

## 7.0 Noise and Vibration

### 7.1 Introduction

- 7.1.1 This chapter of the ES will identify and describe the nature and significance of the effects likely to arise in relation to noise and vibration as a result of the Proposed Development.
- 7.1.2 RSK Acoustics is instructed by Hallam Land Management to undertake a noise and vibration assessment (NVIA) as part of the Environmental Statement (ES).

#### **Competency**

- 7.1.3 The noise chapter has been prepared by Tim Fox of RSK Acoustics. All consultants at RSK Acoustics hold academic qualifications necessary to operate as professional acoustic consultants, holding technical qualifications in acoustics or a related field.
- 7.1.4 RSK Acoustics are sponsor members of the Institute of Acoustics, with all consultants being at individual membership grades ranging from "Associate" to "Member". RSK Acoustics is also a corporate member of the Institute of Environmental Management and Assessment.

### 7.2 Regulatory and Policy Context

#### **National Planning Policy Framework and Planning Practice Guidance**

##### *National Planning Policy Framework, 2021*

- 7.2.1 The National Planning Policy Framework (NPPF), published in March 2012 and updated most recently in July 2021, is currently the relevant document for defining the national policy toward noise sensitive development. It refers to the Noise Policy Statement for England (NPSE), which is discussed in the subsequent section.
- 7.2.2 The current policy on sustainable development influences the emphasis of any noise assessment. The development of a quiet, rural site is by most measures less sustainable than the development of a site located near existing infrastructure and facilities. The rating of development sites based on prevailing noise levels should reflect this.
- 7.2.3 Specifically, on the subject of noise, paragraph 185 of NPPF states:

*"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:*

*a. mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*

*b. identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason;"*

7.2.4 Paragraph 185 references the Noise Policy Statement for England and no other particular standards.

7.2.5 On the general issue of amenity, paragraph 130 states that planning policies and decisions should ensure that developments:

*"create places that [...] promote health and well-being, with a high standard of amenity for existing and future users..."*

7.2.6 Further to this, paragraph 174 states that planning policies and decisions should contribute to and enhance the natural and local environment by:

*"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"*

7.2.7 A notable inclusion in the July 2018 edition of NPPF was the 'agent of change' principle. In terms of noise, this principle requires that those proposing a new noise sensitive development incorporate sufficient mitigation such that the operation of existing premises in the area is not unreasonably restricted in order to control noise impact upon the new development:

*"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."*

*Noise Policy Statement for England, 2010*

7.2.8 This NPSE does not set quantitative guidelines for the suitability of noise sensitive development in an area depending on the prevailing levels of noise. Absent, therefore, is reference to specific noise thresholds which determine whether noise sensitive development is suitable and, if so, whether particular mitigation factors need to be considered.

7.2.9 Instead, the NPSE sets out three aims. The first aim of the NPSE:

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

7.2.10 The second aim of the NPSE:

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

7.2.11 The third aim of the NPSE:

*"Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development."*

7.2.12 Paragraph 2.24 states that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life. It also states that this does not mean that such adverse effects cannot occur.

7.2.13 In essence, therefore, each development site must be judged on its ability to deliver on each of the stated aims. Quantifying the prevailing noise levels is therefore an essential first step in assessing a given site.

7.2.14 The NPSE refers to SOAEL, the Significant Observed Adverse Effect Level. This is defined as the level above which significant adverse impacts on health and quality of life occur. Given the overall thrust of the NPSE, the SOAEL is therefore an important assessment standard although the document also comments that:

*"It is not possible to have a single objective noise based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times."*

7.2.15 Attention is drawn to the fact that the SOAEL is the level above which significant adverse effects can be observed. Importantly, it should be noted that the overall objective is to avoid or minimise significant adverse impacts; some degree of impact is acceptable and it is not necessary to seek to achieve no impact at all.

*National Planning Practice Guidance*

7.2.16 The Department for Communities and Local Government 'Planning Practice Guidance' (PPG) was published on 6 March 2014 and updated in July 2019 in respect of noise.

7.2.17 The PPG on Noise expands upon the NPPF and NPSE and sets out more detailed guidance on noise assessment. Like the NPPF and NPSE, the guidance does not include any specific noise levels but sets out further principles that should underpin an assessment.

7.2.18 The PPG includes a section on noise, which states:

*"Plan-making and decision making need to take account of the acoustic environment and in doing so consider:*

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

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

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

7.2.19 It then refers to the NPSE and states that the aim is to identify where the overall effect of the noise exposure falls in relation to Significant Observed Adverse Effect Level (SOAEL), the Lowest Observed Adverse Effect Level (LOAEL) and the No Observed Effect Level (NOEL).

7.2.20 The guidance then presents a table, which is reproduced as the table below. The implication of the final line of the table is that only the 'noticeable and very disruptive' outcomes are unacceptable and should be prevented. All other outcomes (i.e. all other lines in the table) can be acceptable, depending upon the specific circumstances and factors such as the practicalities of mitigation.

**Table 7.1 – Summary of Noise Exposure Hierarchy (from PPG)**

<b>Response</b>	<b>Examples of Outcomes</b>	<b>Increasing Effect Level</b>	<b>Action</b>
<b>NOEL</b> ( <i>No Observed Effect Level</i> )			
Not present	No Effect	No Observed Effect	No specific measures required
<b>NOAEL</b> ( <i>No Observed Adverse Effect Level</i> )			
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed Adverse Effect	No specific measures required
<b>LOAEL</b> ( <i>Lowest Observable Adverse Effect Level</i> )			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
<b>SOAEL</b> ( <i>Significant Observed Adverse Effect Level</i> )			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep.	Significant Observed Adverse Effect	Avoid

	Quality of life diminished due to change in acoustic character of the area.		
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

7.2.21 Under the topic of further considerations relating to mitigating the impact of noise on residential developments, the PPG states:

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

*a relatively quiet facade (containing windows to habitable rooms) as part of their dwelling;*

*a relatively quiet external amenity space for their sole use, (e.g. a garden or balcony).*

*Although the existence of a garden or balcony is generally desirable, the intended benefits will be reduced if this area is exposed to noise levels that result in significant adverse effects;*

*a relatively quiet, protected, nearby external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings; and/or*

*a relatively quiet, protected, external publically accessible amenity space (e.g. a public park or a local green space designated because of its tranquillity) that is nearby (e.g. within a 5 minute walking distance)."*

*World Health Guidance for Community Noise (1999)*

7.2.22 The Guidelines for Community Noise (World Health Organisation, 1999) included values for community noise in specific environments.

