M60/M62/M66 Simister Island Interchange

TR010064

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 6.1

April 2024

Infrastructure Planning

Planning Act 2008

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

M60/M62/M66 Simister Island Interchange

Development Consent Order 202[ ]

ENVIRONMENTAL STATEMENT
CHAPTER 11 NOISE AND VIBRATION

Regulation Reference	Regulation 5(2)(a)
Planning Inspectorate Scheme Reference	TR010064
Application Document Reference	TR010064/APP/6.1
Author	M60/M62/M66 Simister Island Interchange Costain Jacobs Partnership Project Team & National Highways

Version	**Date**	**Status of Version**
P01	April 2024	DCO APPLICATION ISSUE

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11.1 Introduction

11.1.1 Noise and vibration can have an effect on the environment and on the quality of life enjoyed by individuals and communities. It may in certain circumstances lead to effects on human, ecological and infrastructure (e.g. buildings) receptors.

11.1.2 This chapter describes the findings of the noise and vibration assessment undertaken for the Environmental Statement and the likely environmental effects of the Scheme, during both construction and operation.

11.1.3 This chapter is supported by the following Environmental Statement Figures (TR010064/APP/6.2):

- Figure 11.1a: Noise Study Areas, Noise Important Areas and Existing Noise Barriers
- Figure 11.1b: Noise Monitoring Locations and Areas of Application of Construction Noise Effect Levels
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- Figure 11.9b: Road Traffic Noise – Magnitude of Change in the 2044 Future Year (Night-time)

11.1.4 This chapter is supported by the following Environmental Statement Appendices (TR010064/APP/6.3):

- Appendix 11.1: Introduction to Acoustics
- Appendix 11.2: Noise and Vibration Assessment Guidance and Standards
- Appendix 11.3: Baseline Noise Survey Results
- Appendix 11.4: Construction Noise Calculations
- Appendix 11.5: Operational Noise Calculation Results

11.2 Competent expert evidence

11.2.1 The assessment has been undertaken and reported by a team of competent noise and vibration specialists. The competent expert responsible for the assessment is an Associate Director of Acoustics with a Diploma in Acoustics and Noise Control and a Batchelor of Science in Environmental Sciences. They are a member of the Institute of Acoustics, a member of the Institute of Environmental Sciences and a Chartered Environmentalist. They have over 20 years' experience of undertaking noise and vibration Environmental Impact Assessments (EIA) for major infrastructure and linear schemes, including highways.

11.3 Legislative and policy framework

Legislation

11.3.1 The noise and vibration assessment has been undertaken in accordance with the legislation set out in Table 11.1.

Table 11.1 Legislation relevant to the noise and vibration assessment

Legislation	Relevance to the Scheme	How this legislation is addressed in the assessment
Land Compensation Act 1973	Part I of the Land Compensation Act 1973 (LCA) provides a means by which compensation can be paid to owners of land or property due to a loss in value of these assets caused by public works, such as new or improved roads. Noise and vibration are two of the factors which would be considered in any claims for compensation, but the claim should consider all changes and effects, including betterment. Part II of the Act imposes a duty on authorities to undertake or make a grant in respect of the cost of undertaking noise insulation work in or to eligible buildings. This is subject to meeting certain criteria given in the Noise Insulation Regulations 1975, as amended 1988.	The assessment presented in this chapter considers the changes in road traffic noise that would result from the Scheme, including improved noise mitigation in some areas, providing information that would be used to inform Part I and Part II claims.
The Noise Insulation Regulations 1975 (as amended 1988)	The Noise Insulation Regulations (NIR) are intended to protect residents subject to increases in traffic noise at or above a specified level arising directly from the use of new or altered roads, by making available grants for noise insulation work to be carried out on their homes. Specific circumstances need to be present for the Regulations to apply, as follows; • The receptor is a dwelling or a building used for residential purposes and is located within 300m of the nearest point of the carriageway of the highway; • The road traffic noise level at the dwelling after the work must be above a façade level of $L_{A10,18h}$ 68 decibels (dB); • Be at least 1dB(A) greater than the prevailing noise level immediately before the work; and • The noise level from the highway, additional carriageway, or alteration must contribute at least 1dB(A) to the relevant noise level at the receptor.	An initial assessment of any potential eligibility for noise insulation in accordance with the NIR has been undertaken and is presented in Section 11.10 of this chapter.

Legislation	Relevance to the Scheme	How this legislation is addressed in the assessment
Control of Pollution Act 1974 (CoPA)	The CoPA grants powers to deal with noise nuisances and places a duty on local authorities to inspect their areas from time to time in order to detect anything which should be dealt with under the Act. Section 60 of the CoPA enables a local authority, in whose area work is going to be carried out, or is being carried out, to serve a notice of its requirements for the control of site noise on the person who appears to the local authority to be carrying out the works and on such other persons appearing to the local authority to be responsible for, or to have control over, the carrying out of the works. Under Section 61 of the CoPA, a developer may apply to the local authority for prior consent to carry out construction or demolition works. A Section 61 application will contain details of the work to be carried out, the time of the works and also details of any measures to reduce the noise from the works.	The assessment presented in this chapter considers both temporary and permanent noise and vibration impacts from the Scheme. For any construction works required for the Scheme which have the potential to create effects on noise sensitive receptors a Section 61 consent would be considered or discussed with the Local Authority. This would specify levels of construction noise limits at agreed noise-sensitive properties along with specific mitigation measures.
The Environmental Noise (England) Regulations 2006 (as amended 2008, 2009)	The Environmental Noise Directive 2002/49/EC sets out an ongoing programme of noise mapping and noise action planning, aimed at: '*preventing and reducing environmental noise where necessary and particularly where exposure levels can induce harmful effects on human health and to preserving environmental noise quality where currently good.*' This European Directive was transposed into law by the Environmental Noise (England) Regulations 2006. In addition, following a sift process of the noise mapping, Department for Environment, Food and Rural Affairs (Defra) assigned certain areas the status of an Important Area. Important Areas with respect to noise from roads or railways are where the 1% of the population that are affected by the highest noise levels from roads or major railways are located, according to the results of the strategic noise mapping.	The assessment has identified additional noise mitigation for the Scheme, as described in Section 11.9 of this chapter, in order to reduce environmental road traffic noise impacts. The noise important areas (NIAs) within the study area for the Scheme have been identified and listed in Table 11.15 of this chapter. A summary of predicted noise changes for receptors within these NIAs is presented in Table 11.34.

Legislation	Relevance to the Scheme	How this legislation is addressed in the assessment
Environmental Protection Act, 1990	The Environmental Protection Act contains the main legislative controls for noise pollution in the UK. Section 80 of the Act gives local authorities the power to serve a noise abatement notice where a statutory noise nuisance exists. Section 82 allows any individual to apply to a magistrate's court for a noise abatement notice to be served if the court is convinced that a statutory nuisance exists.	Construction noise and vibration impacts have been considered in Section 11.10 of this chapter. Section 11.9 of this chapter summarises mitigation measures that will be employed during the construction phase to mitigate and minimise noise and vibration impacts.

Policy

National Policy Statement for National Networks

11.3.2 The National Policy Statement for National Networks (NPS NN) (Department for Transport (DfT), 2014) sets out the Government's policies relating to the development of Nationally Significant Infrastructure Projects (NSIPs) on the national road and rail networks in England. The Secretary of State uses the NPS NN as the primary basis for making decisions on DCO applications.

11.3.3 Table 11.2 summarises the policy requirements from the NPS NN relating to the applicant's assessment and mitigation requirements for noise and vibration and how these requirements have been addressed in the assessment. See also the NPS NN Accordance Tables (TR010064/APP/7.2) for an assessment of the Scheme's compliance with the NPS NN.

Table 11.2 NPS NN requirements for noise and vibration

Paragraph reference	Applicant's assessment / mitigation requirement	How this requirement is addressed in the assessment
5.189	*'Where a development is subject to EIA and significant noise impacts are likely to arise from the proposed development, the Applicant should include the following in the noise assessment, which should form part of the environment statement:* • *a description of the noise sources including likely usage in terms of number of movements, fleet mix and diurnal pattern. For any associated fixed structures, such as ventilation fans for tunnels, information about the noise sources including the identification of any distinctive tonal, impulsive or low frequency characteristics of the noise.*	A description of existing conditions is contained within Section 11.7 of this chapter. The noise sources with the Scheme are described within Section 11.8 of this chapter.
	• *identification of noise sensitive premises and noise sensitive areas that may be affected.*	The noise sensitive premises are identified within Section 11.7 of this chapter and are shown on Figure 11.2: Noise Sensitive Receptors of the Environmental Statement Figures (TR010064/APP/6.2).
	• *the characteristics of the existing noise environment.*	The characteristics of the existing noise environment are described within Section 11.7 and within Appendix 11.3: Baseline Noise Survey Results of the Environmental Statement Appendices (TR010064/APP/6.3).
	• *a prediction on how the noise environment will change with the proposed development:* - *In the shorter term such as during the construction period;* - *in the longer term during the operating life of the infrastructure;* - *at particular times of the day, evening and night as appropriate.*	The predicted change in noise arising from the Scheme is provided within Sections 11.8 and 11.10 of this chapter.

