59 It should be noted that the values presented within Table E3.6 are applicable to cosmetic damage only. It is stated within BS 5228-2 that minor damage is possible at vibration magnitudes which are greater than twice those given in the Table. The guide values for building damage are an order of magnitude higher than for human disturbance.

Building Bulletin 93: The Acoustic Design of Schools – A Design Guide (BB93)

14.60 Building Bulletin 93 (BB93) stipulates maximum indoor ambient noise levels in critical spaces, internal partition sound insulation and reverberation time limits in rooms. The latter of these only become critical at the design stage. However, at the planning stage it is prudent to take account of indoor ambient noise levels as they, together with existing external noise levels, determine the building envelope and required means of ventilation.

14.61 BB93 outlines maximum indoor ambient noise levels in teaching spaces, expressed in terms of $L_{Aeq,30mins}$ (dB) which is the average 30-minute L_{Aeq} as detailed below.

Table 14.9: Indoor Ambient Noise Levels by Room Type

Type of Room	Activity Noise (Source Room)	Noise Tolerance (Receiving Room)	Upper Limit for the Indoor Ambient Noise Level $L_{Aeq, 30min}$ (dB)
Nursery School playrooms	High	Low	35[1]
Nursery School quiet rooms	Low	Low	35[1]
Primary School: classrooms, class bases, general teaching areas, small group rooms	Average	Low	35[1]
Secondary School: classrooms, general teaching areas, seminar rooms, tutorial rooms, language laboratories	Average	Low	35[1]
Open-plan[2]			
Teaching areas	Average	Medium	40[1]
Resource areas	Average	Medium	40[1]
Interviewing/counselling rooms, medical rooms	Low	Low	35[1]
Dining rooms	High	High	45
Ancillary Spaces			
Kitchens	High	High	50

Type of Room	Activity Noise (Source Room)	Noise Tolerance (Receiving Room)	Upper Limit for the Indoor Ambient Noise Level $L_{Aeq, 30min}$ (dB)
Offices, staff rooms	Average	Medium	40
Corridors, stairwells	Average – high	High	45
Coats and changing areas	High	High	45
Toilets	Average	High	50

NOTES

1 Research indicates that teaching can be disrupted by individual noisy events such as aircraft flyovers, even where the noise level is below the limits in the above table. For rooms identified above having limits of 35dB or less, the noise level should not regularly exceed 55dB $L_{A1, 30min}$.

2 Acoustic considerations of open-plan areas are complex and are discussed in the BB93 section of Assessment Criteria in Section 2.

14.62 For new schools, BB93 recommends that 60dB $L_{Aeq,30min}$ should be regarded as an upper limit for external noise at the boundary of external premises used for formal and informal outdoor teaching, and recreational areas. However, under some circumstances it is possible to meet the specified indoor ambient noise levels on Sites where external noise levels are as high as 70dB $L_{Aeq,30min}$, but this will require considerable building envelope sound insulation, screening, or barriers.

14.63 BB93 recommends that noise levels in unoccupied playgrounds, playing fields and other outdoor areas should not exceed 55dB $L_{Aeq,30min}$ and there should be at least one area suitable for outdoor teaching activities where noise levels are below 50dB $L_{Aeq,30min}$. If this is not possible due to a lack of suitably quiet Sites, acoustic screening should be used to reduce noise levels in these areas as much as practicable, and an assessment of predicted noise levels and of options for reducing these should be carried out.

14.64 Playgrounds, outdoor recreation areas and playing fields are generally considered to be of relatively low sensitivity to noise, and indeed playing fields may be used as buffer zones to separate school buildings from busy roads where necessary.

Assessment Methodology and Significance Criteria

Assessment Methodology

Scope

14.65 The Scope of the assessment includes the identification of sensitive receptors in the immediate vicinity of the Site that may be subject to noise and vibration from construction activities as well as existing receptors that are

located along any affected highways that are subject to a significant change in traffic flows. Furthermore, the assessment estimates the sound and vibration levels across the proposed Site and the likely effect upon the proposed residential receptors associated with the development.

14.66 The identified receptors in the immediate vicinity are assessed first in relation to proposed sources of sound. Where significant impacts are predicted, further receptors may be considered depending on their geographical situation and other factors.

Site Preparation and Construction Assessment

14.67 The following assessments will be undertaken in relation to the preparation and construction phases:-

- Construction noise at existing and proposed local sensitive receptors in accordance with BS5228;
- Construction generated noise due to construction traffic on the local road network at existing and proposed local receptors in accordance with DMRB; and
- Ground-borne vibration levels at existing local sensitive receptors in accordance with BS5228.

Completed Development Assessment

14.68 The following assessments will be undertaken in relation to the operational phase of the development: -

- The noise levels generated by the existing road and rail network and any proposed changes to such impacting upon the proposed receptors. Assessments will be based on 3D noise modelling and levels compared to those given in ProPG, BS8233 and WHO Guidelines. The 3D noise models are included as **Figures 14.4** and **14.5** in **Volume 2a: Main Text Figures**;
- Noise from existing nearby commercial premises impacting upon the proposed development in accordance with BS4142;
- Rail vibration impacting upon the proposed development in accordance with BS6472; and
- Changes in road traffic noise levels associated with the Proposed Development on existing local noise-sensitive receptors in accordance with DMRB and Calculation of Road Traffic Noise (CRTN).

Identifying Sensitive Receptors

14.69 The sensitivity of receptors depends upon their nature. Where the sensitivity of a receptor is greater, identified impacts could be more significant, and vice versa. For instance, it is commonly considered that heavy industrial installations are not particularly sensitive to noise whilst residential dwellings, hospitals, nursing homes and place of worship are. Between these two extremes receptor types are other locations and places of work such as offices.

14.70 In determining the significance criteria, it is necessary to consider the sensitivity of the receptor in conjunction with the predicted noise and vibration levels / level changes. Table 14.10 presents the criteria used to define the sensitivity of receptors in relation to noise and vibration impacts.

Table 14.10: Criteria Used to Describe Sensitivity of Receptors

Sensitivity	Description	Example Receptor
High	The receptor has little ability to absorb change without altering its present character	Internal and external living areas associated with residential dwellings, quiet outdoor areas used for recreation, conference facilities, auditoria/studios, schools in the daytime, hospitals/residential care homes
Medium	Receptors moderately sensitive to noise/vibration where it may cause some distraction or disturbance	Offices, community facilities, scheduled Ancient Monuments/Listed Buildings
Low	Receptors with a low sensitivity to noise/vibration where it may in extreme cases cause some disturbance	Warehouse, light industry, car park restaurants, commercial Installations, agricultural land.
Negligible	Receptors where distraction or disturbance from noise/vibration is minimal	Heavy industry, motorways, factories, storage centres, railway line

14.71 Construction noise predictions have been undertaken for nine off-site sensitive receptors R1 to R9 as detailed in Table 14.11 below, and the approx. locations are shown on **Figure 14.2**.

14.72 The receptor identified by R10 is a new receptor to be introduced to the area with the proposed development and likely to be finished and occupied before the final completion of the Site.

Table 14.11: Noise and Vibration Sensitive Receptors

Receptor	Address/ Location	X	Y
R1	Cloughfield, Fryer Close – Western Receptors	352668	426265
R2	Copper Beeches	352767	426492
R3	Chefford Close, Burwood Close and Rookery Drive	353718	426479
R4	Leyland Road	353831	426409
R5	Fir Trees Avenue	353937	425959

Receptor	Address/ Location	X	Y
R6	Coote Lane – South East	353812	425617
R7	Coote Lane - South	353392	425465
R8	Coote Lane South West	353018	425501
R9	Chain House Lane – South West	352870	425461
R10	Within the Site (at least 20metres from central construction Phase area)	On-Site	On-Site

Characterisation of Impact

14.73 Impacts in relation to Noise and Vibration will be characterised based firstly on whether an adverse or beneficial impact is predicted/exists. With regards new sound sources introduced, often the impact will be adverse with differing magnitude. With regards operational impacts, these can be beneficial or adverse.

14.74 The extent of the assessments will focus on proposed receptors within the red line boundary, existing receptors within the red line boundary and within the immediate vicinity of the development boundaries and existing receptors along the affected road network. Where significant impacts are predicted for existing receptors in the immediate vicinity, further receptors may be considered.

14.75 Magnitude of impacts will range between negligible/neutral, i.e., no impact, to major impact, i.e., significant adverse/beneficial. Magnitude of impact and significance will be linked to absolute criteria and the level of which predicted levels fall above or below such criteria, but context will also be considered for each assessment and receptor in accordance with the relevant guidance.

14.76 With regards the duration of impact, construction will be considered as temporary/short term and any operational impacts will be considered permanent/long term. Any impacts predicted will be considered reversible, where possible, using mitigation measures.

14.77 Likelihood of adverse impact is not directly considered as the assessments are based on absolute criteria given in the relevant standards and guidance and so are assumed to be likely where an impact is predicted.

Significance Criteria

14.78 The significance of any impacts, whether during construction or operation will account for the sensitivity of the receptor, which in most cases will be high to reflect residential use, the magnitude of impact and the duration of the impact.

Magnitude of change impact

14.79 The criteria used to assess how far an effect deviates from the baseline condition, i.e., the magnitude of change, are described in Table 14.12 below.

Table 14.12 Criteria for determining magnitude of change / impact

Magnitude	Criteria
Large	Total loss or major / substantial alteration to key elements / features of the baseline (pre-development) conditions such that the post development character / composition / attributes will be fundamentally changed.
Medium	Loss or alteration to one or more key elements / features of the baseline conditions such that post development character / composition / attributes of the baseline will be materially changed.
Small	A minor shift away from baseline conditions. Change arising from the loss / alteration will be discernible / detectable but not material. The underlying character / composition / attributes of the baseline condition will be similar to the pre-development circumstances / situation.
Negligible	Very little change from baseline conditions. Change barely distinguishable, approximating to a 'no change' situation.

Construction Significance Criteria

14.80 With respect to hours of work, BS 5228 refers to the fact that noise levels generated during the evening (19:00 to 23:00) may need to be lower than the daytime (07:00 to 19:00) period (a figure of 10dB is quoted) and also that for any night-time operations (23:00 to 07:00) levels should be quieter still. The Standard does not, however, offer guidelines with respect to acceptable levels.

14.81 Following the fixed noise level limits presented in BS 5228-1 for urban areas and regions close to main road traffic, where it is calculated that construction noise levels will exceed **75dB $L_{Aeq,T}$** (facade) applicable to the core working day, it is considered that a noise impact of moderate adverse could arise. Noise levels which are calculated to fall below this criterion are considered to give rise to a neutral/negligible magnitude of impact. An exceedance of less than 3dB is considered minor, an exceedance of more than 3dB is considered moderate and more than 5dB is considered major.

14.82 The significance of vibration effects has been assessed drawing upon the guidance criteria presented within BS 5228-2 as outlined in Table 14.13.

Table 14.13: Magnitude of Impact Criteria Applicable to Construction Vibration

Vibration Level (ppV)	Effect	Magnitude of Impact
0.14mm/s	Vibration might just be perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.	Neutral/Negligible
0.3mm/s	Vibration might be just perceptible in residential environments	Minor
1.0mm/s	It is likely that vibration of this level in residential environments will cause complaint but can be tolerated if prior warning and explanation has been given to residents.	Moderate
10mm/s	Vibration is likely to be intolerable for any more than a very brief exposure to this level.	Major

14.83 Table 14.11 has been generated based upon the guidance on effects of vibration levels as presented within BS 5228-2, the corresponding vibration ranges and associated magnitude ratings adopted for the purpose of this assessment have also been included within the Table.

14.84 With regards the significance, a moderate or major adverse impact is considered significant.

Completed Development Significance Criteria

Change in Road Traffic Noise Impact upon Existing Receptors

14.85 The assessment of noise impact due to changes in road traffic has been undertaken drawing upon the suggested classification of effect provided within the DMRB. The DMRB classification of effects has been adapted to produce a set of magnitude criteria ranging from no effect to major as presented within Table 14.14 for the short term and Table 14.15 for the long term.

