8 NOISE AND VIBRATION

Introduction

8.1 This chapter of the ES assesses the likely significant effects of the Development on the environment in respect of noise and vibration.

8.2 This chapter has been prepared by Tetra Tech Limited (see Appendix 1.2 Statement of Expertise).

8.3 The chapter sets out the methodology followed in undertaking the assessment and provides a review of the baseline features of the Site and surrounding area. Within this chapter, an assessment of off-Site road traffic upon both existing and proposed receptors, on-Site construction and operational phase effects has been undertaken.

8.4 The chapter focuses on the likely significant effects of the Development on existing identified sensitive receptors and proposed future receptors of the Site. The impact of the construction phase and operational road traffic noise attributable to the Development on baseline sensitive receptors and proposed receptors is assessed, in order to determine the magnitude of impact and significance of effect. For the purposes of this ES, the effects of such elements have been established based on whether adopted criteria are exceeded or not with the results presented in this chapter.

8.5 This chapter is to be read in conjunction with Appendix 8.1 Noise Technical Report and the following figures, which have been used to inform the assessment:

- Figure 8.1: Noise Monitoring Locations;
- Figure 8.2: Existing/Proposed Sensitive Receptor Locations (Construction Assessment);
- Figure 8.3: Existing/Proposed Sensitive Receptor Locations (Traffic Noise Assessment);
- Figure 8.4: Indicative Proposed Sensitive Receptor Locations;
- Figure 8.5: Graphical Representation of the Propagation of Vibration from Percussive Piling;
- Figure 8.6: Indicative Glazing and Ventilation Strategy – Living Rooms (Grid Height 1.5m); and
- Figure 8.7: Indicative Glazing and Ventilation Strategy – Bedrooms (Grid Height 4.0m).

Policy Context

National Planning Policy

National Planning Policy Framework

8.6 Published in February 2019, the National Planning Policy Framework (NPPF)[i] sets out the Government's planning policies for England and how these are expected to be applied. Reference to noise is made in Section 15: Conserving and enhancing the natural environment, paragraph 170 of the NPPF, which states that:

> *"Planning policies and decisions should contribute to and enhance the natural and local environment by:*
> *[…]*
> *(e) preventing new and existing development form contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basing management plans."*

8.7 Noise is also referenced within paragraph 180:

> *"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; and*
> *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."*

8.8 Furthermore, paragraphs 182 and 183 state:

> *"182. 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; and*
>
> *183. The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities."*

Noise Policy Statement for England

8.9 Reference is made in the NPPF to the Department for Environment, Food and Rural Affairs (DEFRA) 2010 Noise Policy Statement for England (NPSE)[ii].

8.10 The NPSE was published on 15th March 2010. It sets out the long-term vision of Government noise policy, which is to:

> *"promote good health and a good quality of life through the management of noise within the context of Government policy on sustainable development."*

8.11 The aims of the NSPE are:

> *"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:*
>
> - *avoid significant adverse impacts on health and quality of life;*
> - *mitigate and minimise adverse impacts on health and quality of life; and*
> - *where possible, contribute to the improvement of health and quality of life."*

8.12 Since the publication of the NPSE, this document and the accompanying Explanatory Note[iii] form the basis for noise consideration within the NPPF and the national Planning Practice Guidance (PPG)[iv]. The content of these documents is explained in more detail in the Noise Technical Report (provided at Appendix 8.1). This includes further reference to the following concepts introduced within the NPSE:

- No Observed Effect Level (NOEL) - this is the level below which no effect can be detected and below which there is no detectable effect on health and quality of life due to noise;
- Lowest Observable Adverse Effect Level (LOAEL) - this is the level above which adverse

effects on health and quality of life can be detected;

- Significant Observable Adverse Effect Level (SOAEL) - this is the level above which significant adverse effects on health and quality of life occur. However, specific noise measures such as limits or thresholds are not presented, and the NPSE states that *"It is not possible to have a single objective based measure that defines 'significant effect levels' that is applicable to all sources of noise in all situations."* As such, there remains the requirement to establish relevant criteria based on currently available guidance documents and standards such as the World Health Organisation (WHO) Guidelines[v] and Design Manual for Roads and Bridges (DMRB)[vi].

National Planning Practice Guidance: Noise (PPG: Noise)

8.13 The national PPG web-based resource was launched by the Department for Communities and Local Government (DCLG) on 6th March 2014 to support the NPPF. With respect to Government policy for noise, the national PPG: Noise provides a summary of the effects of noise exposure that gives more definition to the terms used in the NPSE and NPPF, as set out in Table 8.1. The guidance indicates broad parameters with respect to categorising the significance of the basic noise change. The defined categories in the table below have been used to help determine the magnitude level of impact in Table 8.5. The noise levels based on WHO and BS 8233: 2014 '*Guidance on sound insulation and noise reduction for buildings*'[vii] levels, which have informed the assessment, remain appropriate.

Table 8.1: Noise Exposure Hierarchy

Perception	Examples of Outcomes	Increasing Effect Level	Action
No Observed Effect Level			
Not present	No Effect	No Observed Effect	No Specific Measures Required
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed Adverse Effect	No Specific Measures Required
Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of	Significant Observed Adverse Effect	Avoid

Perception	Examples of Outcomes	Increasing Effect Level	Action
	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.		
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

Local Planning Policy

8.14 Policy Bicester 1: North West Bicester Eco-Town of the Cherwell Local Plan 2011-2031 Part 1[viii] adopted by Cherwell District Council (CDC) states the following in reference to noise:

"Consideration and mitigation of any noise impacts of the railway line."