Paragraph reference	Applicant's assessment / mitigation requirement	How this requirement is addressed in the assessment
	• *an assessment of the effect of predicted changes in the noise environment on any noise sensitive premises and noise sensitive areas.*	An assessment is provided in Sections 11.8 and 11.10 of this chapter.
	• *measures to be employed in mitigating the effects of noise. Applicants should consider using best available techniques to reduce noise impacts.*	Mitigation is included in the Register of Environmental Actions and Commitments (REAC), contained within the First Iteration Environmental Management Plan (EMP) (TR010064/APP/6.5), and secured through Requirement 4 of the draft DCO (TR010064/APP/3.1).
	• *the nature and extent of the noise assessment should be proportionate to the likely noise impact.'*	This assessment is considered to be proportionate to the scale of the potential impacts of the Scheme.
5.190	*'The potential noise impact elsewhere that is directly associated with the development, such as changes in road and rail traffic movements elsewhere on the national networks, should be considered as appropriate.'*	The assessment of road traffic noise presented in this Environmental Statement includes consideration of changes in road traffic noise for all road links where a change in noise is predicted, regardless of whether they are close to the Scheme or at a greater distance.
5.191	*'Operational noise, with respect to human receptors, should be assessed using the principles of the relevant British Standards and other guidance. The prediction of road traffic noise should be based on the method described in Calculation of Road Traffic Noise. The prediction of noise from new railways should be based on the method described in Calculation of Railway Noise. For the prediction, assessment and management of construction noise, reference should be made to any relevant British Standards and other guidance which also give examples of mitigation strategies.'*	The predictions of road traffic noise are presented in Section 11.10 of this chapter. They have been undertaken following the calculation methodology provided in Calculation of Road Traffic Noise (CRTN) (Department of Transport and Welsh Office, 1988). The assessments of construction noise and vibration have been undertaken with reference to British Standard (BS) 5228 Part 1 (British Standards Institution (BSI), 2014a) and Part 2 (BSI, 2014b).

Paragraph reference	Applicant's assessment / mitigation requirement	How this requirement is addressed in the assessment
5.192	*'The Applicant should consult Natural England with regard to assessment of noise on designated nature conservation sites, protected landscapes, protected species or other wildlife. The results of any noise surveys and predictions may inform the ecological assessment. The seasonality of potentially affected species in nearby sites may also need to be taken into account.'*	The Applicant has consulted Natural England as detailed in Section 8.4 of Chapter 8: Biodiversity of this Environmental Statement (TR010064/APP/6.1). The assessment of noise impacts on biodiversity, arising during both the construction and operational phase, is also presented in Chapter 8: Biodiversity of this Environmental Statement (TR010064/APP/6.1). It includes consideration of disturbance to protected species as a result of changes in noise levels.
5.195	*'The Secretary of State should not grant development consent unless satisfied that the proposals will meet, the following aims, within the context of Government policy on sustainable development:* • *avoid significant adverse impacts on health and quality of life from noise as a result of the new development;* • *mitigate and minimise other adverse impacts on health and quality of life from noise from the new development; and* • *contribute to improvements to health and quality of life through the effective management and control of noise, where possible.'*	Likely significant adverse effects from the Scheme have been avoided. This has been achieved using the provision of a surface with better noise reducing properties than a conventional low noise surface (LNS) (see Section 11.9 of this chapter for further details). Adverse impacts from the Scheme have been minimised through the choice of alignment. The use of measures to reduce the noise at source (a surface with better noise reducing properties than a conventional LNS) has provided widespread reductions in noise for communities living alongside the Scheme.
5.197	*'The Examining Authority and the Secretary of State should consider whether mitigation measures are needed both for operational and construction noise over and above any which may form part of the project application. The Secretary of State may wish to impose requirements to ensure delivery of all mitigation measures.'*	Mitigation measures are described in Section 11.9 of this chapter. Mitigation is included in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5), and secured through Requirement 4 of the draft DCO (TR010064/APP/3.1).

Paragraph reference	Applicant's assessment / mitigation requirement	How this requirement is addressed in the assessment
5.198	*'Mitigation measures for the project should be proportionate and reasonable and may include one or more of the following:* • *engineering: containment of noise generated;* • *materials: use of materials that reduce noise, (for example low noise road surfacing);* • *lay-out: adequate distance between source and noise-sensitive receptors; incorporating good design to minimise noise* • *transmission through screening by natural or purpose built barriers;* • *administration: specifying acceptable noise limits or times of use (e.g., in the case of railway station PA systems).'*	Mitigation measures are described in Section 11.9 of this chapter. Mitigation is included in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5), and secured through Requirement 4 of the draft DCO (TR010064/APP/3.1). The approach to mitigation is described in Section 11.9 of this chapter, with mitigation measures being considered within the context of sustainable development. The approach to mitigation is to first examine measures that will reduce the noise at source through the use of engineering or materials. Secondly the mitigation approach examines measures to reduce the propagation of noise through lay-out and design. Noise limits during construction have been specified and are shown in Table 11.8 of Appendix 11.4: Construction Noise Calculations of the Environmental Statement Appendices (TR010064/APP/6.3). With regards to administration, there are no noise limits set by National Highways for the operation of the Scheme.

Paragraph reference	Applicant's assessment / mitigation requirement	How this requirement is addressed in the assessment
5.199	*'For most national network projects, the relevant Noise Insulation Regulations will apply. These place a duty on and provide powers to the relevant authority to offer noise mitigation through improved sound insulation to dwellings, with associated ventilation to deal with both construction and operational noise. An indication of the likely eligibility for such compensation should be included in the assessment. In extreme cases, the Applicant may consider it appropriate to provide noise mitigation through the compulsory acquisition of affected properties in order to gain consent for what might otherwise be unacceptable development. Where mitigation is proposed to be dealt with through compulsory acquisition, such properties would have to be included within the development consent order land in relation to which compulsory acquisition powers are being sought.'*	An assessment of eligibility under the Noise Insulation Regulation 1975 is provided in Section 11.10 of this chapter.
5.200	*'Applicants should consider opportunities to address the noise issues associated with the Noise Important Areas as identified through the noise action planning process.'*	Where possible, opportunities have been considered to address the noise issues in NIAs. As required by DMRB LA 111, the impact at each NIA is described within Table 11.34 of this chapter.

11.3.4 The Government has published a draft NPS NN in March 2023 (DfT, 2023). The consultation closed in June 2023 and the draft NPS NN has not yet been designated. However, it is potentially capable of being an important and relevant consideration in the decision-making process. The Environmental Statement continues to reference the 2014 NPS NN though, as it remains the relevant Government policy. Notwithstanding that position, Table 11.3 summarises the policy requirements from the draft NPS NN relating to the applicant's assessment and mitigation requirements for noise and vibration and how these have been addressed in the assessment. See also the NPS NN Accordance Tables (TR010064/APP/7.3) for an assessment of the Scheme's compliance with the draft NPS NN.

11.3.5 Having compared the NPS NN and draft NPS NN, the main aims in the draft NPS NN are not considered to be materially different to those within the NPS NN.

Table 11.3 Draft NPS NN requirements for noise and vibration

Paragraph reference	Applicant's assessment / mitigation requirement	How this requirement is addressed in the assessment
5.222	*'Where noise impacts are likely to arise from the proposed development, the Applicant should include the following in its noise assessment:* • *A description of the noise sources including likely usage in terms of number of movements, fleet mix and diurnal pattern. For any associated fixed structures, such as ventilation fans for tunnels, information about the noise sources including the identification of any distinctive tonal, impulsive or low frequency characteristics of the noise*	A description of existing conditions is contained within Section 11.7 of this chapter. The noise sources with the Scheme are described within Section 11.8 of this chapter.
	• *Identification of noise sensitive premises and noise sensitive areas that may be affected*	The noise sensitive premises are identified within Section 11.7 of this chapter and are shown on Figure 11.2: Noise Sensitive Receptors of the Environmental Statement Figures (TR010064/APP/6.2).
	• *The characteristics of the existing noise environment*	The characteristics of the existing noise environment are described within Section 11.7 of this chapter and within Appendix 11.3: Baseline Noise Survey Results of the Environmental Statement Appendices (TR010064/APP/6.3).
	• *A prediction on how the noise environment will change with the proposed development:* - *In the shorter term during the construction period* - *In the longer term during the operating life of the infrastructure* - *At particular times of the day, evening and night (and weekends) as appropriate*	The prediction of how the noise environment would change with the Scheme and the assessment of effects from this change is provided within Sections 11.8 and 11.10 of this chapter. This includes during the construction and operational phases.

Paragraph reference	Applicant's assessment / mitigation requirement	How this requirement is addressed in the assessment
	- *An assessment of the effect of predicted changes in the noise environment on any noise sensitive premises and noise sensitive areas, including identifying whether any particular groups are more likely to be affected*	
	• *Measures to be employed in mitigating the effects of noise applicants should consider using best available techniques to reduce noise impacts'*	Mitigation measures are described in Section 11.9 of this chapter. Mitigation is included in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5), and secured through Requirement 4 of the draft DCO (TR010064/APP/3.1).
5.223	*'The potential impact elsewhere that is directly associated with the development, such as changes in road and rail traffic movements elsewhere on the national networks, should be considered as appropriate.'*	The assessment of road traffic noise is presented in Section 11.10 of this chapter. It includes consideration of changes in road traffic noise for all road links where a significant change in noise is predicted, regardless of whether they are close to the Scheme or at a greater distance.
5.224	*'Operational noise, with respect to human receptors, should be assessed using the principles of the relevant British Standards and other guidance. The prediction of road traffic noise should be based on the method described in Calculation of Road Traffic Noise and Common Noise Assessment Methods (CNOSSOS). The prediction of noise from new railways should be based on the method described in Calculation of Railway Noise and Common Noise Assessment Methods (CNOSSOS). For the prediction, assessment and management of construction noise, reference should be made to any relevant British Standards and other guidance which also give examples of mitigation strategies.'*	The predictions of road traffic noise are presented in Section 11.10 of this chapter. They have been undertaken following the calculation methodology provided in CRTN (Department of Transport and Welsh Office, 1988). The assessments of construction noise and vibration have been undertaken with reference to BS 5228 Part 1 (BSI, 2014a) and Part 2 (BSI, 2014b).