Table 14.14: Classification of Magnitude of Impact for Comparison of Future Noise against Existing Noise – Short Term

Noise Level Change, LA10,18hr	Short-term Magnitude of Impact
0 – 0.9	Negligible
1.0 – 2.9	Minor
3.0 – 4.9	Moderate
5.0+	Major

Table 14.15: Classification of Magnitude of Impact for Comparison of Future Noise against Existing Noise – Long Term

Noise Level Change, LA10,18hr	Long-term Magnitude of Impact
0 – 2.9	Negligible
3.0 – 4.9	Minor
5.0 – 9.9	Moderate
10.0+	Major

Road and Rail Traffic Noise Impact upon Proposed Development

14.86 During the baseline noise surveys, it was noted that noise generated by road and rail traffic dominated the noise climate across the Site.

14.87 For the assessment of internal noise levels, the BS8233:2014 30dB $L_{Aeq,8hr}$ and 45dB L_{AFmax} applicable to bedrooms and 35dB $L_{Aeq,16hr}$ applicable to living rooms have been adopted for the night-time and daytime periods respectively. Where these criteria are exceeded, without mitigation in place, a moderate or substantial adverse impact will be observed depending on the context and level of exceedance.

14.88 For external amenity area, such as gardens, the BS8233:2014 upper guideline value of 55dB $L_{Aeq,16hr}$ will be aimed for but it is clear from the location of the Site and surrounding noise sources that this may not be achievable, in accordance with the guidance. Therefore, the lowest practicable levels will be achieved. Where noise levels are predicted to exceed 50dB but fall below 55dB a negligible impact is observed. Where noise levels range between 55 and 58dB, a minor impact is predicted. A moderate impact is predicted between 58 and 60dB, depending on the context and any levels above 60dB before mitigation are considered major. However, this is relative to the context of the Site and its proximity to the main roads and railway line, as such it will be more difficult to achieve a noise level below 55dB and accordingly, the significance of impact will be addressed for each area of the Site considering the context.

Commercial Noise Impact upon Proposed Residential Development

14.89 There is potential for noise associated with the operation of existing commercial premises to impact upon proposed noise sensitive receptors. The magnitude of impact will depend on the difference between the

calculated Rating Level, $L_{A,r}$, and the existing background sound level. As such, a difference of 0dB or less is considered negligible, +3dB or below is minor, +5dB or below is moderate and >5dB is considered major.

Proposed Fixed Plant Impact upon Proposed and Existing Residential Development

14.90 There is potential for noise associated with the operation of the proposed school and community centre to impact upon proposed noise sensitive receptors. The magnitude of impact will depend on the difference between the calculated Rating Level, $L_{A,r}$, and the existing background sound level. If the plant noise emission limits are adhered to, this should provide a difference of 0dB or less which is considered negligible. However, an exceedance of +3dB or below is minor, +5dB or below is moderate and >5dB is considered major.

Assumptions/Limitations

14.91 With regards to noise and vibration measurements, Ensafe have endeavoured to ensure that all noise and vibration measurements taken are robust, representative, and reliable to inform an accurate assessment.

14.92 Where mitigation measures are specified in the Chapter, it should be noted that these measures are relative to a specific sound source, both in terms of the measured sound pressure level and the character of the source. Where either the sound pressure level or the character of the sound varies following completion of the sound survey, Ensafe cannot be held responsible for any subsequent variations in the proposed mitigation performance.

Characterisation of Effect

Significance evaluation

The significance of a potential effect is derived by considering both the sensitivity of the feature and the magnitude of change. The following definitions are used to determine the magnitude of change caused by the proposed development.

Table 14. 16: Overall significance of Effect Matrix

Significance of Effects		**Receptor Sensitivity**		
		High	**Medium**	**Low**
Magnitude of Change	**High**	major	moderate/major	moderate
	Moderate	moderated/major	moderate	minor/moderate
	Low	minor/moderate	minor	minor/negligible
	Negligible	minor/moderate	minor/negligible	negligible

14.93 After defining the receptor sensitivity and the nature of the effect, the significance of the effect is stated according to the following definitions:

Table 14. 17: Categories of significance of noise (unwanted sound) effect

Significance Category	Description of Effect
High Beneficial effect	The project would: • Reduce existing ambient noise levels by providing screening to noise exposed areas; • Enable the restoration of ambient sound lost as a result; of changes from inappropriate development; • Cause a very noticeable improvement in the existing ambient sound climate
Moderate beneficial effect	The project would: • Reduce existing ambient noise levels by providing screening to noise exposed areas; • Enable the restoration of ambient sound lost as a result; of changes from inappropriate development; • Cause a very noticeable improvement in the existing ambient sound climate
Minor beneficial effect	The project would: • Follow the local design code quality and value; • Enable some noise abatement; and • Cause a barely perceptible improvement in the existing ambient sound climate.
Negligible effect	The project would: • Maintain the existing ambient sound levels; • Blend in with characteristic features and elements
Minor adverse effect	The project would: • The increase in ambient sound would not be clearly perceived not quite fit the character (including quality and value) of the landscape; • Be at variance with characteristic features and

Significance Category	Description of Effect
	elements; • Detract from a sense of place; and • Cause a barely perceptible deterioration in the existing view. This will typically occur where the viewer is at some distance from the development and the development newly appears in the view, but not as a point of principal focus. It will also occur where the development is closely located to the viewpoint but is seen at an acute angle and at the extremity of the overall view.
Moderate adverse effect	The project would: • Conflict with the character (including quality and value) of the landscape; • Have an adverse impact on characteristic features or elements; • Diminish a sense of place; and • Cause a noticeable deterioration in the existing view.
High adverse effect	The project would: • Be at complete variance with the character (including quality and value) of the landscape; • Degrade or diminish the integrity of a range of characteristic features and elements; • Damage a sense of place or cause a sense of place to be lost; • Cause the integrity of characteristic features and elements to be lost; • Cause a very noticeable deterioration in the existing view; and • Obstruct an existing view of local landscape and the development will dominate the future view.

14.94 The flowing table provides the definition of the duration and the likely effect:

Table 14. 18: Definition of duration effect

Duration	Description
Temporary	Effects lasting one year or less
Short Term	Effects lasting one to seven years
Medium Term	Effects lasting seven to fifteen years
Long Term	Effects lasting fifteen to sixty years
Permanent	Effects lasting over sixty years

14.95 The effect is also evaluated in terms of the outcome contribution to the area

Table 14. 19: Nature, type, and reversibility of impact

Effect category and classification	Description
Neutral	The development will nether enhance nor detract from the existing sound climate
Negative (Adverse)	An impact that is considered to represent an adverse change from the baseline, or to introduce a new undesirable factor. The development will have an adverse effect on the existing sound climate
Positive (Beneficial)	An impact that is considered to represent an improvement to the baseline or to introduce a new desirable factor. The development will improve or enhance the sound climate
Cumulative	Impacts that act together with other impacts (including those from concurrent or planned future third-party activities) to affect the same resources and/or receptors within the area
Reversible	Impact on resources/receptors that cease to be evident, either immediately of following or acceptable period, after termination of a determined activity will decrease back to the previous baseline levels
Irreversible	Impact on resources/receptors that are evident following termination of an

Effect category and classification	Description
	activity, and which remain for an extended period. Impact cannot be reversed by implementation of mitigation measures.
Temporary	Impacts are predicted to be of short duration and intermittent/occasional
Short-term	Impacts that are predicted to last only for a limited period but will cease on completion of the activity or because of mitigation measures
Long term	Impacts that will continue over an extended period but cease when the project stops operation
Permanent	Impacts that occur during the development and cause a permanent change in the affected resource/receptor

Consultation

14.96 The consultation with the Local Authority was carried out in 2018 prior to noise and vibration surveys to confirm suitability of the proposed survey's locations and assessment methodology.

Table 14.20: Consultation

Consultee	Date and Time	Comments	Actions
Environmental Health Department – South Ribble Council	1st August 2018 15:00	Email sent to confirm the proposed survey location and assessment methodology .	Comments received via Scoping Response dated 12th December 2018. Request for consideration towards the West Coast Mainline. This is addressed in the Chapter.

Road Traffic Sound Survey – Penwortham Way

14.97 Ensafe has conducted a Road Traffic Noise Survey to measure the level of noise generated by vehicles using Penwortham Way. The survey was carried out over the following time periods over a full 24-hour weekday period:

- 11:14 Wednesday 8th August to 11:14 Thursday 9th August 2018.

14.98 The following noise measurement position was chosen for the Road Traffic Noise Survey:

- Noise Measurement Position 1 (NMP1): Located on the western boundary of the Site approximately 6m from the nearside carriageway edge. The microphone was in free-field conditions and at a height of 1.5m above local ground level. Noise sources at this location were dominated by road traffic noise from Penwortham Way.

14.99 A summary of the measured sound pressure levels from the Road Traffic Noise Survey are presented in Table 14.21. The full hourly dataset is provided in **Appendix 14.1**.

Table 14.21: Summary of Measured Noise Levels for NMP1 – Penwortham Way

Assessment Period	Measured Sound Pressure Levels (dB)	
	LAeq,1hr	10th Highest LAmax.fast
Daytime (07:00 – 23:00)	74	-
Night-time (23:00 – 07:00)	68	86

Road Traffic Sound Survey – Chain House Lane/Coote Lane

14.100 Ensafe has conducted a Road Traffic Noise Survey to measure the level of noise generated by vehicles using Chain House Lane/Coote Lane. The survey was carried out over the following time periods in accordance with the shortened measurement procedure given in CRTN:

- Thursday 9th August 2018 between 12:33 and 15:33.

14.101 The following noise measurement position was chosen for the Road Traffic Noise Survey:

- Noise Measurement Position 2 (NMP2): Located approximately 12m from the road edge of Chain House Lane/Coote Lane on the southern boundary. The microphone was in free-field conditions and at a height of 1.5m above local ground level. Noise sources at this location were dominated by road traffic noise from Chain House Lane/Coote Lane.

14.102 A summary of the measured sound pressure levels from the Road Traffic Noise Survey are presented in Table 14.22.

Table 14.22: Summary of Measured Noise Levels for NMP2 – Chain House Lane/Coote Lane

Measurement Period Start	Measured Sound Pressure Levels (dB)			
	$L_{Aeq,1hr}$	10th Highest $L_{Amax,fast}$	$L_{A90,1hr}$	$L_{A10,1hr}$
12:33	60.5	76	47.0	64.9
13:33	61.5		47.8	65.0

Measurement Period Start	Measured Sound Pressure Levels (dB)			
	$L_{Aeq,1hr}$	10th Highest $L_{Amax,fast}$	$L_{A90,1hr}$	$L_{A10,1hr}$
14:33	62.5		48.2	64.8

Rail Traffic Sound Survey – Northern before Line Split

14.103 Ensafe has conducted attended sound measurements of train pass-bys during a typical weekday period for the northern section of rail. The survey was carried out between the following time periods:

- 11:59 Wednesday 8th August to 12:00 Thursday 9th August 2018.

14.104 The following noise measurement position was chosen for the Rail Pass-by Noise Survey:

- Noise Measurement Position 3 (NMP3): Located on the eastern boundary of the Site opposite the railway line before it splits further south. The microphone was located 1.5m above ground level and in free-field conditions. Noise sources at this location consisted predominately of train pass-bys, distant road traffic and bird song.

14.105 A summary of the measured sound pressure levels from the Rail Traffic Noise Survey are presented in Table 14.23. The full hourly dataset is provided **Appendix 14.2**.

Table 14.23: Summary of Measured Noise Levels for NMP3 – Rail Traffic

Assessment Period	Measured Sound Pressure Levels (dB)	
	$L_{Aeq,1hr}$	10th Highest $L_{Amax,fast}$
Daytime (07:00 – 23:00)	60	-
Night-time (23:00 – 07:00)	59	82

Rail Traffic Sound Survey – Southern after the Split

14.106 Ensafe (former REC) has conducted attended sound measurements of train pass-bys during a typical weekday period for the southern section of rail after the split. The survey was carried out between the following time periods:

- 11:57 Wednesday 8th August to 12:00 Thursday 9th August 2018.