Legislative Context

Control of Pollution Act

8.15 Part III of the Control of Pollution Act 1974[ix] (CoPA) is specifically concerned with the control of pollution. With regard to noise, the CoPA covers construction sites; noise in the street; noise abatement zones; codes of practice; and Best Practicable Means (BPM).

8.16 Under Part III Section 60 'Control of Noise on Construction Sites' and Section 61 'Prior Consent for Works on Construction Sites'. Discusses the requirements on how works should be undertaken and particular about the method by which they will be carried out, including the steps proposed to be taken to minimise noise resulting from the works.

Other Relevant Guidance

8.17 Other relevant guidance has been used to enable the assessment of the Development in terms of the LOAEL and the SOAEL. Tables 8.4 to 8.11 present equivalent noise levels and associated actions with the target noise level criteria identified. The noise level criteria detailed below have been derived from the following standards and design guidance:

- IEMA (Institute for Environmental Management and Assessment) *'Guidelines for Environmental Noise Impact Assessment October 2014*[x]*'*;
- Table 3.54a & 3.54b of LA 111 'Noise and Vibration' (May 2020) of the *Design Manual for Roads and Bridges*) [xi];
- BS 8233: 2014 '*Guidance on sound insulation and noise reduction for buildings'*;
- BS 5228: 2009 +A1:2014 *'Code of Practice for noise and vibration control on construction and open sites – Part 1 Noise*[xii]*'*;
- BS 5228: 2009 +A1:2014 *'Code of Practice for noise and vibration control on construction and open sites – Part 2 Vibration*[xiii]*;*
- ProPG: Planning & Noise: *Professional Practice Guidance on Planning & Noise – New Residential Development*[xiv]; and
- WHO – *Guidelines for Community Noise* (1999).

Assessment Methodology

Consultation

8.18 Following the Scoping Opinion received from CDC dated 22nd December 2020, it was agreed that Noise and Vibration will be scoped into the ES. The scope of the assessment agreed included: temporary noise / vibration effects during construction and noise change due to traffic and operational noise generated by the proposed development upon existing residential receptors. It was also agreed that the impact of road traffic noise upon proposed residential receptors would also be assessed. Additionally, the operational development is unlikely to give rise to any vibration that would be measurable beyond the Site boundary. Vibration effects from the operation of the proposed development are not expected to be significant and have therefore been scoped out.

8.19 The Council's Environmental Protection Team have requested that noise from the railway line should be included within the assessment. Noise associated with the railway line to the southwest of the Site were measured during the baseline noise monitoring survey and have been included within the assessment upon proposed receptors. The baseline survey however, noted that noise levels across the Site were dominated by road traffic noise, which has also been included within the assessment.

8.20 Additionally, the Council requested that *"if required, reference should be made to BS4142:2014*[xv] *should noise sources be found that require this type of assessment".* There are no noise sources proposed which fall within the scope of a BS4142:2014 assessment and therefore this guidance has not been consulted.

Assessment

8.21 This assessment has been based on a widely used and accepted 'significance matrix assessment approach', which is based on the characteristics of the impact (magnitude and nature) and the sensitivity of the receptor. This allows the relative significance of effects to be determined on a scale and ultimately the significant effects determined, as explained in the following subsections. Where a deviation from this approach has been undertaken, reference has been made in the appropriate sections.

Noise Assessment

Receptor Sensitivity

8.22 Key receptors to noise generally include individual or groups of residential properties, hospitals and schools. Table 8.2 provides examples of the different sensitivities, which can be assigned to different receptors according to the assessment methodology.

Table 8.2: Methodology for Assessing Sensitivity of Noise

Sensitivity	Example of Receptor
High	Residential properties (Permanent tenants) and schools and hospitals Campaign to Protect Rural England (CPRE) rated tranquillity (Zones 8 - 10)
Moderate	Transient residential receptors such as users of hotels CPRE rated tranquillity (Zones 4 – 7)
Low	Commercial premises CPRE rated tranquillity (Zones 1 - 3)

8.23 Within the assessment of the likely significant effects of the Development, all identified receptors have been considered as having high sensitivity, with the exception of the tranquillity assessment, where receptors have been considered to have low sensitivity.

Effect Magnitude

8.24 Guidance with regard to assessing the magnitude of noise impacts is available within the Guidelines for Environmental Noise Impact Assessment, published by IEMA in 2014. The guidance indicates broad parameters with respect to categorising the significance of the basic noise change. For the purposes of this assessment, the categories outlined in Table 8.3 below form a basis to assess the impact magnitude.

Table 8.3: Methodology for Assessing the Magnitude of the Impact

Magnitude of Impact	Assessed Effect Level
Negligible	No Observed Adverse Effect Level
Minor	Lowest Observed Adverse Effect Level
Moderate	Significant Observed Adverse Effect Level
Major	Unacceptable Observed Adverse Effect Level

8.25 The level of significance of each effect in the following section is determined by combining the magnitude of impact with the sensitivity of the receptor.

