



**ENVIRONMENTAL STATEMENT**  
**VOLUME 1**  
**CHAPTER 8 – NOISE AND VIBRATION**



## 8. NOISE AND VIBRATION

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### 8.1. INTRODUCTION

- 8.1.1. This Chapter reports the outcome of the assessment of likely significant effects arising from noise and vibration from the Proposed Development upon neighbouring noise-sensitive residential properties and the Bicester Hotel Golf and Spa (BHGS), as well as the suitability of the Site for the proposed uses.
- 8.1.2. The Chapter describes the assessment methodology, the baseline conditions at the Site and in the surrounding area, any primary and tertiary mitigation adopted for the purposes of the assessment, a summary of the likely significant effects taking into account national legislation, the further mitigation measures required to prevent, reduce or offset any significant negative effects, and the likely residual effects and any required monitoring after these measures have been employed.
- 8.1.3. This Chapter (and its associated figures and appendices) is intended to be read as part of the wider ES, with particular reference to **Chapter 6: Transport and Access**, as well as **Volume II: Appendices 8.1 to 8.3**. A glossary of noise terms is provided in **Appendix 8.1**.

### 8.2. LEGISLATION, POLICY AND GUIDANCE

#### LEGISLATIVE FRAMEWORK

- 8.2.1. The applicable legislative framework is set out in **Appendix 8.1** and is summarised as follows:
- Environmental Protection Act (1990) (**Ref. 8.1**); and
  - Control of Pollution Act (1974) (**Ref. 8.2**).

#### PLANNING POLICY

- 8.2.2. The following key policy documents are described in **Appendix 8.1** and are summarised here:
- Noise Policy Statement for England (NPSE) (**Ref. 8.3**): sets out general principles for noise control in England.
  - National Planning Policy Framework (NPPF) (**Ref. 8.4**): sets out the Government's general planning policies, some of which relate to noise.
  - Online Planning Practice Guidance (PPG) (**Ref. 8.5**): provides greater details in relation to the relevance of noise to the planning process.
  - Cherwell Local Plan 2011-2031 (**Ref. 8.6**): includes policies on the control of noise which requires that development does not generate inappropriate levels of noise impacting on residential amenity.
- 8.2.3. The NPSE introduces the concept of No Observed Effect Level (NOEL), Lowest Observed Adverse Effect Level (LOAEL) and Significant Observed Adverse Effect Level (SOAEL), with further guidance on this given in the PPG.

#### GUIDANCE

- 8.2.4. The applicable guidance described in Appendix 8.1 is summarised as follows:
- British Standard (BS) 5228, Parts 1 and 2 (2009, amended 2014) (**Ref. 8.7 and 8.8**): provides guidance on the control of noise and vibration from construction sites.

- BS 4142 (2014, amended 2019) (**Ref 8.9**): guidance on the control of noise from commercial activities.
- World Health Organization Guidelines (2000) (**Ref. 8.10**): guidelines on acceptable levels of noise from a health perspective (see **Appendix 8.1** for discussion of relevance of these guidelines).
- British Standard (BS) 8233 (2014) (**Ref. 8.11**): provides guidance for the control of noise in and around buildings and suggests appropriate criteria.
- Calculation of Road Traffic Noise (CRTN, 1988) (**Ref. 8.12**): the standard method for predicting road traffic noise levels.
- Design Manual for Roads and Bridges (DMRB, 2011) (**Ref. 8.13**): sets out a methodology for assessing the impacts of noise and vibration.
- Professional Practice Guidance on Planning and Noise (ProPG, 2017) (**Ref. 8.14**): guidance on the management of noise in the context of the planning system.

### 8.3. CONSULTATION, SCOPE, METHODOLOGY AND SIGNIFICANCE CRITERIA

#### CONSULTATION UNDERTAKEN TO DATE

8.3.1. **Table 8.1** provides a summary of the consultation activities undertaken in support of the preparation of this Chapter.

**Table 8.1 - Summary of Consultation Undertaken to Date**

Body / organisation	Individual / stat body / organisation	Meeting dates and other forms of consultation	Summary of outcome of discussions
Cherwell District Council.	Planning Department / Regulatory Services and Community Safety	Scoping report issued in June 2019 and Cherwell District Council response received 30 August 2019.	Environmental Protection Officer confirmed overall satisfaction with proposed scope.  Cherwell District Council noted that Stableford House should be included in the list of residential properties to be considered.  Cherwell District Council also requested that the impact of existing road traffic noise on the proposed users of the site should be considered.
Cherwell District Council.	Planning Department	Pre-application report issued 23 August 2019	A number of potential impacts were raised and these are assessed in the current chapter.
Cherwell District Council.	Amrik Bilkhu, Environmental Protection Officer	Letter issued 30/07/2019 setting out baseline survey details and proposed approach	No adverse comments received.



## SCOPE OF THE ASSESSMENT

- 8.3.2. An EIA Scoping Report was submitted to Cherwell District Council in June 2019, as presented in **Appendix 2.1**. Further information can be found in **Chapter 2: Approach to the Assessment**.
- 8.3.3. This section provides an update on the scope of the assessment since submission of the EIA Scoping Report in June 2019, taking into account the responses received (**Table 8.1**).

### Insignificant Effects

- 8.3.4. The elements below are not considered to give rise to likely significant effects as a result of the Proposed Development and have therefore not been considered within this chapter:
- Site Vibration (Operational Phase): No potential sources of operational vibration will be introduced.
- 8.3.5. This was agreed in the consultation process summarised in **Table 8.1**. Furthermore, the assessment of impacts other than that from site traffic will focus on receptors immediately neighbouring the Site as site noise and vibration impacts will reduce with increasing distance from the Site; therefore, assessment at more distant receptors is not necessary. See Sensitive Receptors in Section 8.4 below.

## ELEMENTS SCOPED INTO THE ASSESSMENT

### Potentially Significant Effects

#### Construction Phase

- 8.3.6. The following elements are considered to have the potential to give rise to likely significant effects during construction of the Proposed Development and have therefore been considered within the ES:
- Site noise and vibration; and
  - Site traffic: direct temporary changes in road traffic noise resulting from additional heavy construction vehicles using existing roads.

#### Operation Phase

- 8.3.7. The following elements are considered to have the potential to give rise to likely significant effects during operation of the Proposed Development and have therefore been considered within this chapter:
- Fixed plant and operational noise within the Proposed Development; and
  - Direct changes in road traffic noise resulting from additional vehicles accessing the Proposed Development using existing roads;

### Site suitability

- 8.3.8. To assess the suitability of the noise environment for the users of the Proposed Development, the following will be assessed:
- Effect of traffic noise on the users of the Proposed Development.