14.107 The following noise measurement position was chosen for the Rail Pass-by Noise Survey:

- Noise Measurement Position 4 (NMP4): Located on the southeast boundary of the site with line of sight to the railway line. The microphone was located 1.5m above ground level and in free-field conditions. Noise sources at this location consisted predominately of train pass-bys, distant road traffic and bird song.

14.108 A summary of the measured sound pressure levels from the Rail Traffic Noise Survey are presented in Table 14.24. The full hourly dataset is provided in **Appendix 14.2**.

Table 14.24: Summary of Measured Noise Levels for NMP4 – Rail Traffic

Assessment Period	Measured Sound Pressure Levels (dB)	
	LAeq,1hr	10th Highest LAmax.fast
Daytime (07:00 – 23:00)	53	-
Night-time (23:00 – 07:00)	47	70

Source Noise Measurements – Southern Commercial

14.109 Ensafe (former REC) has conducted attended commercial source noise measurements during a typical weekday period for the commercial premises that borders the Site to the south.

14.110 The attended surveys were carried out during the following time periods:

- Friday 10th August 2018 between 12:24 and 13:54; and
- Tuesday 14th August 2018 between 06:30 and 10:00.

14.111 The following location was chosen for the survey:

- Noise Measurement Position 5 (NMP5): Located adjacent to the rear of Welch Fencing on the southern boundary. The microphone of the sound level meter was located at a height of 1.5m and in free-field conditions. Sound sources at this location consisted of low frequency humming, Forklift Truck (FLT) movements, hammering and banging. Road traffic sound was audible throughout the survey.

14.112 A summary of the measured specific sound levels is presented in Table 14.25 below. No commercial sound was audible between 06:30 and 07:30.

Table 14.25: Summary of Measured Noise Levels for Commercial Sound at NMP5

Measurement Period	Source	Measured Specific Noise Level, LAeq,T (dB)	Measured On-time in 1-hour Period (seconds)
12:24 – 13:24	Low frequency hum	51.1	534
	FLT movements and sawing	52.2	89

Measurement Period	Source	Measured Specific Noise Level, LAeq,T (dB)	Measured On-time in 1-hour Period (seconds)
	Hammering and banging	51.0	544
13:24 – 13:54	Low frequency hum	52.5	137
	FLT movements and sawing	50.6	35
	Hammering and banging	51.1	456
07:00 – 08:00	FLT movements and sawing	47.3	6
08:00 – 09:00	Low frequency hum	52.5	1200
	FLT movements and sawing	48.5	5
	Hammering and banging	51.1	419
09:00 – 10:00	Hammering and banging	51.3	1561

Background and Ambient Sound Survey

14.113 Ensafe (former REC) has conducted a full weekday and weekend Background Sound Survey in a position considered representative of the closest indicative proposed and existing residential receptors. The survey was carried out during the following time:

- 14:44 Friday 10th August 2018 to 10:44 Tuesday 14th August 2018.

14.114 The following location was chosen for the survey:

- Noise Measurement Position 6 (NMP6): Located centrally within the Site within an existing hedgerow. The microphone of the sound level meter was located at a height of 1.5m above ground level in free field conditions. Sound sources at this location consisted of road traffic on the local road network.

14.115 A summary of the median measured 1-hour ambient sound pressure levels is presented in Table 14.26 below. A full tabulated representation is shown in **Appendix 14.1**

Table 14.26: Median Measured Background Sound Pressure Levels at NMP6

Date	Period	Median Measured Sound Pressure Level, LA90,1hr (dB)
Friday 10th August 2018	Daytime (14:44 – 23:00)	47.2
	Night-time (23:00 – 07:00)	31.8
Saturday 11th August 2018	Daytime (07:00 – 23:00)	40.2
	Night-time (23:00 – 07:00)	35.1
Sunday 12th August 2018	Daytime (07:00 – 23:00)	39.3
	Night-time (23:00 – 07:00)	27.9
Monday 13th August 2018	Daytime (07:00 – 23:00)	45.8
	Night-time (23:00 – 07:00)	28.4
Tuesday 14th August 2018	Daytime (07:00 – 10:44)	46.2

14.116 During the noise surveys, the weather conditions were conductive to the measurement of environmental noise, i.e., wind speeds no more than 5m/s^{-1} and dry conditions.

14.117 Table 14.27 has a list of the equipment used for the Noise Surveys.

14.118 All measurement positions are shown in **Figure 14.3.**

Table 14.27: Noise Measurement Equipment

Measurement Position	Equipment Description	Manufacturer Type	Serial No.	Calibration Due Date
NMP2 and NMP4	Sound Level Meter	01dB – Metravib Black Solo	65771	25th October 2019
	Pre-amplifier	01dB – Metravib Pre21S	16539	
	Microphone	01dB – Metravib MCE212	175280	
	Calibrator	01dB – Metravib Cal-21	34634218	24th April 2019
NMP1	Sound Level Meter	01dB – Metravib Fusion	10819	27th November 2020
	Pre-amplifier	GRAS 40CE	10714	
	Microphone	01dB – Metravib Integrated	217637	
	Calibrator	01dB – Metravib	34554787	11th June 2019

Measurement Position	Equipment Description	Manufacturer Type	Serial No.	Calibration Due Date
		Cal-21		
NMP3, NMP5 and NMP6	Sound Level Meter	01dB – Metravib Black Solo	65947	5th October 2019
	Pre-amplifier	01dB – Metravib Pre21S	16831	
	Microphone	01dB – Metravib MCE212	181856	
	Calibrator	01dB – Metravib Cal-21	34744600	5th October 2019

14.119 The sound level meters were field calibrated prior to and following the survey. No significant drift was reported. Calibration certificates are available on request.

Baseline Vibration

14.120 Ensafe (former REC) has conducted attended vibration measurements of train pass-bys during a typical weekday period. The survey was carried out over the following time period:

- Wednesday 15th August 2018 between 12:15 and 13:15.

14.121 The following vibration measurement position was chosen for the Rail Pass-by Survey:

- Vibration Measurement Position 1 (VMP1): Located on the eastern boundary of the Site with the railway line before the split. The geophone of the meter was secured into the ground using the supplied spikes.

14.122 A summary of the measured vibration levels is presented in Table 14.28.

Table 14.28: Summary of Measured Rail Vibration Levels

Measurement Start Time	Type	Transverse Peak (mm/s)	Longitudinal Peak (mm/s)	Vertical Peak (mm/s)
12:20	Passenger	0.063	0.063	0.048
12:21	Passenger	0.063	0.063	0.063
12:23	Passenger	0.222	0.444	0.238
12:26	Passenger	0.079	0.143	0.095
12:29	Passenger	0.095	0.095	0.063
12:36	Passenger	0.095	0.127	0.079
12:40	Passenger	0.159	0.317	0.19
12:56	Passenger	0.175	0.365	0.079

14.123 The following equipment was used for the vibration survey.

Table 14.29: Vibration Measurement Equipment

Measurement Position	Equipment Description	Manufacturer Type	Serial No.	Calibration Due Date
VMP1	Vibration Meter	Instantel Blastmate III	BA18274	15th May 2019
	Tr-axial Geophone	Instantel Geophone	BG17363	

Embedded Mitigation

Demolition and Construction

14.124 To inform a worst-case assessment, no mitigation measures for the construction phase are assumed to have been embedded.

Completed Development

14.125 Proposals comprise the development of open space including landscaping, access, and associated infrastructure such as SUDs and the retention of hedgerows which provide land buffers to the nearest developable areas on the eastern and southwestern boundaries. This would increase the distance between proposed dwellings to Penwortham Way and the railway lines, thus decrease the incident noise levels upon façades and external amenity areas. Please refer to Land Use Plans shown in **Figure 5.1** and **Figure 5.5**, **Volume 2a: Main Text Figures**.

14.126 The assessment aims to recommend specific mitigation measures where necessary, later in the Chapter.

Assessment of Likely Significant Effects

14.127 For consistency the following terms to describe the impacts will be used throughout:

- The type of impact will be '**beneficial, negligible** or **adverse'**
- The level of impact will be '**minor, moderate** or **major'** (adverse / beneficial)
- The time period for the impact will be classed as 'short (up to 7 year), medium (up to 15 years) or long term (more than 15 years)'
- The impact can be either 'reversible or permanent'
- 'Local level of (on site or neighbouring sites); District level; Regional level; National level (UK); International level'

Demolition and Construction

14.128 This section details the potential effects of the construction and operational phases of the development.

Demolition and Construction Noise

14.129 It is inevitable with any major development that there will be some disturbance caused to those nearby during the clearance and construction phases of the Site. However, disruption due to construction is only temporary, limited to the Site and is of medium-term duration.

14.130 Indeed, the build out timeframe is 8 years, but the impact will be localised to the nearest receptor to a particular phase and, as such, a medium-term impact is considered appropriate.

14.131 The predictions have followed the methodology contained within BS 5228-1 and are in terms of the $L_{Aeq,T}$ over the core working day, which is 08:00 to 18:00 hours Monday to Friday and 08:00 to 14:00 on Saturdays.

14.132 Table 14.30 sets out the typical plant type, number and assumed utilisation (percentage 'on-time') used in the prediction of noise levels during the key construction activities.

Table 14.30: Assumed Construction Plant Details

Plant Type	Sound Pressure Level at 10m, LAeq,T (dB)	No. of Plant	Assumed % On-Time
Cement mixer truck idling	71.0	1	60
Concrete pump + cement mixer	67.0	2	80
Truck mounted concrete pump & boom	80.0	2	80
Mobile telescopic crane	77.0	2	40
Telescopic handler	79.0	1	50
Tower Crane	76.0	2	80
Circular saw	85.0	1	40
Diesel generator	61.0	1	100
Tractor	80.0	2	80
Rotary bored piling	83.0	2	80
Dump truck	86.0	3	80
Tracked excavator	88.0	2	60
Forklift truck	88.0	3	70
Wheeled excavator with hydraulic breaker	78.0	2	70

Plant Type	Sound Pressure Level at 10m, LAeq,T (dB)	No. of Plant	Assumed % On-Time
Diesel generator	94.0	1	80
Poker vibrator	94.0	1	80
Generator	77.0	2	80

14.133 Predictions have been carried out to determine noise levels likely to be generated during the construction phase. For the purpose of these predictions, it was assumed that the intervening ground between the construction noise sources, and the receivers will be acoustically hard such that there will be no additional attenuation of sound due to ground absorption thus informing a worst-case assessment.

14.134 Noise predictions have been undertaken for the ten noise sensitive receptors R1 to R10. These noise sensitive receptors are detailed in **Figure 14.2**.

14.135 Table 14.31 sets out the average predicted unmitigated earthworks and construction noise levels for the construction stage of the works. A 75dB assessment criterion has been adopted in accordance with guidance contained in BS 5228 for urban areas. Any exceedances are highlighted in bold.

14.136 The estimated construction works potential adverse impact upon the existing identified nearest noise sensitive receptors, is based on the average distance between receptor and the central construction phase work area.

14.137 Where the receptors are located at the Site's boundary, the noise impact assessment is based on the distance equivalent to 20metres apart, and it is representative of the likely nearest position to the construction works central location at that specific phase.

14.138 Any works that take place closer to the receptor will be for a short period and an average, central position is considered robust.

Table 14.31: Predicted Mitigated Average Earthworks and Construction Noise Levels, $L_{Aeq,10hr}$

Receptor	Location	Average Distance Used (m)	Average Earthworks Noise Levels, $L_{Aeq,10hrs}$ (dB)	Average Construction Noise Levels, $L_{Aeq,10hrs}$ (dB)
R1	Cloughfield, Fryer Close – Western Receptors	20	**82.7**	**84.5**
R2	Copper Beeches	20	**82.7**	**84.5**
R3	Chefford Close, Burwood Close	20	**82.7**	**84.5**

Receptor	Location	Average Distance Used (m)	Average Earthworks Noise Levels, $L_{Aeq,10hrs}$ (dB)	Average Construction Noise Levels, $L_{Aeq,10hrs}$ (dB)
	and Rookery Drive			
R4	Leyland Road	95	71.1	72.9
R5	Fir Trees Avenue	180	65.5	67.3
R6	Coote Lane – South East	220	63.8	65.6
R7	Coote Lane - South	295	61.3	63.0
R8	Coote Lane South West	200	64.6	66.4
R9	Chain House Lane – South West	270	62.0	63.8
R10	Existing within Red Line Boundary	20	**82.7**	**84.5**

14.139 A review of Table 14.31 identifies that the calculated mitigated earthworks and construction noise levels fall below the 75dB criterion at R4 to R9. However, exceedances are predicted at R1 to R3 and R10, as such, mitigation measures will be required.