7.2.23 It is important to note that the WHO Guidelines are aspirational, as illustrated by the National Noise Incidence Study (NNIS, 2000), which indicates that 55% of the population of England and Wales are exposed to external noise levels above 55 dB  $L_{Aeq, day}$ . A National Physical Laboratory (NPL) report (with reference CMAM 16, dated September 1998) reviewing the original 1980 WHO Guidelines and the 1995 draft version of the current Guidelines stated:

*"Exceedances of the WHO guideline values do not necessarily imply significant noise impact and indeed, it may be that significant impacts do not occur until much higher degrees of noise exposure are reached."*

*"As such, it would be unwise to use the WHO guidelines as targets for any form of strategic assessment, since, given the prevalence of existing noise exposure at higher noise levels, there might be little opportunity for and little real need for any across the board major improvements. On the other hand, the most constructive use for the WHO guidelines will be to set thresholds above which greater attention should be paid to the various possibilities for noise control action when planning new developments. It is important to make clear at*

*this point that exceedances do not necessarily imply an over-riding need for noise control, merely that the relative advantages and disadvantages of noise control action should be weighed in the balance."*

7.2.24 To prevent moderate annoyance in outdoor living areas, such as gardens and balconies of dwellings, the WHO guideline value is 50 dB  $L_{Aeq, 16h}$ . This can be described as an upper limit for the average noise level across the daytime and evening period (07:00h to 23:00h). The corresponding guideline value to prevent serious annoyance is stated as 55 dB  $L_{Aeq, 16h}$ . However, it is again noted that these levels are aspirational in nature.

7.2.25 In terms of the internal noise environment, in order to achieve maximum speech intelligibility and to avoid moderate annoyance, the guideline value for noise levels within dwellings is stated as 35 dB  $L_{Aeq, 16h}$  (covering the day and evening 07:00h to 23:00h). The corresponding value for the night period (23:00h to 07:00h) to avoid sleep disturbance is 30 dB  $L_{Aeq, 8h}$ .

7.2.26 Additionally in terms of sleep disturbance, a guideline value of 45 dB  $L_{Amax}$  is given. In relation to this value, the Guidelines state:

*"When the background noise is low, noise exceeding 45 dB  $L_{Amax}$  should be limited, if possible..."*

*"For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB  $L_{Amax}$  more than 10–15 times per night..."*

*WHO Environmental Noise Guidelines 2018*

7.2.27 An updated version of the Guidelines was published in October 2018. It constitutes a significant revision of the 1999 Guidelines, rather than comprising minor amendments. In relation to road traffic noise, the guidance states the following:

*"For average noise exposure, the GDG strongly recommends reducing noise levels produced by road traffic below 53 decibels (dB)  $L_{den}$ , as road traffic noise above this level is associated with adverse health effects.*

*For night noise exposure, the GDG strongly recommends reducing noise levels produced by road traffic during night time below 45 decibels (dB)  $L_{night}$ , as night-time road traffic noise above this level is associated with adverse effects on sleep.*

*To reduce health effects, the GDG strongly recommends that policy-makers implement suitable measures to reduce noise exposure from road traffic in the population exposed to levels above the guideline values for average and night noise exposures. For specific interventions, the GDG recommends reducing noise both at the source and on the route between the source and the affected population by changes in infrastructure."*

7.2.28 In relation to railway noise, the guidance states the following:

*"For average noise exposure, the GDG strongly recommends reducing noise levels produced by railway traffic below 54 decibels (dB)  $L_{den}$ , as railway noise above this level is associated with adverse health effects.*

*For night noise exposure, the GDG strongly recommends reducing noise levels produced by railway traffic during night time below 44 decibels (dB)  $L_{night}$ , as night-time railway noise above this level is associated with adverse effects on sleep.*

*To reduce health effects, the GDG strongly recommends that policy-makers implement suitable measures to reduce noise exposure from railways in the population exposed to levels above the guideline values for average and night noise exposures. There is, however, insufficient evidence to recommend one type of intervention over another."*

7.2.29 The  $L_{den}$  is an equivalent sound level that represents the situation over the full 24 hour day, taking account of the  $L_{day}$  (0700-1900h), with a penalty of 5 dB(A) for evening noise  $L_{evening}$  (1900-2300h) and a penalty of 10 dB(A) for night time noise  $L_{night}$  (2300-0700). The  $L_{night}$  index is equivalent to the  $L_{Aeq, 8h}$  index as used in other standards such as BS 8233 (but not necessarily with the same numerical guidelines).

7.2.30 The guidance no longer specifies  $L_{Amax}$  criteria but states in section 2.2.2:

*"In many situations, average noise levels like the  $L_{den}$  or  $L_{night}$  indicators may not be the best to explain a particular noise effect. Single-event noise indicators – such as the maximum sound pressure level ( $L_{A,max}$ ) and its frequency distribution – are warranted in specific situations, such as in the context of night-time railway or aircraft noise events that can clearly elicit awakenings and other physiological reactions that are mostly determined by  $L_{A,max}$ . Nevertheless, the assessment of the relationship between different types of single-event noise indicators and long-term health outcomes at the population level remains tentative. The guidelines therefore make no recommendations for single-event noise indicators."*

7.2.31 As with the 1999 WHO document, the guideline values in the 2018 document represent aspirational targets to be achieved in the long term, rather than values that should immediately be adopted into relevant policy.