## EXTENT OF THE STUDY AREA

- 8.3.9. Noise-sensitive receptors directly neighbouring the Site (within approximately 400 m) were considered, as described below in Section 8.4. These are shown in **Figure 8-1** below. Furthermore,

dwellings adjoining the M40, A4095 and local connected roads (potentially affected by noise from Site-generated traffic) were also considered.

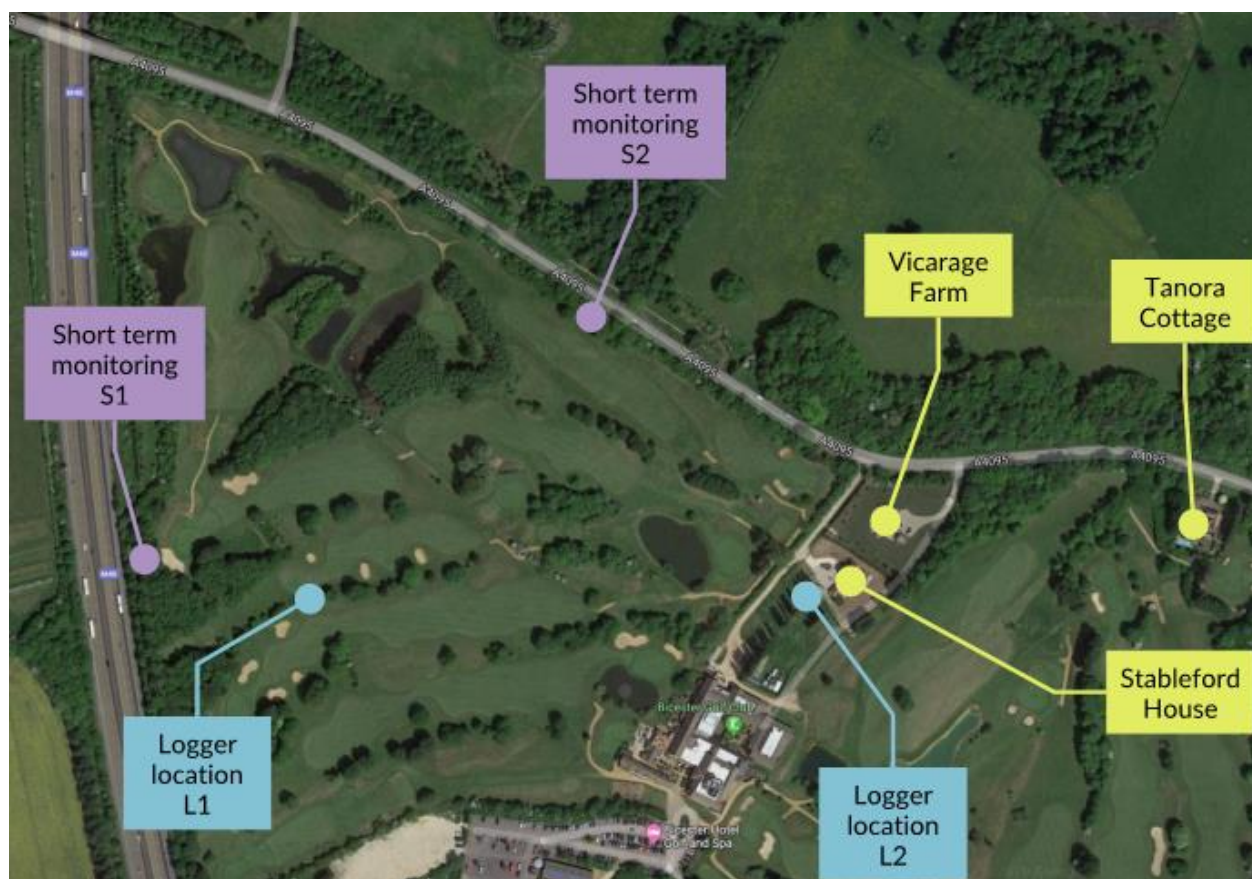
## METHOD OF BASELINE DATA COLLATION

### Desk Study

- 8.3.10. Mapping data for the area including from the Ordnance Survey, was reviewed to identify potential sensitive receptors and develop a computer noise model for the Site.
- 8.3.11. Traffic data for the area and associated with the Proposed Development, as described in **Chapter 6: Transport and Access**, was also referenced.

### Baseline Noise Survey

- 8.3.12. A baseline noise survey was carried out across the Site between Tuesday 19th March 2019 to Monday 25th March 2019 to measure the existing baseline noise climate across the site and surrounding area. A total of four locations were surveyed: two unmanned noise loggers for the entire duration of the survey one central to the Site and the second to the east, representative of the nearest dwellings off the access road for the Bicester Hotel Golf and Spa (BHGS). In addition, two manned short-sample measurements were undertaken, following the Shortened Measurement Procedure described in CRTN, adjacent to the M40 and the A4095 to quantify these noise sources.
- 8.3.13. These locations and the detail of the equipment used are set out in **Appendix 8.2** and shown in **Figure 8-1** below.



**Figure 8-1: Noise measurement locations and nearest noise sensitive receivers**



## ASSESSMENT METHODOLOGY

8.3.14. Potential noise impacts of the Proposed Development have been determined and assessed for likely significant effects for the construction and operational phases. Set out below are the methods followed for calculating the construction and operational noise impacts and how the significance criteria have been developed. The suitability of the Site for its proposed use was also assessed based on potential future noise levels across the Site.

### Construction Noise and Vibration Impact Assessment

8.3.15. Full details of the exact construction method, plant and duration is not available at this stage of the development proposals. The construction noise impact assessment considers the typical activity based on the type and scale of development. **Table 8.2** below shows the assumed construction stages that would take place on Site and the associated sound power levels during these stages. These sound power levels are based on the likely worst-case scenarios. The typical emission levels of **Table 8.2** have been based on assumptions in terms of what plant items will be in operation and the percentage of time the relevant plant will be in use during a 10-hour period: these are detailed in **Appendix 8.3**. Reference data for the emissions of typical construction plant and activities set out in BS 5228-1 (**Ref. 8.7**) was used.