14.140 It should be noted that these predictions are worst case, it should be noted that it is unlikely that operations are to be conducted on the sections of the Site closest to each of the identified receptors for significant periods of time. For most of the construction phase periods, it is expected that activities will be conducted at greater distances from the receptors.

14.141 The sensitivity of the receptors is categorised as **high,** and the magnitude of impact is categorised as **minor** at R4 to R9. Accordingly, there is predicted to be a temporary impact categorised as **negligible** adverse in the short-term at local level. Although the levels fall below the criterion, construction noise will be noticeable above the existing noise climate and would result in some form of impact, albeit not significant.

14.142 At R1 to R3 and R10, the sensitivity of the receptors is categorised as **high,** and the magnitude of impact is categorised as **moderate**. Accordingly, there is predicted to be an adverse temporary impact categorised as **moderate** adverse in the short-term at local level. As such, mitigation measures will be discussed later in the chapter to lessen the impact.

Construction Vibration

14.143 Groundborne vibration calculations have been performed for typical construction activities / machinery based on the empirical prediction procedures and historical measurement data presented within BS 5228-2 and the TRL RR 246.

14.144 Such predictions have been performed to determine the possible distances at which the adopted significance criteria may be registered based on a specified confidence limit (where applicable). In this regard, the groundborne vibration levels and associated distances have been identified for a sample of typical construction vibration sources as shown in Table 14.32.

Table 14.32: Predicted Groundborne Vibration Levels Applicable to Typical Generating Construction Activities

Operation	Confidence Limit	Distance (m)	PPV (mm/s)
Vibratory rollers – start & end	95	60	0.3
	95	23	1.0
Vibratory rollers – steady state[1]	95	3.3	10
Piling – driven cast in place	95	215	0.3
	95	85	1.0
	95	15	10
Rotary bored piling – Augering	N/A	20	≤0.3
	N/A	6	≤1.0
	N/A	0.6	≤10
Rotary bored piling – Auger hitting base	N/A	45	≤0.3
	N/A	14	≤1.0
	N/A	1.4	≤10
Rotary bored piling – Driving casing	N/A	75	≤0.3
	N/A	23	≤1.0
	N/A	2.3	≤10
HGV's[2]	N/A	50	≤0.3
	N/A	17	≤1.0
	N/A	2.5	≤10.0

1. Assumes 2 rollers, 0.4mm amplitude, drum width of 1.3m, e.g. heavy duty ride on roller

2. Assumes max height / depth of surface defect of 50 mm, max speed of 30 km/h, and that surface defect occurs at both wheels.

Note: Where alluvium soils are present, higher vibration levels can be expected.

14.145 It should be noted that the data presented within Table 14.33 is general in nature and is not specific to the Site, however the vibration levels and associated distances can be used to determine the typical distances at which specific impacts are likely to be registered.

14.146 As receptors are located close to Site boundaries, a nominal distance of 20m is considered worst case to the majority of receptors. In this regard, Table 14.32 presents the predicted magnitude of impact at these dwellings, R1 to R3 and R10. It should be noted that the magnitude ratings presented within the table, in some cases, have been generated based on a 95% confidence limit it is likely that lower vibration levels will prevail for the majority of activities. Receptors located further away are well outside the distances where vibration would be perceptible.

Table 14.33: Predicted Magnitude of Effects at 20m for R1 to R3 and R10 – Groundborne Vibration

Activity	Magnitude of Impact
Vibratory Rollers	Moderate
Piling – Driven Cast in Place	Major
Rotary Bored Piling – Driving Casing	Moderate
HGVs	Minor

14.147 During the use of vibratory rollers, the sensitivity of the receptors is categorised as **high,** and the magnitude of impact is categorised as **moderate**. Accordingly, there is predicted to be a **moderate** adverse temporary short-term impact at the local level. This is not considered significant given the short operational duration of their usage along any roads and the implementation of BPM.

14.148 During Driven Cast in Place piling operations, assuming this takes place within 20m of the closest receptors, the sensitivity of the receptors is categorised as **high,** and the magnitude of impact is categorised as **major**. Accordingly, there is predicted to be a potential **major** adverse temporary short-term impact at the local level. This would be considered significant, and it is recommended that rotary bored piling, subject to a **moderate** adverse temporary short-term impact at the local level, be utilised, especially close to existing receptors along the boundary and on-site.

14.149 With regards to vibration due to HGVs, the sensitivity of the receptors is categorised as **high,** and the magnitude of impact is categorised as **minor**. Accordingly, there is predicted to be a **minor** adverse temporary short-term impact at the local level. This is not considered significant.

14.150 It should be noted that this is a worst-case assessment based on the minimum possible distances at which construction activities could reasonably take place from existing vibration sensitive receptors. For most of the earthwork / construction phase, it is expected that activities will take place at greater distances from such properties thus leading to lesser significance of effects. Furthermore, it should be noted that the vibration predictions have utilised a large data set covering a range of measured levels applicable to each operation. It is

evident from this dataset that, for most operations (approximately 95% in most cases), predicted levels will be lower than those presented within Table 14.31.

14.151 It should be noted that the above assessment has been undertaken based on vibration levels associated with a small range of groundborne vibration generative construction activities. It is possible that activities other than those presented may take place. Similarly, some of those presented may not be applicable to the construction activities specific to the Site.

14.152 Where alternate methods are proposed a suitably worded planning condition will secure a CEMP and if required additional monitoring / assessment will be undertaken prior to commencement once precise details are known. Further related information can be found in the mitigation section of this Chapter.

Construction Generated Road Traffic Noise

14.153 The volume of construction traffic will make up a progressively lower proportion of the overall traffic volumes as the development site is developed, with overall traffic volumes anticipated to be the highest on completion. It is also important to consider that the construction period for each phase is relatively short-term and temporary in its effects at each of the sensitive receptors.

14.154 With regards to noise, it should be noted that relatively large increases in road traffic movements would need to prevail in order for noticeable increases in road traffic noise levels to occur as a result of construction generated road traffic. As a general guide, although not accounting for changes in the percentage of HGV's, a 25% increase in traffic movements will only result in a 1dB increase in noise levels. Similarly, a 58% increase would be required for 2dB and 100% increase for a 3dB increase. It should be noted that a 3dB increase in noise levels is generally barely perceptible to the average human.

14.155 The sensitivity of the residential receptors along Penwortham Way and in the vicinity of the proposed Site access is categorised as **high** and the magnitude of impact is categorised as **negligible**.

14.156 Accordingly, there is predicted to be a short-term **negligible** impact at local level at all receptors including the new proposed Plots, (generally considered at circa 20metres from the construction works central area). Furthermore, it should be noted that any increase in noise levels associated with construction generated road traffic is expected to be limited to the daytime hours only.

14.157 Given the predicted effect on local receptors it is not necessary to consider mitigation measures.

Completed Development

14.158 Scenario 1: Application A - 1,100 units with the delivery of a spine road for the development which could become part of a CBLR should the council decide to deliver it in future

Change in Road Traffic Noise Levels on Existing Receptors

14.159 Upon completion of the proposals, it is anticipated that local road traffic noise levels may change as a result of development generated vehicle movements. Therefore, it is appropriate to consider the magnitude of any impacts that might arise.

14.160 The results of the Transport Assessment (Chapter 12) undertaken by VECTOS[11] have been used as the basis for the road traffic noise assessment. This focuses on roads immediately surrounding the site before the development generated traffic is dispersed across the wider network. The traffic data supplied in the form of 18-hour AAWT flows was used in the calculations. The used VECTOS data can be found in **Appendix 14.2**.

14.161 The road traffic noise calculations have been carried out in accordance with CRTN guidelines and therefore at the notional receptor location 10m from the edge of the carriageway of each road considered and 0.5m above ground level.

14.162 The assessment is based on the 2021-year traffic data and compares it to the predicted traffic data on the proposed year of opening 2025 with and without the development.

14.163 The assessment therefore enables to verify the potential of adverse impact related to the increase of traffic noise due to the increase of vehicles accessing the area.

14.164 Table 14.33 shows the summary of the predicted levels at each of the nearby roads. The first columns show the estimated baseline levels. The second and third columns are the projected levels with and without the proposed development.

14.165 The identification of the various links used for the assessment is shown in **Figure 14.1**.

Table 14.34: Predicted Long Term Natural Road Traffic Growth and Traffic Growth with Development

Link ID	Predicted Road Traffic Noise Level, 2021 Baseline, LA10,18hr (dB)	Predicted Road Traffic Noise Level, 2035 without Development LA10,18hr (dB)	Predicted Road Traffic Noise Level, 2035 with Development LA10,18hr (dB)
	A	B	C
1	69.21	69.47	69.53
2	70.95	70.76	70.75
3	63.99	64.4	64.69
4	71.05	70.9	70.99
6	71.39	71.05	71.13

[11] Vectos report reference VN211918 The Lanes, Penwortham – Transport Assessment_01

Link ID	Predicted Road Traffic Noise Level, 2021 Baseline, LA10,18hr (dB)	Predicted Road Traffic Noise Level, 2035 without Development LA10,18hr (dB)	Predicted Road Traffic Noise Level, 2035 with Development LA10,18hr (dB)
	A	B	C
7	72.61	72.96	73.03
8	73.24	73.5	73.59
9	74.21	74.51	74.62
11	72.68	73.16	73.17
12	64.65	65.78	66.32
17	70.47	70.76	70.76
23	71.58	72.49	72.5
24	73.8	74.28	74.4
26	71.19	71.18	71.22
32	71.73	71.49	71.58
33	67.81	68.35	68.54
34	70.61	70.75	70.76
35	69.62	69.95	69.94
36	69.71	70.31	70.17
37	66.45	66.56	66.55
38	67.32	67.87	67.84
39	69.38	69.77	69.93
40	69.35	69.53	69.84
48	71.62	71.95	72.02
48a	70.55	70.75	70.84
53	71.12	71.54	71.65
54	70.53	70.45	70.63
57	70.5	70.44	70.45
59	68.12	68.24	67.96
59a	69.09	68.89	68.96

Link ID	Predicted Road Traffic Noise Level, 2021 Baseline, LA10,18hr (dB)	Predicted Road Traffic Noise Level, 2035 without Development LA10,18hr (dB)	Predicted Road Traffic Noise Level, 2035 with Development LA10,18hr (dB)
	A	B	C
67	70.71	70.82	70.91
68	69.84	70.13	69.99
71	66.68	67.14	67.3
73	68.08	68.6	68.75
78	67.81	67.91	67.83
81	67.25	67.09	67.26

14.166 Table 14.35 below provides the estimated level differences between baseline compared to the calculated traffic noise levels without (Do Minimum, DM) and with (Do Something, DS) the proposed development.