8.26 Table 8.4 shows how magnitude of impact and sensitivity of receptor can be combined to determine the significance of an environmental effect. This guidance with regard to assessing the magnitude of noise impact is available within the Guidelines for Environmental Noise Impact Assessment published by IEMA. The guidance indicates broad parameters with respect to categorising the significance of the basic noise change. The guidance also stipulates that the noise level categories should not be used strictly to define the description of the noise change as there is no simple formulaic approach for relating noise change to a verbal description such as 'slight' or 'moderate'. Therefore, the magnitude of noise impact should be stated as the predicted dB(A) level and not simply as an impact category.

Table 8.4: Significance of Noise Effects Matrix

Magnitude of Impact	Sensitivity of Receptor		
	High	Moderate	Low
Major (UOAEL)	Major	Major-Moderate	Moderate
Moderate (SOAEL)	Major-Moderate	Moderate	Minor
Minor (LOAEL)	Moderate	Minor	Negligible
Negligible (NOAEL)	Minor	Negligible	Negligible

8.27 For the purpose of this ES chapter, the threshold between significant and not significant in EIA terms is defined as follows:

8.28 An effect identified as being of major-moderate significance or above is considered to be significant which equates to the requirements set out in the NPSE (and expanded upon within the NPPF and PPG:noise) to 'identify whether the overall effect of noise exposure is, or would be, above or below the significant observed adverse effect level' (SOAEL). Effects classified below the SOAEL (minor or negligible impact magnitudes) are considered to be not significant for construction and operational effects.

Construction Phase

Construction Noise

8.29 To assess the significance of the construction phase effects of the Development, noise levels from potential construction activities associated with the construction of the Development have been assessed in accordance with BS 5228-1:2009+A1:2014 criteria, which indicate if a significant effect is likely to occur at noise sensitive receptors.

8.30 The types of plant included within the assessment have been derived from the information provided within Chapter 5: Construction Methodology and Phasing of the ES. The noise emissions used for the plant likely to be used during the construction phase has been obtained from Annex C of BS 5228-1.

8.31 This assessment has been undertaken in order to establish the maximum external noise levels at neighbouring properties for the proposed construction activity of the Site and whether typical plant and activities will be within these levels. In order to present a worst-case assessment, the model predicts that all sources will be operating together.

8.32 The criteria in Table 8.5 below provides details of the magnitude of impact of each noise level criteria used, for the construction noise assessment. Further details of the construction assessment methodology are presented in Appendix 8.1.

Table 8.5: Methodology for Assessing the Magnitude of the Impact

Magnitude of Impact	Noise Level Criteria
Negligible	**Fixed Limits** In urban areas noise levels exceed 55dB
Minor	**Fixed Limits** In urban areas noise levels exceed 65dB
Moderate	**Fixed Limits** In urban areas noise levels exceed 75dB
Major	**Fixed Limits** In urban areas noise levels exceed 85dB

8.33 A construction phase effect identified as being of moderate impact or greater is considered to be significant. This equates to noise levels at identified receptors of greater than 75dB(A) as a result of the construction work.

Construction Vibration

8.34 Vibration associated with construction has been assessed qualitatively in-line with BS 5228-1:2009+A1:2014 'Code of Practice for noise and vibration control on construction and open

sites' within this chapter. Measures to reduce construction vibration will be included within the CEMP.

8.35 BS 5228-2:2009 +A1:2014, "Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration" provides a methodology for assessment and guidance with regard to mitigation of construction related vibration.

8.36 Although the use of piling is considered unlikely to be required, to represent a worst-case scenario, vibration levels from piling activities have been assessed in accordance with the criteria to enable the determination of if a significant effect is likely to occur at vibration-sensitive properties.

8.37 The calculation methodology set out in Annex E of BS 5228-2 for percussive piling has been used to determine the propagation of vibration.

$$v_{res} \leq k_p \left[\frac{\sqrt{W}}{r^{1.3}}\right]$$

Where

- v_{res} *is the resultant PPV, in mms*$^{-1}$
- k_p *is the scaling factor of 3*
- *W is the nominal hammer energy, in joules*
- *r is the slope distance from the pile toe or tunnel crown, in meters*

8.38 The values presented within Table 8.6 provides an initial indication of potential effects of vibration.

Table 8.6: Guidance on Effects of Vibration Levels

Vibration Level [A), B), C)]	Effect
0.14 mms^{-1}	Vibration may be just perceptible in the most sensitive situations for most vibration frequencies associates with construction. At lower frequencies, people are less sensitive to vibration.
0.3 mms^{-1}	Vibration might just be perceptible in residential environments
1.0 mms^{-1}	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated and explanation has been given to residents.
10 mms^{-1}	Vibration is likely to be intolerable for any more than a very brief exposure to this level in most building environments.

a) The magnitudes of the values presented apply to a measurement position that is representative of the point of entry into the recipient.
b) A transfer function (which relates to an external level to an internal level) needs to be applied if only external measurements are available
c) Single or infrequent occurrences of these levels do not necessarily correspond to the stated effect in every case. The values are provided to give an initial indication of potential effects, and where these values are routinely measured or expected then an assessment in accordance with BS 6472-1 or -2, and/or other available guidance might be appropriate to determine whether the time varying exposure is likely to give rise to any degree of adverse comment.

8.39 For the purposes of identifying the potential for significant effects in relation to the development Site, a threshold of 10 mms^{-1} has been adopted as any vibration-generating

activities that are required would be communicated in advance to residents and therefore potential levels of perceptible vibration in excess of 1.0mms^{-1} and below 10.0mms^{-1} are likely to be tolerable during construction works.