Paragraph reference	Applicant's assessment / mitigation requirement	How this requirement is addressed in the assessment
5.225	*'The Applicant should consult Natural England with regard to assessment of noise on designated nature conservation sites, protected landscapes, protected species or other wildlife. The results of any noise surveys and predictions may inform the ecological assessment. The seasonality of potentially affected species in nearby sites may also need to be taken into account.'*	The Applicant has consulted Natural England as detailed in Section 8.4 of Chapter 8: Biodiversity of this Environmental Statement (TR010064/APP/6.1). The assessment of noise impacts on biodiversity, arising during both the construction and operational phase, is also presented in Chapter 8: Biodiversity of this Environmental Statement (TR010064/APP/6.1). It includes consideration of disturbance to protected species as a result of changes in noise levels.
5.226	*'The Examining Authority and the Secretary of State should consider whether mitigation measures are needed both for operational and construction noise over and above any which may form part of the project application. The Secretary of State may wish to impose requirements to ensure delivery and future maintenance of all mitigation measures.'*	Mitigation measures are described in Section 11.9 of this chapter. Mitigation is included in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5), and secured through Requirement 4 of the draft DCO (TR010064/APP/3.1).
5.227	*'Mitigation measures for the project should be proportionate and reasonable and may include one or more of the following:* • *Engineering: containment of noise generated* • *Materials: use of materials that reduce noise, (for example, low noise road surfacing)* • *Lay-out: adequate distance between source and noise-sensitive receptors* • *Incorporating good design: to minimise noise transmission through landscaping and screening by natural or purpose-built barriers including topographical changes* • *Administration: specifying acceptable noise limits or times of use (for example, in the case of railway station public address systems)'*	The approach to mitigation is described in Section 11.9 of this chapter, with mitigation measures being considered within the context of sustainable development. The approach to mitigation is to first examine measures that will reduce the noise at source through the use of engineering or materials. Secondly the mitigation approach examines measures to reduce the propagation of noise through lay-out and design. Noise limits during construction have been specified and are shown in Table 11.8 of Appendix 11.4: Construction Noise Calculations of the Environmental Statement Appendices (TR010064/APP/6.3). With regards to administration, there are no noise limits set by National Highways for the operation of the Scheme.

Paragraph reference	Applicant's assessment / mitigation requirement	How this requirement is addressed in the assessment
5.228	*'For most national network projects, the relevant Noise Insulation Regulations will apply. These place a duty on, and provide powers to, the relevant authority to offer noise mitigation through improved sound insulation to dwellings, with associated ventilation to deal with both construction and operational noise. An indication of the likely eligibility for such compensation should be included in the assessment. In extreme cases, the Applicant may consider it appropriate to provide noise mitigation, through the compulsory acquisition of affected properties in order to gain consent for what might otherwise be unacceptable development. Where mitigation is proposed to be dealt with through compulsory acquisition, such properties would have to be included within the Development Consent Order land in relation to which compulsory acquisition powers are being sought.'*	An assessment of eligibility under the Noise Insulation Regulation 1975 is provided in Section 11.10 of this chapter.
5.229	*'Applicants should consider opportunities to address the noise issues associated with the Important Areas as identified through the noise action planning process.'*	Where possible, opportunities have been considered to address the noise issues in NIAs. As required by DMRB LA 111, the impact at each NIA is described within Table 11.34 of this chapter.
5.232	*'The Secretary of State should not grant development consent unless satisfied that the proposals will meet the following aims, within the context of government policy on sustainable development:* • *avoid significant adverse impacts on health and quality of life from noise as a result of the new development* • *mitigate and minimise other adverse impacts on health and quality of life from noise from the new development* • *contribute to improvements to health and quality of life through the effective management and control of noise, where possible'*	Likely significant adverse effects from the Scheme have been avoided. This has been achieved using the provision of a surface with better noise reducing properties than a conventional LNS (see Section 11.9 of this chapter for further details). Adverse impacts from the Scheme have been minimised through the choice of alignment. The use of measures to reduce the noise at source (a surface with better noise reducing properties than a conventional LNS) has provided widespread reductions in noise for communities living alongside the Scheme.

Other relevant policy

11.3.6 In addition to the NPS NN, other relevant policy has been considered as part of the noise and vibration assessment. Table 11.4 sets out other policy documents relevant to this aspect and how the assessment has considered/addressed these policies.

Table 11.4 Other national, regional and local policy relevant to noise and vibration

Plan / Policy document	Key requirements and objectives	How this has been considered/addressed in the assessment
National		
A Green Future: Our 25 Year Plan to Improve the Environment (Defra, last updated 2021). The 25-Year Environment Plan sets out the Government's long-term approach to protecting and enhancing the environment.	Chapter 4: Increasing resource efficiency and reducing pollution and waste *'Over the next 25 years, we must significantly cut all forms of pollution and ease the pressure on the environment. We must ensure that noise and light pollution are managed effectively.'*	This chapter presents an assessment of noise and vibration that includes the recommendation of appropriate mitigation to manage impacts.
Noise Policy Statement for England (NPSE) (Defra, 2010)	In the context of government policy on sustainable development the three main aims of the NPSE are: • To avoid significant adverse impacts on health and quality of life; • To mitigate and minimise adverse impacts on health and quality of life; and • Where possible, contribute to the improvement of health and quality of life. In defining these aims, the terms 'significant adverse' and 'adverse' are used for which the NPSE (para 2.20) notes that:	The assessment presented in this chapter identifies possible significant adverse impacts for noise and vibration and recommends mitigation to reduce any such impacts. The terms Significant Observed Adverse Effect Level (SOAEL) and Lowest Observed Adverse Effect Level (LOAEL) are used within the assessment.

Plan / Policy document	Key requirements and objectives	How this has been considered/addressed in the assessment
	'There are two established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation (WHO). They are: • *NOEL – No Observed Effect Level. This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.* • *LOAEL – Lowest Observed Adverse Effect Level. This is the level above which adverse effects on health and quality of life can be detected.* *Extending these concepts for the purpose of this NPSE leads to the concept of a significant observed adverse level.* • *SOAEL – Significant Observed Adverse Effect Level. This is the level above which significant adverse effects on health and quality of life occur.'*	
National Planning Policy Framework (NPPF) (DLUHC, last updated 2023). The NPPF sets out the Government's planning policies for England and how these should be applied.	<u>Paragraph 185</u> *Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:* *a) Mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and quality of life;*	The assessment presented within this chapter includes mitigation measures to minimise potential adverse noise impacts. No tranquil areas have been identified within the study areas for noise and vibration.

Plan / Policy document	Key requirements and objectives	How this has been considered/addressed in the assessment
	b) *Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason*	
Planning Practice Guidance (PPG): Noise (DLUHC and Ministry of Housing, Community and Local Government (MHCLG), 2019). The PPG provides guidance on how planning can take into account the consideration of noise and vibration.	PPG-Noise advises on how planning can manage potential noise impacts in new development. It lists various acoustic and non-acoustic factors that could influence a decision on whether noise will be a concern for a project. These include the source and absolute level of noise, the time of day it occurs, and the number and frequency and pattern of noise events. This document reaffirms the effect levels set out in the NPSE and also adds an additional term of Unacceptable Adverse Effect Level (UAEL) at which noise should be prevented from reaching sensitive receptors. None of the policy documents assign numeric values to the effect levels. This is because the effect level should reflect the nature of the noise source and the sensitivity of the receptor considering also local context.	The assessment presented in this chapter considers both temporary and permanent noise sources associated with the Scheme and calculates any impacts arising from them. The terms SOAEL and LOAEL are used within the assessment, assigning effect levels that are appropriate to the assessments undertaken.
Regional and Local		
Adopted Bury Unitary Development Plan (Bury Metropolitan Borough Council, 1997)	<u>Policy EN7/2: Noise Pollution</u> *'In seeking to limit noise pollution the Council will not permit:* • *development which could lead to an unacceptable noise nuisance to nearby occupiers and/or amenity users;* • *development close to a permanent source of noise.'*	The assessment presented within this chapter considers potential noise impacts for nearby residential dwellings and other community facilities. Where appropriate suitable mitigation is recommended to manage any impacts.

Plan / Policy document	Key requirements and objectives	How this has been considered/addressed in the assessment
Manchester's Local Development Framework. Core Strategy Development Plan Document (Manchester City Council, 2012)	<u>Policy DM1: Development Management</u> • '*All development should have regard to the following specific issues for which more detailed guidance may be given within a supplementary planning document:-* - *Effects on amenity, including privacy, light, noise, vibration, air quality, odours, litter, vermin, birds, road safety and traffic generation. This could also include proposals which would be sensitive to existing environmental conditions, such as noise.'*	The assessment presented in this chapter considers both temporary and permanent noise sources associated with the Scheme and calculates any impacts arising from them.
Citywide Development Control Policies. Development Control Policies – General Statement (Manchester City Council, 1995)	<u>Policy DC26: Development and Noise</u> *'The Council intends to use the development control process to reduce the impact of noise on people living and working in, or visiting, the City. In giving effect to this intention, the Council will consider both: a. the effect of new development proposals which are likely to be generators of noise; and b. the implications of new development being exposed to existing noise sources which are effectively outside planning control.* *DC26.3 Developments likely to result in unacceptably high levels of noises will not be permitted: a. in residential areas; b. near schools, hospitals, nursing homes and similar institutions; c. near open land used frequently for recreational purposes.'*	The assessment presented in this chapter considers the potential impact of noise on existing noise sensitive receptors.

11.4 Assessment methodology

Assessment scope

11.4.1 The assessment includes consideration of noise and vibration during the construction phase, and operational road traffic noise. The matter of operational vibration impacts from traffic is the only matter that has been scoped out from assessment. This is as described in the Environmental Scoping Report (TR010064/APP/6.6) and confirmed in the Planning Inspectorate's Scoping Opinion (TR010064/APP/6.7).

Scoping Opinion

11.4.2 Table 11.5 summarises the key requirements from the Planning Inspectorate's Scoping Opinion (TR010064/APP/6.7) as relevant to the scope of the noise and vibration assessment, and identifies any matters scoped out of the assessment as agreed with the Planning Inspectorate and other stakeholders. This table also explains any changes to the assessment methodology as a result of this engagement.