Table 14.35: Predicted Level Difference without and with the proposed development

Link ID	Predicted Road Traffic Noise Level, 2021 Baseline, LA10,18hr (dB)	Comparison with baseline, 2025 without Development LA10,18hr (dB)	Comparison with DMRB criteria	Comparison with baseline, 2025 with Development LA10,18hr (dB)	Comparison with DMRB criteria and Effect Significance
	A	(B-A)		(C-A)	
1	69.21	0.26	negligible	0.32	negligible
2	70.95	-0.19	No change/beneficial change	-0.2	No change/beneficial change
3	63.99	0.41	negligible	0.7	negligible
4	71.05	-0.15	No change/beneficial change	-0.06	No change/beneficial change
6	71.39	-0.34	No change/beneficial change	-0.26	No change/beneficial change
7	72.61	0.35	negligible	0.42	negligible

Link ID	Predicted Road Traffic Noise Level, 2021 Baseline, LA10,18hr (dB) A	Comparison with baseline, 2025 without Development LA10,18hr (dB) (B-A)	Comparison with DMRB criteria	Comparison with baseline, 2025 with Development LA10,18hr (dB) (C-A)	Comparison with DMRB criteria and Effect Significance
8	73.24	0.26	negligible	0.35	negligible
9	74.21	0.3	negligible	0.41	negligible
11	72.68	0.48	negligible	0.49	negligible
12	64.65	1.13	small	1.67	small
17	70.47	0.29	negligible	0.29	negligible
23	71.58	0.91	small	0.92	small
24	73.8	0.48	negligible	0.6	negligible
26	71.19	-0.01	No change/beneficial change	0.03	No change
32	71.73	-0.24	No change/beneficial change	-0.15	No change/beneficial change
33	67.81	0.54	negligible	0.73	negligible
34	70.61	0.14	negligible	0.15	negligible
35	69.62	0.33	negligible	0.32	negligible
36	69.71	0.6	negligible	0.46	negligible
37	66.45	0.11	negligible	0.1	negligible
38	67.32	0.55	negligible	0.52	negligible
39	69.38	0.39	negligible	0.55	negligible
40	69.35	0.18	negligible	0.49	negligible
48	71.62	0.33	negligible	0.4	negligible
48a	70.55	0.2	negligible	0.29	negligible
53	71.12	0.42	negligible	0.53	negligible
54	70.53	-0.08	No change/beneficial	0.1	negligible

Link ID	Predicted Road Traffic Noise Level, 2021 Baseline, LA10,18hr (dB) A	Comparison with baseline, 2025 without Development LA10,18hr (dB) (B-A)	Comparison with DMRB criteria	Comparison with baseline, 2025 with Development LA10,18hr (dB) (C-A)	Comparison with DMRB criteria and Effect Significance
			al change		
57	70.5	-0.06	No change/beneficial change	-0.05	No change/beneficial change
59	68.12	0.12	negligible	-0.16	No change/beneficial change
59a	69.09	-0.2	No change/beneficial change	-0.13	No change/beneficial change
67	70.71	0.11	negligible	0.2	negligible
68	69.84	0.29	negligible	0.15	negligible
71	66.68	0.46	negligible	0.62	negligible
73	68.08	0.52	negligible	0.67	negligible
78	67.81	0.1	negligible	0.02	No change
81	67.25	-0.16	No change/beneficial change	0.01	No change

14.167 The above calculation summary indicates negligible increase of traffic noise with or without the development apart from at link 12 with a negligible increase effect of 0.54dB with the development, which according to the DMRB effect criteria is considered negligible. Therefore, the foreseen likely increase in traffic noise will not be clearly perceived and the traffic increase are characterised as “No Observed Adverse Effect Level, NOAEL”

14.168 The predict traffic counting change at link 59 indicates a beneficial reduction of traffic noise with the development.

14.169 The summary of the traffic changes assessment results indicates that the roads in the immediate vicinity of the Site are subject to a negligible and beneficial change in traffic noise levels.

Evaluation of Penwortham Way Dualling

14.170 The sensitivity assessment of the dualling of Penwortham Way is carried out in Table 14.36 below.

14.171 The evaluation only considers the opening year with the proposed development Site combined with the Penwortham Way dualling as the other predictions, i.e., with and without development and without dualling has already been presented in the previous sections.

Table 14.36: Predicted Traffic Levels with Penwortham Way

Link ID	Predicted Road Traffic Noise Level, 2025 Year of Opening with Development LA10,18hr (dB)	Predicted Road Traffic Noise Level, 2025 with Penwortham Way Dualling LA10,18hr (dB)	Predicted difference in noise levels with Penwortham Way Dualling	Comparison with DMRB criteria and Effect Significance
1	69.53	69.50	-0.03	No change/beneficial
2	70.75	70.50	-0.25	No change/beneficial
3	64.69	64.37	-0.32	No change/beneficial
4	70.99	70.63	-0.36	No change/beneficial
6	71.13	71.03	-0.1	No change/beneficial
7	73.03	72.95	-0.08	No change/beneficial
8	73.59	73.38	-0.21	No change/beneficial
9	74.62	75.07	0.45	Negligible
11	73.17	73.33	0.16	Negligible
12	66.32	65.44	-0.88	No change/beneficial
17	70.76	70.75	-0.01	No change/beneficial
23	72.5	72.13	-0.37	No change/beneficial
24	74.4	74.54	0.14	No change/beneficial
26	71.22	71.15	-0.07	No change/beneficial
32	71.58	71.43	-0.15	No change/beneficial
33	68.54	68.63	0.09	Negligible

Link ID	Predicted Road Traffic Noise Level, 2025 Year of Opening with Development LA10,18hr (dB)	Predicted Road Traffic Noise Level, 2025 with Penwortham Way Dualling LA10,18hr (dB)	Predicted difference in noise levels with Penwortham Way Dualling	Comparison with DMRB criteria and Effect Significance
34	70.76	70.5	-0.26	No change/beneficial
35	69.94	70.09	0.15	Negligible
36	70.17	70.38	0.21	Negligible
37	66.55	66.48	-0.07	No change/beneficial
38	67.84	68.22	0.38	Negligible
39	69.93	70.04	0.11	Negligible
40	69.84	69.95	0.11	Negligible
48	72.02	72.04	0.02	Negligible
48a	70.84	70.84	0	No change
53	71.65	71.70	0.05	Negligible
54	70.63	70.68	0.05	Negligible
57	70.45	70.41	-0.04	No change/beneficial
59	67.96	68.10	0.14	Negligible
59a	68.96	68.91	-0.05	No change/beneficial
67	70.91	70.87	-0.04	No change/beneficial
68	69.99	70.05	0.06	Negligible
71	67.3	67.29	-0.01	No change/beneficial
73	68.75	68.59	-0.16	No change/beneficial
78	67.83	67.85	0.02	Negligible
81	67.26	67.17	-0.09	No change/beneficial

14.172 The above summary of results indicates that Penwortham Way dualling will provide mostly no change or negligible effect upon the area in terms of traffic noise impact.

Initial Site Noise Risk Assessment - Proposed Residential Receptors

14.173 The noise risk assessment should provide an indication of the likely risk of adverse effects from noise where no subsequent mitigation is to be included as part of the development proposal. It should indicate whether the proposed site is considered to pose a negligible, low, medium, or high risk from a noise perspective.

14.174 The risk assessment should not include the impact of any new or additional mitigation measures that may subsequently be included in development proposals for the site and proposed as part of a subsequent planning application.

14.175 Accordingly, a Site Noise Risk Assessment has been undertaken for transportation noise.

14.176 For the purposes of this assessment, Ensafe has used noise modelling software, CadnaA 2019 MR2, to determine the impact of noise from the roads and railway lines.

14.177 The following inputs have been included in the model:

- Parameter Plan for proposed indicative receptor locations;
- Existing Site elevations in the form of 1m contours from a Digital Terrain Model (DTM);
- Traffic data has been used for base flows 2035 in 18 hour AAWR format supplied by Crofts;
- A reflection order of 2 has been used in all calculations; and
- Noise levels generated using ISO 9613-1 and ISO 9613-2 "*Acoustics – Attenuation of sound during propagation outdoors*" as incorporated into CadnaA software.

14.178 **Figures 14.4** and **14.5** determine the noise levels across the Site during the daytime and night-time periods, respectively based upon the developable areas as per the parameters plan. **Figure 14.4** determines that the site experiences sound levels of between below 50dB and up to 68dB within the developable areas of the Site during the daytime.

14.179 This results in most of the Site being of **Negligible Risk**. Areas closest to Penwortham Way in the southwest area of the Site are subject to **Medium Risk**. Note the **Medium Risk** corresponds with areas immediately bounding Penwortham Way. However, it is considered that it is to be used for open space including landscaping access and associated infrastructure such as SUDs and retention of hedgerows.

14.180 Areas to the northeast of the proposed green space are subject to low risk. Areas bounding the railway line, once the proposed open space is accounted for are subject **to negligible risk**, and at the most, **Low Risk**.

14.181 **Figure 14.5** determines that noise levels across the Site range between below 45dB and up to 63dB during the night-time period. This results in most of the Site being of **Low to Medium Risk,** with areas closest to Penwortham Way being of **High Risk,** as above.

Predicted Risk Assessment

Negligible to Low Risk

14.182 The areas that fall under the negligible to low risk category for both daytime and night time periods, are unlikely to experience any adverse effects due to excessive noise and therefore are unlikely to require any special acoustic treatment.

Moderate to High Risk

14.183 These areas of the Site are likely to require good acoustic design and mitigation measures to minimise and offset potential adverse impact.

Proposed Residential Receptors

Good Acoustic Design Process

14.184 Good acoustic design should avoid "unreasonable" acoustic conditions and prevent "unacceptable" acoustic conditions. Good acoustic design is not just compliance with recommended internal and external noise exposure standards. Good acoustic design should provide an integrated solution whereby the optimum acoustic outcome is achieved, without design compromises that will adversely affect living conditions and the quality of life of the inhabitants or other sustainable design objectives and requirements.

14.185 Given the potential for plots to fall within Moderate Risk at the boundaries closest to Penwortham Way, Good Acoustic Design is recommended in these areas. Specifically, the following should be considered when designing the Site and plot layouts:

- Plots closest to the road should be orientated such that any garden areas are protected by the building envelope and buildings should wrap around the sides, where possible, to protect the gardens;
- Gaps between dwellings fronting the roads should be kept to a minimum to avoid noise creep into the gardens behind;
- Where possible, mews dwellings would be ideal along the roads; and
- Wherever possible, windows for habitable rooms should face away from the noise sources so that opening windows does not necessarily result in an exceedance of the criteria. However, where this is not possible, internal levels can be controlled by way of mitigation.

14.186 It is highly recommended that the above measures are implemented to all Plots to be located within the moderate risk areas Presented in **Figure 14.4** and **Figure 14.5** of **Volume 2a: Main Text Figures**.

Internal Noise Level Assessment

14.187 The Es provides an outline of the likely sound levels across the Site. Accordingly, the proposed buildings to be located within the moderate risk areas are taken as representative of a worst-case scenario.

14.188 With regards internal noise levels, BS8233:2014 suggest that an acoustic rated glazing unit with configuration 10mm glass/6 to 16mm air space/4mm glass affords sound insulation performance in the order of Rw 35dB however this is for a pink noise spectrum. The same unit, weighted for road traffic noise using the '+C_{tr}' correction (for frequency weighting of road traffic sound), has a sound insulation performance value of approximately **Rw+Ctr 30dB** and so this value has been used to calculate internal noise levels at Plots within the moderate risk area. **This glazing configuration will be referred thereafter as GL2.**

14.189 Likewise, a well installed and sealed standard thermal double glazing typically constructed with 4mm glass/6 to 16mm air gap/4mm glass, would provide a sound transmission loss of circa **Rw+Ctr 25dB**. **This glazing configuration will be referred thereafter as GL1.**

14.190 The noise impact outline also aims to promote natural ventilation as much as possible and estimates the noise transmission loss through an open window to be in the order of 15dB in line with the BS8233:2014 guidelines.

14.191 During the night-time and daytime periods, depending on the siting of dwellings, the highest predicted façade level across the Site is in the order of $L_{Aeq,t}$,60dB to $L_{Aeq,t}$ 68dB respectively. The **high-risk** noise exposure is identified to be located along the boundary with the network of roads near the Site.

14.192 To the **high**-risk areas, this preliminary evaluation indicates that windows may need to be closed to comply with indoors criteria and alternative ventilation need to be implemented. Glazing specification is likely to be as specified by GL2.

14.193 The **negligible to low-risk** areas located within the core of the Site and to be sheltered by the proposed new buildings, the predicted indoor levels are likely to comply with indoors criteria with windows open for ventilation.