Operational Phase

Road Traffic Noise

8.40 The road traffic noise assessment model is based on the Department of Transport Calculation of Road Traffic Noise (CRTN) and ISO 9613[xvi] noise propagation methodology and allows for detailed predictions of noise levels to be undertaken for large numbers of receptor points and different noise emission scenarios both horizontally and vertically.

8.41 The traffic data used within the assessment has been derived from the traffic flows provided by the project's transport consultant. Based on this traffic data, the assessment compares different scenarios to determine the change in noise levels at receptors resulting from the Development with and without other committed development.

8.42 'With the Development' flows are presented as the 'Do Something' (DS) and 'without the Development' flows presented as the 'Do Minimum' (DM). The scenarios assessed are as follows:

- DM (2031) vs DS (2031)

8.43 The criteria in Table 8.7 below provides details of the magnitude of impact of each noise level criteria used, for the traffic assessment. Further details of the methodology, input data, assumptions and model settings are presented within the Noise Technical Report (Appendix 8.1).

Table 8.7: Noise Level Criteria and Actions (Traffic Noise Receptors)

Magnitude of Impact	Noise Level Criteria
Negligible	**Short-Term** Change in noise is: 0.0 – 0.9 dB $L_{A10,18h}$
Minor	**Short-Term** Change in noise is: 1.0 – 2.9 dB $L_{A10,18h}$
Moderate	**Short-Term** Change in noise is: 3.0 – 4.9 dB $L_{A10,18h}$
Major	**Short-Term** Depending on context, change in noise is: >5.0 dB $L_{A10,18h}$

8.44 A road traffic noise effect from the operational Development identified as being of moderate

impact or greater is considered significant. This equates to a change of noise levels of ≥3dB in the short-term as a result of the Development.

Noise Intrusion Assessment for Site Suitability

8.45 With respect to the consideration of future sensitive receptors, the Site suitability assessment presented within this chapter and within detail in Appendix 8.1 considers the guidance presented within BS 8233: 2014 '*Guidance on sound insulation and noise reduction for buildings*'. Table 8.7 provides details of the magnitude of impact of each noise level criteria used, for the combined noise intrusion assessment. Further details of methodology are presented in Appendix 8.1.

Table 8.8: Noise Level Criteria and Actions (Combined Noise Intrusion Assessment)

Magnitude of Impact	Noise Level Criteria
Negligible	**Noise levels below:** Bedrooms – 30 dB $L_{Aeq,8hours}$ / 45 dB L_{Amax} Living Rooms – 35 dB $L_{Aeq,16hours}$ External Amenity Space – 50 dB $L_{Aeq,16hours}$
Minor	**Noise levels exceed:** Bedrooms – 30 dB $L_{Aeq,8hours}$ / 45 dB L_{Amax} Living Rooms – 35 dB $L_{Aeq,16hours}$ External Amenity Space – 55 dB $L_{Aeq,16hours}$
Moderate	**Noise levels exceed:** Bedrooms – 35 dB $L_{Aeq,8hours}$ Living Rooms – 40 dB $L_{Aeq,16hours}$ External Amenity Space – 60 dB $L_{Aeq,16hours}$
Major	**Noise levels with mitigation exceed:** Bedrooms – 35 dB $L_{Aeq,8hours}$ Living Rooms – 40 dB $L_{Aeq,16hours}$ External Amenity Space – 60 dB $L_{Aeq,16hours}$

8.46 An operational noise magnitude of impact from the Development identified as being of a moderate impact or greater is considered significant. This equates to a noise level exceeding 30 dB $L_{Aeq,8hours}$ / 45 dB L_{Amax} within bedrooms and 35 dB $L_{Aeq,16hours}$ within living rooms and 60 dB $L_{Aeq,16hours}$ within external amenity spaces.

8.47 For the purposes of the noise intrusion assessment, due to the outline nature of the scheme, worst-case building locations with respect to surrounding noise sources have been used in order to determine the noise exposure of future occupiers and to produce a suitable glazing and ventilation strategy. Noise intrusion levels have been determined using road traffic noise levels with the Development and committed developments as well as verified noise levels from surrounding roads not included in the Transport Assessment and verified railway noise.

Limitations and Assumptions

8.48 Construction noise levels are based on typical fixed and mobile plant noise levels presented

within BS5228-1:2009+A1:2014. As precise locations with respect to construction activities are hard to predict, the assessment is considered worst-case with construction operations located at the shortest distance to the noise sensitive receptor and operating simultaneously for a total of 15 minutes every hour. In this respect, a medium to high degree of confidence is assigned to the predicted significance of the construction effects.

8.49 The baseline survey was undertaken with additional restrictions in place due to COVID-19. However, during the attended monitoring, all major roads were observed to have continuous, free-flowing traffic and so at the time of the survey, traffic conditions were considered to be representative of typical conditions. Furthermore, the assessment upon proposed receptors includes traffic data provided by the project's transport consultants, which has been used along with the measurement data to verify the noise model, to present a robust assessment.

Baseline Conditions

8.50 The noise assessment study area was determined by the selection of appropriate sensitive receptors in relation to the Development. Receptor locations were chosen at worst-case locations, where impacts as a result of the Development are likely to be greatest with regards to the construction and operational phase of the Development. These were identified prior to the noise monitoring survey, where on-Site observations confirmed the locations of the closest existing receptors surrounding the development Site and local road network.

