M3 Junction 9 Improvement

Scheme Number: TR010055

6.1 Environmental Statement Chapter 11 Noise and Vibration

APFP Regulation 5(2)(a)

Planning Act 2008

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

Volume 6

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Infrastructure Planning

Planning Act 2008

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M3 Junction 9 Improvement
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6.1 ENVIRONMENTAL STATEMENT - CHAPTER 11: NOISE AND VIBRATION

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Document Reference 6.3 – Environmental Statement Appendices

11 Noise and Vibration

11.1 Introduction

11.1.1 This chapter presents the findings of the assessment of the construction and operation of the M3 Junction 9 Improvement Scheme (hereafter referred to as the Scheme) on noise and vibration. This chapter outlines legislative, policy framework and guidance, describes the assessment methodology, study area, baseline conditions, an overview of potential impacts, mitigation measures, likely residual effects, monitoring and a summary.

11.1.2 This chapter should be read in conjunction with **Environmental Statement** (**ES**) **Figures 11.1 – 11.22** (**Document Reference 6.2**) and **Appendices 11.1 to 11.4** of the **ES (Document Reference 6.3)** which comprise:

- ES Appendix 11.1: Construction Activities in Noise and Vibration Assessment
- ES Appendix 11.2: Receptors Affected by Noise from Construction Traffic Diversion Routes
- ES Appendix 11.3: Construction Noise Receptor Results
- ES Appendix 11.4: Operational Noise Receptor Results

11.1.3 This chapter should be read in parallel to **Chapter 6 (Cultural Heritage), Chapter 7 (Landscape and Visual), Chapter 12 (Population and Human Health) and Chapter 15 (Cumulative Effects)** of the **ES (Document Reference 6.1)**.

11.1.4 An assessment of noise on biodiversity has not been included within this chapter, this is presented in **Chapter 8 (Biodiversity)** of the **ES (Document Reference 6.1).**

11.2 Consultation

11.2.1 Consultation and engagement have informed the noise and vibration assessment. Comments and responses to the Scoping Opinion received in November 2020 are provided in **Appendix 4.2 (Scoping Comments and Responses)** of the **ES (Document Reference 6.3)** and comments and responses received during statutory consultation between May and June 2021 are provided in **Appendix K** of the **Consultation Report (Document Reference 5.1).**

11.2.2 **Table 11.1** outlines further engagement that has been undertaken with the Environmental Health Officer to inform the Scheme and the assessment.

Table 11.1: Consultation undertaken relevant to Noise and Vibration

Reference	Comment	Response
1 September 2020, 21 September 2020 and 17 November 2020	Request to Environmental Health Officer (EHO) at Winchester City Council to confirm suitability of environmental sound survey methodology.	Acceptance of proposed environmental sound survey on 17 November 2020.

11.3 Legislative, policy framework and guidance

11.3.1 This assessment has been undertaken considering current legislation, together with national, regional and local plans and policies. A list is provided below and further detail regarding National Policy can be found in the **National Policy Statement for National Networks (NPS NN) Accordance Table (Document Reference 7.2):**

- Land Compensation Act 1973
- The Control of Pollution Act (CoPA) (HMSO, 1974)
- Environmental Protection Act (EPA) (HMSO, 1990)
- Noise Insulation Regulations 1975
- National Policy Statement for National Networks (2014)
- National Planning Policy Framework (2021)
- Planning Practice Guidance (online resource)
- Noise Policy Statement for England (NPSE) (2010)
- Winchester District Local Plan Part 1 – Joint Core Strategy (2013)
- Winchester District Local Plan Part 2 – Development Management and Site Allocations (2017)
- South Downs Local Plan (2019)
- Winchester District Draft Local Plan 2018 - 2038 (emerging)

11.3.2 In addition to the legislation and national and local planning policies listed above, this assessment has also been carried out in accordance with the following professional standards and guidance:

- BS 5228-1:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise

- BS 5228-2:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 2: Vibration
- British Standard 7445: Part 1:2003 Description and Measurement of Environmental Noise. Guide to Quantities and Procedures
- Design Manual for Road and Bridges (2020) LA 111 Noise and Vibration
- The Calculation of Road Traffic Noise (Department for Transport Welsh Office, 1988)
- Converting the UK Traffic Noise Index LA10,18h to EU Noise Indices for Noise Mapping. P G Abbott and P M Nelson (TRL Limited). Project Report PR/SE/451/02, 2002
- World Health Organisation Environmental Noise Guidelines for the European Region 2018
- Guidelines for Community Noise, World Health Organisation, 1999
- Night Noise Guidelines for Europe, World Health Organisation, 2009

11.4 Assessment methodology

Scope of the assessment

11.4.1 This chapter presents an assessment of impacts upon construction and demolition noise and vibration and operational noise. The assessment has been undertaken in accordance with the Design Manual for Roads and Bridges (DMRB) LA 111 Noise and Vibration (Highways England, 2020).

Study area and baseline approach

11.4.2 The study area is defined within **Section 11.5** (Study area)**.** Baseline data (and identification of noise and vibration receptors) is outlined in **Section 11.6.** The baseline has been informed through gathering readily available desk-based information and baseline noise surveys.

Approach to design, mitigation and enhancement measures

11.4.3 The Scheme has been designed to avoid or reduce effects on noise and vibration. Embedded mitigation is listed within **Chapter 4 (Environmental Assessment Methodology)** of the **ES (Document Reference 6.1).** Essential mitigation measures have been identified within this chapter. This mitigation is also included within the **first iteration Environmental Management Plan (fiEMP) (Document Reference 7.3)**.

Assessment approach - construction noise

11.4.4 DMRB LA 111 Noise and Vibration (Highways England, 2020) states that when determining the need for an assessment of potential noise impact during the construction phase, the potential for exceeding the criteria provided in LA 111 should be considered. This includes the effects of any temporary road closures resulting from construction works.

11.4.5 The Lowest Observed Adverse Effect Level (LOAEL) is set at a level where construction becomes the dominant noise source, whereas the Significant Observed Adverse Effect Level (SOAEL) is set at a level where construction noise exceeds thresholds determined in accordance with British Standard 5228 Code of practice for noise and vibration control on construction and open sites Part 1: Noise (BS 5228-1) (BSI, 2009a).

11.4.6 The guidance in DMRB LA 111 Noise and Vibration (Highways England, 2020) has been reproduced for construction noise, in **Table 11.2**. Alternative criteria have been developed for ecological noise sensitive receptors for the assessment as defined within **Chapter 8 (Biodiversity) of the ES (Document Reference 6.1)**. For reference, the $L_{Aeq,T}$ refers to the equivalent continuous sound level of a notional steady sound, at a given position and over a defined period of time that would have the same A-weighted acoustic energy as the measured naturally fluctuating sound.

Table 11.2: Effect Levels for Construction Noise

Time Period	LOAEL	SOAEL
Day (07:00-19:00) weekday and (07:00-13:00 Saturdays)	Baseline noise level $L_{Aeq,T}$	Threshold level determined as per BS 5228-1: 2009 + A1: 2014 (BSI, 2009a) Section E3.2 and Table E.1
Night (23:00-07:00)	Baseline noise level $L_{Aeq,T}$	Threshold level determined as per BS 5228-1: 2009 + A1: 2014 (BSI, 2009a) Section E3.2 and Table E.1
Evening and weekends (time periods not covered above)	Baseline noise level $L_{Aeq,T}$	Threshold level determined as per BS 5228-1: 2009 + A1: 2014 (BSI, 2009a) Section E3.2 and Table E.1

Source – LA 111 Noise and Vibration (Highways England, 2020) Table 3.12

11.4.7 The magnitude of impact of construction noise at noise sensitive receptors has been determined in accordance with the guidance outlined in **Table 11.3**. It should be noted that BS 5228-1 (BSI, 2009a) sets out these thresholds as an example for residential receptors, whereas LA 111 (Highways England, 2020) applies them to all types of noise sensitive receptors. This results in a

conservative assessment outcome in terms of impact for non-residential noise sensitive receptors.

Table 11.3: Magnitude of Impact for Construction Noise Levels

Magnitude of Impact	Construction Noise Level
Major	Above or equal to SOAEL + 5dB
Moderate	Above or equal to SOAEL and below SOAEL+ 5dB
Minor	Above or equal to LOAEL and below SOAEL
Negligible	Below LOAEL

Source – LA 111 Noise and Vibration (Highways England, 2020) Table 3.16

11.4.8 An impact may be significant in EIA terms when the noise level at sensitive receptors during construction works is a Moderate or Major impact. As advised within LA 111 (Highways England, 2020) a significant effect is anticipated if a Moderate or Major impact is exceeded for a period of 10 or more days of working in any 15 consecutive days or for a total number of days exceeding 40 in any six consecutive months. Similarly, adverse effects might be expected where noise levels result in a minor magnitude of impact, but these are not considered to be significant.

11.4.9 The potential construction noise levels at ecological receptors are presented within this chapter, and the impact is assessed within **Chapter 8 (Biodiversity)** of the **ES (Document Reference 6.1)**.

Assessment approach - construction vibration

11.4.10 LA 111 Noise and Vibration (Highways England, 2020) states when determining the need for assessment of potential vibration effects during the construction phase, the potential for exceeding the criteria provided in LA 111 Noise and Vibration (Highways England, 2020) should be considered.

11.4.11 The guidance reproduced in **Table 11.4** relates to vibration sensitive receptors as defined in DMRB LA 111 Noise and Vibration (Highways England, 2020). Where appropriate, alternative criteria have been developed for ecological vibration sensitive receptors within **Chapter 8 (Biodiversity)** of the **ES (Document Reference 6.1)**.

Table 11.4: Effect Levels for Construction Vibration

Effect level	Peak particle velocity (PPV)
SOAEL	1.0mm/s
LOAEL	0.3mm/s

Source – LA 111 (Highways England, 2020) Table 3.31

11.4.12 The prediction methodology presented in British Standard 5228 Code of practice for noise and vibration control on construction and open sites Part 2: Vibration (BS 5228-2) (BSI, 2009b) has been used to calculate construction vibration levels from piling and vibration compaction works. This methodology estimates the probability of exceeding calculated vibration values.

11.4.13 Table B.2 of BS 5228-2:2009+A1:2014 (BSI,2009b) and Table 1 of BS 7385-2:1993 Evaluation and measurement for vibration in building – Part 2: Guide to damage levels from groundborne vibration provides guidance on Peak Particle Velocity (PPV) vibration values for transient excitation for different building types above which cosmetic damage may occur. **Table 11.5** outlines the guidance values detailed in Table B.2 of BS 5228-2:2009+A1:2014 (BSI, 2009b).

Table 11.5: Transient Vibration Guide Values for Cosmetic Damage

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

Source – BS 5228-2:2009+A1:2014 Table B.2 and BS 7385-2:1993 Table 1

11.4.14 The magnitude of impact of construction vibration has been determined in accordance with the guidance outlined in **Table 11.6**.

Table 11.6 Magnitude of Impact for Construction Vibration

Magnitude of Impact	Vibration Level
Major	Above or equal to 10mm/s PPV
Moderate	Above or equal to SOAEL (1.0mm/s PPV) and below 10mm/s PPV
Minor	Above or equal to LOAEL (0.3mm/s PPV) and below SOAEL (1.0 mm/s PPV)
Negligible	Below LOAEL (0.3mm/s PPV)

Source – LA 111 (Highways England, 2020), Table 3.33

11.4.15 As advised within LA 111 (Highways England, 2020), a significant effect may occur if this vibration level is exceeded for a period of 10 or more days of working in any 15 consecutive days or for a total number of days exceeding 40 in any six consecutive months.

11.4.16 The potential impact from construction vibration on building structures has been considered. The potential construction vibration impacts at ecological receptors are presented in **Chapter 8 (Biodiversity)** of the **ES (Document Reference 6.1)**.