7.2.32 This is reflected in the following excerpt from the government's Aviation 2050 consultation document (which relates to aircraft noise but the principle of the statement is relevant to other noise sources):

*"The government is considering the recent new environmental noise guidelines for the European region published by the World Health Organisation (WHO). It agrees with the ambition to reduce noise and to minimise adverse health effects, but it wants policy to be underpinned by the most robust evidence on these effects, including the total cost of action and recent UK specific evidence which the WHO report did not assess."*

7.2.33 Therefore, other current standards and guidance, such as BS 8233, still represent the most relevant and appropriate basis for assessment.

*BS 8233:2014 - Guidance on sound insulation and noise reduction for buildings;*

7.2.34 Guideline values for dwellings with respect to internal and external noise levels are included in BS 8233:2014 Guidance on sound insulation and noise reduction for buildings (BSi).

7.2.35 The standard states 50 dB  $L_{Aeq, T}$  as being desirable as a steady state noise level not to be exceeded in gardens. It also states 55 dB  $L_{Aeq, T}$  as an upper guideline value. The time period  $T$  is usually taken to be the 16 hour day (07:00h to 23:00h).

7.2.36 Paragraph 7.7.3.2 of the standard goes on to say the following:

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

*Other locations, such as balconies, roof gardens and terraces, are also important in residential buildings where normal external amenity space might be limited or not available, i.e. in flats, apartment blocks, etc. In these locations, specification of noise limits is not necessarily appropriate. Small balconies may be included for uses such as drying washing or growing pot plants, and noise limits should not be necessary for these uses. However, the general guidance on noise in amenity space is still appropriate for larger balconies, roof gardens and terraces, which might be intended to be used for relaxation. In high-noise areas, consideration should be given to protecting these areas by screening or building design to achieve the lowest practicable levels. Achieving levels of 55 dB  $L_{Aeq, T}$  or less might not be possible at the outer edge of these areas, but should be achievable in some areas of the space."*

7.2.37 It can be seen that external noise levels, especially on small balconies to apartment blocks, are not proposed to be a controlling index by which suitability of a residential site is defined.

7.2.38 Therefore, when designing noise sensitive developments that incorporate gardens or other external amenity areas, the intent shall be to provide an area for each property in which the noise levels are consistent with these standards (in whole or in part). Where these standards cannot be achieved, then reasonable measures shall be employed to provide screening or other forms of mitigation so as to minimise the noise levels in the external amenity areas.



- 7.2.39 An important principle here is that sustainable development sites will often be exposed to relatively high levels of environmental noise, and while means are available to insulate internal spaces, they are not always available to protect external spaces. Strict adherence to the enforcement of such external noise criteria would preclude development in the majority of areas considered for development in semi-urban or urban environments or in areas in the vicinity of transportation noise sources. This is why the external standards shall be viewed as targets or triggers of mitigation measures rather than thresholds not to be exceeded in all circumstances.
- 7.2.40 Buildings can be designed to achieve specific levels of insulation against external noise. It is reasonable, therefore, to set specific internal noise standards as the test of whether a development satisfies the requirements of the NPPF and the aims of the NPSE. In essence, these require a high quality design that achieves a good standard of amenity.
- 7.2.41 Guidance in respect of indoor ambient noise levels is contained in Table 4 of BS 8233:2014 and tabulated below.

**Table 7.2 – Table 4 of BS 8233:2014**

<b>Activity</b>	<b>Location</b>	<b>07:00 to 23:00</b>	<b>23:00 to 07:00</b>
Resting	Living room	35 dB $L_{aeq,16h}$	-
Dining	Dining room/area	40 dB $L_{aeq,16h}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{aeq,16h}$	30 dB $L_{aeq,8h}$
<i>Note 7 Where development is considered necessary or desirable, despite external levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved.</i>			

- 7.2.42 The previous edition of BS 8233 included quantitative guidance with respect to night-time  $L_{Amax}$  noise levels in bedrooms. BS 8233:2014 does not provide such guidance, however in paragraph 7.7.5.1.1 it is noted that the recommendations for ambient noise in hotel bedrooms are similar to those for living accommodation and Table H.3 in Annex H.3 gives example night-time  $L_{Amax}$  limits in hotel bedrooms of 45-55 dB.
- 7.2.43 The WHO study informing the 1999 Guidelines derived the  $L_{Amax}$  night time noise standard on the basis of 10 to 15 occurrences per night.
- BS5228: Noise Control on Construction and Open Sites*
- 7.2.44 BS 5228-1:2009 provides guidance concerning methods of predicting and measuring construction noise, and assessing its impact on those exposed to it. It is therefore relevant to consider on this site.
- 7.2.45 Example method 1 in Annex E of BS 5228-1 provides guidance on how to set threshold noise levels which can be used to identify potential significant effects at receptors. Ambient noise levels on site without construction noise are rounded to the nearest 5 dB and compared against the construction noise emission levels. If the construction noise level exceeds the category value shown in the table below, then a potential significant impact is indicated.