8.51 Full details of the noise baseline monitoring survey including grid references to monitoring locations and meteorological conditions are provided in Appendix 8.1.

8.52 A baseline monitoring survey was undertaken at nine locations from Wednesday 9th August 2020 to Wednesday 16th August 2020. Attended short term measurements were undertaken at seven locations during day, evening and night-time periods with two additional locations being measured unattended over a 164-hour period. These monitoring locations are shown illustratively on Figure 8.1. The raw data collected from the long-term monitoring is available upon request.

8.53 Existing ambient noise levels at the Site were dominated by road traffic noise from the B4100 as well as distant road traffic noise from the M40 and rail noise from the railway line to the southwest of the Site.

8.54 A number of existing key receptors have been selected to enable an assessment to be undertaken of the potential noise effects from the Development. For this assessment, all receptors are classed as being of high sensitivity.

8.55 Table 8.9 below summarises the closest existing sensitive receptor locations. These receptors have been selected to represent the worst-case residential receptors with respect to changes in noise from construction noise. These are also shown illustratively on Figure 8.2.

Table 8.9: Existing/Proposed Sensitive Receptor Locations (Construction Noise Assessment)

Ref.	Description	Approximate Distance to Source (m)	Assessed Height (m) (Daytime)
C01	Bicester Eco Town Exemplar Site Caversfield	84	1.5
C02	Bicester Eco Town Exemplar Site Caversfield	47	1.5
C03	Bicester Eco Town Exemplar Site Caversfield	45	1.5
C04	Bicester Eco Town Exemplar Site Caversfield	80	1.5
C05	Bicester Eco Town Exemplar Site Caversfield	80	1.5
C06	Bicester Eco Town Exemplar Site Caversfield	94	1.5
C07	Bicester Eco Town Exemplar Site Caversfield	60	1.5
C08	13 Haricot Vale Road	51	1.5
C09	Stable Cottage, Caversfield	85	1.5
C10	St Laurence Church, Caversfield	96	1.5
C11	Home Farm Cottage, Banbury Road	100	1.5
C12	10 Pippin Close	265	1.5
C13	3 Wintergreen Fields	45	1.5
C14	1 Caraway Fields	45	1.5
C15	1 Lovage View	98	1.5

8.56 Table 8.10 below presents receptors that have been selected to represent the worst-case residential receptors with respect to changes in road traffic noise. These are also shown illustratively on Figure 8.3.

Table 8.10: Existing/Proposed Sensitive Receptor Locations (Traffic Noise Assessment)

Ref.	Description	Closest Source	Approximate Distance to Source (m)
T01	Bicester Eco Town Exemplar Site Caversfield	B4100	18
T02	Bicester Eco Town Exemplar Site Caversfield	Braeburn Avenue	20
T03	22 Sage Street	Braeburn Avenue	5
T04	9 Autumn Close	B4100	16
T05	Northside Lodge, Caversfield	B4100	6
T06	Stable Cottage, Caversfield	B4100	22
T07	Home Farm Cottage, Banbury Road	B4100	60
T08	82 Charlotte Avenue	Charlotte Avenue	5
T09	31 Charlotte Avenue	Charlotte Avenue	5
T10	8 Orchard Walk	B4100	18
T11	104 Mullein Road	A4095 Lord's Lane	30

Ref.	Description	Closest Source	Approximate Distance to Source (m)
T12	14 Tamarisk Gardens	A4095	18

8.57 Given the outline nature of the planning application, indicative proposed receptor locations have been placed around the Site in worst-case locations with respect to off-Site and on-Site road traffic noise as well as noise from the railway line to the south of the Site. Indicative building locations have been placed in the worst-case areas based upon the maximum extents shown in the parameter plans provided (see Chapter 3). These are shown illustratively on Figure 8.4.

Future Baseline

8.58 Future baseline noise levels at the identified existing receptors will be broadly similar to the existing baseline given their proximity/relationship to the local road network and permanent location of the closest roads to residential dwellings.

Likely Significant Effects

Construction Phase

Construction Noise

8.59 Table 8.11 shows the predicted levels of construction noise at receptors for comparison with the recommended fixed noise limit criteria of 75dB(A), i.e. the SOAEL (as defined in Table 8.4).

Table 8.11: Construction Phase Noise Assessment Results (Fixed Limit Method)

Ref.	Construction Noise Level (dBA)	Criteria (dBA)	Within Recommended Fixed Noise Limit
C01	61.9	**75**	Yes
C02	67.9	**75**	Yes
C03	66.6	**75**	Yes
C04	68.3	**75**	Yes
C05	66.1	**75**	Yes
C06	65.1	**75**	Yes
C07	64.5	**75**	Yes
C08	63.4	**75**	Yes
C09	62.4	**75**	Yes
C10	61.6	**75**	Yes
C11	61.1	**75**	Yes
C12	57.1	**75**	Yes
C13	73.3	**75**	Yes

Ref.	Construction Noise Level (dBA)	Criteria (dBA)	Within Recommended Fixed Noise Limit
C14	70.5	**75**	Yes
C15	61.5	**75**	Yes

8.60 The results show the predicted construction noise levels at all receptors are within the 75 dB(A) noise level limit. The magnitude of impact is assessed as minor, and the sensitivity of the residential receptors have been assessed as high. Therefore, the effect will be moderate adverse within the Lowest Observed Adverse Effect Level and therefore not significant.