Table 11.5 Scoping Opinion feedback for noise and vibration

Stakeholder	Comment	Response
Planning Inspectorate	ID 4.7.1 – *'On the basis that the maintained road surface once complete will be free of irregularities under general maintenance provisions, the Inspectorate agrees that operational vibration can be scoped out of the ES due to the low likelihood of long-term significant effects. The Inspectorate also notes the presence of the existing road network in terms of future baseline conditions.'*	Noted. Operational vibration is scoped out of the assessment.
	ID 4.7.2 – '*Figure 12.1 and section 12.2 refers to "three study areas" that are "generally sufficient for most projects". It is also stated that the assessment "will not be limited to these distances if it is considered there is a risk of likely significant effects beyond 100m for construction vibration, 300m for construction noise, or 600m for operational noise".*	The study areas used in the assessments presented within this chapter are fully described and justified in Section 11.6 of this chapter.

Stakeholder	Comment	Response
	The ES should provide a clear definition of the individual study areas and set out where potential for likely significant effects has been assessed beyond the "generally sufficient" study areas and the locationally specific circumstances under which additional receptors are considered beyond those areas.'	
	ID 4.7.3 – *'Reference is made to the presence of existing noise mitigation along some sections of the M60 and M66, but that further details of location, length and height of these barriers are needed to inform the assessment. The ES should be clear about any assumptions made within the assessment and how they are taken into account at part of any modelling (e.g. assumptions around efficacy and condition of these features). The ES should be particularly clear about whether or not existing noise mitigation:* • *Will be removed / altered as part of the Proposed Development (and if not, how its retention will be safeguarded as part of the design)* • *Fits in as part of any wider mitigation package of new / extended noise barriers to be installed.'*	Existing noise barriers have been identified and are listed in paragraph 11.5.4 of this chapter and shown on Figure 11.1a: Noise Study Areas, Noise Important Areas and Existing Noise Barriers of the Environmental Statement Figures (TR010064/APP/6.2).

Stakeholder	Comment	Response
	ID 4.7.4 – *'Paragraphs 12.3.12 and 12.3.14 state that cumulative impacts are both implicit in the future "Do-Minimum" and "Do-Something" scenarios traffic modelling but also would need to be considered in terms of the introduction of any new noise sensitive receptors from future development. With reference to the transport assessment(s), the noise chapter of the ES should clearly present these distinct strands of the cumulative assessment and clearly identify representative "worst case" receptor locations for modelling of any future noise sensitive receptors, identify any mitigation needs for these future receptors and set out how they would be secured and delivered as part of the DCO.'*	Other developments that include noise sensitive receptors have been identified and are listed in Table 11.17 of this chapter. These new receptors have been included in the assessment of residential dwellings. See Chapter 15: Assessment of Cumulative Effects of this Environmental Statement (TR010064/APP/6.1) for the assessment of cumulative effects.
Public Health England (now the UK Health Security Agency (UKHSA)) (Appendix 2 of the Scoping Opinion)	Project should meet the aims of the NPSE.	This chapter reports against the three aims within the NPSE (Defra, 2010) and describes the actions taken to support delivery of each aim.
	Project should explore opportunities to improve the health and quality of life.	This has been undertaken by the consideration of alternatives (see Chapter 3: Assessment of Alternatives of this Environmental Statement (TR010064/APP/6.1) for further details, and the provision of improved surfacing where possible (see Section 11.9 of this chapter for details of mitigation and enhancement measures).
	Need to ensure the approach is consulted on and agreed.	The Scheme has an ongoing process of consultation with various stakeholders. Specific to noise, the local authority were consulted in May 2021. The approach agreed was to follow the guidance within DMRB LA 111. The agreed methodologies have not changed since May 2021.

Stakeholder	Comment	Response
	PHE recommends that values for SOAEL and LOAEL are carefully considered for each Scheme based on local conditions.	The setting of values for SOAEL and LOAEL is an area where DMRB LA 111 provides example values but allows for modification to fit local circumstances. The suggested values for LOAEL and SOAEL within DMRB LA 111 are based on values that have been used for consented road schemes over the past six years. The Scheme is similar to many of these schemes, both in terms of the type of scheme and the surrounding environment. For these reasons the example values of LOAEL and SOAEL provided in DMRB LA 111 have been used.
	PHE expects consideration of potential adverse effects due to noise and vibration during construction.	The Scheme already has a Principal Contractor appointed and has provided details of the construction methodology. This information has been used to inform the calculations and assessment undertaken. This assessment follows the methodology within DMRB LA 111. Due to the nature of the Scheme there will be requirement for night working, which is both necessary and unavoidable. The implications of this and actions to control the noise are described within this chapter.
	For noise mitigation, priority should be given to reducing noise at source, and noise insulation schemes should be considered as a last resort.	It is agreed that priority should be given to reducing noise at source, and noise insulation for dwellings should be considered as a last resort.
	Use of L_{den} (in noise assessment chapter).	The values of LOAEL and SOAEL have been provided within this chapter in terms of L_{den} in order to assist other environmental aspects. However, the noise assessment focuses on established indices for noise impact assessment in the UK, such as L_{Aeq} and L_{A10}.

Stakeholder	Comment	Response
	Use of health metric (e.g. disability-adjusted life year (DALY)) for the noise assessment.	Paragraph 3.28 of DMRB LA 112: Population and human health (Highways England, 2020b) states that a qualitative assessment of human health shall be undertaken, with evidence to support conclusions. The population and human health assessment has been scoped on this basis in Chapter 12: Population and Human Health of this Environmental Statement (TR010064/APP/6.1).The noise assessment focuses on established indices for noise impact assessment in the UK, such as L_{Aeq} and L_{A10}.
	PHE expects to see a clear outline of the steps taken to arrive at the final judgement of significance.	As described in Appendix 11.2: Noise and Vibration Assessment Guidance and Standards of the Environmental Statement Appendices (TR010064/APP/6.3), the determination of significance has not been simply undertaken by considering the decibel change. Other factors are considered, such as the absolute noise level and the location of the noise source and whether it will change. The steps taken to arrive at significance are reported in this chapter as required by DMRB LA 111.
	Receptor types to consider during the assessment.	Different types of sensitive receptors have been examined as shown in Section 11.7 of this chapter. These include dwellings, schools, places of worship and community facilities.

Stakeholder	Comment	Response
	Consider measures for enhancement.	Measures for enhancement have been investigated in the form of provision of a road surface with better noise reducing properties than a conventional LNS (see Section 11.9 of this chapter for further details). As stated in paragraph 11.9.8 of this chapter, whilst this is required as essential mitigation for sensitive receptors where potential significant effects are likely, this will also provide road traffic noise reduction for other receptors within the study area where potential significant effects are not likely (with standard low noise surfacing). The surfacing with better noise reducing properties than a conventional LNS will therefore constitute an enhancement for those receptors.
	Qualitative characterisation of the area.	Site visits and noise surveys have been undertaken by noise consultants and during each visit, notes were made of the characteristics of the noise climate. This included the dominant noise sources. This information is reported in Appendix 11.3: Baseline Noise Survey Results of the Environmental Statement Appendices (TR010064/APP/6.3).
	Length of noise surveys.	Noise surveys have been undertaken at each of the five locations for a period of one week. For the Scheme the noise climate in the immediate vicinity of the M60 J18 changes very little as the road noise is dominant. A week-long survey is therefore considered sufficient length to characterise the noise climate. The surveys included a weekend period as there would be weekend construction working for the Scheme (see Section 2.6 of Chapter 2: The Scheme of this Environmental Statement (TR010064/APP/6.1) for further details).

Stakeholder	Comment	Response
	Use of different metrics (e.g. events) for the assessment.	Given the Scheme has a very dominant and near continuous noise source, it is considered very unlikely that examining further metrics would provide any assistance in the determination of a significant effect, and this has not been examined further.
	Use the mitigation hierarchy when considering mitigation.	Priority is given to reducing noise at source. When the need for mitigation is identified, or enhancement is considered, reducing the noise at source has been considered first. See Section 11.9 of this chapter for further details regarding design, mitigation and enhancement measures.
	Undertaking of post opening monitoring.	In accordance with DMRB LA 111 (paragraph 4.2), there is no intention to undertake post-opening noise monitoring. However, noise is one of the environmental aspects that is assessed within National Highways' Post Opening Project Evaluation (POPE) process, which examines how a scheme is performing against the predicted impacts after one and five years after opening. See Section 11.11 of this chapter for further details regarding monitoring.
	Production of an EMP.	A First Iteration EMP has been produced (TR010064/APP/6.5). This would be developed into a Second Iteration EMP for implementation during construction and secured by Requirement 4 of the draft DCO (TR010064/APP/3.1).

Stakeholder	Comment	Response
	The Scheme should consider the development of green spaces.	The Scheme has little opportunity to develop large areas of green space. Private amenity areas would not be physically changed, although the noise climate in some outdoor spaces may change and this has been considered when determining significance. Outdoor spaces have also been considered in Chapter 7: Landscape and Visual and Chapter 12: Population and Human Health of this Environmental Statement (TR010064/APP/6.1).
	Consider the step change in noise during the assessment.	The change in noise on opening of the Scheme forms the initial indication of likely significance of effect. Within DMRB LA 111 there is a move away from examining the long-term effects.
	Requirement for stakeholder communications to use available technology.	The Scheme has a dedicated stakeholder team, and communications with key stakeholders have been ongoing. The stakeholder team will be taking full advantage of current technology for communications. All comments raised during consultation, as well as the Applicant's responses, are included in Annex Q of the Consultation Report Annexes (TR010064/APP/5.2).

Statutory consultation

11.4.3 Table 11.6 identifies the key feedback received from statutory bodies during the statutory consultation. All comments raised during the statutory consultation, as well as the Applicant's responses, are included in Annex Q of the Consultation Report Annexes (TR010064/APP/5.2).