Assessment approach - construction traffic

11.4.17 The magnitude of impact of construction traffic noise has been determined in accordance with the guidance outlined in **Table 11.7**.

Table 11.7: Magnitude of Impact for Construction Traffic Noise

Magnitude of Impact	Increase in Baseline Noise Level of Closest Public Road Used for Construction Traffic (dB)
Major	Greater than or equal to 5.0
Moderate	Greater than or equal to 3.0 and less than 5.0
Minor	Greater than or equal to 1.0 and less than 3.0
Negligible	Less than 1.0

11.4.18 As advised within LA 111 (Highways England, 2020), a significant effect may occur if construction traffic produces a Moderate or Major noise increase for a period of 10 or more days of working in any 15 consecutive days or for a total number of days exceeding 40 in any six consecutive months.

11.4.19 Where full carriageway night-time closures take place during the night (23:00-07:00 hours) to enable construction works, the sudden change of traffic levels on diversion routes, as a result of night-time closures, is highly likely to cause disturbance to receptors within 25m of the road. The potential noise impact from night-time diversion routes has been identified within this chapter.

Assessment approach – road traffic noise during operation

11.4.20 The assessment of permanent road traffic noise impacts arising from the Scheme involves calculations for noise sensitive receptors in the study area, as well as a Basic Noise Level assessment for routes outside the study area (i.e. the wider road network).

11.4.21 This aspect of the assessment considers the following scenarios:

- Opening year (2027) – Do-Minimum (i.e. without the Scheme)
- Opening year (2027) – Scheme Do-Something (i.e. with the Scheme)
- Future year (2042) – Do-Minimum
- Future year (2042) – Scheme Do-Something

11.4.22 The assessment makes the following comparisons, as specified in LA 111 Noise and Vibration (Highways England, 2020):

- Do-Minimum in the opening year versus Do-Minimum in the future year (long-term)
- Do-Minimum in the opening year versus scheme Do-Something in the opening year (short-term)
- Do-Minimum in the opening year versus scheme Do-Something in the future year (long-term)

11.4.23 All road traffic noise predictions have been undertaken in accordance with the calculation methodology presented in the former Department of Transport/Welsh Office technical memorandum (CRTN) (Department of Transport Welsh Office, 1988) and the advice contained in Appendix A2 of LA 111 Noise and Vibration (Highways England, 2020). Traffic speeds have been derived in accordance with Appendix A3 of LA 111 Noise and Vibration (Highways England, 2020).

11.4.24 The classification of magnitude of noise impacts associated with short and long-term changes in noise levels (as defined in **paragraph 11.4.22**) have been determined in accordance with the criteria presented in **Table 11.8**, which are taken from LA 111 Noise and Vibration (Highways England, 2020). Both adverse and beneficial changes have been considered in the assessment.

Table 11.8: Classification of Magnitude of Noise Impacts

Magnitude of Impact	Noise Change, dB ($L_{A10,18h}$ or L_{night})	
	Short-term	Long-term
Major	≥5.0	≥10.0
Moderate	3.0 – 4.9	5.0 – 9.9
Minor	1.0 – 2.9	3.0 – 4.9
Negligible	<1	<3

Source – DMRB LA 111 Noise and Vibration (Highways England, 2020) Tables 3.54a and 3.54b

11.4.25 Particular consideration has been given to noise impacts within Noise Important Areas (NIA)s within 600m of the Scheme.

11.4.26 An assessment of likely eligibility for sound insulation measures under the Noise Insulation Regulations 1975 has been carried out to identify residential dwellings that may potentially qualify under the Regulations. The Noise Insulation Regulations state that (CRTN) (Department of Transport Welsh Office, 1988) should be used to identify eligibility. This assessment is largely based on (CRTN) (Department of Transport Welsh Office, 1988), however it also incorporates updated guidance from DMRB LA 111 (Highways England, 2020) and therefore only provides an indication of likely eligibility and is not the final assessment to determine eligibility under the Noise Insulation Regulations.

11.4.27 In addition to the requirements of LA 111 Noise and Vibration (Highways England, 2020), consideration of the Scheme with respect to national policy has been undertaken.

11.4.28 Appropriate criteria have been defined for the purposes of identifying potential significant environmental effects arising from the operation phase of the Scheme. The criteria have been defined based on the guidance provided in LA 111 Noise and Vibration (Highways England, 2020) and are detailed in **Table 11.9**.

Table 11.9: SOAEL and LOAEL Values for Operational Noise

Time period	LOAEL	SOAEL
Day (06:00-24:00)	55dB $L_{A10,18h}$ (façade)	68dB $L_{A10,18h}$ (façade)
Night (23:00-07:00)	40dB $L_{night,outside}$ (free-field)	55dB $L_{night,outside}$ (free-field)

Source – DMRB LA 111 (Highways England, 2020) Table 3.49.1

11.4.29 For reference, the equivalent 16 hour daytime average noise levels (L_{Aeq}) would be approximately 1-2 dB lower than the above $L_{A10,18h}$ sound levels.

11.4.30 If the predicted magnitude of impact at a sensitive receptor is above Moderate or Major (see **Table 11.8**), then there is the potential for a significant effect to occur. Where the magnitude of impact in the short-term is Minor, Moderate or Major at noise sensitive buildings, **Table 11.10** (Table 3.60 of LA 111 Noise and Vibration (Highways England, 2020)) would be considered as part of the process to determine the final significance. Both LA 111 (Highways England, 2020) and LA 104 (Highways England, 2020) have been used to determine the final significance, based on the magnitude of noise impact (DMRB LA 111 (Highways England, 2020)) and receptor sensitivity (LA 104 (Highways England, 2020)).

Table 11.10: Determining Operational Significance on Noise Sensitive Buildings

Local Circumstance	Influence of Significance Judgement
Noise level change (is the magnitude of change close to the minor/moderate boundary?)	1) Noise level changes within 1dB of the top of the 'minor' range can indicate that it is more appropriate to determine a likely significant effect. Noise level changes within 1dB of the bottom of a 'moderate' range can indicate that it is more appropriate to consider a change is not a likely significant effect.
Differing magnitude of impact in the long-term to magnitude of impact in the short-term	1) Where the long-term impact is predicted to be greater than the short-term impact, it can be appropriate to conclude that a minor change in the short-term is a likely significant effect. Where the long-term impact is predicted to be less than the short-term it can be appropriate to conclude that a moderate or major change in the short-term is not significant. 2) A similar change in the long-term and non-project noise change can indicate that the change is not due to the project and not an indication of a likely significant effect.
Absolute noise level with reference to LOAEL and SOAEL (by design this includes sensitivity of receptor)	1) A noise change where all do-something absolute noise levels are below SOAEL requires no modification of the initial assessment. 2) Where any do-something absolute noise levels are above the SOAEL, a noise change in the short-term of 1.0dB or over results in a likely significant effect.
Location of noise sensitive parts of a receptor	1) If the sensitive parts of a receptor are protected from the noise source, it can be appropriate to conclude a moderate or major

Local Circumstance	Influence of Significance Judgement
	magnitude change in the short-term and/or long-term is not a likely significant effect. 2) Conversely, if the sensitive parts of the receptor are exposed to the noise source, it can be more appropriate to conclude a minor change in the short-term and/or long-term is a likely significant effect. 3) It is only necessary to look in detail at individual receptors in terms of this circumstance where the decision on whether the noise change gives rise to a significant environmental effect is marginal.
Acoustic context	1) If a project changes the acoustic character of an area, it can be appropriate to conclude a minor magnitude of change in the short-term and/or long-term is a likely significant effect.
Likely perception of change by residents	1) If the project results in obvious changes to the landscape or setting of a receptor, it is likely that noise level changes would be more acutely perceived by the noise sensitive receptors. In these cases it can be appropriate to conclude that a minor change in the short-term and/or long-term is a likely significant effect. 2) Conversely, if the project results in no obvious changes for the landscape, particularly if the road is not visible from the receptor, it can be appropriate to conclude that a moderate change in the short-term and/or long-term

Source – DMRB LA 111 (Highways England, 2020) Table 3.60

Assessment approach - receptor sensitivity

11.4.31 The sensitivity of receptors to noise and vibration have been based on the descriptions of sensitivity within Table 3.2N in DMRB LA 104 Environmental Assessment Methodology (Highways England, 2020), reproduced in the **Table 11.11**.

Table 11.11: Environmental Value (Sensitivity) and Descriptions

Value (sensitivity) of receptor / resource	Typical description
Very High	Very high importance and rarity, international scale and very limited potential for substitution.
High	High importance and rarity, national scale, and limited potential for substitution.
Medium	Medium or high importance and rarity, regional scale, limited potential for substitution.
Low	Low or medium importance and rarity, local scale.
Negligible	Very low importance and rarity, local scale.

Source – DMRB LA 104 (Highways England, 2020) Table 3.2N of DMRB LA 104

11.4.32 Sensitivity to noise and vibration varies from person to person and noise can affect people in different ways (e.g. due to sleep disturbance, amenity, ability to communicate or the ability to concentrate).

11.4.33 Based on the descriptions outlined in **Table 11.11**, the sensitivity of receptors to noise and vibration considered within this assessment are presented in **Table 11.12**.

Table 11.12: Value (Sensitivity) of Receptors

Receptor	Environmental Value (sensitivity) of receptor / resource
Residential / Dwellings	High
Commercial	Medium
Educational	High
Healthcare Building	High
Community Uses	Medium
Scheduled Monuments / Listed Buildings	Medium
Public Rights of Way	Medium

11.4.34 Based on guidance provided within Table 3.7 of DMRB LA 104 Environmental assessment and monitoring (Highways England, 2020), the significance categories are defined for the assessment in **Table 11.13**.

Table 11.13: Significance Categories and Typical Descriptions

Significance category	Typical description
Very large	Effects at this level are material in the decision-making process.
Large	Effects at this level are likely to be material in the decision-making process.
Moderate	Effects at this level can be considered to be material decision-making factors.
Slight	Effects at this level are not material in the decision-making process.
Neutral	No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

Source – DMRB LA 104 (Highways England, 2020) Table 3.7

11.4.35 Based on guidance provided within **Tables 11.12 and 11.13**, the significance category has been defined in according with Table 3.8.1 of DMRB LA 104 Environmental assessment and monitoring (Highways England, 2020). The significance matrix is reproduced in **Table 11.14**. Where necessary, to be in accordance with DMRB LA 111 (Highways England, 2020), the significance of operational noise has been modified in accordance with Table 3.60.

Table 11.14: Significance Matrix

	Magnitude of Impact (Degree of Change)					
		No Change	Negligible	Minor	Moderate	Major
Environmental Value (Sensitivity)	**Very High**	Neutral	Slight	Moderate or large	Large or very large	Very large
	High	Neutral	Slight	Slight or moderate	Moderate or large	Large or very large
	Medium	Neutral	Neutral or slight	Slight	Moderate	Moderate or large
	Low	Neutral	Neutral or slight	Neutral or slight	Slight	Slight or moderate
	Negligible	Neutral	Neutral	Neutral or slight	Neutral or slight	Slight

Source – DMRB LA 104 (Highways England, 2020) Table 3.8.1

11.4.36 With reference to Note 3 of Table 3.7 (of DMRB LA 104 Environmental assessment and monitoring (Highways England, 2020)) Significant effects typically comprise residual effects which are within the Moderate, Large or Very

Large categories. Where more than one significance of effect can be assigned, professional judgement has been used and explained.

Reasonable worse case parameters for assessment

11.4.37 An assessment has been conducted within the Limits of Deviation (LoD) outlined within **Chapter 2 (The Scheme and its Surroundings)** of the **ES (Document Reference 6.1)**. The vertical and lateral LoD for the Scheme have been reviewed with respect to sensitive receptors identified within this ES chapter. The vertical and lateral LoD are not considered to affect the conclusions of the assessment reported in this chapter.