14.194 Other Plots with some line of sight to the roads network and at some distance from the roads, may need to close windows to comply with indoor criteria, however indoor levels are likely to be met with standard glazing as specified by GL1 type.

14.195 Where GL1 glazing need to be closed to comply with indoors criteria, standard ventilation such as trickle vents are likely to suffice to provide the necessary background ventilation.

14.196 The chosen ventilation system should provide not less than Dne,w 31dB for the GL1 glazing and Dne,w 36dB for the GL2 glazing. Please note that these figures are for one unit per room. Where additional ventilation units are necessary due to the floor area, the sound transmission loss should be increased by 3dB, i.e., two vent units should be Dne.w 34dB for GL1 and Dne,w 39dB for GL2 each additional unit.

14.197 Windows should always remain openable for purge ventilation.

14.198 With regards the maximum instantaneous noise levels at night, the 10th highest level of 86dB $L_{Amax,fast}$ for Penwortham Way has been distance corrected to the closest developable boundary, resulting in a level of 71dB. Accordingly, standard glazing would be considered sufficient along the closest boundary to Penwortham Way assuming proposed locations (Indoor level of 38dB). Additionally, when windows are partially open, the indoor level would be 56dB. Accordingly, alternative ventilation would be required for bedrooms with line of sight to Penwortham Way. A level of 82dB was measured on the boundary opposite the railway line. Accordingly, the above advice applies here.

External Amenity Area Noise Level Assessment

14.199 **Figure 14.4** indicated that noise levels across the Site within the proposed designated amenity areas falls mostly circa $L_{Aeq,T}$ 55dB. Note that the housing layout may provide noise screening and abatement to most proposed amenity areas however, noise barrier may need to be implanted to reduce areas exposed to an excess of noise.

14.200 Therefore, to be implemented as a Design Code, it is strongly advised to place gardens behind buildings with minimal gaps between them, and where buildings cannot be joined together, garden fencing should be used as acoustic barriers to shield the gardens behind.

14.201 Note that there is provision for the 55dB criteria to be exceeded but this must be justified and is usually reserved for developments close to main roads and motorways and in urban areas. Given the locality of the Site being in a semi-urban location, it is considered that with good acoustic design and the potential use of garden fencing as acoustic barriers (offering around 5 to 10dB of attenuation), the 55dB limit could be met in the worst affected areas, and 50dB achieved for the majority, if located behind dwellings.

Other Relevant Issues

14.202 This ProPG primarily seeks to encourage a good acoustic design process for new residential development. It is recognised that it may not always be possible to achieve the internal noise level guidelines in all rooms within noise sensitive developments. Where it is not possible to achieve the recommended standards in every respect, regard should be had to the number of dwellings and number of habitable rooms in each of the dwellings where the recommended standard cannot be achieved.

14.203 Similarly, regard should be had to the extent to which the guidance on the external amenity area noise assessment has been followed, including whether access to quiet or relatively quiet external amenity areas is considered necessary, and the extent of any adverse impacts on external amenity areas that are an intrinsic part of the overall design.

14.204 Design measures taken to reduce intrusion by noise may have unintended adverse consequences for the building or the nearby environment and may affect the attractiveness of the living environment for the

occupants. Examples include roadside barriers that remove views or prevent crossing roads, sealed facades that affect personal control over the internal environment etc. Wherever possible, such unintended adverse consequences should be obviated by good acoustic design.

14.205 Some wider planning objectives may have unforeseen acoustic implications. For example, the encouragement of 'active facades' that overlook public footpaths etc. to ensure 'safe by design' could result in some residential units facing noisy streets or railways. The encouragement of active outdoor lifestyles may require the careful protection of amenity spaces from sources of transport noise. The creation of vibrant mixed use commercial and residential neighbourhoods can introduce challenges that will need to be overcome by careful acoustic design.

Proposed Educational Receptors – Proposed school

Internal Teaching Space

14.206 Daytime levels are predicted up to 68dB are the worst-case developable boundaries closest to the roads.

14.207 In the absence of details of the siting of the school, the grid noise maps have been used to determine the requirement for mitigation. Accordingly, Table 14.37 below details the requirements. BB93 provides a criteria for a school classroom of 35dB $L_{Aeq,T}$.

Table 14.37: School Internal Assessment

Period	Incident Façade Noise Level above which Higher Specification Glazing is Required	Incident Façade Noise Level above which Alternative Ventilation is Required
Daytime	>65	>50

14.208 Note that the noise exposure during daytime may imply that the higher glazing configuration GL2[12] is used combined with alternative ventilation system.

14.209 With regards alternative ventilation, it has been assumed that the opening of windows would be required for fresh air flow and background ventilation. If windows are opened, it has been shown, that the internal criteria would be exceeded for across most of the site. Therefore, a system is required that provides fresh air flow and background ventilation to the offices with windows remaining openable for purge ventilation.

External Play Areas for Schools

14.210 BB93 recommends that noise levels in unoccupied playgrounds, playing fields and other outdoor areas should not exceed 55dB $L_{Aeq,30min}$. 60dB $L_{Aeq,30min}$ should be regarded as an upper limit for external noise at the boundary of external premises used for formal and informal outdoor teaching, and recreational areas.

[12] GL2 refers to glazing transmission loss Rw +Ctr 30dB.

Table 14.38: Calculation of Noise Levels for Playing Fields and Outdoor Play Areas

Period	Highest Predicted Extneral Noise Level LAeq,30min (dB)	BBS93 criterion LAeq,30min (dB)	Difference (+/-) dB(A)
Daytime (07:00-23:00)	68	55	+13

14.211 Playgrounds, outdoor recreation areas and playing fields are generally considered to be of relatively low sensitivity to noise, and indeed playing fields may be used as buffer zones to separate school buildings from the railway where necessary.

14.212 It should be noted that certain play areas may benefit from a degree of shielding by the buildings depending upon the eventual orientation.

Commercial Sound

14.213 In order to advise on Good Acoustic Design, firstly a BS4142:2014 assessment is required.

14.214 The assessment has used measured noise levels from NMP5 which are considered representative of the closest developable area. These noise levels have been used to predict the rating level at the closest proposed potential receptors during typical daytime operating periods observed on Site, as follows:

- Monday to Friday 07:30 – 18:00.

14.215 With regard to assumptions for the assessment, the following has been considered:

- The daytime period has been assessed between the hours of 07:00 to 18:00. BS4142:2014 has been used to determine the likelihood of adverse impact within the garden areas over a reference time period of 1 hour; and
- The assumed on-times have been taken from the worst-case levels and account for more than 1-hour period in some cases and, as such, considered worst case.

14.216 The following measured noise levels and assumed on-times have been used for each Source along with the calculated Specific Noise Level. The residual level during the survey, when commercial sound was not audible ranged between 49.9dB and 53dB. Accordingly, the measured specific levels have also been corrected for the residual sound immediately prior and after the measured levels.

Table 14.39: Calculated Specific Noise Level at Red Line Boundary

Source	Measured Sound Level, LAeq,T (dB)	On-Time in 1-hour Period (Daytime) (seconds)	Calculated Specific Nosie Level at Closest Boundary, LAeq,1hr (dB)
Low Frequency Hum	52.5	1200	42
FLTs and Sawing	52.2	89	26
Hammering and Banging	51.3	1561	45

14.217 For the BS4142:2014 assessments, penalties are applied to the specific sound level to provide the rating level. These penalties relate to the acoustic features of the sound source. Accordingly, the following subjective features have been accounted for in the assessment, in accordance with the subjective method detailed in BS4142:2014. Objective analysis wasn't possible due to the interference of road traffic sound.

Table 14.40: Acoustic Character

Source	Character	Applicable?	Attributable Penalty	Comment
Welch Fencing	Tonality	Yes	+2dB	Low frequency hum just perceptible over the residual noise level
	Impulsivity	No	0	Impulsivity not audible considering the specific noise level (26dB) falls well below the residual level (51dB).
	Intermittency	Yes	+3dB	Intermittent operations
	Other	No	0	Other penalties applied

14.218 Table 14.41 details the BS4142 Assessment for a typical daytime period between 07:00 and 18:00 Monday to Friday. The median measured daytime Background Sound Level during these hours has been used in accordance with BS4142:2014 for typical levels and to inform a worst-case assessment.

Table 14.41: BS4142:2014 Assessment – Daytime

Source	Combined Specific Nosie Level at Closest Boundary, LAeq,1hr (dB)	Acoustic Character Correction (dB)	Combined Rating Level, LA,r (dB)	Median Measured Background Sound Level, LA90,1hr (dB)	Difference, +/- (dB)
Low Frequency Hum	46	+5	51	46	**+5**
FLTs and Sawing					
Hammering and Banging					

14.219 Table 14.41 indicates that the difference between the rating level and the Background Sound Level is between +5dB at the closest proposed residential uses to Welch Fencing. BS4142:2014 provides the following guidance in relation to this outcome:

- A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context.

14.220 Without good acoustic design and/or mitigation measures considered, there is the potential for a **moderate** impact in the long term and at local level depending on the eventual siting of garden areas.

14.221 Given the exceedance, it is considered that mitigation measures would be required. Furthermore, first and foremost, it is recommended that the following is incorporated into the Site design:

- Areas along the commercial premises could consist of non-sensitive uses, i.e. access roads, drainage areas, open space, etc;
- Plots facing the commercial premises will need to be orientated such that the garden areas are protected by the building envelope to protect the gardens facing the commercial;
- Gaps between dwellings facing the commercial should be kept to a minimum, where possible, to avoid noise creep into the gardens behind; and
- Wherever possible, windows for living rooms should face away from the noise sources so that opening windows does not necessarily result in an exceedance of the criteria. However, where this is not possible, internal levels can be controlled by way of mitigation.

Proposed Playground Noise

14.222 There is the potential for noise from the proposed playground to impact upon nearby existing and proposed receptors. It is understood that the school would have a proposed capacity of 420 pupils. However, as the potential location of the school has not yet been determined given the outline nature of the application, it is not possible to accurately determine the magnitude of impact and the significance.

14.223 To provide an indicative assessment of the noise impact of the playground on the closest receptor, a change in ambient noise level assessment will be undertaken where a change of less than 2.9dB is considered negligible as a change of less than 3dB is not perceptible to the human ear. Although the noise from the playground may be noticeable, the level produced by the activities is not likely to be different in magnitude to the existing ambient noise levels when the sports facilities are in use.

14.224 As the exact location of the proposed school is unknown, an assessment has been undertaken to determine the minimum stand-off distance to the proposed receptor before the implementation of good acoustic design and mitigation measures, this is derived from the following formula:

$$L_{Aeq,1hr} = 20 \times \log (D2/D1)$$

Where D1 = Measurement Distance; and

D2 = Distance to Receptor.

14.225 To provide an indication of the potential effects, Ensafe has used library data for school playground noise. A noise level of 78dB at 1m for 30 children playing has been quantity corrected to account for 420 children as 90dB at 1m. This is a 15-minute average noise level and includes casual, normal, raised voices and shouting. This has been quantity corrected to account for up to 420 children outside, and as the assessment is based on the 1-hour noise level for the change in ambient and the 16 hour for the internal it is considered pertinent to convert the measured 15 minute noise level to the 1 hour noise level, resulting in a $L_{Aeq,1hr}$ of 83.5dB at 1m.

Table 14.42: Calculation of Minimum Stand-off Distance for Negligible Impact

Receptor	Lowest Median Ambient Sound Level LAeq,1hr (dB)	Maximum Combined Noise Level for negligible impact LAeq,1hr (dB)	Corresponding Maximum Specific Sound Level of Source at receptor LAeq,1hr (dB)	Typical free-field Sound level of Source at 10m, LAeq,1hr (dB)	Difference in level between Sound Level at Receptor and Typical Sound Level at 10m (dB)	Minimum Required Stand-off Distance to receptor (m)
Nearest Proposed/Existing Receptor	45.8	48.7	45.5	83.5	38	80

14.226 At present, no information is available regarding operation times for the proposed school playground, therefore the lowest median weekday daytime level has been used to inform the assessment. This has been informed by the weekday and weekend ambient survey undertaken at NMP6 (Table 14.25). A measured level of 45.8dB has been used.