8.61 During the construction phase, the number of construction vehicles on the local road network are anticipated to be less than the number of vehicles forecasted when the Development is operational. Therefore, the traffic noise assessment for the operational phase is considered to be representative of the potential worst-case effects of construction traffic on the local road network.

Construction Vibration

8.62 An initial calculation of vibration levels resulting from worst-case piling activities was carried out to determine at what distance there could be an impact from construction-phase activities; Figure 8.5 shows the expected reduction in levels over distance from the works.

8.63 Comparison of the graph above with the criteria presented in Table 8.6, indicates that adverse impacts are unlikely to occur beyond approximately 20m. Based upon the distances to sensitive receptors as detailed within Table 8.9, the developable area of the Site is at least 45m from the nearest existing building, therefore there are not expected to be any significant effects in relation to construction-phase vibration.

Operational Phase

Road Traffic Noise Assessment

8.64 Traffic data has been provided by the project's transport consultant in 18hr Annual Average Weekday Traffic (AAWT) format for the year 2031. 'With the Development' flows are presented as the 'Do Something' (DS) and 'without the Development' flows presented as the 'Do Minimum' (DM).

8.65 To assess the effect of changes in traffic, noise modelling has been undertaken using the Cadna-A software in accordance with the guidance provided with the Calculation of Road Traffic Noise (CTRN).

8.66 The traffic assessment presented below considers impacts from the Development and nearby committed and consented developments, as well as general growth in road traffic volumes. Table 8.12 below shows a summary of the worst affected sensitive receptors for the short-term assessment by the change in traffic noise.

Table 8.12: Traffic Noise Assessment (2031)

Location	2031 DM dB $L_{A10,18hr}$	2031 DS dB $L_{A10,18hr}$	Difference dB(A)
T01	69.0	69.1	0.1
T02	55.6	57.4	1.8
T03	59.6	61.9	2.3
T04	68.1	68.5	0.4
T05	72.6	73.0	0.4
T06	66.5	66.8	0.3
T07	53.0	53.4	0.4
T08	64.5	65.2	0.7
T09	64.8	65.4	0.6
T10	68.1	68.5	0.4
T11	63.4	63.6	0.2
T12	67.7	67.8	0.1

8.67 In summary at all representative high-sensitivity residential receptors, there is no greater change than 2.3 dB(A) in the short-term assessment. The magnitude of this increase in noise level is assessed as minor adverse and the sensitivity of the residential receptors have been assessed as high. The effect will be moderate adverse which falls within the Lowest Observed Adverse Effect Level and is not considered to be significant.

Noise Intrusion Assessment for Site Suitability

8.68 Given the outline nature of the planning application, an assessment has been undertaken of the open Site in accordance with ProPG Stage 1 to identify the acoustic challenges at the Site.

8.69 Based on the verified L_{Aeq} noise models, noise levels at the Site are between 45-70dB $L_{Aeq,16hours}$ during the daytime and between 38-65dB $L_{Aeq,8hours}$ in the night-time. Therefore, the Site falls within 'Negligible' to 'High' Noise Risk Categories during both the daytime and night-time periods. As such, these noise levels indicate that a good acoustic design process should be followed.

8.70 Modelling and assessment have been undertaken for proposed sensitive properties across the Site using an indicative building layout which is based upon the maximum extent of developable area based off the parameter plans. Internal noise levels within proposed properties have been assessed both with windows open, where a reduction from a partially

open window of 10 dB has been used, and with windows closed where an assumption of glazing with specification R_w+C_{tr} 30 dB (e.g. 6/12/8mm double glazing or equivalent) has been used. The results are presented in Tables 8.13-8.15.

Table 8.13: Daytime Noise Intrusion Levels $L_{Aeq\ 16\ hour}$

Location	External L_{Aeq} at 1m from facade	Internal L_{Aeq} with windows open	Internal L_{Aeq} with windows closed	Criteria Internal L_{Aeq}
PR01	46.5	36.5	16.5	35
PR02	42.0	32.0	12.0	35
PR03	42.5	32.5	12.5	35
PR04	54.6	44.6	24.6	35
PR05	47.6	37.6	17.6	35
PR06	62.6	52.6	32.6	35
PR07	60.0	50.0	30.0	35
PR08	50.5	40.5	20.5	35
PR09	48.3	38.3	18.3	35
PR10	43.4	33.4	13.4	35
PR11	45.9	35.9	15.9	35
PR12	56.0	46.0	26.0	35
PR13	43.7	33.7	13.7	35
PR14	40.2	30.2	10.2	35
PR15	40.0	30.0	10.0	35
PR16	41.0	31.0	11.0	35
PR17	41.8	31.8	11.8	35

Table 8.14: Night-time Noise Intrusion Levels $L_{Aeq\ 8\ hour}$

Location	External L_{Aeq} at 1m from facade	Internal L_{Aeq} with windows open	Internal L_{Aeq} with windows closed	Criteria Internal L_{Aeq}
PR01	41.6	31.6	11.6	30
PR02	36.8	26.8	6.8	30
PR03	37.5	27.5	7.5	30
PR04	49.1	39.1	19.1	30
PR05	42.6	32.6	12.6	30
PR06	56.2	46.2	26.2	30
PR07	52.8	42.8	22.8	30
PR08	43.1	33.1	13.1	30
PR09	41.5	31.5	11.5	30
PR10	38.8	28.8	8.8	30
PR11	40.7	30.7	10.7	30
PR12	50.3	40.3	20.3	30
PR13	38.4	28.4	8.3	30
PR14	32.7	22.7	2.7	30
PR15	32.9	22.9	2.9	30
PR16	32.1	22.1	2.1	30
PR17	37.1	27.1	7.1	30