**Table 7.3 – Table E1 of BS 5228-1**

Assessment category and threshold value period	Threshold value, in dB ( $L_{Aeq,T}$ )		
	Category A <sup>(A)</sup>	Category B <sup>(B)</sup>	Category C <sup>(C)</sup>
Night-time (23:00-07:00)	45	50	55
Evenings and weekends <sup>(D)</sup>	55	60	65
Daytime (07:00-19:00) and Saturdays (07:00-13:00)	65	70	75
<p><i>Note 1 A potential significant effect is indicated if the <math>L_{Aeq,T}</math> noise level arising from the site exceeds the threshold level for the category appropriate to the ambient noise level.</i></p> <p><i>Note 2 If the ambient noise level exceeds the Category C threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a potential significant effect is indicated if the total <math>L_{Aeq,T}</math> noise level for the period increases by more than 3 dB due to site noise.</i></p> <p><i>Note 3 Applied to residential receptors only.</i></p>			
<p><i>(A) Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values.</i></p> <p><i>(B) Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values.</i></p> <p><i>(C) Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values.</i></p> <p><i>(D) 19.00–23.00 weekdays, 13.00–23.00 Saturdays and 07.00–23.00 Sundays.</i></p>			

**Local Policy**

*Cherwell Local Plan Part 1 2011-2031 (Adopted 2015)*

7.2.46 Policy Bicester 1: North West Bicester Eco-Town refers specifically to the need for “consideration and mitigation of any noise impacts of the railway line” in the planning of development within the North West Bicester development. The allocation of a mixed use development at Northwest Bicester is made having taken full account of the noise environment. No particular consideration is required by the policy of noise levels associated with the A4095.

*North West Bicester Supplementary Planning Document, 2016*

7.2.47 Similarly, the North West Bicester Supplementary Planning Document reiterates the need for “consideration and mitigation of any noise impacts of the railway line.”

**7.3 Assessment Methodology**

**Overview of Approach**

- 7.3.1 An acoustic calculation model of the site and surrounding area has been prepared, verified by primary survey data, and used to evaluate the noise climate across the site and the operational noise climate in 2031 - the with development scenario.
- 7.3.2 In accordance with the NPPF, NPSE and PPG guidance for noise, lowest observable (LOAEL) and significant observable adverse effect levels (SOAEL) are proposed for each noise and vibration source under assessment in this ES Chapter.
- 7.3.3 In respect of the EIA Regulations, the beneficial and adverse effect levels of noise and vibration effects will be related to the significance levels. Based on the descriptions of the adverse effect levels in the PPG for noise, recommended actions for each significance level will be suggested if required.
- 7.3.4 The noise and vibration significance criteria are presented in Table 7.4 below.

**Table 7.4 - Noise and Vibration Significance Criteria**

<b>Significance Level</b>	<b>Noise and Vibration Adverse Effect Level</b>	<b>Impact and Action (to be applied to potential effects)</b>
Substantial		Noise causes extensive and regular changes in behaviour and could lead to psychological stress or physiological effects. This level is unacceptable and should be prevented.
Major	SOAEL	Noise causes a material change in behaviour and/or attitude. This level should be avoided.
Moderate		Noise can be heard and causes small changes in behaviour or attitude. Noise should be mitigated and reduced to a minimum.
Minor	LOAEL	Noise can be heard but does not cause a change in behaviour or attitude. No specific mitigation measures are required.
Not Significant/Neutral	NOEL	Noise has no effect. No specific measures required

**Scoping and Response**

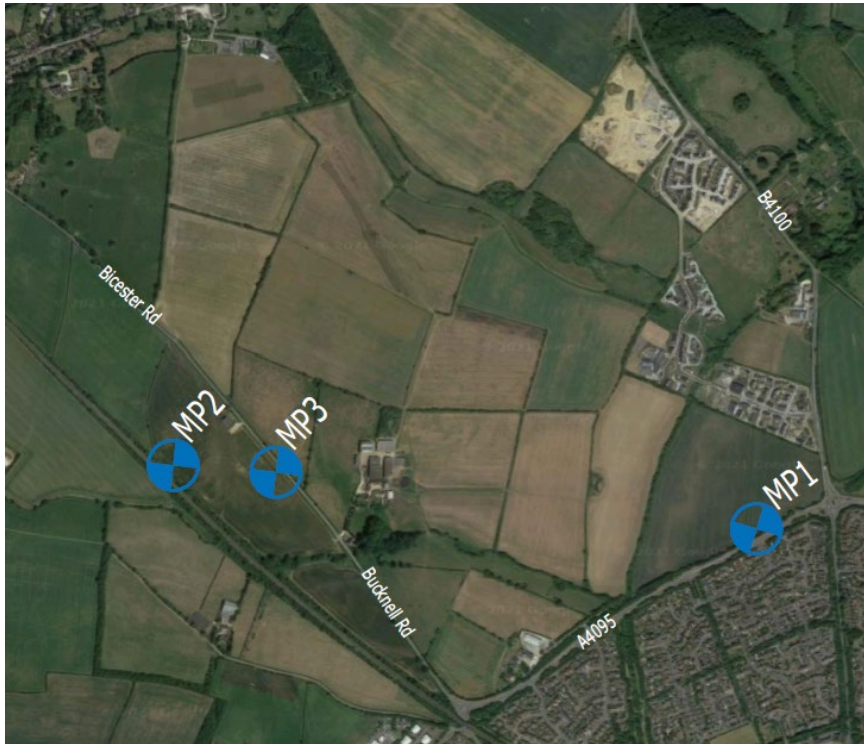
- 7.3.5 A scoping report was prepared with a section relating to noise and vibration. It was agreed that an assessment of construction noise (albeit indicative at this stage), road traffic and railway noise affecting the development site and changes in road traffic flows associated with the development impacting existing receptors should be undertaken.