**Table 8.2 – Assumed Construction Work Stage Sound Power Levels (i.e. at source).**

Work Stage	Plant / equipment assumed to be in operation	Sound power level assumed $L_{WA}$ (dB)
Enabling Works and earthworks	20 tonne excavator, bulldozer and dumper truck, Mobile Crane.	108
Substructure	20t excavator; mobile crane; bored piling rig; tower crane; and concrete pump and dumper truck.	116
Superstructure	Tower cranes; concrete pump; MEWPS; and material hoists.	110
Envelope	Tower cranes; MEWPS; and goods/passenger hoists.	104
Fit-out	MEWPS (cherry picker); and goods/passenger hoists.	96

8.3.16. The analysis of the resulting likely construction noise levels at receptor locations has been undertaken in accordance with BS 5228-1 which provides methods for undertaking such predictions. The BS 5228 calculated levels have then been compared against absolute noise limits for temporary construction activities which are commonly regarded as providing an acceptable level of protection from the short-term noise levels associated with construction activities. These are discussed further below under Significance Criteria.

8.3.17. The short-term impact of traffic associated with construction has been assessed for the peak construction year (2021). Criteria on changes in short-term road traffic noise contained within DMRB (see below) have been used to classify the magnitude of associated impacts.

8.3.18. The construction vibration impact assessment considers the typical activity based on the type and scale of development. The main source of vibration during construction is most likely to come from the piling of foundations. It is likely that bored piling would be used, with the exact method to be determined at a later stage. Estimated associated levels of vibration at nearby receivers were determined using guidance set out in BS 5228-2 (Ref. 8.8).

### Operational Noise Impact Assessment

8.3.19. Operational impact from changes in noise levels experienced at existing receptors brought about by the Proposed Development may be introduced through changes in road traffic flows, site activity and fixed plant associated with the Proposed Development.

### Road Traffic Flows

8.3.20. Future noise levels have been calculated using a noise model created in DataKustik Cadna-A proprietary noise modelling software. This software implements the environmental noise propagation prediction methodology set out in CRTN for predicting the level of daytime and night-time noise from road traffic and other sources. Terrain profile for the area were imported to provide more realistic predictions. Four road traffic scenarios have been considered for the noise model, as summarised in Table 8.3, using road traffic flow data provided by transport consultants Motion.

**Table 8.3 – Noise Model Scenarios Used**

Scenario	Traffic flow year	Description
A	2022	Future Baseline (completion of the Proposed Development), representative of scheme opening, without the Proposed Development.
B	2022	Future Baseline (completion of the Proposed Development), representative of scheme opening, with the Proposed Development.
C	2037	Design year (15 <sup>th</sup> year after completion), without Proposed Development and including other committed developments.
D	2037	Design year (15 <sup>th</sup> year after completion), with Proposed Development and including other committed developments.

8.3.21. The change in long-term road traffic noise level has been determined following the methodology set out in CRTN by the difference between scenario D, with the Proposed Development in the design year (taken as the 15<sup>th</sup> year after opening) and scenario A, the future baseline year without the Proposed Development. This is in line with the assessment method set out in DMRB. Criteria on changes in long-term road traffic noise changes contained within DMRB (see below) have been used to classify the magnitude of any impact from changes in operational road traffic noise.

8.3.22. For further information, a comparison is also made between scenario D and scenario C, both in the 2037 design year, with and without the Proposed Development. This allows further evaluating the specific effect of the Proposed Development in isolation. These changes are considered in relation to the criteria for short-term traffic noise changes (see below).

8.3.23. In addition, a current baseline scenario based on 2019 flows (without the Proposed Development) was also modelled and results compared with the results of the baseline survey to validate the model (see below).





- 8.3.24. Finally, to consider the impact of construction traffic, a 2021 baseline year was considered as the peak construction year, and traffic flow data provided by Motion for two scenarios, both with and without the construction traffic.

#### Fixed Plant

- 8.3.25. Full details of the proposed fixed mechanical and electrical plant items will not be known at this stage of the development. An assessment is made based on professional judgement given the type and location of plant likely to be used and noise control measures are outlined below. Noise limits at neighbouring residential properties have been proposed for these sources based on guidance contained within BS 4142 and the measured background noise levels: these limits can form the basis of planning conditions to control this source of noise.
- 8.3.26. Although the BHGS falls outside the scope of BS 4142, the potential impact of noise from fixed plant can be assessed in terms of existing ambient noise levels based on professional judgement.

#### Site Activity

- 8.3.27. Service activity in the service yard can also be assessed in accordance with BS4142. The noise of a large vehicle accessing the service yard and loading/unloading was represented using a sound power of  $L_{WA}$  108 dB (which is considered conservative). It was assumed that this activity would typically occur during the day-time, over a duration of 30 minutes.
- 8.3.28. The noise from traffic movements within the Site and car park, as well as noise from the water park, have been assessed in relation to baseline noise levels, in the absence of specific guidance for this type of source. For movements in the car park, sound power levels of  $L_{WA}$  87 dB were assumed for car movements and  $L_{WA}$  69 dB for cars manoeuvring.
- 8.3.29. In both cases, noise propagation calculations were undertaken using the ISO 9613-2 methodology (Ref. 8.15).

#### Site Suitability Assessment

- 8.3.30. The assessment for the suitability of road traffic noise experienced across the Proposed Development uses the calculated future noise levels under Scenario D (see **Table 8.3**). Method 3 detailed in the TRL Report '*Converting the UK traffic noise index  $L_{A10,18h}$  to EU noise indices for noise mapping*' (Ref. 8.16) has been followed to convert the road traffic noise levels calculated using CRTN to average day-time and night-time values.
- 8.3.31. **Appendix 8.1** explains that BS 8233 (Ref. 8.11) recommends internal noise levels not exceeding 35 dB  $L_{Aeq,16hours}$  for day-time periods and 30 dB  $L_{Aeq,8hours}$  for night-time periods (23:00 to 07:00). At night, internal  $L_{Amax}$  levels from typical events should also not exceed 45 dB. On this basis, and in line with the above-described noise policy, LOAEL and SOAEL criteria have been defined for the hotel receptors: **Table 8.4**. The LOAEL threshold was based on assuming 15 dB reduction from an open window, whereas the SOAEL is based on assuming a reduction of 40 dB from a reasonably high-specification façade (with mechanical ventilation).