Table 8.15: Night-time Noise Intrusion Levels L_{Amax}

Location	External L_{Amax} at 1m from facade	Internal L_{Amax} with windows open	Internal L_{Amax} with windows closed	Criteria Internal L_{Amax}
PR01	62.4	52.4	32.4	45
PR02	57.8	47.8	27.8	45
PR03	57.9	47.9	27.9	45
PR04	59.3	49.3	29.3	45
PR05	59.5	49.5	29.5	45
PR06	79.4	69.4	49.4	45
PR07	75.5	65.5	45.5	45
PR08	64.9	54.9	34.9	45
PR09	63.1	53.1	33.1	45
PR10	56.2	46.2	26.2	45
PR11	58.5	48.5	28.5	45
PR12	59.7	49.7	29.7	45
PR13	58.0	48.0	28.0	45
PR14	55.4	45.4	25.4	45
PR15	55.4	45.4	25.4	45
PR16	55.8	45.8	25.8	45
PR17	58.0	48.0	28.0	45

8.71 The results show that noise intrusion levels are exceeded at a number of proposed sensitive receptors assuming a windows-open scenario. The magnitude of impact is assessed as moderate and the sensitivity of the residential receptors have been assessed as high. Therefore, the significance will be major-moderate adverse and therefore significant in the absence of mitigation.

Mitigation Measures

Construction Phase

14.1 Mitigation is proposed in the form of detailed best practice within a Construction Environmental Management Plan (CEMP) to be secured by a planning condition. An example of best practice measures with regard to construction noise and vibration can be found in Appendix 8.1.

Operational Phase

Road Traffic Noise Assessment

8.72 No additional mitigation measures outlined.

Noise Intrusion Assessment for Site Suitability

8.73 All indicative living rooms will benefit from standard double glazing with a sound reduction of $R_w + C_{tr}$ 30 dB as a minimum, along with an alternative means of ventilation across a number of facades. Figure 8.6 illustratively shows the locations of this mitigation for living room façades. The assessment has demonstrated that this level of glazing is sufficient to meet internal noise level target of 35dB in a window-closed scenario across the Site.

8.74 Nearly all indicative bedroom spaces will benefit from standard double glazing with a sound reduction of $R_w + C_{tr}$ 30 dB as a minimum, along with an alternative means of ventilation across all facades. Bedroom facades within 40m of B4100 will feature enhanced glazing with a sound reduction of up to $R_w + C_{tr}$ 35 dB, along with an alternative means of ventilation which matches the performance of the glazing. Figure 8.7 illustratively shows the locations of this mitigation for bedroom façades. The assessment has demonstrated that this level of glazing is sufficient to meet internal noise level targets of 30dB $L_{Aeq,8hr}$/45dB L_{Amax} in a window-closed scenario across the Site.

8.75 Due to the outline nature of the Development, further consideration at the detailed design stage will be given to the orientation and internal layouts of the proposed dwellings (including consideration of amenity spaces) and the choice of boundary features (i.e. fences), to provide further protection to future residents from noise associated with road traffic noise along the B4100.

8.76 Proposed amenity spaces should be placed upon shielded facades of proposed dwellings, facing away from the road network, particularly for dwellings directly adjacent to the B4100. In order to further reduce noise levels within amenity spaces, solid 1.8m high garden fences can be utilised to reduce noise levels as far as practicable. If amenity spaces within 50m of the B4100 were directly exposed to the B4100, further mitigation may be required to reduce noise levels, such as increased garden fence heights or an acoustic barrier adjacent to the B4100.

8.77 These measures, along with the specification of glazing will be subject to further detailed noise assessment at the detailed design stage, to identify specific localised mitigation. This subsequent stage of the assessment will be secured by a suitably worded planning condition.

Residual Effects

Construction Phase

8.78 The construction noise levels at all high-sensitivity receptors are predicted to be within the 75 dB(A) noise level limit. The effect is assessed as minor adverse, which is considered to be not significant.

8.79 Given the developable area of the Site is at least 45m from the nearest existing building, there are not expected to be any significant effects in relation to construction-phase vibration.

Operational Phase

Road Traffic Noise Assessment

8.80 The overall effect remains the same as detailed within the likely significant effects.

Noise Intrusion Assessment for Site Suitability

8.81 With the inclusion of mitigation in the form of a suitable glazing and ventilation strategy to be developed at the detailed design stage, internal daytime L_{Aeq}, night-time L_{Aeq} and night-time L_{Amax} noise levels will be within the criteria at all proposed high-sensitivity residential receptors with windows open or closed. The magnitude of this is considered to be negligible, which is considered to be not significant.

Cumulative Effects

Construction Phase

8.82 During the construction phase, the number of construction vehicles on the local road network are anticipated to be less than the number of vehicles forecasted when the Development is operational. Therefore, the traffic noise assessment for the operational phase is considered to be representative of the potential worst-case cumulative effects of construction traffic on the local road network.