Construction noise and vibration

11.4.38 The calculation of noise and vibration due to construction activities is determined using the guidance detailed in BS 5228 Parts 1 and 2:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites (British Standards Institute, 2014). However, the precision of the calculations is necessarily limited by the number of assumptions made regarding the number and type of plant proposed to be utilised, their location and detailed operating arrangements. The information provided by the contractor is as expected at this point in the process. Some of this information would be clarified at the detailed design stage and when resources are mobilised, but other information (such as exactly where the plant operates and for how long) would remain uncertain, even after works had commenced.

11.4.39 The acoustic model is based on all works within each sub-phase being undertaken simultaneously. This is a worst-case assumption, as it would only be possible for works to take place in specific areas at any time. This assumption is likely to lead to an overestimate in the overall impact of construction noise, resulting in a robust assessment approach.

11.4.40 The acoustic model also includes works being undertaken at the working boundary, and therefore is representative of the worst-case conditions anticipated at the nearest noise sensitive receptors.

Construction traffic noise

11.4.41 Based on the current preliminary design information for the construction stage, the following approximate number of earthworks related vehicle movements across the construction phases (as described in **Chapter 2 (The Scheme and its Surroundings)** of the **ES (Document Reference 6.1)** are anticipated:

- Phase 1 – 14,153 lorry movements and 3,692 van movements
- Phase 2 – 12,899 lorry movements and 3,365 van movements
- Phase 3 – 6,951 lorry movements and 1,813 van movements

11.4.42 On the basis that the scheme would require 260 workdays per year, the following average number of vehicle movements are anticipated per day:

- Phase 1 - 110 two-way lorry movements and 30 two-way van movements per day on average
- Phase 2 – 100 two-way lorry movements and 26 two-way van movements per day on average
- Phase 3 – 54 two-way lorry movements and 14 two-way van movements per day on average

11.4.43 These are recognised to be the average number of vehicle movements per day, and that on some working days the number of vehicles may be more or less than this.

Assessment assumptions and limitations

Construction noise and vibration

11.4.44 The assessment of construction noise and vibration is based on an outline construction programme described in **Chapter 2 (The Scheme and its Surroundings)** of the **ES (Document Reference 6.1)**, and noise generating activities during the construction stage as identified by the Principal Contractor.

11.4.45 The baseline noise model used to assess construction noise impacts is based on modelled traffic data over the construction period, with speeds limited to 50mph on the M3, A33 and A34 due to speed restrictions which are anticipated to be put in place. During Phase 2 speed limits may be 40mph along the M3 due to the temporary re-alignment. Based on the change in noise levels anticipated from this speed change, noise levels from traffic along the M3 may be approximately 1dB lower than during other phases. This is not anticipated to materially affect the assessment, and the assumptions and modelling techniques employed are anticipated to result in at least a 1dB overestimation of noise levels from construction. During Phase 3A speed limits may also be reduced to 30mph for a short duration southbound along the A34, however, again this is not considered to significantly change the assessment.

11.4.46 The construction activities identified are outlined in **Table 11.15**. As per **paragraph 11.4.39**, the assessment approach is considered to represent impacts during each phase. Where works span across multiple phases they are included in the relevant phases to ensure cumulative impact between phases is considered.

Table 11.15: Key Construction Noise and Vibration Phases and Activities

Phase	Reference	Activity	Location
Site Set-up	0.1	Compound clearance and construction	Central construction compound A33 and A34, Junction 9 materials storage areas
	0.2	Utilities diversions	Works required for Openreach, SSEN, SGN and Southern Water
	0.3		
Phase 1	1.1	Traffic management set-up	M3 Junction 9 and A33/A34
	1.2	Removal of gantries	Gantry locations
	1.3	Bulk earthworks	East and west of M3
	1.4	Compound Operation	Central construction compound A33 and A34, Junction 9 materials storage areas
Phase 1a Central reservation phase	1a.1	Earthworks	M3 diverge, A34 southbound merge (on east) Partial A33 and A34 southbound
	1a.2	Laying asphalt	
	1a.3	Laying kerbs	
	1a.4	Laying asphalt	Kingsworthy Bridge
	1a.5	Laying kerbs	
Phase 1b	1b.1	Earthworks	M3 Junction 9 gyratory
	1b.2	Pile boring and piling	
	1b.3	Sheet piling	
	1b.4	Laying asphalt	South of M3 Junction 9 gyratory
	1b.5	Laying kerbs	
	1b.6	Reinforced concrete	M3 Junction 9 gyratory
Phase 2	2.1	Reinforced concrete	M3 Junction 9 gyratory
	2.2	Sheet piling	
	2.3	Bridge installation	
	2.4	Earthworks	A33 north and A34 southbound (west)
	2.5	Laying asphalt	
	2.6	Laying kerbs	
	2.7	Earthworks	M3 mainline works M3 underpass A34 underpass
	2.8	Laying asphalt	
	2.9	Laying kerbs	

Phase	Reference	Activity	Location
	2.10	Sheet piling	A33 retaining walls
	2.11	Earthworks	M3 slip roads
	2.12	Laying asphalt	
	2.13	Laying kerbs	
	2.14	Demolition of existing gyratory	M3 Junction 9 gyratory
	2.15	Compound Operation	Central construction compound A33 and A34, Junction 9 materials storage areas
Phase 3	3.1	Compound Operation	Central construction compound A33 and A34, Junction 9 materials storage areas
Phase 3a	3a.1	Earthworks	A34 southbound (east) new configuration
	3a.2	Laying asphalt	
	3a.3	Laying kerbs	
	3a.4	Earthworks	M3 mainline works
	3a.5	Sheet piling	
	3a.6	Laying asphalt	
	3a.7	Laying kerbs	
	3a.8	Laying asphalt	Complete A34 northbound
	3a.9	Laying kerbs	
Phase 3b	3b.1	Earthworks	Excavation of new ponds
	3b.2	Laying kerbs	Footpath works
	3b.3	Earthworks	
	3b.4	Earthworks	River Itchen cycle/footbridge construction (piling and boring works not taking place within the river channel)
	3b.5	Pile boring and piling	

11.4.47 Details of the construction plant used in the assessment are presented in **Appendix 11.1 (Construction Activities)** of the **ES (Document Reference 6.3)**. The number of plant items, type of equipment and working locations have been based on information provided by the Principal Contractor and based on equipment requirements from other similar schemes.

11.4.48 Working hours would be restricted to the following core hours:

- 07.00 to 19.00 Monday to Friday
- 07.00 to 13.00 Saturday
- No Sunday working

11.4.49 Works outside of the core working hours are likely to be required in certain circumstances and would be carried out following consultation with Winchester City Council. These works are currently envisaged to comprise:

- Lifting of gantry and large signs onto concrete bases due to the need for a larger working area to ensure the safety of the workforce and minimise disruption to traffic
- Works predominantly within the M3 and A34 corridors which would be similar to maintenance works e.g. planing, resurfacing, painting road markings
- Closing of gyratory slip roads to allow re-alignment works to take place
- Installation and removal of barriers to allow traffic management switches to take place

11.4.50 There may also be circumstances where works would continue outside of core working to allow for efficiencies and engineering reasons. Examples of these would be to complete a concrete pour or to complete an excavation to a safe completion point. Note: A Section 61 application under Control of Pollution Act 1974 for the works would be made (prior consent for work on construction sites) and agreed with the Winchester City Council, and further controlled through the Noise and Vibration Management Plan secured by the fiEMP (Document Reference 7.3).

11.4.51 Owing to the nature of the works proposed outside of the core hours and the commitment to obtaining Section 61 consent and preparing (and adhering to) a Noise and Vibration Management Plan, works outside of the core hours would not lead to significant effects and are not assessed in this chapter.

Operational noise

11.4.52 The assumptions and limitations of the operational noise model are outlined in **Table 11.16**.

Table 11.16: Operational Noise Model Assumptions and Limitations

Element	Assumptions and Limitations
Traffic Data	▪ Traffic data (Annual Average Weekly Traffic 18-hour) for the assessed scenarios has been provided by the Scheme's Transport Consultant. ▪ The resultant noise levels ($L_{A10,18h}$ and L_{night}) have been

Element	Assumptions and Limitations
	calculated using SoundPlan V8.2, based on guidance provided within CRTN and modifications stated in DMRB LA 111. ■ The resultant L_{night} noise levels have been calculated using the conversion process detailed in Method 3 of the Transport Research Laboratory (TRL) conversion study (TRL Limited, 2002). The opening year for the assessment is 2027, and the future year is 2042 (i.e. 15 years after opening).
Road Alignments	■ The alignment of existing roads is based on open Ordnance Survey data. ■ The new highway alignment of the Scheme is based on the design shown in **Figure 2.2 (General Arrangement)** of the **ES (Document Reference 6.2)**.
Road Surfaces	■ The road surface correction applied in the Do-Minimum scenario is based on data within the Highways England Pavement Management System (NHPMS), where available. ■ Based on data within the NEPMS, the M3, A33 and A34 have been modelled with a Low Noise Road Surface (with a road surface influence (RSI) of -3.5dB in the Do-Minimum and Do-Something scenarios), where modelled speeds are above 75 km/h.
Topography	■ The topography used within the Scheme extent is based on data provided by the Scheme's Civil Engineering team from a bespoke and detailed topography survey. ■ The topography used within the study area is based on open Ordnance Survey data.
Buildings	■ Buildings within the study area are based on OS Mastermap (National Highways Geostore) data. ■ Building heights have been based on OS Mastermap (National Highways Geostore) data.

Element	Assumptions and Limitations
	▪ Buildings have been modelled with a reflection loss of 1dB.
Ground and Building Absorption	▪ In rural areas, the ground is assumed to be acoustically absorbent, with a ground factor 1. ▪ In urban areas, the ground is assumed to be mixed, with a proportion of absorbent ground of 0.5. ▪ Roads have been modelled as acoustically hard, with a ground factor of 0.
Address Data	▪ Property addresses and use types have been derived from OS AddressBase Plus data.

11.4.53 Noise generated by vehicle movements with combustion engines is considered largely to consist of two elements: engine noise and tyre noise. At lower speeds (i.e. below 40 km/h), noise levels are considered to be dominated by engine noise. At higher speeds, noise levels are considered to be dominated by tyre noise.

11.4.54 A transition to vehicles without combustion engines is likely to remove or significantly reduce the amount of noise associated with the combustion engine, particularly at lower speeds. However, the amount of noise produced by vehicles travelling at higher speeds is unlikely to be significantly different, as the main type of noise would be tyre noise.

11.4.55 Therefore, when considering noise impacts along the M3, A33 and A34, noise levels are unlikely to change as a result of a change in vehicle fleet. On local roads where vehicles travel at lower speeds, noise levels may reduce marginally in the future. At this time there is no standard or guidance which takes this change into account, and therefore the assessment reported in this chapter is based on the latest available standards and guidance and does not take future engine types into account.

11.5 Study area

11.5.1 Four study areas have been defined, relevant to the assessment type, based on guidance provided within DMRB LA 111 Noise and Vibration (Highways England, 2020).

Construction noise

11.5.2 The study area for construction noise extends 300m in all directions from the land within the Application Boundary. The study area is outlined in **Figure 11.1 (M3 Junction 9 Noise Study Areas, Noise Measurement Locations and Receptors)** of the **ES (Document Reference 6.2)**.

Construction vibration

11.5.3 The study area for construction vibration extends 100m in all directions from the land within the Application Boundary. The construction vibration study area is outlined in **Figure 11.1 (M3 Junction 9 Noise Study Areas, Noise Measurement Locations and Receptors)** of the **ES (Document Reference 6.2)**.

Construction traffic noise

11.5.4 The diversion route study area, where full carriageway closures are required during the night (23:00 – 07:00 hours), is defined as 25m from the kerb along diversion routes (see **Chapter 2 (The Scheme and its Surroundings)** of the **ES (Document Reference 6.1)**, and **Figure 2.4 (Temporary Traffic Diversion Routes (Document Reference 6.2)** for further detail on temporary traffic diversion routes.