**Table 8.4 - Road Noise Criteria for Acceptability of Site for Hotel Use**

Day-time ambient noise level	Night-time ambient noise level	Description	Likely adverse effect level
<50dB L <sub>Aeq</sub> , 16hr	<45 dB L <sub>Aeq</sub> , 8hr < 60 dB L <sub>Amax</sub>	Noise level considered acceptable.	NOEL, below LOAEL threshold.
50 to 75 dB L <sub>Aeq</sub> , 16hr	45 to 70 dB L <sub>Aeq</sub> , 8hr 60 to 85 dB L <sub>Amax</sub>	Considered to be acceptable provided suitable internal noise levels can be achieved.	Between LOAEL and SOAEL.
> 75 dB L <sub>Aeq</sub> , 16hr	> 70 dB L <sub>Aeq</sub> , 8hr > 85 dB L <sub>Amax</sub>	Most likely considered to be unacceptable, unless development of the site is desirable and careful mitigation of external noise levels is applied.	Above SOAEL.

- 8.3.32. BS 8233 cites external noise design criteria for residential amenity spaces (“such as gardens and patios”): a desirable level of 50 dB L<sub>Aeq</sub> with an upper guideline value of 55 dB L<sub>Aeq</sub> for noisier environments. The standard also recognises this is not always achievable and that the lowest practicable levels should be achieved in noisier areas. Furthermore, these criteria relate to residential amenity and not necessarily for temporary/leisure use such as for hotels: they will therefore only be considered for indicative purposes.

### SIGNIFICANCE CRITERIA

- 8.3.33. The assessment of potential effects as a result of the Proposed Development has taken into account both the Construction and Operational Phases. The Construction Phase includes enabling works, earthworks and construction activities as set out in **Chapter 4: The Proposed Development**.
- 8.3.34. The significance level attributed to each effect has been assessed based on the magnitude of change due to the Proposed Development and the sensitivity of the affected receptor, as well as a number of other factors that are outlined in more detail in **Chapter 2: Approach to the Assessment**. The sensitivity of the affected receptor is assessed on a scale of high, medium, low and negligible, and the magnitude of change is assessed on a scale of high, medium, low and negligible (as shown in **Chapter 2: Approach to the Assessment**).
- 8.3.35. **Table 8.5** summarises the sensitivities for the different receptor types. It should be noted that residential receptors are classed as high sensitivity, but that users of the neighbouring BHGS are considered to have a medium sensitivity.

**Table 8.5 – Sensitivity of Receptors**

Receptor Sensitivity	Receptor Type
High	Residential receptors (e.g. houses, flats and apartments, as well as residential healthcare and educational establishments). Educational facilities (e.g. schools and colleges).
Medium	Healthcare (non-residential). Noise sensitive leisure receptors (e.g. non-residential hospitals and hotels, museums, libraries etc.).
Low	Commercial facilities (e.g. retail, office developments).
Negligible	Industrial Receptors (e.g. workshops, warehouses).

- 8.3.36. The magnitude of impact will depend on the nature and characteristic of the noise that a listener is subjected to. Set out below are the various magnitudes of impact associated the potential impacts considered in the present chapter.
- 8.3.37. The DMRB provides guidance on the classification of magnitudes of change in noise associated with road traffic. It advises that different magnitudes should be used for the short-term, (*i.e.* when a project opens, or for construction traffic) where a change of 1 dB may be perceptible, and for the long-term (*i.e.* changes over a 15 year period during its operation) where a 3 dB change is considered perceptible. Impact magnitude classifications based on the DMRB guidance are set out in **Table 8.6**.

**Table 8.6 – Classification of Magnitude of change in Road Traffic Noise Levels**

Impact Magnitude	Short-term Change in Sound Level (dB)	Long-term Change in Sound Level (dB)
High	5+	10+
Medium	3 to 4.9	5 to 9.9
Low	1 to 2.9	3 to 4.9
Negligible	0.0-0.9	0.0-2.9

- 8.3.38. Annex E of BS 5228-1 provides example criteria of absolute noise limits for construction activities and has been used to determine the impact of construction noise impacts within this assessment. The criteria do not represent mandatory limits but rather a set of example approaches intended to reflect the type of methods commonly applied to construction noise. In broad terms, the example criteria are based on a set of fixed limit values which, if exceeded, may result in a significant effect unless ambient noise levels are sufficiently high to provide a degree of masking of construction noise.
- 8.3.39. The range of guidance values detailed in BS 5228-1 Annex E have been used to numerically define the magnitude levels, as per **Table 8.7**, based on existing ambient noise levels at the nearest noise-

sensitive locations (see **Table 8.11** below). These values relate to daytime hours from 08:00 to 18:00 on weekdays, and 08:00 to 13:00 on Saturdays. Furthermore, these criteria relate to sustained activity which would last for 4 weeks or more at the specified noise levels. For short-term activity, lasting less than 4 weeks, a reduced impact magnitude would apply: for example, medium impact according to **Table 8.7** would reduce to low for short-term impacts. As construction noise will always be an introduction of a new noise source (albeit temporary), where impacts are identified they will be adverse.

**Table 8.7 – Magnitude of Construction Noise Impacts**

Magnitude of Impact (adverse)	Level of Noise from Construction Works	Typical criteria descriptors
High	>75 LAeq,T	Trigger level for noise insulation works, or cost thereof, as set out in E.4 of BS 5228.
Medium	66 to 75 dB LAeq,T	Above threshold of SOAEL using the ABC method given in Annex E of BS 5228 and considering existing ambient levels.
Low	56 to 65 dB LAeq,T	Threshold value for significant impact using the ABC method given in Annex E of BS 5228 and considering existing ambient levels. Considered to be between LOAEL and SOAEL.
Negligible	<55 dB LAeq,T	Noise comparable to or lower than existing ambient noise levels in the area.

8.3.40. BS 5228-2 Annex B provides example criteria for the significance of construction vibration. The criteria of **Table 8.8** were determined accordingly. These are defined in terms of Peak Particle Velocity (PPV).

**Table 8.8 - Magnitude of Construction Vibration Impacts**

Magnitude of Impact	Vibration Level, PPV mm/s	Typical criteria descriptors
High	> 10	Vibration above this level is likely to be intolerable, even during brief exposures. Cosmetic damage may start to occur in some light-weight structures. Considered to be above SOAEL.
Medium	≤ 10 > 1.0	Vibration at 10 mm.s <sup>-1</sup> is likely to become intolerable for any more than a very brief exposure and therefore the considered as the onset of SOAEL.
Low	≤ 1.0 > 0.3	The threshold of which construction vibration might be perceptible in residential environments. The upper value may cause complaint if prior warning is not given. Considered to be between LOAEL and SOAEL.
Negligible	≤ 0.3	Vibration is unlikely to be perceptible for most vibration frequencies associated with construction. Considered as the onset of LOAEL.