- 7.3.6 The only identified potential source of vibration affecting the development site is the adjacent railway line. Vibration surveys were undertaken and report in the Environmental Statement that accompanied the previous application (14/01384/OUT) relating to major development of the site. The measurements, taken at 5m and 10m from the track alignment indicated that VDV values are below the range of 0.2-0.4  $\text{ms}^{-1.75}$  and therefore, as per BS 6472, would result in a low probability of adverse comment at such close distances. As no development is proposed within 15 metres of the track alignment, vibration impacts have been scoped out of the assessment.
- 7.3.7 The construction method cannot be set out in detail at this stage. No detailed assessment of vibration from construction will therefore be carried out at part of this assessment. Any appropriate mitigation measures will however be identified for the construction phase and presented within the CEMP (Construction Environment Management Plan).
- 7.3.8 The Council's Environmental Protection Team have confirmed that the methodologies presented have been agreed.

***Noise Survey Undertaken***

- 7.3.9 Current baseline noise conditions have been quantified through a noise monitoring survey undertaken at various locations around the Site. Full details of the noise survey methodology are included in Appendix 7.1 Outline Noise Assessment.
- 7.3.10 Figure 7.1 identifies the noise monitoring locations. The locations at which the noise survey has been conducted are set out below:
- MP1 – Free-field position located 1.5 m above local ground level on the southern boundary of the site approximately 12 m from the kerb of the A4095.
  - MP2 – Free-field position located 4 m above local ground level on the western boundary of the site, approximately 16 m from the raised rail line that runs parallel with the site boundary.
  - MP3 – Free-field position located 1.5 m above local ground level approximately 6 m from the kerb of Bicester Road.

**Figure 7.1 - Noise Measurement Positions**



**Method for Assessing Future Baseline Conditions**

- 7.3.11 In the absence of the Proposed Development and with all Other Surrounding Developments / Committed Developments constructed, the baseline noise levels would be expected to increase, albeit not significantly, due to the increase in traffic flow numbers.
- 7.3.12 Traffic flow data (provided by the Transport Consultant) has been used to define a future baseline road traffic scenario and so the likely future noise conditions associated with traffic on surrounding roads has been quantified.

**Method for Assessing Impacts and Magnitude and Significance of Effects**

*Construction Noise*

- 7.3.13 Guidance for assessment of noise impact from construction noise will be taken from British Standard 5228 Code of Practice for Noise and Vibration Control on Construction (BS 5228-1:2009+A1:2014) and Open Sites.
- 7.3.14 Details of the types of construction methods and plant likely to be used during the construction phases have yet to be formulated. At this stage in the scheme's design it is not possible to state precisely where plant will operate and for how long during the working day.
- 7.3.15 However, it is likely that the main construction phases would include site levelling/clearance, ground excavation, concreting and building construction. The building construction phase, and the servicing and fitting out of new buildings, is normally not a significant source of noise or vibration for local receptors.

7.3.16 To minimise associated impacts on local residents, guidance contained within BS 5228 Part 1 (2009) will be used. This guidance details information on noise reduction measures and promotes the 'best practicable means' (BPM) approach to the construction process.

7.3.17 Proposed construction noise criteria are set out in the table below, based on the guidance previously presented and taken from Annex E to BS 5228-1.

**Table 7.5 – Construction Noise Assessment Criteria**

Assessment Position	Period	Residential Façade $L_{Aeq}$ in any Daytime Period	
		Impact Threshold	Mitigation Threshold
Houses on opposite side of A4095	07:00 – 19:00 Monday to Friday	70	75
	0700 – 13:00 Saturday	70	75
All other houses	07:00 – 19:00 Monday to Friday	65	70
	0700 – 13:00 Saturday	65	70

7.3.18 The criteria include thresholds for noise levels at which impacts are expected to arise. It would be anticipated that noise levels within 5 dB below the impact threshold would relate to a minor effect with levels above the impact threshold a moderate effect and levels above the mitigation threshold a major effect, as presented in the following table.

**Table 7.6 – Guidance on Effects of Construction Noise Levels**

Assessment Position	Noise Level, dB(A)	Significance Level	Effect Significance
Houses on opposite side of A4095	< 65	Negligible	Not significant
	$65 \leq X < 70$	Minor	Not significant
	$70 \leq X < 75$	Moderate	Significant
	$\geq 75$	Major	Significant
All other houses	< 60	Negligible	Not significant
	$60 \leq X < 65$	Minor	Not significant
	$65 \leq X < 70$	Moderate	Significant
	$\geq 70$	Major	Significant

*Noise from Traffic on the Local Road Network*

7.3.19 The noise impact from any significant changes in traffic flows relating to the scheme on existing residences has been considered.

7.3.20 When assessing potential noise effects due to changes in road traffic flows as a result of a development, it is appropriate to refer to the Design Manual for Roads and Bridges

(DMRB:2011). The Manual sets out noise assessment procedures to be followed when undertaking highway works such as building new roads.

- 7.3.21 DMRB sets out thresholds at which potential effects may start to become apparent, based on changes in 18-hour daytime noise levels (06h00-24h00) within short and long terms.
- 7.3.22 The short term assessment according to DMRB is considered to be a comparison of the year of opening with and without the introduction of development. The long term assessment, again according to DMRB, is considered to be a comparison between the year of opening and the year in which the greatest traffic flows will occur within 15 years of opening. In addition, it is appropriate to consider comparisons between future scenarios, with and without the site, as a long term assessment.
- 7.3.23 In general, calculations are carried out using Basic Noise Levels for the various scenarios, using the methodology set out in the Department for Transport (DfT) document Calculation of Road Traffic Noise.
- 7.3.24 The calculations are based on traffic flow data supplied by the project transport planners and take account of the percentage made up of Heavy Goods Vehicles (HGVs) and the stated speed limit for the roads. The resultant noise level figure is the  $L_{A10,18hr}$  dB.
- 7.3.25 As set out in the CRTN<sup>1</sup> guidance document, it is assumed that the source line for traffic is 3.5 metres in from the edge of the kerb and the noise level for the purposes of comparative assessment has been calculated at 10 metres from the edges of the kerb.
- 7.3.26 The calculated Basic Noise Level does not relate directly to noise exposure at individual residences, rather it is a reference noise level, comparison of which in various scenarios provide a good indication of the noise level changes that are expected to occur along an existing road link, where the road itself is the dominant road traffic noise source.
- 7.3.27 The changes in noise level are calculated based upon a comparison of the Basic Noise Level with and without development in the baseline year to the Basic Noise Level in the future year both with and without development.
- 7.3.28 In summary, the scenarios which have been assessed are detailed below:
- DM – Do Minimum 2031 (Local plan and committed developments only without any proposed development)
  - DS – Do Something 2031 (Local plan, committed developments and proposed development for year of opening)
- 7.3.29 The assessed roads are presented in Appendix 7.3.
- 7.3.30 In addition to looking at the change in noise levels it is relevant to consider the absolute noise levels. WHO Guidelines for Community Noise and BS 8233:2014 provide guidance correlating to annoyance to external absolute daytime noise levels. Thresholds of 55 dB