11.5.5 The construction traffic study area includes areas within 50m of a road identified to experience a potential noise increase of 1dBA as a result of construction traffic.

Operational traffic

11.5.6 The operational noise study area encompasses an area of 600m around new or changed road links which form part of the Scheme. The operational noise study area is outlined in **Figure 11.1 (M3 Junction 9 Noise Study Areas, Noise Measurement Locations and Receptors)** of the **ES (Document Reference 6.2)**.

11.5.7 The operational noise study area also includes areas within 50m of other road links within the modelled road traffic network, which have the potential to experience a change of more than 1dB in the opening year. The following roads are 600m or more away from the Scheme and are identified to have a noise change of more than 1dB:

- A reduction of 1.7dB along the westbound of the A31 between Chilcomb Roundabout and Bar End Roundabout
- A reduction of 1.3dB along the southbound slip road of the A34 to the roundabout with the A272 and Christmas Hill
- An increase of 1.4dB along the northbound slip road of the A34 to the Three Maids Hill Roundabout

- A decrease of 1.5dB along the B3047 between Martyr Worthy and Itchen Abbas

11.5.8 Further assessment of the impacts associated with change in noise levels on the A31 between Chilcomb Roundabout and the Bar End Roundabout has not been included within the assessment as there are no noise sensitive receptors within 50m of the link.

11.5.9 Further assessment of the impacts associated with change in noise levels on the slip roads off the A34 to the A272/Christmas Hill and Three Maids Hill Roundabout has not been included within the assessment as there are no noise sensitive receptors within 50m of the link.

11.5.10 The study area includes an area 50 m around the B3047 between Martyr Worthy and Itchen Abbas as this link is identified as experiencing a noise change of more than 1 dB.

11.6 Baseline conditions

Baseline noise conditions

11.6.1 To establish baseline sound levels and validate the noise model prepared for the assessment reported in this chapter, environmental sound surveys were carried out in July 2019 and in January-February 2021. The measurement locations are indicated in **Figure 11.1 (M3 Junction 9 Noise Study Areas, Noise Measurement Locations and Receptors)** of the **ES (Document Reference 6.2)**.

11.6.2 An acoustic model has been created based on the baseline (2015) traffic flows. The purpose of the baseline acoustic model is to validate modelled baseline sound levels. This provides an indication of the reliability of the opening year and future year acoustic models.

11.6.3 The equivalent average daytime ($L_{Aeq,\ 16h}$) measured and modelled free-field sound levels are presented in **Table 11.17**. For reference, the equivalent L dB sound levels are anticipated to be approximately 1-2 dB higher than the daytime $L_{Aeq,16h}$ dB sound levels.

Table 11.17: Measured and Modelled Baseline Sound Levels

Position	Survey A 02/07/2019 - 18/07/2019	Survey B 07/01/2021 – 18/02/2021	Modelled Baseline (2019)
1 – 70 Longfield Road Winchester SO23 0NT	61dB $L_{Aeq, 16h}$	62dB $L_{Aeq, 16h}$	61dB $L_{Aeq, 16h}$
2 – Fulling Mill Cottage Easton SO21 1DG	59dB $L_{Aeq, 16h}$	59dB $L_{Aeq, 16h}$	61dB $L_{Aeq, 16h}$
3 – 24 Willis Waye Kings Worthy SO23 7QT	63dB $L_{Aeq, 16h}$	62dB $L_{Aeq, 16h}$	62dB $L_{Aeq, 16h}$

11.6.4 The measured and modelled baseline sound levels are within 1dB of each other at positions 1 and 3, and within 2dB at position 2. On this basis, the noise model is considered to represent noise emissions from the main road noise sources within the study area.

11.6.5 The environmental sound survey conducted in 2021 took place during national Covid-19 restrictions within the UK, impacting vehicle traffic flows in the area. To compare the measured sound levels, traffic counts from National Highways taken over the survey period have been compared to the baseline model traffic flows.

11.6.6 The results are as follows:

- Position 1 – Traffic surveys undertaken along the M3 adjacent to 70 Longfield Road indicated a reduction in traffic flows of 20-26%. This equates to a reduction in noise levels of approximately 1dB
- Position 2 – Traffic surveys undertaken along the M3 adjacent to Fulling Mill Cottage indicated a reduction in traffic flows of 24-26%. This equates to a reduction in noise levels of approximately 1dB
- Position 3 – Traffic surveys undertaken along the A34 adjacent to 24 Willis Waye indicated a reduction in traffic flows of 7-35%. This equates to a reduction in noise levels of approximately 1-2dB

11.6.7 Based on the results of the comparison, the impact of Covid-19 on resultant noise levels during the survey from traffic is not likely to have materially affected the measured sound levels.

Noise important areas

11.6.8 Three NIAs have been identified (see **Figure 11.1 (M3 Junction 9 Noise Study Areas, Noise Measurement Locations and Receptors) of the ES (Document Reference 6.2)**), as follows:

- NIA 4008 – located to the west of the M3, south of the Junction 9 gyratory
- NIA 4007 – located along the A34 in Kings Worthy
- NIA 4006 – located to the west of the M3 to the north of Junction 9

Sensitive receptors

11.6.9 Other receptors which are considered to be noise and vibration sensitive located within the study area and included within the assessment include:

- Residential/dwellings
- Commercial
- Educational
- Healthcare Buildings
- Community Buildings
- Scheduled monuments / listed buildings
- Public rights of way

Baseline evolution

11.6.10 In the absence of the Scheme, the noise climate in and around the Scheme has the potential to change as a result of local committed developments and a natural change in traffic flows and vehicle fuel sources.

11.6.11 **Appendix 15.1 (Long List of Cumulative Developments)** of the **ES (Document Reference 6.3)** provides a full list of Schemes which have been identified as being likely to be in operation prior to the construction of the Scheme. Where relevant, these schemes therefore form part of the future baseline scenario and have been taken into account in the assessment of likely significant effects from the Scheme (construction and operation) presented in this chapter.

11.6.12 To establish the likely evolution in baseline conditions, the results of the 2027 Opening Year Do-Minimum scenario have been compared against the results of the baseline (2019) scenario. The results of the comparison can be found in **Table 11.18**.

Table 11.18: Measured and Modelled Baseline Evolution Sound Levels

Position	Modelled Baseline (2019)	Modelled Do-Minimum Opening Year (2027)	Modelled Change
1 – 70 Longfield Road	62dB $L_{A10,18h}$	61dB $L_{A10,18h}$	< 1dB decrease
2 – Fulling Mill Cottage	62dB $L_{A10,18h}$	61dB $L_{A10,18h}$	< 1dB decrease
3 – 24 Willis Waye	65dB $L_{A10,18h}$	63dB $L_{A10,18h}$	< 2dB decrease

11.6.13 The above results indicate that the change in dB $L_{A10,18h}$ sound level between the existing sound climate and the likely sound climate in 2027 is calculated to be no greater than a 2dB decrease.

11.6.14 In accordance with DMRB LA 111 Noise and Vibration (Highways England, 2020), changes in noise levels which are not related to the Scheme should be determined between the 2027 Opening Year Do-Minimum and the 2042 Future Year Do-Minimum scenarios in the absence of the Scheme.

11.6.15 An assessment of the change in noise levels between the 2027 Opening Year Do-Minimum and 2042 Future Year Do-Minimum scenarios has been undertaken. **Table 11.19** presents the number of receptors that are subject to different changes in noise levels within the study area.

Table 11.19: Results of Baseline Evolution Noise Change Assessment between the 2027 Opening Year Do-Minimum and 2042 Future Year Do-Minimum

Change in noise level (dB)		Magnitude of impact	Daytime (dB $L_{A10,18h}$)		Night-time (dB $L_{Aeq,8h}$)	
			Number of dwellings	Number of other noise sensitive receptors	Number of dwellings	Number of other noise sensitive receptors
Increase in noise level	0.1 to 0.9	Negligible	1374	335	1167	294
	1.0 to 2.9	Minor	0	0	0	0
	3.0 to 4.9	Moderate	0	0	0	0
	> 5	Major	0	0	0	0
No change	0	No Change	0	1	0	0
Decrease in noise level	0.1 to 0.9	Negligible	307	120	514	162
	1.0 to 2.9	Minor	0	0	0	0
	3.0 to 4.9	Moderate	0	0	0	0
	> 5	Major	0	0	0	0

Dwellings - daytime

11.6.16 The above results indicate that in the absence of the Scheme, 1374 residential receptors are calculated to experience an increase in noise levels of between 0.1 and 0.9dB $L_{A10,18h}$ (06:00 to 00:00 hours).

11.6.17 In the absence of the Scheme, a total of 307 residential receptors are anticipated to experience a decrease in noise levels of between 0.1 and 0.9dB $L_{A10,18h}$.

Dwellings – night-time

11.6.18 In the absence of the Scheme, a total of 1167 residential receptors are anticipated to experience an increase in noise levels of between 0.1 and 0.9dB $L_{Aeq,8h}$.

11.6.19 In the absence of the Scheme, a total of 514 residential receptors are anticipated to experience a decrease in noise levels of between 0.1 and 0.9dB $L_{Aeq,8h}$.

Other noise sensitive receptors – daytime

11.6.20 In the absence of the Scheme, the above results indicate that in the absence of the Scheme, 335 other noise sensitive receptors are anticipated to experience an increase in noise levels of between 0.1 and 0.9dB $L_{A10,18h}$.

11.6.21 In the absence of the Scheme, a total of 120 other noise sensitive receptors are anticipated to experience a decrease in noise levels of between 0.1 and 0.9dB $L_{A10,18h}$. A single other noise sensitive receptor is anticipated to experience no change in noise level.

Other noise sensitive receptors – night-time

11.6.22 In the absence of the Scheme, a total of 294 other noise sensitive receptors are anticipated to experience an increase in noise levels of between 0.1 and 0.9dB $L_{Aeq,8h}$.

11.6.23 In the absence of the Scheme, a total of 162 other noise sensitive receptors are anticipated to experience a decrease in noise levels of between 0.1 and 0.9dB $L_{A10,18h}$.

Baseline evolution summary

11.6.24 The above results generally indicate that there would be a negligible noise increase at the majority of noise sensitive receptors between the Do-Minimum 2027 scenario and the Do-Minimum 2042 scenario.

11.7 Potential impacts

11.7.1 The Scheme could cause adverse noise and vibration impacts during the construction and operation stages. Embedded mitigation measures are outlined in **Chapter 4 (Environmental Assessment Methodology)** of the **ES (Document Reference 6.1)**. Essential mitigation and enhancement measures are outlined in **Section 11.8**.

Construction (including site preparation)

11.7.2 The construction works would include a major area of earthworks requiring deposition of ground into landscaping mitigation areas.

11.7.3 Noise and vibration impacts are anticipated to occur during the various phases of the Scheme as a result of major earthworks, bridge demolition, piling and construction for the new gyratory, the new cycle and footbridge installation and road construction and re-surfacing works along the M3, A33 and A34.

11.7.4 Noise impacts are also anticipated to occur due to temporary traffic diversion routes as identified in **Chapter 2 (The Scheme and its Surroundings)** of the **ES (Document Reference 6.1)**.

Operation

11.7.5 Noise impact during operation of the Scheme is likely to be most influenced by horizontal and vertical alignment of the new roads, as opposed to change in traffic flows.

11.7.6 Where roads are being located away from noise sensitive areas this is likely to result in a beneficial impact (i.e. reduction in noise). Where roads are being located closer to noise sensitive areas this is likely to result in an adverse impact (i.e. increase in noise). The changes are likely to affect noise levels locally, and at distances further away from the Scheme, changes in road layout are unlikely to result in impacts.

11.7.7 The new slip roads are being moved eastwards, which is likely to result in an increase in noise levels locally to the east of the Scheme, and a decrease in noise levels to the west of the Scheme.