8.3.41. The magnitude of impact of commercial noise (including noise from fixed plant) on dwellings is based the difference between the noise rating level ( $L_{A,Tf}$ ) of the plant or activity, including any corrections for acoustic features as necessary, and the prevailing typical background noise levels ( $L_{A90}$ ), as discussed in BS 4142 (Ref. 8.9, see Appendix 8.1). The standard also requires consideration of the context of each situation. BS 4142 advises that the greater the difference (i.e. the greater the rating level is above the prevailing background level) the greater the magnitude of impact, depending on the context. Table 8.9 provides the magnitude of operational noise from commercial activity impacting on residential properties. The assessment of non-residential locations is outside the scope of the BS 4142 standard.

**Table 8.9 - Magnitude of Operational Commercial and Plant Noise Impacts**

Magnitude of Impact	Difference, $L_{A,Tf} - L_{A90,T}$	Typical criteria descriptors
High	$\geq 10$	Described in BS 4142 to be a likely indication of a significant adverse impact, depending on context.
Medium	$> 10$ $\geq 5$	An adverse impact is expected in this range; however, not a significant adverse impact.
Low	$< 5$ $\geq 0$	Small impact maybe present. Does not exceed the threshold at which BS 4142 considers an adverse impact to occur.
Negligible	$< 0$	Described by BS 4142 as a low impact, depending on the context.

8.3.42. Noise from traffic movements in the car park do not fall under the scope of BS 4142. To consider the potential impact of these movements, predicted noise levels are compared to existing ambient noise levels. A difference of less than 3 dB (or a negative difference) corresponds to a negligible impact, 3 to 5 dB a low impact magnitude, 5 to 10 dB a medium impact, and 10 dB or more represents a high impact.

### EFFECT SIGNIFICANCE

8.3.43. The significant effect of a predicted impact, as summarised in Table 8.10, was determined through a standard method of assessment based on professional judgement, considering the sensitivity of the receptor (as set out in Table 8.5) and the magnitude of change (as set out above). As set out in Chapter 2: Approach to the Assessment, effects that are classified as major or moderate (either beneficial or adverse) are considered to be significant. Effects classified as minor or negligible are considered to be not significant.

**Table 8.10 - Determination of Effect Significance**

Sensitivity	Impact magnitude			
	High	Medium	Low	Negligible
High	Major	Moderate	Minor	Negligible
Medium	Moderate	Minor	Minor	Negligible
Low	Minor	Minor	Negligible	Negligible
Negligible	Minor	Negligible	Negligible	Negligible

## 8.4. BASELINE CONDITIONS

- 8.4.1. The existing noise climate experienced across the Site and at nearby dwellings is dominated by road traffic noise and natural sounds, such as wind disturbed vegetation.
- 8.4.2. Detailed results of the baseline survey are set out in **Appendix 8.2**.
- 8.4.3. **Table 8.11** shows a summary of the results of the baseline survey. Location L1 is representative of the proposed hotel accommodation nearest to the M40, and location L2 is representative of the nearest residential dwellings (Stableford House and Vicarage Farm, see below) as well as the BHGS. This is apparent from **Figure 8-1** above.

**Table 8.11 – Summary of Measured Noise Levels**

Measurement position	Day-time ambient L <sub>Aeq</sub> , 16 hours	Night-time ambient L <sub>Aeq</sub> , 8 hours	Typical day-time background L <sub>A90</sub> , 1 hour	Typical night-time background L <sub>A90</sub> , 15 min
L1	62 dB	58 dB	55 dB	47 dB
L2	57 dB	53 dB	47 dB	44 dB

- 8.4.4. **Appendix 8.3** sets out the results of the noise model for the 2019 year traffic flows. This shows a good match (less than 2 dB difference) with the results of the monitoring set out in **Appendix 8.2** and therefore provides an effective validation of the model developed for the current situation.

## FUTURE BASELINE

- 8.4.5. As discussed above in Section 8.3, a future baseline year of 2022 has been considered as representative of the Proposed Development being completed and in operation. The baseline noise environment for this year has been represented in the computer model developed.



## SENSITIVE RECEPTORS

8.4.6. The following are the sensitive receptors which have been assessed:

- Vicarage Farm;
- Stableford House;
- Tanora Cottage;
- Bicester Hotel Golf and Spa (BHGS); and
- Accommodation and users within the Proposed Development (site suitability assessment);

8.4.7. All key sensitive receptor locations are shown on **Figures 1-3 and 1-4**. Please note that Vicarage Farm was previously erroneously referenced as “Aleen” in the scoping report.

8.4.8. In addition, the impact of additional traffic along the M40, A4095 and local connected roads has been assessed in the computer model described above.

## 8.5. RELEVANT ELEMENTS OF THE PROPOSED DEVELOPMENT AND ESTABLISHING THE PRE-MITIGATION SCENARIO

### CONSTRUCTION PHASE

8.5.1. The construction of the Proposed Development is described in **Chapter 4: The Proposed Development**. This sets out the likely construction activities involved and the construction programme.

8.5.2. A Construction Management Plan (CMP) would be secured through planning conditions and manage the effects of the construction including noise. A draft CMP is included in **Appendix 4.2**. In particular, hours of construction work on site will be restricted to day time hours from 08:00 to 18:00 on weekdays, and 08:00 to 13:00 on Saturdays, except in exceptional circumstances and with prior agreement of the Local Authority.

8.5.3. The CMP will also require regular communication between the contractor and affected neighbours so as to clearly understand the anticipated level and duration of noise and vibration throughout the construction period.

8.5.4. Good practice measures to reduce noise levels will be used where practicable (through use of quiet plant, switching off when not in use, screening and use of mufflers, etc.) based on guidance set out in BS 5228-1.

### OPERATIONAL PHASE

8.5.5. The Proposed Development is described in **Chapter 4: The Proposed Development**. It comprises in particular a hotel and leisure development with associated infrastructure including a car-park.

8.5.6. The proposed landscaping includes a number of measures which will screen noise from the Proposed Development and road traffic noise, including bunding and solid fencing (along the M40 and on the north-east corner of the Site). This is shown in the Landscape General Arrangements, **Figures 4-7 to 4-10**.