14.227 Table 14.42 indicates that the ambient noise level at the closest proposed residential receptors will increase by 2.9dB provided minimum stand-off distance of 80m from the playground is embedded into proposals.

14.228 If it is desirable that the proposed playground is located within the 80m buffer, noise levels can be reduced by using the school building to shield proposed and existing dwellings from the playground. Alternatively, mitigation measures in the form of acoustic barriers may be used to allow the school to be developed within the buffer discussed.

14.229 Therefore, as long as the specific sound level at the existing or proposed receptors do not exceed a level of 45.5dB, a negligible impact should be observed due to the playground being in use.

Proposed Fixed Plant Impact upon Proposed and Existing Receptors

14.230 This section looks at the potential impact of the proposed school and community centre upon proposed and existing noise-sensitive receptors.

14.231 At the time of producing this report the precise details of any operational plant incorporated into the design of these aspects are unknown and so it is appropriate to set noise emission limits which are based upon the measured background sound levels, and the following criterion in accordance with BS4142:2014:

- LAr = LA90

14.232 This corresponds with the following advice:

14.233 "The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact."

14.234 This indicates that the Rating Level, from any single or combined plant items and operations, shall not exceed the existing background sound level, when measured or calculated at the façade of the closest existing and proposed residential receptors.

14.235 The proposed operating periods for the plant had not been finalised at the time of producing this assessment, as such Table 14.43 details the calculated plant noise emission limit based on the typical measured 1-hour background sound level for the daytime and 15-minute for the night-time period, in accordance with BS4142:2014.

14.236 Table 14.43 provides to Plant Noise Emission Limits Assessment Period based on the Lowest Measured Median Background Sound Level, LA90,T (dB) Most Stringent BS4142:2014 Criteria (dB) Rating Level, LA,r (dB)

Table 14.43: Plant Noise Emission Limits

Assessment Period	Lowest Median Background Sound Level	Most Stringent BS4142:2014 criteria	Rating Level LA,r (dB)
Daytime (07:00 – 23:00)	39	LA,r = LA90	39
Night-time (23:00 – 07:00)	28		28

14.237 It should be noted that the emission limit is a rating level which can include for a range of penalties or 'acoustic feature corrections' as detailed in BS4142:2014 and as such the actual measured or calculated sound pressure level outside the closest residential window could be up to 18dB lower than the values presented here.

14.238 Therefore, as long as the derived rating levels are not exceeded at the proposed and existing receptors, a negligible impact should be observed due to fixed plant noise.

Rail Vibration Assessment

14.239 The total VDV for the daytime period and night-time period, for trains has been calculated in accordance with the methodology presented in BS6472: 2008 using the appropriate weightings.

14.240 The total number of trains has been obtained from counting the number of pass-bys from the 24-hour noise measurement. Although no vibration measurements of freight were undertaken, the number of freight movements along the line are restricted to no more than 5 per day. Freight trains are easily recognisable on the trace due to the time it takes for them to pass the microphone. This number of freight trains compared to the passenger trains, total 294 per day, is insignificant.

14.241 Table 14.44 below summarises the results of the vibration assessment.

Table 14.44: Summary of Predicted Rail Vibration Levels

Train Type	Timetabled Movements		Predicted Vibration Dose Value (m/s1.75)	
	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)
Passenger	243	51	0.020	0.014

14.242 Table 14.45 determines the appropriate comment in accordance with BS6472:2008.

Table 14.45: Determination of Applicable Comment

Place	Calculated Vibration Dose Value (m/s1.75)	Applicable Comment
Residential Buildings (16-hour Day)	0.020	Unlikely probability of adverse comment
Residential Buildings (8-hour Night)	0.014	

14.243 The rail vibration assessment determined an unlikely probability of adverse comment due to train pass-bys.

14.244 The sensitivity of the receptors is considered **high** and the impact is categorised as **negligible.** As such, there is predicted to be a **negligible** impact in the long term and at local level.

Additional Mitigation / Enhancement Measures

Demolition and Construction

Mitigation from Earthworks and Construction Noise Effects

14.245 In order to reduce noise levels at the receptors, it is assumed that Best Practicable Means (BPM) will be followed on-site considering the close proximity of existing and proposed residential receptors.

14.246 Accepted safeguards exist to minimise the effects of construction noise, these include:

- The various EC Directives and UK Statutory Instruments that limit noise emissions from a variety of construction plant;
- Guidance set out in BS5228-1 which covers noise control on construction sites; and,
- The powers that exist for local authorities under Sections 60 and 61 of the Control of Pollution Act 1974 to control noise from construction application sites.

14.247 The adoption of Best Practicable Means, as defined in Section 72 of the Control of Pollution Act 1974 is usually the most effective means of controlling noise from construction sites. Such measures where appropriate may include the following:

- Any compressors brought on to the Site to be silenced or sound reduced models fitted with acoustic enclosures;

- All pneumatic tools to be fitted with silencers or mufflers;
- Care to be taken when erecting or striking scaffolds to avoid impact noise from banging steel. All operatives undertaking such activities to be instructed on the importance of handling the scaffolds to reduce noise to a minimum;
- The majority of deliveries to be programmed to arrive during normal working hours only. Care to be taken when unloading vehicles to minimise noise.
- Delivery vehicles to be routed so as to minimise disturbance to local residents. Delivery vehicles to be prohibited from waiting within or in the vicinity of the Site with their engines running;
- All plant items to be properly maintained and operated according to manufacturers' recommendations in such a manner as to avoid causing excessive noise;
- All plant to be sited so that the noise impact at nearby noise sensitive properties is minimised;
- Local hoarding, screens or barriers to be erected as necessary to shield particularly noisy activities; and,
- Problems concerning noise from construction works can often be avoided by taking a considerate and neighbourly approach to relations with the local residents.
- Works should only take place during given periods, e.g. during normal construction hours and not at night.

14.248 It is recommended that the above measures be included in any Construction Environmental Management Plan (CEMP) that may be issued to and agreed with the contractor(s) conducting the works.

14.249 Experience from other sites has shown that by implementing the above measures, typical noise levels from construction works can be reduced by approximately 5dB to 10dB. As such, a -10dB is considered here thus reducing noise levels at R1 to R3 and R10 to below 75dB.

14.250 With Best Practicable Means followed, there would be a **minor** impact at local level in the short term at each receptor. Construction noise will be audible, regardless if the criterion is achieved, and so a minor impact is considered applicable as a worst case.

Construction Vibration

14.251 In light of the predicted significance of effects it is recommended that a vibration monitoring programme be put in place in the event that activities are conducted at distances at which effects of major adverse significance may occur. Where vibration levels exceed 10mm/s PPV, works within such areas should cease and alternative methods / working practices should be considered.

14.252 It is possible to employ a number of physical and operational measures in order to reduce the potential effects resulting from construction generated vibration. These may include:

- Adoption of low vibration working methods. Consideration should be given to use of the most suitable plant;

- Where processes could potentially give rise to significant levels of vibration, on - site vibration levels should be monitored regularly by a suitably qualified person;
- Where piling is to take place, any obstructions within the ground such as shallow-lying stone, should first be removed;
- The provision of cut-off trenches in order to interrupt the direct transmission path of vibrations;
- Reduction of energy input per blow (applicable to piling); and,
- Application of piling techniques aimed at reducing resistance to penetration e.g. pre-boring for driven piles and adding water to the hole for impact bored piles.

14.253 It is expected that mitigation measures and operational considerations such as these would be incorporated within the development of the site construction methodologies in order that the effects of groundborne construction vibration can be controlled wherever practically possible..

14.254 With Best Practicable Means followed, there would be a **negligible** impact at local level in the short term at each receptor.

Completed Development

Site Layout and Design

Road Traffic Sound

14.255 With regards the areas immediately along the boundaries closest to Penwortham Way, the following design features are recommended:

- Plots bounding the road will need to be orientated such that the garden areas are protected by the building envelope and buildings should wrap around the sides, where possible, to protect the gardens;
- Gaps between dwellings along the boundaries with the road should be kept to a minimum to avoid noise creep into the gardens behind;
- Where possible, mews dwellings would be ideal along the road; and
- Wherever possible, windows for habitable rooms should face away from the noise sources so that opening windows does not necessarily result in an exceedance of the criteria. However, where this is not possible, internal levels can be controlled by way of mitigation.

14.256 Should the above be followed, there would be a **negligible** impact at local level in the long term at all proposed receptors.

Rail Traffic Sound

14.257 With regards the areas immediately along the boundary with the railway lines, no specific consideration towards good acoustic design is required. Given the exceedance of the internal noise levels with windows open, however, the following is recommended:

- Wherever possible, windows for habitable rooms should face away from the noise sources so that opening windows does not necessarily result in an exceedance of the criteria. However, where this is not possible, internal levels can be controlled by way of mitigation.

Commercial Sound

14.258 Given the exceedance at the southern boundary, it is considered that mitigation measures would be required. Furthermore, first and foremost, it is highly recommended that the following is incorporated into the Site design:

- Areas along the commercial premises could consist of non-sensitive uses, i.e. access roads, drainage areas, open space, etc;
- Plots facing the commercial premises will need to be orientated such that the garden areas are protected by the building envelope to protect the gardens facing the commercial;
- Gaps between dwellings facing the commercial should be kept to a minimum, where possible, to avoids noise creep into the gardens behind; and
- Wherever possible, windows for living rooms should face away from the noise sources so that opening windows does not necessarily result in an exceedance of the criteria. However, where this is not possible, internal levels can be controlled by way of mitigation.

14.259 The exceedance of +5dB is not considered significant and the above is a recommendation only. However, where the above is not followed, mitigation measures in the form of acoustic barriers will likely be required.

14.260 Should the above be followed or mitigation measures be implemented, there would be a **negligible** impact at local level in the long term at all proposed receptors.

Internal Amenity Area – Glazing and Ventilation Requirements

14.261 The previous section has indicated that standard thermal double glazing would not be sufficient across the Site assuming glazing provides at least 30dB $R_W + C_{t,r}$. If habitable rooms are located immediately on the developable boundaries with Penwortham Way a glazing specification of up to 33dB $R_W + C_{t,r}$ would be required. However, lower specification glazing would be possible for certain habitable rooms within the Site.

14.262 The previous Section determined that, with a partially open window, the internal noise levels for habitable rooms facing the roads and railway lines would exceed the internal target criteria when habitable rooms cannot be orientated away from the source.

14.263 Accordingly, alternative ventilation would be required up to a performance of 33dB $D_{n,e,w} + C_{t,r}$ if habitable rooms are located on the worst-case boundaries. For the majority of habitable rooms, it would be recommended that a through-frame window mounted trickle ventilator is incorporated into the glazing unit of the habitable rooms of the facades so that fresh air can enter the room without having to open windows.

14.264 Alternatively, a through wall trickle ventilator could be used. It is recommended that the trickle ventilator be combined with a system that provides whole house background ventilation without the need for opening windows but windows should, ideally, be openable in order to provide purge ventilation. Ideally, any inlet for fresh air should be located away from the noise source to ensure the freshest air available is brought into the habitable rooms. A range of systems are available and detailed within the Building Regulations, ranging from System 1; trickle ventilators and extract fans in wet rooms, to System 4; Mechanical Ventilation with Heat Recovery. The actual system will be dependent on the developer and the requirements for fresh air flow detailed in the Building Regulations.

Acoustic Design Statement

14.265 The Initial Noise Risk Assessment resulted in the following:

14.266 The majority of the Site is subject to noise levels of **Negligible** to **Low Risk** during the daytime and night-time periods, but in the areas closest to Penwortham Way the site is subject to **Medium Risk** in the day-time and at night. Therefore, an Acoustic Design Statement will be required to ensure everything possible has been done to design the layout with acoustics in mind. Additionally, mitigation measures such as alternative ventilation may still be required following this process.

14.267 Due to areas being of Medium Risk along the southwest boundaries, good acoustic design and/or mitigation measures will be required. As such, the adverse impacts of noise will be mitigated and minimised as follows:

- Good Acoustic Design with gardens behind dwellings facing the road, gaps kept to a minimum and buildings forming around corners; and
- Habitable rooms facing away from the noise source or implementation of alternative ventilation systems.