11.8 Design, mitigation and enhancement measures

11.8.1 Mitigation measures incorporated into the design of the Scheme are reported as embedded mitigation in **Chapter 4 (Environmental Assessment Methodology)** of the **ES (Document Reference 6.1)** those relevant to noise and vibration are included below. This section also outlines essential mitigation required. Essential mitigation is outlined within the **fiEMP (Document Reference 7.3).** Prior to the implementation of mitigation, the Scheme has the potential to have noise impacts during construction and operation and vibration impacts during construction.

Embedded mitigation

11.8.2 To reduce noise impacts associated with the operation of the scheme, low noise road surfaces are proposed to be embedded as part of the Scheme where new roads surfaces are to be laid. The surface shall be specified to achieve a Road Surface Influence (RSI) of -3.5dB. This has been included within the operational noise model where relevant.

Essential mitigation

Construction (including site preparation)

11.8.3 The exact specification and location of equipment to be used during the construction phase is unknown at this stage. Therefore, in order to provide a worst-case assessment, the assessment of likely significant effects during the construction phase considers the impact of noise and vibration at receptors in the absence of any essential mitigation measures.

11.8.4 To reduce noise impact associated with the demolition and construction works, the following practices would be followed, as included within the **fiEMP (Document Reference 7.3):**

- Appropriate operational hours as described in **paragraph 11.4.48**
- Working methods to ensure quiet working, including the selection of suitably quiet plant and appropriate working hours for excessive noise generating activities
- Restriction of number of plant items in use at any one time
- Locating noisy plant and equipment at a suitable distance away from noise and vibration sensitive receptors
- Frequent maintenance of plant and equipment
- Where practical, carry out loading and unloading activities at a suitable distance away from residential dwellings
- Closing of compressor, generator and engine compartment doors when in use or idling
- Careful lowering of materials/equipment and the minimisation of drop heights
- Installation of close board fencing around the main works compound

11.8.5 In addition to the above a Noise and Vibration Management Plan outlining how construction noise and vibration would be managed (and monitored) throughout the construction of the Scheme including any noise limits would be prepared and agreed with the EHO prior to construction. This plan would be prepared by the Principal Contractor during the detailed design stage and would be **Appendix K** of the second iteration EMP (siEMP). A commitment to preparing the Noise and Vibration Management Plan is included withing the **fiEMP (Document Reference 7.3).**

11.8.6 In addition to the Noise and Vibration Management Plan a Section 61 application would also be applied for - the commitment to applying for this consent is outlined within the **fiEMP (Document Reference 7.3)**.

Operation

11.8.7 No essential mitigation is proposed or required during operation.

11.9 Assessment of likely significant effects

11.9.1 This section presents the assessment of likely significant effects during the construction and operational phases on noise and vibration sensitive receptors. The assessment of effects takes into account the potential impacts to each receptor following the implementation of embedded mitigation measures (but not essential mitigation) to determine the significance of the residual effects.

Construction noise (including site preparation)

11.9.2 Noise impacts associated with construction within the study areas over each phase are presented in **Figures 11.2-9** of the **ES (Document Reference 6.2)**.

11.9.3 **Table 11.20** summarises the receptors anticipated to experience temporary Moderate and Major noise impact across the construction phases. Impacts at all receptors within the study area over each phase are provided in **Appendix 11.3 (Construction Noise Receptor Results)** of the **ES (Document Reference 6.3)**.

Table 11.20: Construction Noise Receptors Anticipated to Experience Temporary Moderate and Major Construction Noise Impacts

Phase	Figure Reference (Document Reference 6.2)	Number of Receptors Anticipated to Experience Impact
Phase 0	Figure 11.2	Moderate: 4 (2 residential)
		Major: 2 (0 residential)
Phase 1	Figure 11.3	Moderate: 79 (10 residential)
		Major: 29 (2 residential)
Phase 1A	Figure 11.4	Moderate: 92 (13 residential)
		Major: 44 (4 residential)
Phase 1B	Figure 11.5	Moderate: 53 (4 residential)
		Major: 54 (0 residential)
Phase 2	Figure 11.6	Moderate: 162 (87 residential)
		Major: 78 (11 residential)
Phase 3	Figure 11.7	Moderate: 0 (0 residential)
		Major: 0 (0 residential)
Phase 3A	Figure 11.8	Moderate: 38 (5 residential)
		Major: 13 (0 residential)
Phase 3B	Figure 11.9	Moderate: 39 (2 residential)
		Major: 2 (1 residential)

11.9.4 **Table 11.20** indicates that a number of receptors, which are located close to certain construction stages, may experience a temporary Moderate or Major magnitude of noise impact without mitigation.

11.9.5 DMRB LA 111 Noise and Vibration (Highways England, 2020) advises that a significant effect would occur when a moderate or major impact is expected for 10 or more days or nights in any 15 consecutive days or night, or for a total number of days exceeding 40 in any six consecutive months.

11.9.6 The durations for which the activities would be ongoing within each phase have not yet been finalised by the Principal Contractor, however the likely duration of noise exposure during the works has been considered to identify potential significant impacts.

11.9.7 During traffic management set-up (Phase 1) and road surfacing works (Phases 1, 1A, 2, 3A and 3B) (Phasing is explained further in **Chapter 2 (the Scheme and its Surroundings)** of the **ES (Document Reference 6.1))** the Principal Contractor is expected to work linearly along the road surface, and it is unlikely and impractical that works would occur near to the identified receptors for 10 or more days or nights in any 15 consecutive days or nights, or for a total number of days exceeding 40 in any six consecutive months. As such, a significant effect would not occur due to traffic management set-up (Phase 1) and road surfacing works (Phases 1, 1A, 2, 3A and 3B), even when considered in combination with other elements of work.

11.9.8 Noise impacts associated with Phase 0 are primarily related to the preparation of temporary soil deposition areas to the east of the Scheme as described in paragraph 11.7.2. These works are anticipated to occur over a two to four month period, and exceed the temporal threshold and expose individual receptors to related noise for 10 or more days or nights in any 15 consecutive days or nights, or for a total number of days exceeding 40 in any six consecutive months. Four properties (two of which are residential and two are commercial) are anticipated to experience a moderate adverse impact and result in temporary significant effects. Two properties (both commercial) are anticipated to experience a major adverse impact and result in temporary significant effects.

11.9.9 Noise impacts associated with Phase 1 are primarily related to the traffic management set-up along the Scheme, and bulk earthworks within the central and eastern areas of the Scheme. Due to the linear method of working along the Scheme, noise impact associated with traffic management set-up is not anticipated to expose individual receptors for 10 or more days or nights in any 15 consecutive days or nights, or for a total number of days exceeding 40 in any six consecutive months. The bulk earthworks to the centre and east of the Scheme are anticipated to exceed this temporal threshold. 79 properties (68 of which are commercial, one is community and 10 are residential) and anticipated to experience a moderate adverse impact and result in temporary significant effects. 29 properties (27 of which are commercial and two are residential) are anticipated to experience a major adverse impact and result in temporary significant effects.

11.9.10 Noise impacts associated with Phase 1A are primarily related to the road surfacing, and earthworks within the central area of the Scheme. Due to the linear method of working along the Scheme, noise impact associated with road surfacing is not anticipated to expose individual receptors for 10 or more days or nights in any 15 consecutive days or nights, or for a total number of days exceeding 40 in any six consecutive months. The earthworks to the centre of the Scheme are anticipated to exceed this temporal threshold. 92 properties (76 of which are commercial, two are community and 13 are residential) are anticipated to experience moderate adverse impact and result in temporary significant effects. 44 properties (40 of which are commercial and four are residential) are anticipated to experience major adverse impact and result in temporary significant effects.

11.9.11 Noise impacts associated with Phase 1B are primarily related to sheet piling in the centre of the Scheme and at the M3J9 gyratory. Due to the linear method of working along the Scheme, noise impact associated with sheet piling in the centre of the Scheme is not anticipated to expose individual receptors for 10 or more days or nights in any 15 consecutive days or nights, or for a total number of days exceeding 40 in any six consecutive months. Piling works associated with the M3J9 gyratory are also not anticipated to exceed the temporal threshold.

11.9.12 Noise impacts associated with Phase 2 are primarily related to construction and demolition works at the M3J9 gyratory, sheet piling at the centre of the Scheme, road surfacing along the Scheme and earthworks in the centre of the Scheme. Due to the linear method of working along the Scheme, noise impact associated with sheet piling and road surfacing is not anticipated to expose individual receptors for 10 or more days or nights in any 15 consecutive days or nights, or for a total number of days exceeding 40 in any six consecutive months. Works relating to the construction and demolition works at the M3J9 gyratory and earthworks at the centre of the Scheme are anticipated to exceed the temporal threshold. 162 properties (73 of which are commercial, two are community and 87 are residential) are anticipated to experience moderate adverse impact and result in significant effects. 78 properties (65 of which are commercial, 11 are residential, one community and one educational) are anticipated to experience major adverse impact and result in temporary significant effects.

11.9.13 Noise impacts associated with Phase 3A are primarily related to the road surfacing along the Scheme, and earthworks within the central areas of the Scheme. Due to the linear method of working along the Scheme, noise impact associated with road surfacing is not anticipated to expose individual receptors for 10 or more days or nights in any 15 consecutive days or nights, or for a total number of days exceeding 40 in any six consecutive months. The earthworks to the centre of the Scheme are anticipated to exceed this temporal threshold. 38 properties (33 of which are commercial, five are residential) are anticipated to experience moderate adverse impact and result in temporary significant effects. 13 properties (all of which are commercial) are anticipated to experience major adverse impact and result in temporary significant effects.

11.9.14 Noise impacts associated with Phase 3B are primarily related to the road surfacing along the Scheme, and earthworks within the central areas of the Scheme. Due to the linear method of working along the Scheme, noise impact associated with road surfacing is not anticipated to expose individual receptors for 10 or more days or nights in any 15 consecutive days or nights, or for a total number of days exceeding 40 in any six consecutive months. The earthworks to the centre of the Scheme are anticipated to exceed this temporal threshold. 39 properties (37 of which are commercial and two are residential) are anticipated to experience moderate adverse impact and result in temporary significant effects. Two properties (one commercial and one is residential) are anticipated to experience major adverse impact and result in temporary significant effects.

11.9.15 Based on the above, and with no noise mitigation measures, the assessment indicates that temporary moderate adverse and major adverse noise impacts are anticipated at noise sensitive receptors. Receptors anticipated to be exposed to moderate adverse and major adverse noise impacts which would give rise to significant effects are outlined in **Appendix 11.3 (Construction Noise Receptor Results)** of the **ES (Document Reference 6.3)**.

11.9.16 The following number of noise sensitive receptors are anticipated to be exposed to moderate or major noise impacts, due to exceedance of the SOAEL and the temporal threshold, leading to significant effects, without noise mitigation:

- Phase 0 – Four properties with moderate adverse impact. Two properties are residential, with a high sensitivity, resulting in moderate or large effects which are significant. Two properties are commercial, with a medium sensitivity, resulting in a moderate effect which is significant.

- Phase 0 – Two commercial properties with major adverse impact and medium sensitivity, resulting in moderate or large effects which is significant.

- Phase 1 – 79 properties with moderate adverse impact. 10 properties are residential, with a high sensitivity, resulting in moderate or large effects which are significant. 68 properties are commercial, with a medium sensitivity, resulting in a moderate effect which is significant. One property is community use, with a medium sensitivity, resulting in moderate or large effects, which is significant.

- Phase 1 – 29 properties with major adverse impact. Two properties are residential, with a high sensitivity, resulting in a large of very large effect, which is significant. 27 properties are commercial, with a medium sensitivity, resulting in moderate or large effects, which is significant.