## 8.6. ASSESSMENT OF EFFECTS, MITIGATION AND RESIDUAL EFFECTS

### CONSTRUCTION PHASE

<p><b>Site construction: noise and vibration</b></p>	<p><b>Noise</b></p> <p><b>Appendix 8.3</b> sets out the results of predictions of worst-case construction noise levels for the different work stages considered in <b>Table 8.2</b> according to the methodology described above. This shows that most of the enabling and structural works, as well as construction of the road and parking infrastructure, would be associated with predicted noise levels of less than 65 dB LAeq over the working day at the nearest noise-sensitive residential locations. With reference to the criteria of <b>Table 8.7</b>, and accounting for the proposed restrictions on working hours, this corresponds to a <b>low adverse</b> impact magnitude. The likely duration of the construction programme means these may represent short- to medium-term impacts. The building envelope and fit-out work is predicted to be associated with noise levels of less than 55 dB LAeq, representing a <b>negligible</b> impact magnitude.</p> <p>The exception would potentially be for enabling works undertaken in relative proximity (50 m or less) from the nearest locations (Vicarage Farm and Stableford House) where noise levels of up to 75 dB LAeq may be produced. However, this would represent a relatively brief period of less than two weeks. Furthermore, the resulting landscaping including bunds will provide a form of screening which will reduce noise levels during the remainder of the construction. Therefore, these activities would also be associated with a <b>low adverse</b> magnitude of impact.</p> <p>Predicted worst-case noise levels affecting the BHGS are of up to 66 dB LAeq for the enabling phase and up to 68 dB LAeq for the substructure construction, with levels below 62 dB for other phases. Depending on the duration and the levels actually experienced during these phases of the work this would be associated with a <b>low to medium adverse</b> impact magnitude.</p> <p>The sensitivity of the residential receptors considered above is considered to be high, and the magnitude of change prior to mitigation is considered to be low at most. Therefore, there is likely to be a <b>direct temporary short- to medium-term minor adverse</b> effect on these dwellings (<b>not significant</b>).</p> <p>The sensitivity of the BHGS is considered to be medium, and the magnitude of change prior to mitigation is considered to be medium at most. Therefore, there is likely to be a <b>direct temporary short- to medium-term minor adverse</b> effect on this receptor (<b>not significant</b>).</p> <p><b>Vibration</b></p> <p>In terms of vibration, a key potential source would be ground vibratory compaction during the enabling works phase. It is estimated that even at distances of 40 m from the nearest residential locations, the worst-case associated vibration levels would not exceed PPV levels of 1 mm/s, which would correspond to a <b>low adverse</b> impact magnitude according to <b>Table 8.8</b>, particularly if warning is given to the residents as proposed in the draft CMP. As the associated construction activities are more limited in extent, this would represent a short-term effect.</p> <p>Although piling is likely to be employed as part of the substructure work, this will occur at further distances of more than 150 m from the nearest residential properties, and 100 m from the BHGS, such that, even on the basis of worst-case assumptions, the associated vibration levels are likely to be less than 0.3 mm/s which represents a <b>negligible</b> impact.</p> <p>Other construction activities would produce lower levels of vibration.</p> <p>The sensitivity of the receptors considered is medium to high, and the magnitude of change prior to mitigation is considered to be at most <b>low</b>. Therefore, there is likely to</p>
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	be a <b>direct temporary short-term minor adverse</b> effect from construction vibration on the receptors ( <b>not significant</b> ).
<b>Secondary Mitigation</b>	None required.
<b>Residual effects and monitoring</b>	The effect of construction noise would remain <b>direct temporary short- to medium-term minor adverse (not significant)</b> , and similarly the effect of construction vibration would be <b>direct temporary short-term minor adverse (not significant)</b> .

<b>Construction traffic noise</b>	<p><b>Appendix 8.3</b> sets out the results of predictions of short-term changes in road traffic noise for 2021, which represents the peak construction year, both without and with the Proposed Development. The construction traffic is predicted to result in noise increases of 0.3 to 0.6 dB according to the CRTN methodology at the residential properties considered. No increase is predicted at the BHGS.</p> <p>These results are considered in relation to the classification of <b>Table 8.6</b> for short-term changes in traffic which are based on DMRB guidance. In all cases, a <b>negligible</b> impact magnitude is predicted.</p> <p>The sensitivity of the receptors considered is medium to high, and the magnitude of change prior to mitigation is considered to be negligible. Therefore, there is likely to be a <b>negligible</b> effect from construction traffic noise on the receptors (<b>not significant</b>).</p>
<b>Secondary Mitigation</b>	None required.
<b>Residual effects and monitoring</b>	The effect would remain <b>negligible</b> for all receptors ( <b>not significant</b> ).

## OPERATIONAL PHASE

<b>Road traffic flows</b>	<p><b>Appendix 8.3</b> sets out (in tabular and graphical form) the results of predictions of changes in long-term road traffic noise by subtracting the calculated noise in 2022 without the Proposed Development (scenario A, <b>Table 8.3</b>) from the noise with the Proposed Development for the 2037 design year (scenario D) at noise-sensitive receptors adjacent to existing roads which are likely to have a change in traffic flow because of the development. For highly sensitive residential receptors, the associated long-term change in noise varies between a decrease of 0.4 dB at Stableford House and an increase of 1.6 dB at Tanora Cottage. This corresponds to impacts of negligible magnitude according to the classification of <b>Table 8.6</b> (for long-term changes). For the BHGS, a decrease in noise of 1.5 dB is predicted which also represents a negligible impact magnitude. The decreases in noise at some receptors are associated with the Proposed Development building providing screening of road traffic on the M40.</p> <p>Some of the above effects are based on long-term changes in traffic not associated with the Proposed Development. An additional comparison is also then made in <b>Appendix 8.3</b> between scenarios C and D, i.e. the 2037 design year, both with and without the Proposed Development. For highly sensitive residential receptors, the associated short-term change in noise varies between a decrease of 1.2 dB at Stableford House, which represents a <b>low positive</b> impact magnitude according to the classification of <b>Table 8.6</b></p>
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	<p>(for short-term changes), and an increase of 0.1 to 0.8 dB at Vicarage Farm and Tanora Cottage respectively which represents a <b>negligible</b> magnitude impact. For the BHGS, a decrease in noise of 2.2 dB is predicted which also represents a <b>low positive</b> impact magnitude.</p> <p>The sensitivity of the residential receptors considered above is considered to be high, and the magnitude of change prior to mitigation is considered to be low positive or negligible. Therefore, there is likely to be a <b>negligible to permanent indirect long-term minor beneficial</b> effect from traffic noise on these dwellings (<b>not significant</b>).</p> <p>The sensitivity of the BHGS is considered to be medium, and the magnitude of change prior to mitigation is considered to be low positive or negligible. Therefore, there is likely to be a <b>negligible to permanent indirect long-term minor beneficial</b> effect from traffic noise on this receptor (<b>not significant</b>).</p>
<b>Secondary Mitigation</b>	None required.
<b>Residual effects and monitoring</b>	The effect would remain <b>negligible</b> for most receptors ( <b>not significant</b> ) and negligible to <b>permanent indirect long-term minor beneficial</b> for Stableford House and the BHGS ( <b>not significant</b> ).