8.83 Additionally, any consented developments are likely to implement standard best practice measures with respect to hours of operation and following the implementation of standard mitigation measures, effects from the Proposed Development that could combine with construction effects from surrounding consented sites would be minimised. The effect is

assessed as minor adverse, which is considered to be not significant.

Operational Phase

Road Traffic Noise Assessment

8.84 Based on the traffic data provided by the project transport consultant, the assessment above compares different scenarios to determine the change in noise levels resulting from the Future Year 2031 scenario. The traffic noise assessment includes the cumulative impact of other consented developments within the surrounding area; traffic noise levels are expected to increase at a number of high-sensitivity residential properties. The effect will be moderate adverse which falls within the Lowest Observed Adverse Effect Level and is not considered to be significant.

Summary

8.85 A comprehensive assessment of the noise effects of the Development has been undertaken with regards to construction and operational activities. The assessment considers the relevant national and local policy guidance.

8.86 The assessment included baseline monitoring to establish existing baseline noise levels within and around the Site including locations representative of future dwelling locations and measurements of the surrounding road network. The results were used to determine the noise exposure of proposed sensitive receptors during the operational phase of the Development.

Construction Phase

8.87 In terms of construction noise levels, with the implementation of a CEMP, the results of the assessment indicate that it will have a minor effect on the noise levels at assessed receptors, as previously defined this is considered not significant.

8.88 In terms of construction vibration, given the distance of sensitive receptors from proposed construction operations and with the implementation of best practice measures detailed within the CEMP, there are not expected to be any significant effects in relation to construction-phase vibration.

Operational Phase

8.89 In terms of sensitive properties, generated road traffic noise from the operational phase of

the Development, indicate a moderate effect in the short-term which falls within the Lowest Observed Adverse Effect Level. This effect is therefore considered not significant.

8.90 Noise levels associated with road traffic and rail noise has been assessed at assumed proposed receptor locations. With the inclusion of mitigation measures in the form of a suitable glazing and ventilation strategy at the detailed design stage, noise levels within proposed sensitive spaces are predicted to be negligible and not significant.

8.91 Table 8.16 contains a summary of the likely significant effects of the Development.

Table 8.16: Table of Significance – Noise & Vibration

Potential Effect	Nature of Effect (Permanent/Temporary)	Significance (Major/Moderate/Minor) (Beneficial/Adverse/Negligible)	Mitigation / Enhancement Measures	Geographical Importance*							Residual Effects (Major/Moderate/Minor) (Beneficial/Adverse/Negligible)
				I	UK	E	R	C	B	L	
Construction											
Construction Noise	Temporary	Moderate Adverse	Best practice mitigation measures detailed within a suitably-worded CEMP secured by planning condition								Minor Adverse (Not significant)
Construction Vibration	Temporary	Negligible	Best practice mitigation measures detailed within a suitably-worded CEMP secured by planning condition								Negligible
Completed Development											
Road Traffic Noise	Permanent	Moderate Adverse	None								Moderate Adverse (Not significant)
Noise Intrusion for Site Suitability	Permanent	Major-Moderate Adverse	A suitable glazing and ventilation strategy and consideration of internal and external layout at the detailed design stage								Negligible
Cumulative Effects											
Construction											
Construction Noise	Temporary	Moderate Adverse	Best practice mitigation measures detailed within a suitably-worded CEMP secured by planning condition								Minor Adverse
Completed Development											
Road Traffic Noise	Permanent	Moderate Adverse	None								Moderate Adverse

*** Geographical Level of Importance**

I = International; UK = United Kingdom; E = England; R = Regional; C = County; B = Borough; L = Local

REFERENCES

[i] National Planning Policy Framework (NPPF) and Technical Guidance, February 2019
[ii] Noise Policy Statement for England (Department for the Environment, Food and Rural Affairs), May 2010
[iii] Noise Policy Statement for England (Department for the Environment, Food and Rural Affairs) Explanatory Note, May 2010
[iv] National Planning Practice Guidance, March 2014
[v] World Health Organisation – Guidelines for Community Noise (1999)
[vi] DMRB Volume 11, Section 3, LA 111 Noise and Vibration.
[vii] BS 8233:2014 '*Guidance on sound insulation and noise reduction for buildings'*
[viii] Cherwell Local Plan 2011-2031 Part 1 (incorporating Policy Bicester 13 re-adopted on 19 December 2016)
[ix] Secretary of State. (1974). The Control of Pollution Act. HMSO
[x] IEMA (Institute for Environmental Management and Assessment) 'Guidelines for Environmental Noise Impact Assessment October 2014'
[xi] LA 111 Noise and Vibration: Volume 11 Section 3 Environmental Assessment Environmental Assessment Techniques (Design Manual for Road and Bridges), 2020
[xii] BS 5228: 2009 +A1:2014 'Code of Practice for noise and vibration control on construction and open sites – Part 1 Noise'.
[xiii] BS 5228: 2009 +A1:2014 'Code of Practice for noise and vibration control on construction and open sites – Part 2 Vibration'.
[xiv] ProPG: Planning and Noise, (2017); Professional Practice Guidance on Planning and Noise – New Residential Development
[xv] BS 4142:2014 'Methods for Rating and Assessing Industrial and Commercial Sound'.
[xvi] International Standards Organisation. (1996) ISO 9613-2: 1996 Acoustics - Attenuation of sound during propagation outdoors - Part 2: General Method of Calculation.