- Phase 1a – 92 properties with moderate adverse impact. 13 properties are residential, with a high sensitivity, resulting in moderate or large effects which are significant. 76 properties are commercial, with a medium sensitivity, resulting in a moderate effect which is significant. Two properties

are community buildings, with a medium sensitivity, resulting in a moderate effect which is significant.

- Phase 1a – 44 properties with major adverse impact. Four properties are residential, with a high sensitivity, resulting in a large of very large effect, which is significant. 40 properties are commercial, with a medium sensitivity, resulting in moderate or large effects, which is significant.

- Phase 2 – 162 properties with moderate adverse impact. 87 properties are residential, with a high sensitivity, resulting in moderate or large effects which are significant. 73 properties are commercial, with a medium sensitivity, resulting in a moderate effect which is significant. Two properties are community, with a medium sensitivity, resulting in a moderate effect which is significant.

- Phase 2 – 78 properties with major adverse impact. 11 properties are residential, with a high sensitivity, resulting in a large of very large effect, which is significant. 65 properties are commercial, with a medium sensitivity, resulting in moderate or large effects, which is significant. One property is education use, with a high sensitivity, resulting in large or very large effects, which is significant.

- Phase 3a – 38 properties with moderate adverse impact. Five properties are residential, with a high sensitivity, resulting in moderate or large effects which are significant. 33 properties are commercial, with a medium sensitivity, resulting in a moderate effect which is significant.

- Phase 3b – 38 properties with moderate adverse impact. Two properties are residential, with a high sensitivity, resulting in moderate or large effects which are significant. 36 properties are commercial, with a medium sensitivity, resulting in a moderate effect which is significant.

- Phase 3b – Two properties with major adverse impact, one of which is residential with a high sensitivity, resulting in a large of very large effect, which is significant. One property is commercial, with a medium sensitivity, resulting in a moderate effect which is significant.

11.9.17 As stated above, these significant effects are based on no noise mitigation being provided during construction works. With the inclusion of the mitigation outlined within the **fiEMP (Document Reference 7.3)**, the resultant significance is anticipated to be reduced such that temporary moderate adverse impacts are likely to be reduced to temporary minor adverse impacts, and temporary major impacts are likely to be reduced to temporary moderate adverse impacts. For residential dwellings with a high sensitivity, this equates to slight or moderate effects for minor adverse impacts and moderate or large for moderate adverse effects. In the long-term these effects are not considered significant, as the impact is short-term only. Based on guidance provided within DMRB LA 111 Noise and Vibration (Highways England, 2020), minor construction noise

impacts are not significant and therefore minor adverse impacts are considered to result in slight significance, which is not significant.

Considered construction noise receptors outside study area

11.9.18 As requested by Kings Worthy and Abbots Worthy Parish Council. The anticipated noise impact at Kings Worthy Primary School and Princes Meads School, located more than 300m from construction works, has been considered over the construction phases. Based on the results of the noise modelling, the noise impact at Kings Worthy Primary School and Princes Meads School is anticipated to be Minor or Negligible, and no significant effect is anticipated.

Construction vibration (including site preparation)

11.9.19 Vibration during the demolition and construction phases are primarily associated with piling activity and vibratory compaction during road surfacing. It is understood that piling (which may require continuous flight auguring (CFA) or rotary open bored) and sheet piling may be used during construction.

11.9.20 There is potential for a significant effect to occur in locations where construction vibration levels are likely to exceed the SOAEL. **Table 11.21** presents the distance at which vibration levels are likely to fall below 0.3mm/s, 1mm/s and 10mm/s. The vibration levels for piling and compaction activities have been based on source data outlined in BS 5228-2:2009+A1:2014. The values for vibratory compaction relate to vibration levels during start-up and run-down as vibration levels during this period of operation are anticipated to be higher than during steady-state operation.

Table 11.21: Construction Vibration SOAEL Zones

Activity	Distance (m) at which vibration level is anticipated to be exceeded (33% Probability of Exceedance)		
	0.3mm/s PPV	1mm/s PPV	10mm/s PPV
Vibratory Sheet Piling	>100*	42	7
Bored Piling	20	10	-
Vibratory Compaction	55	20	4

*Due to limitations in the calculation methodology, the distance at which the vibration level is likely to be exceeded cannot be calculated beyond the distance noted.

11.9.21 To understand the worst-case potential impacts, **Table 11.22** presents the vibration sensitive receptors which are within 100m of piling works and 30m of road surfacing works. Significant effects from road surfacing works are not anticipated to occur 30m from road surfacing works based on professional

judgement. Consideration has been given to the likelihood of exceeding the SOAEL based on the distance between the piling activities and the receptor. The probability of exceeding the SOAEL is noted within the table. If the SOAEL is not exceeded, the effect would be Minor.

Table 11.22: Properties Within 100m of Piling Works and 30m of Road Surfacing Works

Commercial Property	Activity	Minimum Distance (m)	Comment	Receptor Sensitivity	Impact
M3 Motorway Maintenance Compound SO23 7TY	Pile boring and piling and sheet piling	61	<33% probability of exceeding 1mm/s PPV	Medium	<33% probability of a Moderate adverse impact, otherwise impact would be Minor
Homebase, Easton Lane SO23 7UD	Sheet piling	95	<5% probability of exceeding 1mm/s PPV	Medium	<5% probability of a Moderate adverse impact, otherwise impact would be Minor
Unit E, Moorside Road SO23 7RX	Sheet piling	69	<33% probability of exceeding 1mm/s PPV	Medium	<33% probability of a Moderate adverse impact, otherwise impact would be Minor
Unit 1, Moorside Road SO23 7RX	Sheet piling	50	<33% probability of exceeding 1mm/s PPV	Medium	<33% probability of a Moderate adverse impact, otherwise impact would be Minor
Unit 3, Moorside Road	Sheet piling	45	<33% probability of exceeding	Medium	<33% probability of a Moderate adverse impact, otherwise

Commercial Property	Activity	Minimum Distance (m)	Comment	Receptor Sensitivity	Impact
SO23 7RX			1mm/s PPV		impact would be Minor
Unit 5, Moorside Road SO23 7RX	Sheet piling	74	<5% probability of exceeding 1mm/s PPV	Medium	<5% probability of a Moderate adverse impact, otherwise impact would be Minor
Cipher House, Moorside Road SO23 7RX	Sheet piling	66	<33% probability of exceeding 1mm/s PPV	Medium	<33% probability of a Moderate adverse impact, otherwise impact would be Minor
Unit 2, Moorside Road SO23 7FX	Sheet piling	97	<5% probability of exceeding 1mm/s PPV	Medium	<5% probability of a Moderate adverse impact, otherwise impact would be Minor
Unit 3, Moorside Road SO23 7FX	Sheet piling	94	<5% probability of exceeding 1mm/s PPV	Medium	<5% probability of a Moderate adverse impact, otherwise impact would be Minor
Unit 4, Moorside Road SO23 7FX	Sheet piling	90	<5% probability of exceeding 1mm/s PPV	Medium	<5% probability of a Moderate adverse impact, otherwise impact would be Minor

Commercial Property	Activity	Minimum Distance (m)	Comment	Receptor Sensitivity	Impact
Unit 7, Moorside Road SO23 7FX	Sheet piling	72	<5% probability of exceeding 1mm/s PPV	Medium	<5% probability of a Moderate adverse impact, otherwise impact would be Minor
Unit 8, Moorside Road SO23 7FX	Sheet piling	67	<33% probability of exceeding 1mm/s PPV	Medium	<33% probability of a Moderate adverse impact, otherwise impact would be Minor
Grove Works, Moorside Road SO23 7SS	Sheet piling	93	<5% probability of exceeding 1mm/s PPV	Medium	<5% probability of a Moderate adverse impact, otherwise impact would be Minor
Unit 1, London Road, SO23 7QA	Vibratory compaction	25	<33% probability of exceeding 1mm/s PPV	Medium	<33% probability of a Moderate adverse impact, otherwise impact would be Minor
Unit A, London Road, SO23 7QA	Vibratory compaction	25	<33% probability of exceeding 1mm/s PPV	Medium	<33% probability of a Moderate adverse impact, otherwise impact would be Minor
Unit I, London	Vibratory compaction	25	<33% probability of exceeding	Medium	<33% probability of a Moderate adverse impact,

Commercial Property	Activity	Minimum Distance (m)	Comment	Receptor Sensitivity	Impact
Road, SO23 7QA			1mm/s PPV		otherwise impact would be Minor
Unit 1, Easton Lane, SO23 7SL	Vibratory compaction	21	<33% probability of exceeding 1mm/s PPV	Medium	<33% probability of a Moderate adverse impact, otherwise impact would be Minor
Unit 2, Easton Lane, SO23 7SL	Vibratory compaction	22	<33% probability of exceeding 1mm/s PPV	Medium	<33% probability of a Moderate adverse impact, otherwise impact would be Minor
Homebase, Easton Lane, SO23 7UD	Vibratory compaction	16	<50% probability of exceeding 1mm/s PPV	Medium	<50% probability of a Moderate adverse impact, otherwise impact would be Minor
Tesco, Easton Lane, SO23 7RS	Vibratory compaction	26	<33% probability of exceeding 1mm/s PPV	Medium	<33% probability of a Moderate adverse impact, otherwise impact would be Minor

11.9.22 It is not considered that vibration levels would reach 10mm/s PPV at any commercial property and therefore the risk of building damage due to vibration is very low (based on **Table 11.5**). Furthermore, only commercial properties have been identified to be within 100m of piling works and 30m of road surfacing works, which have a Medium receptor sensitivity.

11.9.23 Based on the results of the construction vibration assessment, the probability of moderate impact at one commercial property is less than 50%. Based on the commercial property having a medium sensitivity, this would result in a moderate effect. A significant effect is therefore considered unlikely.

11.9.24 Based on the results of the construction vibration assessment, the probability of moderate impact at 12 commercial properties is less than 33%. Based on the commercial properties having a medium sensitivity, this would result in a moderate effect. A significant effect is therefore considered unlikely.

11.9.25 Based on the results of the construction vibration assessment, the probability of moderate impact at 7 commercial properties is less than 5%. Based on the commercial properties having a medium sensitivity, this would result in a moderate effect. A significant effect is therefore considered unlikely.

11.9.26 Where there is a possibility that moderate impacts could occur, care should be taken on site during vibratory sheet piling works to minimise excessive vibration where practicable, and trial vibration monitoring should be undertaken. As the works would be undertaken linearly (i.e. the location would continuously change as works progress) the probability of moderate construction vibration impacts is reduced further, as it is unlikely that receptors would be exposed to these levels of vibration for 10 or more days or nights in any consecutive 15 days or night, or a total number of days exceeding 40 in any 6 consecutive months. Significant effects are therefore not anticipated.

Construction traffic

11.9.27 As described in **Paragraph 11.4.42**, the average number of two-way vehicle movements could be up to 140 per day during Phase 1, which is the largest number across all three phases.

11.9.28 Material supplies for the Scheme are anticipated to access the site from the M3 heading northbound, the M3 heading southbound, or the A34 heading south.

11.9.29 Annual Average Weekday Traffic (18 hour) levels on these routes during construction (excluding construction vehicles) are as follows:

- A34 southbound (north of A33) – 23,733, 17% HGV
- A34 northbound (north of A33) – 30,803, 15% HGV
- A34 southbound – 30,087, 14% HGV
- A34 northbound – 36,150, 13% HGV
- M3 southbound (north of Junction 9) – 32,490, 10% HGV
- M3 northbound (north of Junction 9) – 34,803, 7% HGV
- M3 southbound (south of Junction 9) – 57,424, 12% HGV

- M3 northbound (south of Junction 9) – 61,444, 11% HGV

11.9.30 Based on vehicles travelling along the major road network to access the site, noise levels are not anticipated to increase by 1dBA or more and therefore significant effects as a result of construction traffic noise are not anticipated.

11.9.31 Major temporary diversions anticipated during construction are outlined in **Chapter 2 (The Scheme and its Surroundings)** of the **ES (Document Reference 6.1)**.