<b>Fixed plant</b>	<p>The Proposed Development includes several items of mechanical plant, some of which will be located externally with an external exhaust, as well as electrical substations, which represent a potential source of noise to the neighbouring noise-sensitive receptors. As the design of the Proposed Development is at a relatively early stage, details regarding the size, likely positions, specifications and operational hours of any fixed plant are not confirmed. It is therefore proposed to set noise limits at neighbouring dwellings in line with BS4142 which would apply to the combination of all fixed plant serving the Proposed Development. This was based on the results of the baseline survey given that the above assessment concluded that the effect of the Proposed Development on existing noise levels at neighbouring dwellings would be negligible. This assessment assumes that fixed plant will be operational 24 hours a day.</p> <p>It is proposed to set a noise rating limit for fixed plant level, assessed according to BS 4142 guidance, at the nearest residential locations which is equal to the measured background noise levels: see <b>Table 8.12</b>. This would correspond to a <b>negligible</b> impact magnitude according to the criteria in <b>Table 8.9</b>. This limit is considered achievable in practice given that the majority of the noise-generating building plant and proposed substation will be more than 300 m from the dwellings considered, with the proposed buildings often providing a screening effect. A foul water pumping station is proposed in the north-east corner of the Site: this is closer to the dwellings, but it will be enclosed in a building and screened from the properties by the solid fencing and landscape bund proposed.</p> <p>The BHGS is outside the scope of the BS 4142 standard. But by setting the noise limit of <b>Table 8.12</b> at the residential properties, this will also limit noise levels at the BHGS, given their relative location, such that noise levels are likely to be low in relation to existing ambient levels in the area, resulting in a <b>negligible</b> impact magnitude.</p> <p>The sensitivity of the receptors considered is medium to high, and the magnitude of change prior to mitigation is considered to be <b>negligible</b> at most. Therefore, there is likely to be a <b>negligible</b> effect on these dwellings (<b>not significant</b>).</p>
<b>Secondary Mitigation</b>	The proposed plant noise limits of <b>Table 8.12</b> could be secured through a planning condition which would limit noise from fixed plant, including any correction for the character of the noise. The Applicant would take this into account in the detailed design

	of the Proposed Development. This can be achieved by including standard noise control measures (such as attenuators, selection of quiet plant, screening, etc.) such that the total noise from all plant did not exceed the proposed noise limits.
<b>Residual effects and monitoring</b>	The effect would remain <b>negligible</b> for the relevant receptors ( <b>not significant</b> ).

**Table 8.12 – Fixed Plant Noise Limits (Rated Noise Level According to BS4142)**

<b>Location</b>	<b>Day-time noise limit L<sub>Ar</sub></b>	<b>Night-time noise limit L<sub>Ar</sub></b>
Nearest residential locations (Vicarage Farm and Stableford House)	47 dB	44 dB

<b>Site activity</b>	<p>The potential noise associated with vehicles accessing the service yard of the Proposed Development was assessed in line with BS 4142 as it represents an activity commercial in nature. The traffic flow data discussed above suggests typically one Heavy Goods Vehicle movement per day would be associated with the Proposed Development, so this forms the basis of the assessment. Based on the assumptions described in <b>Section 8.3</b> and accounting for the separation distance and screening from the service yard offered by the building itself, the associated noise levels are considered unlikely to exceed 40 dB L<sub>Aeq,1hr</sub>. Even accounting for a correction of +3 dB to represent a noticeable character, the associated rated level of 43 dB L<sub>Ar</sub> would represent a negligible impact magnitude when assessed in accordance with the criteria of BS 4142 set out in <b>Table 8.9</b>.</p> <p>The BHGS is outside the scope of a BS 4142 assessment, but the noise levels associated with the service yard can be considered. Accounting for the screening offered by the landscape bunds located between that receptor and the service yard, the predicted noise levels of 47 dB L<sub>Aeq</sub> are 10 dB below the existing ambient noise levels during day-time periods at this location (<b>Table 8.11</b>) and this therefore represents a negligible impact.</p> <p>Similarly, given the predicted level of traffic associated with the Proposed Development, as a reasonable worst-case, five separate vehicles moving and manoeuvring around the car park were modelled using the assumptions described in <b>Section 8.3</b>. The associated noise levels at the nearest noise-sensitive receptors would be of 37 dB L<sub>Aeq</sub> or less, which is 10 dB or more below existing ambient noise levels, even during quiet periods of the day. This therefore represents an impact of negligible magnitude.</p> <p>The sensitivity of the receptors considered above is either high or medium, and the magnitude of change prior to mitigation is considered to be negligible. Therefore, there is likely to be a <b>negligible</b> effect from site activities on these dwellings (<b>not significant</b>).</p>
<b>Secondary Mitigation</b>	None required.
<b>Residual effects and monitoring</b>	The effect would remain <b>negligible</b> for the relevant residential receptors ( <b>not significant</b> ).

## SITE SUITABILITY

- 8.6.1. Detailed predictions results are set out in **Appendix 8.3** (figures 3 to 6), based on scenario D (2037 Design year with Proposed Development). These show that incident noise levels at the façades of the proposed guestrooms most exposed to traffic noise from the M40 vary between 61 to 66 dB  $L_{Aeq, 16hr}$  and 57 to 62 dB  $L_{Aeq, 8hr}$  for day-time and night-time periods respectively, with the highest noise levels predicted for the upper building elevations (as shown on figures 4 and 6 in **Appendix 8.3**). This is between the LOAEL and SOAEL criteria based on **Table 8.4**, meaning that the incident noise environment can be considered acceptable provided that suitable internal noise levels can be achieved.
- 8.6.2. The proposed guestrooms will be mechanically ventilated. On this basis, it was determined that suitable internal noise levels in guestrooms can be achieved with standard thermal double glazing (with an acoustic performance of at least  $R_w + C_{tr}$ , 27 dB).
- 8.6.3. Noise levels in the main outdoor breakout area of the hotel at ground height are predicted to be between 60 to 65 dB  $L_{Aeq}$ . This accounts for the screening from the M40 traffic provided by the proposed solid barrier west of this area. These noise levels are higher than would be ideally recommended for private residential amenity areas; however, as discussed above, this is not directly relevant for temporary leisure use such as associated with the Proposed Development. The noise environment in this area would be quieter than for the existing leisure golf use because of the proposed solid screen. This is considered acceptable given the context of the Site and the proposed use of the space, and that the noise levels were reduced as much as was reasonably practical given the context. Noise levels in the wider outdoor amenity areas, to the north-west of the Proposed Development, would be higher but involve more occasional use and would be similar to existing levels for the existing golf use and therefore are considered reasonable.