Table 11.6 Key statutory consultation feedback for noise and vibration

Stakeholder	Comment	Response
Transport for the North (TfN)	TfN acknowledge that in developing plans for the scheme, National Highways are working hard to minimise potential negative impacts on the natural environment. This is particularly the case in managing the air and noise quality challenges of the area, which have both been identified as current management areas.	Noted.
UKHSA	UKHSA suggests the inclusion of the WHO (2018) Environmental Noise Guidelines for the European Region as relevant guidance. The aim of the WHO ENG 2018 is to provide expert recommendations on the health effects of noise based on the growing noise and health evidence base, and we therefore recommend consideration of the summarised evidence when assessing the effects of noise on the local population. In addition, UKHSA recommends Defra (2014) Environmental Noise: Valuing impacts on sleep disturbance, annoyance, hypertension, productivity and quiet as relevant guidance.	The Applicant has made reference to the Environmental Noise Guidelines for the European Region (WHO, 2018) within Appendix 11.2: Noise and Vibration Assessment Guidance and Standards of the Environmental Statement Appendices (TR010064/APP/6.3). Within the appendix it is stated that the levels themselves have not been adopted as threshold values, as there are UK policy-based threshold noise levels that are considered to be more appropriate and established for the assessment of impacts from road traffic noise. The assessment in Chapter 12: Population and Human Health of this Environmental Statement (TR010064/APP/6.1) refers to the Environmental Noise Guidelines for the European Region (WHO, 2018). The guidance within Environmental Noise: Valuing impacts on sleep disturbance, annoyance, hypertension, productivity and quiet (Defra, 2014) has been used by the UK government to develop the monetised approach within the Transport Analysis Guidance (TAG) appraisal tool. The

Stakeholder	Comment	Response
		results from this are included within the economic appraisal for the Scheme.
	UKHSA believes that NSIPs should not only limit significant adverse effects, but also explore opportunities to improve the health and quality of life of local communities already adversely affected by noise, and to reduce inequalities.	The third aim of the NPS NN (DfT, 2014) is *'Where possible, contribute to the improvement of health and quality of life'.* How the Scheme meets this aim is reported within Section 11.12 of this chapter.
	UKHSA notes that a baseline sound survey has been carried out (12.7.6). The long-term survey results should be used to test the assumptions of the modelling (i.e. whether the proportionate traffic flow volumes within the study area between daytime and night-time, and different days of the week, can be considered as typical within the context of DMRB terminology). This is especially important since, as stated in the Preliminary Environmental Information Report (PEIR), *"the assessment of potential changes in road traffic noise has been carried out based on a scheme design and traffic model that have subsequently been superseded"* (12.10.32). UKHSA expects future modelling to be based on a more accurate picture of the scheme design.	The long-term noise survey results have not been used to test the modelling assumptions since there is no recognised approach to undertaking such a comparison. The assessment reported within this chapter has been undertaken using the Scheme design and using data from the traffic model. The assessment has been carried out in accordance with the recognised modelling approach as set out within the DMRB LA 111.
	Understanding the absolute noise levels which will be experienced by receptors, alongside the changes in noise level, is extremely important. Furthermore UKHSA recommends that the Applicant expresses its chosen LOAELs and SOAELs in health terms, referring to the evidence in the WHO 2018 guidelines for this purpose.	The absolute noise level at a receptor is considered when determining whether a significant effect exists. The approach to this is described within Section 11.4 of this chapter and follows the requirements and advice within DMRB LA 111. The values assigned to LOAEL and SOAEL for this assessment are presented in terms of the L_{den} noise index in Table 11.12 of this chapter.
	UKHSA notes Table 12.13 showing the number of dwellings against the predicated change in operational noise level. UKHSA recommends that more extensive information is presented in the ES on how noise exposure will change within a broader context of	The results from the noise assessment for dwelling and non-residential receptors are first presented in tables that only show the change in noise (e.g. Table 11.33 of this chapter). Where necessary, other factors such as absolute

Stakeholder	Comment	Response
	absolute noise levels, NIAs and other contextual factors, and how these factors informed conclusions on significance. Non-residential receptors appear to be assessed as one category (c.f. Table 12.13) with no apparent consideration of their specific sensitivities.	noise level and context are then considered to determine whether there is a likely significant effect. The results from the noise assessment are presented in detail in Appendix 11.5: Operational Noise Calculation Results of the Environmental Statement Appendices (TR010064/APP/6.3) and are shown on Figures 11.8a/b and 11.9a/b of the Environmental Statement Figures (TR010064/APP/6.2) where the specific sensitivity of non-residential receptors are indicated.
	UKHSA notes that a quantitative assessment of construction noise impacts has been undertaken (12.10). There are large numbers of noise sensitive receptors predicted to experience moderate and major construction noise impacts during the day and night-time throughout the construction period (533 daytime and 1037 night-time experiencing moderate impact, 352 daytime and 1882 night-time experiencing major impact). This is concerning, especially because of the Applicant's choice for construction LOAELs and SOAELs for daytime and night-time. Considering the high numbers affected, UKHSA expects a detailed strategy of mitigation of these effects to protect the health of local communities, including methods of liaison between local communicates and contractors. UKHSA also recommends that the Applicant sets up a scheme for monitoring the health and wellbeing of local communities exposed to extended periods of construction noise.	Measures to reduce the impacts from construction noise are described in Section 11.9 of this chapter and included in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5). Monitoring requirements are described in Section 11.11 of this chapter.
	UKHSA recommends that the Environmental Statement documentation gives a much clearer acknowledgement of the strengthening body of evidence that road traffic noise is associated with adverse health effects, including annoyance, sleep disturbance, and cardiovascular and metabolic health outcomes (1, 5, 6), in both the Noise and Vibration and Population and Human Health chapters,	The Applicant acknowledges that there is a strengthening body of evidence that road traffic noise is associated with adverse health effects. This evidence is summarised in Appendix 12.2: Human Health Literature Review and Evidence of the Environmental Statement Appendices (TR010064/APP/6.3).

Stakeholder	Comment	Response
	including reference to the expected health impacts as a result of the Scheme. UKHSA encourages the Applicant to carry out a quantitative assessment of the expected health impacts of the Scheme, by quantifying the change in the number of people that will be chronically highly annoyed and sleep disturbed, and any predicted additional (or a reduction of) cases of cardiovascular disease, using established methodologies (1, 2, 7-9). The Applicant should also acknowledge that adverse health outcomes are likely from construction noise, although it is not currently possible to quantify these effects.	Impacts on human health are presented in Chapter 12: Population and Human Health of this Environmental Statement (TR010064/APP/6.1).
	The scientific evidence suggests that areas valued for their tranquillity, acoustic character, and/or quiet areas can have a direct and beneficial health effect and can help restore or compensate for adverse health effects attributed to noise within the residential environment (10-14). Therefore, UKHSA requests clarity in Chapter 12 whether any such areas were found within the study area, and if so, how this was considered in the assessment of noise impacts.	There are no areas valued for their tranquillity, acoustic character, and/or quiet areas identified within the noise and vibration study areas.
	UKHSA expects the Applicant to use all practicable means to mitigate the effect of construction noise. The full strategy should be described in the Construction Environmental Management Plan (CEMP) at ES stage to guide best practices in construction activities. It is important that affected communities are given a meaningful say in the choice of mitigation measures, and therefore effective communication between contractor and communities at all stages is key.	Section 11.9 of this chapter describes Scheme-specific mitigation measures, including those for construction. Commitment NV1 in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5), is to produce a Noise and Vibration Management Plan (NVMP) that will describe the strategy for the mitigation of construction noise. Community liaison is an ongoing activity for the Scheme.
	Any proposals to acoustically insulate buildings, whether for construction or operation noise mitigation, need a holistic consideration of indoor environmental quality to ensure that control of external noise ingress does not come at the expense of poorer indoor	Section 11.9 of this chapter describes Scheme-specific mitigation measures. The assessment of construction noise indicates that there may be buildings where noise insulation is considered

Stakeholder	Comment	Response
	air quality, an increased risk of overheating, or exposure to high levels of noise from mechanical ventilation. UKHSA also recommends that socio-acoustic surveys are undertaken pre and post interventions to ensure that the insulation has the desired effect for residents. UKHSA recommends that the Applicant considers a broad set of noise mitigation measures. Whilst the primary focus should rightly be at reducing noise at source (low-noise road surfaces and noise barriers), there are many other mitigation measures that can be considered, some of which involve addressing the so-called non-acoustic factors that moderate the causal relationship between noise and health [17]. Potential mitigation measures not mentioned in the PEIR include speed restrictions, access to quiet (either as a quiet side for dwellings or access to good quality local tranquil spaces [18,19]), education and communication [17]. Some of these measures may have co-benefits for other topic areas, such as air quality and carbon. It is important that local communities are given a meaningful say in the choice of mitigation measures.	appropriate, and a strategy for determining and implementing this is included in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5) (commitment NV1). The assessment of operational road traffic noise presented in Section 11.10 has initially identified that there would be no dwellings eligible for noise insulation under the NIR. Where insulation is offered under the NIR then appropriate measures will be considered for each building, including ventilation.

General approach

11.4.4 The assessment of impacts from noise and vibration has been undertaken in accordance with DMRB LA 111. This chapter draws upon published guidance and standards to guide the assessor through the assessment. By using the requirements and advice within DMRB LA 111 it is considered that the Scheme can be measured against the NPS NN policy requirements.

11.4.5 DMRB LA 111 incorporates the noise effect levels that have been introduced to English noise policy by the NPSE (Defra, 2010). These effect levels are defined as:

- LOAEL - Lowest Observed Adverse Effect Level. This is the level above which adverse effects on health and quality of life can be detected.
- SOAEL - Significant Observed Adverse Effect Level. This is the level above which significant adverse effects on health and quality of life occur.

11.4.6 The NPSE does not assign decibel values to these effect levels as they will vary depending upon the type of assessment being undertaken. However, suggested effect levels for construction noise and vibration and operational noise are contained within DMRB LA 111 and these have been used for the environmental assessment of the Scheme.

Construction noise

11.4.7 The assessment of noise from construction has been undertaken quantitatively based on the requirements and advice within DMRB LA 111, which in turn references the guidance and calculation methodology within BS 5228-1:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise (BSI, 2014a).

11.4.8 Noise predictions from construction are undertaken using known noise levels from the various items of plant that would be used during the different activities associated with the construction of the Scheme. Until construction physically starts some of the information required to inform these predictions has been based on experience of similar schemes and in collaboration with the Principal Contractor.