11.9.32 In accordance with DMRB LA 111 Noise and Vibration (Highways England, 2020), dwellings within 25m of the kerbs of night-time diversion routes have been identified. Based on dwellings having a high sensitivity and the noise impact being Moderate or Major along diversion routes at night, the resultant effects could be Moderate, Large or Very Large at receptors within 25m of the diversion routes.

11.9.33 The dwellings anticipated to experience Moderate, Large or Very Large effects which are significant are detailed in **Appendix 11.2 (Receptors Affected by Noise from Construction Traffic Diversion Routes)** of the **ES (Document Reference 6.3)** and identified in **Figure 11.2 to Figure 11.9** of the **ES (Document Reference 6.2)**.

11.9.34 The number of residential properties within 25m of night-time traffic diversion routes are summarised in **Table 11.23**.

Table 11.23: Properties Within 25m of Night-time Traffic Diversion Routes

Diversion Route	Number of Properties within 25m	Duration & instances
A34 Southbound	210	10 X Overnight
A34 Northbound	267	10 X Overnight
M3 Junction 9-11	207	32 X Overnight
Easton Lane Northbound	163	5 X Overnight
Easton Lane Southbound	154	5 X Overnight
A272 Spitfire Link	207	10 X Overnight
A33 Northbound	54	10 X Overnight

Diversion Route	Number of Properties within 25m	Duration & instances
A33 Southbound	56	10 X Overnight

11.9.35 In total, 1,318 residential dwellings are anticipated to experience noise impacts during traffic diversions at night. Based on the anticipated timings of the road closures, (i.e. not being over 15 days/nights in any 40 days/nights or 40 days/nights in six consecutive months) these impacts are not anticipated to be significant.

Operation – opening year (short-term)

11.9.36 The study area for the operational noise assessment is provided in **Figure 11.1: M3 Junction 9 Noise Study Areas, Noise Measurement Locations and Receptors** (**Document Reference 6.2**).

11.9.37 A summary of the operational noise change between the Do-Minimum and Do-Something scenarios in the Opening Year (2027) is presented in **Table 11.24**.

Table 11.24: Results of Operational Noise Change Assessment – Short-term

Change in Noise Level (dBA)		Magnitude of Impact	Daytime (dB $L_{A10,18h}$)		Night-time (dB L_{night})	
			Number of Dwellings	Number of Other Noise Sensitive Receptors	Number of Dwellings	Number of Other Noise Sensitive Receptors
Increase in Noise Level	0.1 to 0.9	Negligible	1031	254	961	222
	1.0 to 2.9	Minor	373	68	510	152
	3.0 to 4.9	Moderate	0	1	0	1
	> 5 +	Major	0	0	0	0
No Change	0	No Change	18	1	27	0
	0.1 to 0.9	Negligible	121	49	51	38

Change in Noise Level (dBA)		Magnitude of Impact	Daytime (dB $L_{A10,18h}$)		Night-time (dB L_{night})	
			Number of Dwellings	Number of Other Noise Sensitive Receptors	Number of Dwellings	Number of Other Noise Sensitive Receptors
Decrease in Noise Level	1.0 to 2.9	Minor	136	39	132	31
	3.0 to 4.9	Moderate	2	32	0	10
	> 5 +	Major	0	12	0	2

11.9.38 The relative noise change and noise impact at individual receptors is identified in **Figure 11.19 (Operational Noise Change 2027 Do-Minimum Scenario Vs Do-Something Scenario (Daytime))** and **Figure 11.20 (Operational Noise Change 2027 Do-Minimum Scenario Vs Do-Something Scenario (Night Time))** of the **ES (Document Reference 6.2)** and the noise impact at each receptor is reported in **Appendix 11.4 (Operational Noise Receptor Results)** of the **ES (Document Reference 6.3)** and described in **paragraph 11.9.76** onwards.

11.9.39 Based on the results, there are no residential properties which are anticipated to be eligible for additional noise insulation under the Noise Insulation Regulations. This is because no properties are anticipated to experience an increase of more than 1dBA above the specified level (68dB $L_{A10,18hr}$).

11.9.40 The majority of dwellings anticipated to experience a noise increase are as an indirect result of the Scheme due to an increase in traffic flow along Easton Lane / Wales Street. The highest modelled noise increase at these receptors is 1.8dB $L_{A10,18h}$ (minor adverse impact). The significance is concluded below under 'Operation – significant effects'.

11.9.41 Dwellings are anticipated to experience a noise decrease as a direct and indirect result of the Scheme. Indirect effects are due to reduced traffic flows along the B3047. Direct effects are due to the conversion of the slip road from the A34 to the A33 into a public footpath. The greatest modelled noise decrease at these receptors is 3.1dB (moderate beneficial impact). The significance is concluded below under 'Operation – significant effects'.

11.9.42 32 receptors anticipated to experience a noise decrease of between 3.0 and 4.9dB (moderate beneficial) are commercial receptors along Moorside Road, due to the re-routing of traffic along the A34, which with the Scheme, would be moved towards the east.

11.9.43 12 receptors anticipated to experience a noise decrease of more than 5dB (major beneficial) are commercial receptors along Moorside Road, due to the re-routing of traffic along the A34, which with the Scheme, would be moved towards the east. One commercial receptor is expected to experience a noise increase of between 3.0 and 4.9 dB (moderate adverse) along Easton Lane as a result of the change in traffic along Easton Lane. The significance is concluded below under 'Operation – significant effects'.

Noise important areas

11.9.44 Three NIAs have been identified, refer to **Figure 11.1 (M3 Junction 9 Noise Study Areas and Noise Measurements Locations and Receptors)** of the **ES (Document Reference 6.2)**.

11.9.45 The largest anticipated increase in noise levels in NIA 4006 is 1.2dB $L_{A10,18h}$, which represents a minor increase. There are no anticipated decreases in noise in NIA 4006. There are two residential properties located within NIA 4006. The modelled sound levels at properties exposed to an increase of 1dB or more are below the SOAEL (i.e. below 68 dB $L_{A10,18hour}$)

11.9.46 The largest anticipated increase in noise levels in NIA 4007 is 0.5dB $L_{A10,18h}$, which represents a negligible increase. The largest anticipated decrease in noise levels in NIA 4007 is 0.7dB $L_{A10,18h}$, which also represents a negligible decrease. There are 37 residential properties located within NIA 4007.

11.9.47 The largest anticipated increase in noise levels in NIA 4008 is 1.1dB $L_{A10,18h}$, which represents a minor increase. The largest anticipated decrease in noise levels in NIA 4008 is 0.2dB $L_{A10,18hr}$, which represents a negligible decrease. There are 197 residential properties located within NIA 4008. The modelled sound levels at properties exposed to an increase of 1dB or more are below the SOAEL (i.e. below 68 dB $L_{A10,18hour}$)

11.9.48 Based on the results, the magnitude of noise impact therefore ranges between minor adverse and negligible beneficial. For residential dwellings with a high sensitivity, this equates to a slight beneficial and slight adverse effect which is not significant.

Public rights of way

11.9.49 Based on the results of the noise modelling exercise, average daytime $L_{Aeq,16h}$ noise levels along existing public rights of way (including within the National Park) are 63dB $L_{Aeq,16h}$ in both the Do-Minimum and Do-Something scenario, and the increase is less than 1dB. The magnitude of noise impact is therefore considered to be negligible. For public rights of way, as receptors with medium sensitivity, this equates to a neutral or slight effect which is not significant.

11.9.50 The proposed new public right of way to the west of the Scheme (as shown on **Figure 2.3 (Environmental Masterplan)** of the **ES (Document Reference 6.2)** is anticipated to experience average daytime $L_{Aeq,16h}$ noise level of 71dB.

11.9.51 The proposed new public right of way to the east of the Scheme (as shown on **Figure 2.3 (Environmental Masterplan)** of the **ES (Document Reference 6.2)** is anticipated to experience average daytime $L_{Aeq,16h}$ noise levels of 64dB.

11.9.52 There is no noise change associated with noise along the proposed new public right of ways as these public rights of way do not exist in the Do-Minimum scenario. It is therefore not possible to attribute a significance in terms of noise impact.

Heritage assets

11.9.53 The results of the noise modelling exercise at heritage assets are summarised in **Table 11.25**.

Table 11.25: Operation Noise Change at Heritage Assets – Short-term

Receptor	Daytime $L_{Aeq,16h}$ (dB)		
	2027 Do-Minimum	2027 Do-Something	Change
Anglo-Saxon Cemetery	54.0	54.3	0.3
Round Barrow Cemetery	55.1	55.1	0
Site of St Gertrude's Chapel	56.2	57.4	1.2

11.9.54 The above results indicate that with the Scheme, one scheduled monument (Round Barrow Cemetery) is anticipated to experience no change in daytime noise levels. For scheduled monuments, as receptors with medium sensitivity, this equates to a neutral effect which is not significant.

11.9.55 The above results indicate that with the Scheme, one scheduled monument (Anglo-Saxon Cemetery) is anticipated to experience a negligible increase in daytime noise levels of between 0.1 and 0.9dB $L_{A10,18h}$. For scheduled monuments, as receptors with medium sensitivity, this equates to a neutral or slight adverse effect which is not significant.

11.9.56 The above results indicate that with the Scheme, one scheduled monument (Site of St Gertrude's Chapel) is anticipated to experience a minor increase in daytime noise levels of between 1.0 and 2.9dB $L_{A10,18h}$. For scheduled monuments, as receptors with medium sensitivity, this equates to a slight adverse effect which is not significant.

Ecological receptors

11.9.57 Noise levels at the River Itchen Bridge are anticipated to be 69.1dB $L_{Aeq,16hr}$ in the Do-Minimum 2027 scenario and 70.4dB $L_{Aeq,16hr}$ in the 2027 Do-Something Scenario, which equates to a 1.3 dB increase.

11.9.58 Based on the results of the noise modelling exercise, noise levels at ecological receptors with the scheme are not anticipated to increase or decrease by more than 3dB in the Opening Year (2027) Do-Minimum. The magnitude of noise impact is therefore considered to be negligible. The significance is considered within **Chapter 8: Biodiversity (Document Reference 6.1)**.

Operation - future year (long-term)

11.9.59 A summary of the operational noise change between the Do-Minimum Opening Year (2027) and Do-Something Future Year (2042) scenarios is presented in **Table 11.26**.

Table 11.26: Results of Operational Noise Change Assessment – Long-termChange in Noise Level (dBA)		**Magnitude of Impact**	**Daytime (dB $L_{A10,18h}$)**		**Night-time (dB L_{night})**	
			Number of Dwellings	**Number of Other Noise Sensitive Receptors**	**Number of Dwellings**	**Number of Other Noise Sensitive Receptors**
Increase in Noise Level	0.1 to 2.9	Negligible	1490	333	1453	358
	3.0 to 4.9	Minor	0	1	0	1
	5.0 to 9.9	Moderate	0	0	0	0
	> 10 +	Major	0	0	0	0
No Change	0	No Change	0	0	1	0
Decrease in Noise Level	0.1 to 2.9	Negligible	191	95	227	85
	3.0 to 4.9	Minor	0	15	0	10
	5.0 to 9.9	Moderate	0	12	0	2
	> 10 +	Major	0	0	0	0

11.9.60 The relative noise change and noise impact at individual receptors is identified in **Figure 11.21 (Operational Noise Change 2027 Do-Minimum Scenario Vs 2042 Do-Something Scenario (Daytime))** and **Figure 11.22 (Operational**

Noise Change 2027 Do-Minimum Scenario Vs 2042 Do-Something Scenario (Night Time)) of the **ES (Document Reference 6.2)** and significance is reported in **Appendix 11.4 (Operational Noise Receptor Results)** of the **ES (Document Reference 6.3)** below under 'Operation – significant effects'.