## 8.7. LIMITATIONS AND ASSUMPTIONS

- 8.7.1. No material limitations have been identified.
- 8.7.2. The assessment of construction noise has been based on typical activities likely to be associated with the construction of the Proposed Development on the basis of a reasonable worst-case analysis.
- 8.7.3. The noise model has been based on a simplified representation of the Proposed Development and surrounding environment, and estimated traffic flows, but this is standard practice and representative for the purpose of the analysis undertaken.
- 8.7.4. A detailed quantitative assessment of noise from fixed plant could not be undertaken at this stage but noise limits were defined and considered achievable based on professional judgement: therefore, a suitable noise control strategy has been put in place in this regard. This can be secured through planning conditions.

## 8.8. SUMMARY

- 8.8.1. An assessment of potential noise and vibration effects on noise-sensitive locations associated with the Proposed Development was undertaken in line with relevant policy and guidance. A baseline survey was undertaken to characterise the existing noise environment, which is mainly dominated



by road traffic noise. A predictive model was developed to predict the future noise environment and the effects associated with the construction and operation of the Proposed Development.

- 8.8.2. Following mitigation, the construction noise effects will be **direct temporary short- to medium-term minor adverse (not significant)**, and similarly the effect of construction vibration would be **direct temporary short-term minor adverse (not significant)**.
- 8.8.3. Following mitigation, the effects of the operation of the Proposed Development in terms of associated road traffic, on-site activities and fixed plant are negligible (not significant). The reduction in road traffic noise impacting the BHGS and Stableford House will represent a **negligible to permanent indirect long-term minor beneficial effect (not significant)**.
- 8.8.4. This is summarised in **Table 8.13** below.
- 8.8.5. The suitability of the noise environment at the Site for the Proposed Development was confirmed. Incident traffic noise levels could be reduced to suitable internal noise levels in the proposed hotel guestrooms using standard thermal double glazing.

**Table 8.13 - Summary of Effects Table for Noise and Vibration**

Description of Effects	Receptor	Significance and Nature of Effects Prior to Mitigation / Enhancement	Summary of Mitigation / Enhancement	Significance and Nature of Effects Following Mitigation / Enhancement (Residual)
Construction Phase				
Site construction noise	Residential properties and BHGS	Minor (not significant) - / T / D / ST to MT	None	Minor (not significant) - / T / D / ST to MT
Site construction vibration	Residential properties and BHGS	Minor (not significant) - / T / D / ST	None	Minor (not significant) - / T / D / ST
Construction traffic	Residential properties and BHGS	Negligible (not significant)	None	Negligible (not significant)
Operational Phase				
Road traffic flows	BHGS, Stableford House	Negligible to Minor (not significant) + / P / I / LT	None	Negligible to Minor (not significant) + / P / I / LT
	Other residential properties	Negligible (not significant)	None	Negligible (not significant)
Fixed plant	Residential properties and BHGS	Negligible (not significant)	Plant noise limits ( <b>Table 8.12</b> ) secured through planning conditions.	Negligible (not significant)
Site activity	Residential properties and BHGS	Negligible (not significant)	None	Negligible (not significant)

NB: Aspects of the Proposed Development considered as part of the pre-mitigation scenario are summarised above in Section 8.5.

Key to table:

+ / - = Positive or Negative P / T = Permanent or Temporary, D / I = Direct or Indirect, ST / MT / LT = Short Term, Medium Term or Long Term N/A = Not Applicable

## 8.9. REFERENCES

- **Ref 8.1:** HMSO (1990): Environmental Protection Act, Part III.
- **Ref 8.2:** HMSO (1974): Control of Pollution Act, Part III.
- **Ref 8.3:** Department for Environment, Food and Rural Affairs (2010), Noise Policy Statement for England (NPSE).
- **Ref 8.4:** Department for Communities and Local Government (2019), National Planning Policy Framework (NPPF).
- **Ref 8.5:** Ministry of Housing, Communities & Local Government (2014, update July 2019), Planning Practice Guidance. [Online] Accessed via <https://www.gov.uk/guidance/noise--2> [accessed September 2019].
- **Ref 8.6:** Cherwell District Council (2016). Cherwell Local Plan 2011-2031. Available at: <https://www.cherwell.gov.uk/info/83/local-plans> Accessed May 2019
- **Ref 8.7:** BSI (2014), BS 5228 1:2009-A1:2014, Code of practice for noise and vibration control on construction and open sites – Part 1: Noise.
- **Ref 8.8:** BSI (2014), BS 5228 2:2009-A1:2014, Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration.
- **Ref 8.9:** BSI (2014), BS 4142 2014-A1 2019: Methods for rating and assessing industrial and commercial sound.
- **Ref 8.10:** World Health Organization (WHO) (2000), Guidelines for Community Noise.
- **Ref 8.11:** BSI (2014), BS 8233, Guidance on sound insulation and noise reduction for buildings.
- **Ref 8.12:** HMSO Department of Transport (1988), Calculation of Road Traffic Noise.
- **Ref 8.13:** The Highways Agency (2011), Design Manual for Roads and Bridges, Volume 11, section 3, Part 7, Traffic Noise and Vibration.
- **Ref 8.14:** Institute of Acoustics, Chartered Institute of Environmental Health & Association of Noise Consultants (2017), Professional Practice Guidance on Planning and Noise (ProPG).
- **Ref 8.15:** International Standards Organisation (1996), ISO 9613-2:1996 'Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation'.
- **Ref 8.16:** TRL (2002), Converting the UK traffic noise index  $L_{A10,18h}$  to EU noise indices for noise mapping, Project Report PR/SE/451/02 for DEFRA.