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<sup>1</sup> Calculation of Road Traffic Noise

$L_{Aeq,16hr}$  and 50 dB  $L_{Aeq,16hr}$  are quoted, referring to “serious” and “moderate” annoyance respectively.

7.3.31 Changes in noise levels generated are assessed in terms of changes in calculated  $L_{A10,18hr}$  noise levels, in context with DMRB guidance. This is converted to an  $L_{Aeq,16hr}$ , where appropriate, for comparison to the lower thresholds in terms of absolute noise levels of 50 dB and 55 dB  $L_{Aeq,16hr}$  as referred to by WHO and BS 8233.

7.3.32 Taking into account the above, the following criteria have therefore been derived:

**Table 7.7 – Road Traffic Noise Assessment Criteria**

<b>Free-field Absolute Noise Level</b>	<b>Change in Noise Level</b> $L_{A10,18h} / L_{Aeq,16h}$	<b>Significance Level in Short Term</b>	<b>Significance Level in Long Term</b>
$L_{Aeq,16h} < 50$ dB	0.0	No Change	No Change
	0.1 to 0.9	Negligible	Negligible
	1.0 to 2.9	Minor	Negligible
	3.0+	Minor	Minor
$50$ dB $\leq L_{Aeq,16h} < 55$ dB	0.0	No Change	No Change
	0.1 to 0.9	Negligible	Negligible
	1.0 to 2.9	Minor	Negligible
	3.0 to 4.9	Moderate	Minor
	5.0+	Moderate	Moderate
$L_{Aeq,16h} \geq 55$ dB	0.0	No Change	No Change
	0.1 to 0.9	Negligible	Negligible
	1.0 to 2.9	Minor	Negligible
	3.0 to 4.9	Moderate	Minor
	5.0 to 9.9	Major	Moderate
	10.0+	Major	Major

7.3.33 It should be noted that the presentation of changes in sound level to one decimal place in the table is not a reflection of the accuracy of any assessment undertaken but rather serves to provide a clear threshold between adjacent impact descriptions.

*Suitability of Site for Development*

7.3.34 The noise impact on the proposed new dwellings, from existing and proposed noise sources will be considered. Vibration has been scoped out of this assessment due to the distances between both the existing and proposed roads and the proposed dwellings.

7.3.35 The assessment of potential noise effects on the proposed new dwellings from noise sources considers the internal and external noise levels within habitable rooms and associated external amenity areas respectively. Calculations will take account of the existing noise



climate, as measured during the survey, along with the changes in noise levels due to the development.

7.3.36 These noise level requirements are as follows:

- Living rooms and bedrooms (daytime): 35 dB  $L_{Aeq,16h}$
- Dining rooms: 40 dB  $L_{Aeq,16h}$
- Bedrooms: 30 dB  $L_{Aeq,8h}$
- Aspirational external amenity areas: 55 dB  $L_{Aeq,16h}$

7.3.37 Although not specifically referenced within BS 8233:2014, a further requirement of 45 dB  $L_{Amax}$  has been included for bedrooms during the night time period, for robustness.

7.3.38 The external amenity area requirement is listed as aspirational, taking guidance from BS 8233:2014, where it makes clear that these noise levels may not be achievable within many locations where housing would be desirable. This is because external amenity areas cannot, by definition, be contained or benefit from the levels of noise mitigation that are available to internal spaces within buildings. As a consequence, design standards for external noise cannot be considered as thresholds that determine whether a high quality design has been implemented and a good level of amenity achieved. Rather, the external noise standards should be used to establish whether mitigation is appropriate as a means of minimising the adverse impacts of environmental noise.

7.3.39 Where the internal noise levels can be achieved, this has been determined to give rise to a Negligible effect, where significant adverse effects are avoided. If internal noise levels are calculated to exceed the above criteria, this has been determined to be a significant effect.

7.3.40 Where the aspirational external noise levels can be achieved, this has been determined to give rise to a Negligible effect. If external noise levels are calculated to exceed the above criteria, this has been determined to be a Moderate effect due to the aspirational nature of the criteria.

### ***Limitations and Assumptions***

#### ***Construction Noise***

7.3.41 The exact methods of construction are not yet known and it is therefore only possible to provide a general guidance as to best practice, rather than to provide comment on specific activity types. There is a reliance on the contractors to follow the advice set out in the guidance provided.

#### ***Noise from Traffic on the Local Road Network***

7.3.42 The uncertainties surrounding noise assessments undertaken based on traffic data are linked to the accuracy of the data provided by the transport consultant, and commentary of uncertainties provided by them would also apply to the traffic noise assessment.

*Suitability of Site for Development*

- 7.3.43 As the application is based upon a parameter plan, rather than a detailed layout, indicative façades have been assumed at specific distances from the boundary of each noise source to allow an assessment to be undertaken.
- 7.3.44 The calculations have assumed that the external façade of the buildings will be of a cavity masonry construction. The use of a lightweight alternative façade construction would require specific consideration to ensure that a suitable specification with an adequate sound reduction performance was utilised, however, this would not be expected to be problematic for the noise levels to which the majority of these dwellings are predicted to be exposed.