11.4.9 The noise levels from construction have been calculated at selected locations which are considered to be representative of all noise sensitive receptors in the study area. These selected locations may be individual sensitive receptors or groups of sensitive receptors. Calculations of construction noise have been undertaken using spreadsheets, with the noise levels and a 3-Dimensional (3D) Geographical Information System (GIS) process to calculate propagation from noise source locations to receptors. Detailed information on assumed plant and equipment are provided for information within Appendix 11.4: Construction Noise Calculations of the Environmental Statement Appendices (TR010064/APP/6.3).

11.4.10 The impact from additional construction traffic on the road network and that from diversion routes has been assessed in accordance with the requirements and advice from paragraph 3.15 to 3.19 within DMRB LA 111. For roads within the construction traffic study area, the potential change in road traffic noise with additional construction traffic has been calculated using the methodology contained within the CRTN (Department of Transport and Welsh Office, 1988) for the year of construction when the highest construction traffic flows are expected. For traffic diversion routes used at night a major magnitude of impact is determined at any noise sensitive receptor within the diversion route study area.

Construction vibration

11.4.11 The assessment of vibration from construction has been undertaken quantitatively based on the requirements and advice within DMRB LA 111, which in turn references the guidance and calculation methodology within BS 5228-2:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 2: Vibration (British Standards Institution, 2014b).

11.4.12 For some activities of construction (e.g. piling and compaction) equations are available within BS 5228-2:2009+A1:2014 to calculate the level of vibration at a distance from the construction activity. Certain input parameters are required for these calculations and, until the exact plant to be used is confirmed, some of the information required has been based on typical plant and machinery for such activities, and professional judgement.

11.4.13 The level of vibration has been calculated at selected locations which are considered to be representative of all vibration sensitive receptors in the study area.

Operation

11.4.14 The assessment of noise from the operation of the Scheme has been undertaken quantitatively based on the requirements and advice within DMRB LA 111. The approach within DMRB LA 111 is to compare the predicted noise level with and without the Scheme at individual or groups of sensitive receptors. Noise levels have been calculated using the methodology contained within CRTN (Department of Transport and Welsh Office, 1988) using proprietary noise modelling software.

11.4.15 The prediction method has taken into account factors, such as the traffic flow, composition and speed, the alignment and distance of the road relative to receiving property, the road surface type, the nature of the intervening ground cover between the road and reflections from building façade to calculate the required noise levels.

11.4.16 The road traffic noise assessments have been based on a comparison of ‘Do Minimum’ and ‘Do Something’ scenarios. The ‘Do Minimum’ scenario represents the future baseline with minimum interventions and without the Scheme or alternatives. The ‘Do Something’ scenario represents predicted road traffic levels based on the Scheme in operation in the year of opening in 2029 and also future assessment year 2044.

11.4.17 Annual average weekday traffic (AAWT) flows, speeds and percentage of heavy goods vehicles (HGVs) have been used to allow for seasonal variations. AAWT is the traffic flow expected between 06:00 and 24:00 hours on a weekday, averaged over a year. The traffic data used within the noise model has been generated from a traffic model produced as part of the Scheme development. The traffic model has provided traffic data for the future years of 2029 and 2044.

Assessment criteria

11.4.18 Chapter 4: Environmental Assessment Methodology of this Environmental Statement (TR010064/APP/6.1) sets out the general approach to assessing the significance of effects and follows DMRB LA 104 Environmental assessment and monitoring (Highways England, 2020c).

11.4.19 The significance principles for noise and vibration differ from DMRB LA 104 since the sensitivity of a receptor is not defined within DMRB LA 111. Some key aspects of the requirements and advice provided within DMRB LA 111 to determine significance of effects are given below, with more detail provided within Appendix 11.2: Noise and Vibration Assessment Guidance and Standards of the Environmental Statement Appendices (TR010064/APP/6.3).

Construction noise

11.4.20 Noise impact thresholds over certain time periods for construction activities at residential premises, and other noise sensitive receptors are defined based on Table 3.12 of DMRB LA 111 and reproduced in Table 11.7.

Table 11.7 Construction time period LOAEL and SOAEL

Time Period	LOAEL	SOAEL
Day (07:00-19:00 hours weekday and 07:00-12:00 hours—Saturdays)	Baseline noise levels $L_{Aeq,T}$	Threshold level determined as per BS 5228-1:2009+A1:2014 Section E3.2 and Table E.1 BS 5228-1:2009+A1:2009
Night (23:00-07:00 hours)	Baseline noise levels $L_{Aeq,T}$	Threshold level determined as per BS 5228-1:2009+A1:2014 Section E3.2 and Table E.1 BS 5228-1:2009+A1:2009
Evening and weekends (time periods not covered above)	Baseline noise levels $L_{Aeq,T}$	Threshold level determined as per BS 5228-1:2009+A1:2014 Section E3.2 and Table E.1 BS 5228-1:2009+A1:2009

11.4.21 The LOAEL and SOAEL levels that have been derived from baseline noise measurements are presented in Table 11.8. See Appendix 11.5: Construction Noise Calculations of the Environmental Statement Appendices (TR010064/APP/6.3) for further details.

Table 11.8 Construction LOAEL and SOAEL

Location ID	Daytime		Night-time		Evening and weekend	
	LOAEL	SOAEL	LOAEL	SOAEL	LOAEL	SOAEL
N1	64	70	59	61	62	66
N2	67	70	63	66	66	71
N3	69	75	64	67	67	70
N4	62	65	58	61	59	62

11.4.22 To determine significance of effect from construction noise, the method involves a comparison between the predicted noise level arising from construction operations and the pre-construction ambient noise level (LOAEL). Table 3.16 of DMRB LA 111 includes a scale of magnitude that has been used to determine the impact, and this table is reproduced in Table 11.9.

Table 11.9 Magnitude of impact and construction noise descriptors

Magnitude of change	Criteria
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

11.4.23 The magnitude of impact from additional construction traffic on the road network and that from diversion routes has been determined by calculating the Basic Noise Level (BNL), which is the road traffic noise level calculated from the predicted traffic flow, speed and composition of heavy vehicles at a reference position of 10m from the edge of the road for the scenarios without and with additional construction traffic. A comparison of the existing level of traffic noise against that predicted during construction with additional construction traffic has been undertaken. Table 3.17 of DMRB LA 111 includes a scale of magnitude that has been used to determine the impact, and this table is shown in Table 11.10.

Table 11.10 Magnitude of construction traffic impact at receptors

Magnitude of impact	Increase in basic 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

11.4.24 For diversions routes used at night, a Major magnitude of impact for construction noise impact shall be determined at any noise sensitive receptors within the diversion route study area.

11.4.25 Construction noise and construction traffic shall constitute a significant effect where it is determined that a Major or Moderate magnitude of impact would occur for a duration exceeding (DMRB LA 111 paragraph 3.19):

- 10 or more days or nights in any 15 consecutive days or nights
- A total number of days exceeding 40 in any six consecutive months

11.4.26 Where significant effects are identified then specific noise mitigation measures to reduce the noise impact from activities have been identified.

Construction vibration

11.4.27 To determine significance of effect from construction vibration, the magnitude of the predicted level has been compared against impact criteria shown in Table 3.31 of DMRB LA 111 and a magnitude scale shown in Table 3.33 of DMRB LA 111. These tables are reproduced below in Table 11.11 and Table 11.12 respectively, where the unit of measurement for vibration is Peak Particle Velocity (PPV).

Table 11.11 Construction vibration LOAELs and SOAELs for all receptors

Time Period	LOAEL	SOAEL
All time periods	0.3mm/s PPV	1.0mm/s PPV

Table 11.12 Magnitude of construction vibration impact at receptors

Magnitude	Vibration level
Major	Greater than or equal to 10mm/s PPV
Moderate	Above or equal to SOAEL and below 10mm/s PPV
Minor	Above or equal to LOAEL and below SOAEL
Negligible	Below LOAEL

11.4.28 Construction vibration shall constitute a significant effect where it is determined that a Major or Moderate magnitude of impact would occur for a duration exceeding (DMRB LA 111 paragraph 3.34):

- 10 or more days or nights in any 15 consecutive days or nights
- A total number of days exceeding 40 in any six consecutive months

11.4.29 Where significant effects are identified, then specific vibration mitigation measures to reduce the vibration impact from activities have been identified.

Operation noise

11.4.30 The LOAEL and SOAEL for noise sensitive receptors within the study area for operational road traffic noise are listed in Table 11.13 (reproduced from Table 3.49.1 of DMRB LA 111). These suggested values for the day and night LOAEL and SOAEL within DMRB LA 111 are based upon those used for recent large road schemes and are considered appropriate for the Scheme.

11.4.31 In order to assist other environmental aspects the equivalent L_{den} is shown in the table for information, this has been converted from the equivalent $L_{Aeq,16hr}$ value using guidance provided in an article in the International Journal of Hygiene and Environmental Health in 2018 (Brink *et al.*, 2018).

Table 11.13 Operational noise LOAEL and SOAEL for all receptors

Time Period	LOAEL	SOAEL
Day (06:00 – 24:00)	55dB $L_{A10,18hr}$ façade 50.5dB $L_{Aeq,16hr}$ free-field	68dB $L_{A10,18hr}$ façade 63.5dB $L_{Aeq,16hr}$ free-field
Night (23:00 – 07:00)	40dB $L_{night,outside}$ free-field	55dB $L_{night,outside}$ free-field
L_{den} (24-hour period)	52.9 L_{den} free-field	65.9 L_{den} free-field

11.4.32 These suggested values for the day and night LOAEL and SOAEL within DMRB LA 111 are based upon those used for recent large road schemes, including some that have been through the DCO process, and are considered appropriate for the Scheme.

11.4.33 The LOAEL for the daytime period is considered to be 50.5dB $L_{Aeq,16hr}$ (free-field). The WHO Guidelines for Community Noise (WHO, 1999) identify that 50dB $L_{Aeq,16hr}$ represents the outside (in amenity areas) day-time noise level below which the majority of the adult population will be protected from becoming moderately annoyed.