14.268 With regards commercial sound, it is considered that mitigation measures would be required. Furthermore, first and foremost, it is highly recommended that the following is incorporated into the Site design:

- Areas along the commercial premises could consist of non-sensitive uses, i.e., access roads, drainage areas, open space, etc.;
- Plots facing the commercial premises will need to be orientated such that the garden areas are protected by the building envelope to protect the gardens facing the commercial;
- Gaps between dwellings facing the commercial should be kept to a minimum, where possible, to avoids noise creep into the gardens behind; and

- Wherever possible, windows for living rooms should face away from the noise sources so that opening windows does not necessarily result in an exceedance of the criteria. However, where this is not possible, internal levels can be controlled by way of mitigation.

14.269 The assessment results indicates that the predicted levels across the Site are suitable for residential development if Plots exposed to excess of noise have the suggested mitigation measures implemented.

Likely Residual Effects of the Development and their Significance

Construction Phase

Construction Noise and Vibration

14.270 With regards noise, Best Practicable Means are required to achieve acceptable levels of noise at the receptors and to avoid adverse impact, more than minor significance. The resulting assessment determined an adverse temporary short-term impact categorised as **minor adverse** in the short-term at local level. Although the levels fall below the criterion, construction noise will be noticeable above the existing noise climate and would result in some form of impact, albeit not significant.

14.271 During the use of vibratory rollers, where applicable, there is predicted to be a **moderate adverse** temporary short-term impact at the local level. This is not considered significant given the short operational duration of their usage along any roads and the implementation of BPM.

14.272 During Driven Cast in Place piling operations, assuming this takes place within 20metres of the closest receptors, there is predicted to be a potential for a **major adverse** impact at the local level. This is considered significant, and it is recommended that rotary bored piling, subject to a **moderate adverse** temporary short-term impact at the local level be utilised, especially close to existing receptors along the boundary and on-site.

14.273 With regards to HGVs, the sensitivity of the receptors is categorised as **high,** and the magnitude of impact is categorised as **minor**. Accordingly, there is predicted to be a **minor adverse** temporary short-term impact at the local level. This is not considered significant.

14.274 No residual impacts are predicted given the short-term, temporary nature of the works.

Construction Generated Traffic

14.275 There is predicted to be a short-term **negligible adverse** impact at local level at all receptors. Furthermore, it should be noted that any increase in noise levels associated with construction generated road traffic is expected to be limited to the daytime hours only.

Operational Phase

Development Generated

Change in Road Traffic Noise

14.276 It is predicted a **negligible** effect in traffic noise in the year of opening with and without the proposed development Site. However, with the proposed Site, there are indication of a beneficial effect due to the decrease of traffic noise levels at the area identified by the predicted levels at the identified Link 59.

14.277 In the long term, most roads in the immediate vicinity of the Site are subject to a negligible change in levels.

Transportation Sound Impact upon Proposed Receptors

14.278 During the daytime periods the site experiences sound levels of between below 45dB and up to 68dB within the developable boundaries of the Site. This results in most of the Site being of **Negligible Risk**. Areas closest to Penwortham Way are subject to **Medium Risk**.

14.279 Areas to the northeast of the open space corridor are subject to low risk. In the southwest area of the Site, potential residential areas may be subject to **Medium Risk**.

14.280 During the night-time, noise levels across the Site range between below 45dB and up to 60dB during the night-time period. This results in most of the Site being of **Negligible to Low Risk,** with areas closest to Penwortham Way being of **Medium and High Risk,** as above.

14.281 As such, good acoustic design is highly recommended for areas closest to Penwortham Way.

14.282 Should good acoustic design measures be implemented, then the overall impact upon potential residents will be **negligible** in the long term and at local level.

Proposed School

14.283 Regarding the proposed school, there is potential for the BB93 criterion for internal classrooms to be exceeded if located on the worst-case boundaries. However, at the detailed planning stage, specifications on the required glazing and alternative ventilation performance can be provided to ensure the overall impact upon potential educational receptors will be **negligible** in the long term and at local level.

14.284 For external play areas and teaching space, the assessment indicates that there is a possibility that without mitigation, the recommended noise level of 55dB could be exceeded. If these areas are located along the worst-case boundaries closest to the roads, there is potential for a **major** impact to occur. However, provided recommendations of suitable layout are adhered to, and specific mitigation measures where required, it is considered that a **negligible** impact can be achieved in the long term.

Commercial Sound Impact upon Proposed Receptors

14.285 Any additional new source of noise to be implemented to the area should comply with the set noise limit criterion based on the recorded prevailing background levels.

14.286 Should good acoustic design be followed and/or mitigation measures be implemented, there would be a **negligible** impact at local level in the long term at all proposed receptors.

Proposed Fixed Plant upon Proposed and Existing Receptors

14.287 As the details of any proposed fixed plant associated with the proposed school and local centre is currently unavailable, plant noise emission limits have been provided based upon the measured background sound pressure levels.

14.288 Therefore, as long as the derived rating levels are not exceeded at the receptors, a **negligible** impact should be observed due to fixed plant noise.

Rail Vibration

14.289 The rail vibration assessment determined an unlikely probability of adverse comment due to train pass-bys.

14.290 The impact is categorised as **negligible.** As such, there is predicted to be a **negligible** impact in the long term and at local level.

Residual Effects Evaluation

14.291 Table 14.46 identifies the predicted residual effect significance once mitigation measures have been implemented.

Table 14.46: Residual Effects

Receptor	Description of the Residual Effect	Scale and Nature	Significant / Not Significant	Geo	D I	P T	R IR	St Mt Lt
Construction Works								
R1	Construction noise and vibration/ Increase traffic flow	Moderate/negligible	Not significant due to the relatively short time construction period/traffic increase is not significant	L	D	T/ P	R/ IR	St/ Lt
R2	Construction noise and vibration/	Moderate/negligible	Not significant due to the relatively short time	L	D	T/ P	R/ IR	St/ Lt

Receptor	Description of the Residual Effect	Scale and Nature	Significant / Not Significant	Geo	D I	P T	R IR	St Mt Lt
	Increase traffic flow		construction period/traffic increase is not significant					
R3	Construction noise and vibration/ Increase traffic flow	Moderate/negligible	Not significant due to the relatively short time construction period/traffic increase is not significant	L	D	T/ P	R/ IR	St/ Lt
R4	Construction noise and vibration/ Increase traffic flow	Minor/negligible	Not significant due to the relatively short time construction period/traffic increase is not significant	L	D	T/ P	R/ IR	St/ Lt
R5	Construction noise and vibration/ Increase traffic flow	Minor/negligible	Not significant due to the relatively short time construction period/traffic increase is not significant	L	D	T/ P	R/ IR	St/ Lt
R6	Construction noise and vibration/ Increase traffic flow	Minor/negligible	Not significant due to the relatively short time construction period/traffic increase is not significant	L	D	T/ P	R/ IR	St/ Lt
R7	Construction noise and vibration/ Increase traffic flow	Minor/negligible	Not significant due to the relatively short time construction period/traffic increase is not significant	L	D	T/ P	R/ IR	St/ Lt
R8	Construction noise and vibration/ Increase traffic flow	Minor/negligible	Not significant due to the relatively short time construction period/traffic increase is not significant	L	D	T/ P	R/ IR	St/ Lt
R9	Construction	Minor/negligible	Not significant due	L	D	T/	R/	St/

Receptor	Description of the Residual Effect	Scale and Nature	Significant / Not Significant	Geo	D I	P T	R IR	St Mt Lt
	noise and vibration/ Increase traffic flow		to the relatively short time construction period/traffic increase is not significant			P	IR	Lt
R10	Construction noise and vibration/ Increase traffic flow	Moderate/negligible	Not significant due to the relatively short time construction period/traffic increase is not significant	L	D	T/ P	R/ IR	St/ Lt
Completed Development								
Traffic flow	Potential increase	Negligible	Not Significant	L	D	P	IR	P
HVAC	Building services noise	Negligible	Not Significant	L	D	P	IR	P

Notes:
Residual Effect
- Scale = Negligible / Minor / Moderate / Major
- Nature = Beneficial or Adverse

Geo (Geographic Extent) = Local (L), Borough (B), Regional (R), National (N)
D = Direct / I = Indirect
P = Permanent / T = Temporary
R = Reversible / IR= Irreversible
St = Short Term / Mt = Medium Term / Lt = Long Term
N/A = not applicable / not assessed

Conclusions

14.292 This chapter assesses the potential impact of the proposed development Site regarding Noise and Vibration. It considers the potential effects generated by the construction works upon the nearby identified noise and vibration sensitive receptors. Additionally, the assessment evaluates the ambient noise impact on the proposed development and suitability in terms of noise and vibration for the proposed residential and school buildings.

14.293 Therefore, the noise and vibration chapter prepared by Ensafe, describes the methods used to assess the impacts, the baseline conditions currently existing at the site and surroundings, the potential direct and indirect impacts of the development arising from noise and vibration. Furthermore, the chapter also informs about areas of high noise risk and advise on the adoption of a Design Code where amenity areas and noise sensitive rooms are sheltered or facing away from the nearby network of roads.

14.294 There are areas along the roads that may require closed windows to comply with good acoustic indoor levels. The building external envelope at Plots located at the boundary with the roads network, may require an upgraded acoustic glazing specification and alternative ventilation.

14.295 Additionally, the noise and vibration impact assessment include all existing receptors in the immediate vicinity of the Site and new receptors to be introduced to the area with the Site, that may be subject to noise and vibration from construction activities as well as receptors that are located along the nearby roads network that may be affected by the changes to be caused by the Site operation.

14.296 With regards to construction noise and vibration, Best Practicable Means are required in order to achieve acceptable levels of noise and vibration at the receptors and to avoid adverse impact, no more than minor significance.

14.297 The resulting assessment determined an adverse temporary short-term impact categorised as **minor adverse** in the short-term at local level at most of the identified nearest receptors and **moderate adverse** at NSRs identified by R1, R2, R3 and R10.

14.298 It should be noted that any increase in noise levels associated with construction generated road traffic is expected to be limited to the daytime hours only. No residual impacts are predicted given the short-term, temporary nature of the works.

14.299 In the short term, roads in the immediate vicinity of the Site are subject to a **negligible** impact in the short term and at local level. This short-term impact will not have any residual effects.

14.300 In the long term, most roads in the immediate vicinity of the Site are subject to a **negligible** change in levels. Additionally, any change in road traffic levels will be gradual and likely not perceptible over the course of the development becoming fully operational.

14.301 With regards to existing transportation sound impacting upon the development site, during the daytime the site experiences sound levels of circa 65dB along the most exposed areas of the Site. This results in most of the Site being of **Negligible Risk**. Areas immediately bounding Penwortham Way are subject to **Medium Risk**.

14.302 During the night-time, the site experiences sound levels of circa 60dB along the most exposed areas of the Site. This results in most of the Site being of **Negligible to Low Risk,** with areas along the boundaries with Penwortham Way being of **Medium and High Risk,** as above.

14.303 As such, good acoustic design is essential for areas closest to Penwortham Way. Should good acoustic design measures be implemented then the overall impact upon potential residential residents will be **negligible** in the long term and at local level.

14.304 There is the potential for a +5dB exceedance of the background sound level at the closest proposed residential uses to Welch Fencing due to commercial sound. Should good acoustic design be followed and/or mitigation measures be implemented, there would be a **negligible** impact at local level in the long term at all proposed receptors.

14.305 Plant Noise Emission limits have been set for any proposed fixed plant associated with the development. Therefore, as long as the noise limit is not exceeded at the receptors, a **negligible** impact should be observed due to proposed fixed plant noise. Note that the noise limit most be set based on the rating levels, Lr dB(A), of the new plant items to be introduced to the area.

14.306 The rail vibration assessment determined an unlikely probability of adverse comment due to train pass-by.

14.307 The impact is categorised as **negligible.** As such, there is predicted to be a **negligible** impact in the long term and at local level.