## **7.4 Baseline Conditions**

### ***Existing Baseline Conditions***

- 7.4.1 In order to calculate the significance of any impacts it is first necessary to establish the baseline condition. From this, the increase in noise levels can be calculated and compared to the impact descriptors.
- 7.4.2 For existing residences, an increase in noise levels can lead to an adverse impact as there is a perceived change in the noise climate. Any change in noise levels at the proposed residences would only cause an adverse impact if it caused the internal and external noise criteria to be exceeded.
- 7.4.3 The baseline road traffic noise assessment scenario is based on traffic data provided by the project transport consultant, Jubb.
- 7.4.4 The baseline data includes the vehicular movements associated with committed developments in the local area; which are assumed to be completed by 2031.
- 7.4.5 Noise survey work has been undertaken to quantify baseline exposure levels around the proposed development, as stated in section 1.

### ***Future Baseline Conditions (DO Nothing Scenario)***

- 7.4.6 In the absence of the Proposed Development and with all Other Surrounding Developments / Committed Developments constructed, the baseline noise levels would be expected to increase, albeit not significantly, due to the increase in traffic flow numbers.
- 7.4.7 Traffic flow data (provided by the Transport Consultant) has been used to define a future baseline road traffic scenario and so the likely future noise conditions associated with traffic on surrounding roads has been quantified.

## **7.5 Assessment of Likely Significant Effects**

### ***Construction Effects***

- 7.5.1 Noise generated during the construction phase will have the potential to affect nearby noise sensitive buildings.
- 7.5.2 Pending a more detailed development of the construction noise processes and phasing, construction noise criteria have been proposed in the methodology section, setting out thresholds at which impacts may arise and also at which effects may become 'Major' if exceeded for long periods.
- 7.5.3 Appendix 7.2 provides an example code of construction practice document relating to controlling noise levels and it is anticipated that this or similar will be adopted. It is also assumed construction working hours will be restricted to 0700 – 1900 hours Monday to Friday and 0700 – 1300 on Saturdays.
- 7.5.4 Taking this into account it is expected to control the construction noise effects to be at worst Moderate adverse and short term. In most cases the effects would be considered Minor adverse and short term.
- 7.5.5 The temporary nature of construction work also needs to be considered in the evaluation of construction noise effects. On this basis, the significance of construction noise impacts to existing sensitivities is assessed as being low.

### ***Operational Effects***

#### ***Noise from Traffic on the Local Road Network***

- 7.5.6 The potential post completion noise effects on existing sensitivities are limited to noise from road traffic.
- 7.5.7 Appendix 7.3 shows the noise levels associated with each scenario alongside the comparison between these and the magnitude of effect.
- 7.5.8 Without any consideration to the sensitivities near each road link, the impact is negligible or minor adverse on all assessed road links except Middleton Road, West of Bucknell. The effect alongside this road is assessed as major adverse. However, there is only one residential property located along this road. This property is located in relatively close proximity to the M40 motorway that noise levels are calculated to be controlled from the M40 and any change in noise level from Middleton Road is not expected to significantly increase the overall noise climate at the property. Therefore, the effect at the property is assessed as minor adverse.

#### ***Suitability of Site for Development***

- 7.5.9 Internal and external noise levels have been calculated for indicative proposed dwellings within the parcels on the parameters plan, as discussed in detail within Appendix 7.1.

7.5.10 It is expected for the substantial majority of houses, it is possible to achieve internal and external noise criteria without any additional mitigation. These dwellings and associated external amenity areas will benefit from screening provided by the outermost dwellings on the respective parcel of land. The magnitude of the noise effect is found to be Negligible for dwellings located within each parcel. This is below the threshold for a significant adverse effect.

7.5.11 For the outermost dwellings facing each noise source, the levels are calculated to be above the internal noise criteria depending on the proximity to the noise source. The magnitude of the noise effect is found to be significant, unmitigated, for dwellings located on or near the boundary of each parcel.

7.5.12 It is proposed that garden spaces relating to houses facing noise sources be located such that the housing themselves will provide screening so that at least part of the garden areas will achieve the external noise criteria.

## **7.6 Mitigation Measures**

### ***Mitigation of Construction Effects of Development***

7.6.1 Appendix 7.2 provides an example code of construction practice document relating to controlling noise levels to form as part of the CEMP and it is anticipated that this or similar will be adopted. It is also assumed construction working hours will be restricted to 0700 – 1900 hours Monday to Friday and 0700 – 1300 on Saturdays.

7.6.2 The CEMP will include as appropriate, but will not be limited to the following best practical means of noise control:

- All vehicles and mechanical plant used for the purpose of carrying out the works shall be fitted with effective exhaust silencers and shall be maintained in good and efficient working order so that extraneous noises shall be reduced to a minimum;
- All compressors and generators shall be “sound reduced” models fitted with properly lined and sealed acoustic covers which shall be kept closed whenever the machines are in use. All ancillary pneumatic percussion tools shall be fitted with mufflers or silencers of the type recommended by the manufacturers. Generators shall be positioned and enclosed so as to minimise noise transmission to the inhabitants in the neighbourhood as agreed with the Employer’s Agent;
- All pumps shall be position and enclosed so as to minimise noise transmission to inhabitants in the neighbourhood;
- All machines in intermittent use shall be shut down in the intervening periods between work or, where this is impracticable, throttled down to a minimum;