11.4.34 An external noise level of 50.5dB $L_{Aeq,16hr}$ would result in a noise level within a property of 35dB $L_{Aeq,16hr}$ when taking account a typical reduction from an open window. The WHO Guidelines for Community Noise deem this noise level to be where moderate annoyance could occur within properties.

11.4.35 Based upon the use of WHO, and the definition of No Observed Adverse Effect in PPG-Noise (DLUHC and MHCLG, 2019), it is concluded that external noise below 50.5 dB $L_{Aeq,16hr}$ would meet this PPG definition.

11.4.36 The LOAEL for the night-time period is considered to be 40dB $L_{night,outside}$ free-field. This is consistent with WHO Night Noise Guidelines for Europe (WHO, 2009), which states that the night noise guideline of 40dB $L_{night,outside}$ should be the noise level target.

11.4.37 The SOAEL for the daytime period is considered to be 63.5dB $L_{Aeq,16hr}$ free-field. This level is consistent with the specified level in the Noise Insulation Regulations 1975 (amended 1988) after adding a façade correction and converting from an $L_{A10,18hr}$ level to an $L_{Aeq,16hr}$ level.

11.4.38 The SOAEL for the night-time period is considered to be 55dB $L_{night,outside}$ free-field. This noise level represents the interim noise level target presented in the WHO Night Noise Guidelines for Europe (WHO, 2009).

11.4.39 Exceedance of SOAEL in itself does not result in a significant effect for any given sensitive receptor. To determine the significance of effect, the predicted change in noise in the short-term (i.e. on opening) has been compared against the scale of magnitude shown in Table 11.14 (Tables 3.54a and 3.54b in DMRB LA 111). Where the magnitude of change in the short-term is negligible this has been deemed as not giving rise to a likely significant effect.

Table 11.14 Classification of magnitude of operational noise impacts

Magnitude of impact	Noise Change, dB	
	Short term noise change (dB $L_{A10,18h}$ or L_{night})	Long term noise change (dB $L_{A10,18h}$ or L_{night})
Major	Greater than or equal to 5.0	Greater than or equal to 10.0
Moderate	3 – 4.9	5 – 9.9
Minor	1 – 2.9	3 – 4.9
Negligible	Less than 1.0	Less than 3.0

11.4.40 For noise sensitive receptors a magnitude of change in the short-term of Moderate or Major has been used as the starting point to determine whether the effect is likely to be significant. Other factors have been considered in determining whether the impact is significant or not. Table 3.60 of DMRB LA 111 provides a series of factors that can be considered, and these are summarised as:

- The actual short-term change where it is close to the minor/moderate boundary, i.e. a change of 2.9dB or less (in the short-term) may still be considered a significant environmental effect where it is within 1dB of this boundary, or may it be considered more appropriate to not be considered a significant environmental effect where a change is within 1dB above this boundary
- Different magnitudes of impact in the short-term and the long-term assessments should be considered as this can indicate that it is appropriate to change the overall effect, depending on the circumstances
- A similar magnitude of impact 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 the LOAEL and SOAEL values, where a Minor magnitude short-term noise change of 1 to 2.9dB above SOAEL results in a likely significant effect
- Circumstances of the receptor or receptor group, e.g. location of windows, outdoor spaces, use of receptor

- The existing acoustic character of the area
- Changes to the landscape or setting of the receptor or receptor group

11.4.41 An initial assessment of the potential eligibility for sound insulation measures under the NIR 1975 (as amended 1988) has also been undertaken to identify residential dwellings that may potentially qualify under these regulations.

11.4.42 The noise level at all noise sensitive receptors within the study area have been calculated using noise modelling software that incorporates the methodology contained in CRTN (Department of Transport and Welsh Office, 1988) and additional advice within DMRB LA 111. CRTN is a technical memorandum produced by the Department of Transport and Welsh Office which provides a method of predicting road traffic noise. Night-time noise levels have been calculated using Method 3 contained within the following report - PR/SE/451/02 Converting the UK traffic noise index $L_{A10,18h}$ to EU noise indices for noise mapping (Transport Research Laboratory, 2002). A calculation height of 4m above local ground level has been used unless the building is only one story where the noise levels are calculated at 1.5m. The calculated levels for outdoor community facilities are calculated at 1.5m.

11.5 Assessment assumptions and limitations

Construction

11.5.1 The assessment of potential construction noise and vibration effects has been based on the construction programme as detailed in Section 2.6 of Chapter 2: The Scheme of this Environmental Statement (TR010064/APP/6.1). Assumptions regarding the plant and equipment that may be used have been developed in consultation with the Principal Contractor. When the Principal Contractor is on site it may be necessary to use different plant and equipment complements. It will be the responsibility of the Principal Contractor to confirm that the final construction methodology, including programme, plant and equipment, would not give rise to any materially new or materially different significant adverse effects in comparison with those reported in this Environmental Statement (Requirement 3 of the draft DCO (TR010064/APP/3.1)). The risk of changes to plant and/or methods resulting in differing results is considered to be minimal due to early discussions with the Principal Contractor, who are experienced in delivering similar schemes.

Operation

11.5.2 The type of road surface is a factor that is taken into account when predicting noise levels. A conventional LNS can provide up to -3.5dB(A) reduction while a standard hot rolled asphalt provides a -0.5dB(A) correction where speed levels are above 75kph (based on paragraphs 5 and 6a of Appendix A2 in DMRB LA 111. The existing surfacing along the sections of the M60, M62 and M66 within the study area are known and have been taken into account within the noise model and calculation process. The existing surfacing is summarised as follows:

- Existing LNS and Hot Rolled Asphalt on M60 clockwise (CW) and anticlockwise (ACW) between J17 and J18

- Existing LNS on M60 CW and ACW carriageways between J18 and J19
- Existing LNS on M60 ACW and Hot Rolled Asphalt on M60 CW between J16 and J17
- Existing LNS on M66 northbound and southbound carriageways between J3 and J4
- Hot Rolled Asphalt on M62 eastbound and westbound carriageways between J18 and J19
- The surface of the local roads is assumed as Hot Rolled Asphalt.

11.5.3 The following assumptions have been made regarding the surfacing in the Do Something scenarios;

- The new road links and the online sections of the Scheme will be surfaced with a conventional LNS, which includes all lanes of the M60 between J17 to J18.
- All other local roads will remain as they are in the Do Minimum.

11.5.4 Existing noise mitigation in the form of noise barriers has been identified along the M60 between J17 and J18 and are included within the noise model. These existing noise barriers are shown on Figure 11.1a: Noise Study Areas, Noise Important Areas and Existing Noise Barriers of the Environmental Statement Figures (TR010064/APP/6.2) and have been identified from existing data sources, and are:

- EB01: 143m of timber noise barrier alongside the M60 J17 CW off-slip road, close to dwellings on Philips Park Road, Stanley Drive, Park Close and Sycamore Place. This is assumed to be 1.5m high and will remain in place with the Scheme
- EB02: 78m of timber noise barrier alongside the M60 J17 ACW on-slip road. This is assumed to be 1.5m high and will remain in place with the Scheme
- EB03: 186m of brick wall north of the M60 CW mainline carriageway, between Besses o' th' Barn and Balmoral Avenue, assumed to be 2.5m high. Adjoining the east end of this barrier there is a 331m long timber noise barrier running along Glendevon Place, assumed to be between 1.5m and 2.5m high. Both will remain in place with the Scheme
- EB04: 734m of timber noise barrier alongside the M60 ACW mainline carriageway, between Bury Old Road (A665) and Warwick Avenue, assumed to be between 1m and 2.5m high. This noise barrier will remain in place with the Scheme
- EB05: 470m of timber noise barrier alongside the M60 CW mainline carriageway, between Sandgate Road and Brathay Close, assumed to be 1.5m high. This noise barrier will remain in place with the Scheme

- EB06: 435m of timber noise barrier alongside the M60 ACW mainline carriageway, between Sandgate Road and Parrenthorn Road, assumed to be 1.5m high. This noise barrier will remain in place with the Scheme
- EB07: 142m of timber noise barrier alongside the M60 J18 CW off-slip road and assumed to be 1m high. This noise barrier would be removed to allow for the construction of the new M60 J18 CW off-slip road leading to the Northern Loop, and it would be replaced by a similar length and height noise barrier at a location alongside the new slip road that will provide the same noise reduction as at present (commitment NV5 in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5))
- EB08: 335m of timber noise barrier alongside the M60 CW mainline carriageway, in the vicinity of Egypt Lane. This is assumed to be 3m high and will remain in place with the Scheme
- EB09: 346m of timber noise barrier running above the concrete wall bounding alongside the dedicated left turn from the westbound M62 to the M60 CW at Simister. This is assumed to be 1.5m high and will remain in place with the Scheme

11.5.5 This assessment has been undertaken for the Scheme design (as shown on Figure 2.2: Scheme Design of the Environmental Statement Figures (TR010064/APP/6.2)) and assumes a reasonable worst-case basis afforded by the limits of deviation (see Section 2.5 of Chapter 2: The Scheme of this Environmental Statement (TR010064/APP/6.1)). While the limits of deviation (as shown on the Works Plans (TR010064/APP/2.4)) could result in changes in the location of the main lines of traffic lanes, this is limited to 2 metres, free-flow links onto and off the M60 at J18 and the Northern Loop to 5m. It is considered that such changes are unlikely to affect the predicted levels of likely significant effects reported in this assessment based on calculations of BNL that have been undertaken to test these limits of deviation.

11.6 Study area

11.6.1 Requirements on how to set the study area for an assessment of noise and vibration is provided within DMRB LA 111. The distances used for the study areas have been chosen based on these requirements and professional judgement and correspond to the distance where it is considered that receptors could potentially be affected by noise or vibration. Figure 11.1a: Noise Study Areas, Noise Important Areas and Existing Noise Barriers of the Environmental Statement Figures (TR010064/APP/6.2) indicates the study areas for noise and vibration.