11.9.61 The 12 receptors anticipated to experience a noise decrease of more than 5dB (moderate beneficial impact) are commercial receptors along Moorside Road, due to the re-routing of traffic along the A34, which with the Scheme, would be moved towards the east.

11.9.62 With the exception of the commercial units anticipated to experience a moderate beneficial impact in noise terms, the magnitude of noise impact at other receptors ranges between negligible and minor beneficial and adverse at the assessed receptors.

Noise important areas

11.9.63 The noise levels in NIA 4006 are expected to reduce by 0.7dB $L_{A10,18h}$, which is considered to be a negligible decrease. There are two residential dwellings located within NIA 4006.

11.9.64 The largest anticipated increase in noise levels in NIA 4007 is 0.6dB $L_{A10,18h}$, which is considered to be negligible increase. There are 37 residential dwellings located within NIA 4007.

11.9.65 The largest anticipated increase in noise levels in NIA 4008 is 1.1dB $L_{A10,18h}$, which is considered to be a negligible increase. There are 197 residential dwellings located within NIA 4008.

11.9.66 The magnitude of noise impact is considered to be negligible. For residential dwellings with high sensitivity the effect is slight beneficial and slight adverse which is not significant.

Public rights of way

11.9.67 Based on the results of the noise modelling exercise, average daytime $L_{Aeq,16h}$ noise levels along existing public rights of way (including those within the National Park) are 63 and 63dB $L_{Aeq,16h}$ in both the Do-Minimum and Do-Something scenarios respectively, and the increase is less than 1dB. The magnitude of noise impact is therefore considered to be negligible. For public rights of way, as receptors with medium sensitivity, this equates to a slight adverse effect which is not significant.

11.9.68 The proposed new public right of way to the west of the Scheme (as shown on **Figure 2.3 (Environmental Masterplan)** of the **ES (Document Reference 6.2)** is anticipated to experience average daytime $L_{Aeq,16h}$ noise level of 71dB.

11.9.69 The proposed new public right of way to the east of the Scheme (as shown on **Figure 2.3 (Environmental Masterplan)** of the **ES (Document Reference 6.2)** is anticipated to experience average daytime $L_{Aeq,16h}$ noise levels of 64dB.

11.9.70 There is no noise change associated with noise along the proposed new public right of ways as these public rights of way do not exist in the Do-Minimum scenario. It is therefore not possible to attribute a significance in terms of noise impact.

Heritage assets

11.9.71 The results of the noise modelling exercise at heritage assets are summarised in **Table 11.27**.

Table 11.27: Operation Noise Change at Heritage Assets – Long-term

Receptor	Daytime $L_{Aeq,16h}$ (dB)		
	2042 Do-Minimum	2042 Do-Something	Change
Anglo-Saxon Cemetery	54.0	54.1	0.1
Round Barrow Cemetery	55.2	55.3	0.1
Site of St Gertrude's Chapel	56.0	57.4	1.4

11.9.72 The above results indicate that with the Scheme, three scheduled monuments are anticipated to experience a negligible increase in daytime noise levels of between 0.1 and 1.4dB $L_{A10,18h}$.

11.9.73 For scheduled monuments, as receptors with medium sensitivity, this equates to a slight adverse effect which is not significant.

Ecological receptors

11.9.74 Noise levels at the River Itchen Bridge are anticipated to be 65.8dB $L_{Aeq,16hr}$ in the Do-Minimum 2042 scenario and 68.1dB $L_{Aeq,16hr}$ in the 2042 Do-Something Scenario, which equates to a 2.3 dB increase.

11.9.75 Based on the results of the noise modelling exercise, noise levels at ecological receptors with the scheme are not anticipated to increase or decrease by more than 5dB in the Future Year (2042) against the Opening Year (2027) Do-Minimum scenario. The magnitude of noise impact is therefore considered to be negligible. The significance is considered within **Chapter 8: Biodiversity** of the **ES (Document Reference 6.1)**.

Operation – significant effects

11.9.76 Properties anticipated to experience short-term and long-term significant effects are identified in **Appendix 11.4: Operational Noise Receptor Results** of the **ES (Document Reference 6.3)**.

11.9.77 Based on the results and guidance provided within Table 3.60 of LA 111 Noise and Vibration (Highways England, 2020) and reproduced in **Table 11.10**, short-term significant beneficial effects are anticipated at 2 dwellings based on the magnitude of impact (i.e. moderate), sensitivity of dwellings (i.e. high) and exposure to absolute sound levels above the SOAEL. The effect is anticipated to be indirectly related to the Scheme. The indirectly affected dwelling is anticipated to experience a reduction in traffic flows on the surrounding road network, as a result of the Scheme. In the long-term, these effects are not considered significant, as the impact in the long-term is negligible.

11.9.78 Short-term significant adverse effects are anticipated at 20 dwellings based on the magnitude of impact in the short-term (i.e. minor), sensitivity of dwellings (i.e. high) and exposure to absolute sound levels above the SOAEL. Of these, none are anticipated to be directly related to traffic using the Scheme, and 20 are anticipated to be indirectly related to the Scheme. These indirectly affected dwellings are anticipated to experience an increase in traffic flows on the surrounding road network, as a result of the Scheme. In the long-term, these effects are not considered significant, as the impact in the long-term is negligible, and where minor noise increases are anticipated at night, the absolute sound level at the receptor is below the SOAEL.

11.9.79 Long-term significant adverse effects are not anticipated at any dwellings, as there are no dwellings which are anticipated to experience minor noise increases or decreases.

11.9.80 Short-term significant adverse effects are anticipated at one commercial receptor based on the magnitude of impact in the short-term (i.e. moderate) and sensitivity of commercial receptors (i.e. medium). The impact at this receptor is not directly related to traffic using the scheme (i.e. it is indirectly affected). In the long-term, these effects are not considered significant, as the impact in the long-term is minor.

11.9.81 Short-term significant beneficial effects are anticipated at 44 commercial receptors based on the magnitude of impact in the short-term (i.e. moderate or major) and sensitivity of commercial receptors (i.e. medium). The impact at these receptors is directly related to traffic using the scheme. In the long-term, 8 of these commercial receptors are anticipated to experience significant beneficial effects based on the magnitude of impact in the long-term (i.e. moderate) and sensitivity of commercial receptors (i.e. medium). These effects are considered significant, as the impact in the long-term is moderate. The remaining 36 commercial receptors are anticipated to experience negligible or minor noise impacts and would not result in significant effects in the long-term.

11.9.82 Based on the results of the short-term and long-term assessments, significant beneficial effects during operation are anticipated at 8 commercial receptors.

11.10 Monitoring

Construction

11.10.1 Paragraph 4.1 of the DMRB LA 111 (Highways England, 2020) states:

"*Likely significant environmental effects from noise and/or vibration during construction shall be monitored.*

Monitoring of likely significant effects should include one or more of the following:

1) *verification that specific noise and vibration mitigation measures are in place for activities where there is potential for likely significant effects to occur in their absence;*

2) *measurement of noise and/or vibration;*

3) *checking that noise and vibration management procedures and practices are sufficient to ensure that adverse effects are no worse than set out in the assessment report*."

11.10.2 The requirement for demolition and construction noise and vibration monitoring would be agreed with Winchester City Council through a Section 61 application – the commitment to applying for this consent is outlined within the **fiEMP (Document Reference 7.3)**. In addition, monitoring requirements would also be outlined within the Noise and Vibration Management Plan.

11.10.3 The exact methodology and location of the monitoring would be agreed with the Local Authority through the submission of a Section 61 application and the Noise and Vibration Monitoring Plan prior to the commencement of any works.

Operational road traffic noise

11.10.4 Paragraph 4.2 of the DMRB LA 111 (Highways England, 2020) states:

"*Likely significant environmental effects from noise during operation shall be monitored and include:*

1) *ensuring mitigation measures included with the project design are incorporated with the as-built project. Where they are not included, ensuring resultant noise levels, taking account of any additional mitigation installed but not included in the assessed design, are no higher than set out in the project assessment;*

2) *ensuring specifications of noise mitigation measures, including barriers and low noise surfaces, meet design specifications."*

11.10.5 However, with respect to post construction noise monitoring, the note to Paragraph 4.2 states:

> "*Post construction noise monitoring cannot provide a reliable gauge for whether the predicted magnitude and extent of operational adverse impacts are greater or less than those predicted in the assessment, this is due to the following reasons:*
>
> *1) the assessment is based on annual average conditions with and without the project to ensure a like-for-like comparison, which is not possible to replicate through monitoring within a reasonable timescales;*
>
> *2) monitoring in the absence of the project would need to be completed before the start of the construction works, and would therefore be a number of years before the with-scheme monitoring and the assessment completed for the environmental statement is based on calculated road traffic noise levels, whereas ambient noise monitoring can be affected by other noise sources such as people, agricultural activities, military activities, aircraft etc."*

11.10.6 Therefore, based on the information outlined above, noise monitoring during the operational phase of the Scheme has not been proposed.

11.11 Summary

11.11.1 An assessment has been undertaken of the likely effects of the construction, and operational phases of the Scheme on the sound and vibration climate at noise sensitive receptors around the Scheme.

11.11.2 Noise arising from demolition and construction of the Scheme was assessed to determine the impact on existing receptors. Construction noise and vibration from the Scheme is anticipated to have a minor to negligible impact on existing receptors at the majority of receptors and is deemed to be not significant. However, some residential areas located close to the Scheme are likely to experience temporary significant effects from demolition and construction noise. However, the assessment was undertaken without noise mitigation being implemented. With no noise mitigation, temporary moderate effects which are significant, are anticipated at a number of residential dwellings and commercial properties. Although, with the inclusion of the mitigation outlined within the **fiEMP (Document Reference 7.3)**, the resultant effect is anticipated to be reduced such that temporary moderate adverse impacts would be reduced to temporary minor adverse impacts, and temporary major adverse impacts are likely to be reduced to temporary moderate adverse impacts. For residential dwellings with a high sensitivity, this equates to slight or moderate effects for minor adverse impacts and moderate or large effects for moderate adverse impacts. In the long-term these effects are not considered significant, as the impact is short-term only.

11.11.3 Noise arising from night-time diversions has been assessed. Based on the anticipated schedule of night-time diversions, significant effects are not anticipated.

11.11.4 Operational noise from traffic flows on the Scheme has been assessed to determine the impact on the existing and new road network and the potential change of road traffic noise on existing receptors.

11.11.5 Based on the results and guidance provided within Table 3.60 of LA 111 Noise and Vibration (Highways England, 2020) and reproduced in **Table 11.10**, short-term significant beneficial effects are anticipated at one dwelling based on the magnitude of impact (i.e. moderate), sensitivity of dwellings (i.e. high) and exposure to absolute sound levels above SOAEL. The dwelling is anticipated to be indirectly related to the Scheme (i.e. they do not result from changes in noise levels from traffic using the Scheme). The effect on the residential dwelling which is indirectly affected by the Scheme, results from a reduction in traffic flows on the surrounding road network, due to the Scheme. In the long-term, these effects are not considered significant, as the impact in the long-term is negligible.

11.11.6 Short-term significant adverse effects following the implementation of mitigation (e.g. very low noise road surfacing of resurfaced elements) are anticipated at 20 residential dwellings based on the magnitude of impact in the short-term (i.e. minor), sensitivity of dwellings (i.e. high) and exposure to absolute sound levels above SOAEL. Of these, none are anticipated to be directly related to traffic using the Scheme, and 20 are anticipated to be indirectly related to the Scheme (i.e. they do not result from changes in noise levels from traffic using the Scheme). The residential dwellings which are indirectly affected by the Scheme result from an increase in traffic flows on the surrounding road network, due to the Scheme.

11.11.7 In the long-term, these effects would not be significant, as the impact in the long-term is predicted to be negligible. On this basis, mitigation is not considered to be required.

11.11.8 Significant beneficial effects are anticipated at 8 commercial receptors based on the results of the short-term and long-term noise impacts.