- No machine shall be permitted which uses a system of dropping a heavy weight, power assisted or by gravity, for the purposes of breaking up paving or foundations;
  - Access to the Site shall be such as to ensure minimal disturbance to persons in adjacent buildings by vehicles or plant entering or leaving the Site. No deliveries to Site shall take place outside the agreed working hours;
  - Any work agreed to be carried out, out of hours will be subject to agreement to noise levels with Environmental Health Officer. The Contractor shall provide details on work involved, machinery or plant used, exact location, and calculated noise levels at monitoring points;
  - Any fixed or static plant operating outside normally permitted working hours shall not give rise to a 'Rating Level', as defined in BS 4142:2014 "Method for Rating and Assessing Industrial and Commercial Sound," in excess of the existing free-field background LA90 noise levels at noise control stations;
  - Use of solid hoardings to the Site perimeter to screen low level sources to lower floors of noise sensitive properties;
  - Use of Hydraulic rather than percussive techniques during demolition where practicable;
  - Use of off-site prefabrication where practicable;
  - All plant to be properly maintained and silenced where appropriate;
  - Plant shall not be left running needlessly;
  - Plant used to be certified as meeting relevant EU/UK noise limits;
  - Contractors to follow guidance in BS 5228;
  - Loading and unloading of vehicles on Site to be done to minimise noise and where practicable away from noise sensitive receivers.
  - Where practicable, noise generating plant to be located away from noise sensitive receivers.
  - Noise complaints investigation procedures to be put in place, including having designated project team member responsible for complaints and enquiries.
- 7.6.3 Care will need to be taken to ensure that construction vehicle movements to and from the Site are constrained to haul routes avoiding as far as practicable noise sensitive routes.
- 7.6.4 It is expected that this will limit any noise impacts to be Minor Adverse at worst, and temporary.

#### ***Mitigation of Operational Stages of Development***

##### ***Noise from Traffic on the Local Road Network***

- 7.6.5 Impacts to all residences are assessed as being either Negligible or Minor Adverse so no means of mitigation are necessary.

*Suitability of Site for Development*

- 7.6.6 An assessment of the existing noise climate on the proposed new dwellings has been conducted, as detailed in Appendix 7.1, having regard to the Parameters Plan. Full details of the mitigation measures required are shown within the appendix.
- 7.6.7 The results of the assessment have shown that mitigation is likely to be required to dwellings located closest to respective noise sources and therefore. in order to adequately control noise ingress to habitable rooms in these areas it will be necessary for the various elements of the external building fabric to provide certain minimum levels of sound insulation performance (through enhanced acoustic glazing and acoustic ventilators). This will be for the outermost dwellings on each parcel on facades facing noise sources and is dependent on the final layout.
- 7.6.8 It is also necessary to provide trickle ventilation in order to achieve suitable background ventilation rates with windows closed.
- 7.6.9 Across the site, it has been shown that internal noise levels can be achieved without specific mitigation.
- 7.6.10 With the specified mitigation measures in place, the impact of noise on the proposed dwellings in the most sensitive locations will be Negligible.

## **7.7 Residual Effects**

### ***Construction Effects***

- 7.7.1 Construction noise is inherently temporary in nature so no residual effects will occur.
- 7.7.2 Any temporary effects will be controlled through best practice principles in the employment of construction methodologies, to ensure that noise emissions are minimised. It is expected that any temporary effects will be limited to Moderate adverse at worst.

### ***Operational Effects***

- 7.7.3 Residual effects are those that are predicted to remain after implementation of the secondary mitigation measures described above. No significant residual effects are expected with the above mitigation measured employed.

## **7.8 Cumulative Effects**

- 7.8.1 The noise assessment for the operation of the Proposed Development has utilised traffic data that has incorporated all known cumulative developments in the locality of the Site and incorporated this into the local road network assessment. The above assessment therefore incorporates the combined effects of the Proposed Development with those identified in Chapter 1

- 7.8.2 The effects of noise from construction site activity tend to be localised and are only likely to have a cumulative effect when different developments are in close proximity to each other. Committed development in the area will have their own CEMP's and will also be required to implement mitigation during construction to reduce noise and vibration. The cumulative effect during the construction phase of the Proposed Development is therefore likely to be Negligible.

## **7.9 Summary Statement of Effects**

- 7.9.1 Assessments have been carried out to consider the potential noise effects identified.
- 7.9.2 Noise impacts during the construction phase have been considered, noise criteria have been set out. Appendix 7.2 provides an example code of construction practice document relating to controlling noise levels and it is anticipated that this or similar will be adopted. It is also assumed construction working hours will be restricted to 0800 – 1800 hours Monday to Friday and 0800 – 1300 on Saturdays.
- 7.9.3 Changes in noise levels at the existing and proposed dwellings, associated with changes in traffic flows on existing roads and the proposed relief road have been assessed and shown to be Negligible or Minor in the worst instance.
- 7.9.4 The effect on the existing noise climate on the proposed dwellings has been assessed and mitigation measures in the form of enhanced acoustic glazing and acoustic ventilators have been specified in the most exposed locations of the site, dependant on a more detailed layout. It has been shown that through a considered layout and localised screening, external amenity noise levels can be suitably controlled.

**Table 7.8: Assessment of Significance of Residual Effects**

Possible Effect	Duration	Significance Major/Moderate/ Minor/Negligible Beneficial/Adverse	International/ National/ Regional/ Local	Mitigation	Residual Effect
<b>Construction</b>					
Construction noise	Temporary	Moderate Adverse	Local	Code of construction practice within Construction Environmental Management Plan	Minor Adverse
<b>Operational Development</b>					
Road traffic	Short term	Minor Adverse	Local	None Required	Minor Adverse
Noise to development – internal noise levels	Long term	Major Adverse	Local	Enhanced acoustic glazing and ventilation	Minor Adverse
Noise to development – external noise levels	Long term	Minor Adverse	Local	Embedded mitigation through screening provided by housing	Negligible