11.6.2 For construction noise, calculations have been undertaken for receptors up to 300m from construction activity. For construction vibration, any receptors within 100m of an activity likely to generate a noticeable level of vibration have been assessed.

11.6.3 For construction traffic, a study area is defined as 50m from the kerb line of public roads with the potential for an increase in the BNL of 1dB or more as a result of the addition of construction traffic to existing traffic levels. For any route diversions, a study area is defined at 25m width from the kerb line of the diversion route, where a diversion is required during the night (23:00-07:00 hours) to enable construction works to take place.

11.6.4 The study area for operational road traffic noise has been chosen as the area within 600m of new road links or road links physically changed or bypassed by the Scheme. There are no road links outside of this area where a change in the short term BNL of more than 1.0dB(A) as a result of the Scheme have been identified. As such, no extension to the study area has been considered.

11.7 Baseline conditions

Baseline sources

11.7.1 The following sources have been used to inform the baseline:

- England Noise and Air Quality Viewer (Extrium, 2019)
- Baseline noise surveys undertaken between October and December 2021 (see Appendix 11.3: Baseline Noise Survey Results of the Environmental Statement Appendices (TR010064/APP/6.3) for further details)
- Ordnance Survey (OS) AddressBase Plus data

Baseline information

11.7.2 The existing noise climate near the Scheme is dominated by road traffic noise, predominantly from the M60, M62 and M66, as well as traffic using local roads. There is also a combined railway line and Metrolink tramline that passes over the M60 at the western end of the Scheme, about 240m east of M60 J17. Railway noise would therefore contribute to the local noise climate in some locations.

11.7.3 There are six NIAs within 600m of the Scheme. These have been identified from the England Noise and Air Quality Viewer (Extrium, 2019). Four of them are directly adjacent to the motorway network, and the remaining two located adjacent to the local road network. NIAs are listed in Table 11.15 and shown on Figure 11.1a: Noise Study Areas, Noise Important Areas and Existing Noise Barriers of the Environmental Statement Figures (TR010064/APP/6.2). Although the NIA 1406 lies just within the operational noise study area there are no residential dwellings within both NIA 1406 and the operational noise study area. It has been included in Table 11.15 for completeness.

Table 11.15 NIAs within the study area

NIA number	Description	Location	Noise source asset owner	Number of dwellings within NIA
1406	On M66 north of the Scheme	Adjacent to the motorway network	National Highways	63
1670	On A56 Bury New Road to the north-west of the Scheme	Adjacent to the local road network	Bury Metropolitan Borough Council	171
1671	On M60 extending from west of J17 to west of J18	Adjacent to the Scheme and local road network	National Highways and Bury Metropolitan Borough Council	821
8188	On M60 J18	Adjacent to the Scheme and motorway network	National Highways	170
10718	On M62 north-east of M60 J18	Adjacent to the motorway network	National Highways	2
10719	On A665 Higher Lane to the west of the Scheme	Adjacent to the local road network	Bury Metropolitan Borough Council	38

11.7.4 The wider area around the Scheme is mostly urban, with the exception of the area around M60 J18, which is more rural with open space immediately adjacent to three quadrants and the settlement of Simister located to the south-east of M60 J18. As shown on Figure 11.2: Noise Sensitive Receptors of the Environmental Statement Figures (TR010064/APP/6.2), sensitive receptors for humans include multiple residential properties located either side of the M60 in Prestwich to the south and Besses O'Th'Barn to the north. The settlement areas also contain other noise sensitive receptors, including educational premises and healthcare facilities (such as Prestwich Hospital and a doctor's surgery) within the study area. The closest residential property is approximately 12m from the south-east section of M60 J18 in Simister, and the closest school is St Margaret's Church of England Primary School at approximately 125m south of the M60 near J18. There are also isolated properties in semi-rural areas alongside the Scheme. Examples of other sensitive receptors include places of worship, community services and leisure facilities.

11.7.5 Figure 11.2: Noise Sensitive Receptors of the Environmental Statement Figures (TR010064/APP/6.2) shows the noise sensitive receptors within the noise study area. These also include outdoor noise sensitive areas such as Heaton Park Registered Park and Garden and Poppythorn Conservation Area (see Chapter 6: Cultural Heritage of this Environmental Statement (TR010064/APP/6.1) for further details), and Prestwich Country Park and Hollins Vale Local Natural Reserve (see Chapter 8: Biodiversity of this Environmental Statement (TR010064/APP/6.1) for further details). There is no indication that Bury Metropolitan Borough Council have designated any Quiet Areas within the study area for the noise assessment.

11.7.6 A series of baseline noise surveys were undertaken between October and December 2021. These surveys were undertaken at five locations that are representative of individual or groups of sensitive receptors. The full details of the noise measurement surveys, including the rationale for the selection of each location, is provided in Appendix 11.3: Baseline Noise Survey Results of the Environmental Statement Appendices (TR010064/APP/6.3). The noise survey locations are indicated in Figure 11.1b: Noise Monitoring Locations and Areas of Application of Construction Noise Effect Levels of the Environmental Statement Figures (TR010064/APP/6.2). Table 11.16 summarises the locations and baseline measurement results.

Table 11.16 Baseline noise survey results

Noise Survey ID	Description	Survey dates	Measured $L_{A10,18h}$ dB (free-field)	Measured $L_{Aeq,T}$ dB (free-field)		
				Daytime	Night-time	Evening and weekend
N1	Droughts Lane Simister, south-east quadrant of M60 J18	05/10/21 to 12/10/21	60.8	61.2	56.1	59.1
N2	Eastview, Corday Lane South-west quadrant of M60 J18	05/10/21 to 12/10/21	63.2	63.8	59.9	62.6
N3	Conisborough Place Adjacent to eastbound carriageway of M60 between J17 and J18	05/10/21 to 12/10/21	66.0	65.4	61.3	64.3
N4	Marston Close North-east quadrant M60 J18	05/10/21 to 12/10/21	59.4	58.3	54.6	55.8
N5	Cowl Gate Farm Isolated property west of M66 northbound	30/11/21 to 07/12/21	72.8	72.6	66.5	70.0

Future baseline

11.7.7 The Do Minimum traffic scenario is representative of the predicted growth in traffic, accounting for local and regional development. Cumulative impacts are implicit in the future Do Minimum and Do Something scenarios because committed developments are included in the traffic model. Other committed developments identified in the assessment of cumulative effects which are taken into account in the traffic model are listed in Table 15.3 of Chapter 15: Assessment of Cumulative Effects of this Environmental Statement (TR010064/APP/6.1).

11.7.8 Traffic growth aside, the future noise baseline around the Scheme is likely to be similar to the existing baseline.

11.7.9 There are areas of proposed housing development alongside the M60, M62 and M66 as well as within the surrounding area, either currently being constructed or with planning approval to be constructed (see Chapter 15: Assessment of Cumulative Effects of this Environmental Statement (TR010064/APP/6.1) for further details). Those developments within 600m of the Scheme, listed in Table 11.17, have been included within the noise assessment as sensitive receptors.

Table 11.17 Proposed developments included within the noise assessment

Planning application reference	Location	Proposed number of dwellings	Overlap in temporal scope? Construction M60: 2025-2029 M60 opening year: 2029
65379 – Residential	92 Mersey Drive, Whitefield, Manchester, M45 8LF	27	The demolition of the existing building has been completed. Construction of the proposed development is currently underway and it is therefore likely to have been completed prior to construction of the Scheme. Sensitive receptors within the development have been included within the assessment as it will be in place before construction of the Scheme.

11.7.10 Future climate change has the potential to alter the noise climate, as rainfall, temperature and wind are factors that can influence the generation or propagation of noise. However, none of these factors are used within the NPS NN stated calculation methodology for the prediction of road traffic noise (i.e. CRTN (Department of Transport and Welsh Office, 1988)). In addition, the weather conditions are not considered within the assessment methodology contained within DMRB LA 111.

Value (sensitivity) of receptors

11.7.11 DMRB LA 111 does not provide a scale of value or sensitivity for receptors. A receptor is either sensitive or not sensitive to noise and/or vibration. Within the table of Terms and Definitions, DMRB LA 111 defines a noise sensitive receptor as *'dwellings, hospitals, healthcare facilities, education facilities, community facilities, international and national designated sites, public rights of way and cultural heritage assets'*. Figure 11.2: Noise Sensitive Receptors of the Environmental Statement Figures (TR010064/APP/6.2) shows the sensitive receptors within the noise study area which have been defined within DMRB LA 111.

11.7.12 With no scale of value, it is therefore not possible for the noise and vibration assessment to use the matrix-based approach to determine potentially significant effects. However, the value of a receptor as sensitive or not sensitive has been taken into consideration as a factor when determining whether an effect is significant or not, taking into account the determining significance sections in DMRB LA 111.

11.8 Potential impacts

11.8.1 In this section the potential impacts from noise and vibration on the sensitive receptors during both construction and operation are described. For construction this considers only adverse impacts since it is not possible for a construction activity to reduce the ambient noise level at a receptor. However, the presence of a reduced speed limit along the route during the construction phase can cause a reduction in noise that is often noticeable to nearby residents when works are not taking place in the immediate vicinity.

11.8.2 For construction impacts, the main activities taking place that are likely to generate noise and/or vibration are described below for each of the main construction areas.

11.8.3 Mobilisation is expected to start in late 2025 with the main construction phase expected to start in early 2026 and finish in 2029 (see Section 2.6 of Chapter 2: The Scheme of this Environmental Statement (TR010064/APP/6.1) for further details). For construction impacts, the main activities taking place that are likely to generate noise and/or vibration are described below.

11.8.4 For the potential impacts from the operation of the new road (i.e. when it is open for traffic), only noise is considered for the opening year of 2029, and a future assessment year of 2044.

Construction

Construction noise

11.8.5 The assessment of airborne noise during construction has considered the impact of the following factors:

- The different construction activities and techniques
- Plant and equipment to be used
- Noise emissions from plant
- Distances from the nearest noise sensitive receptors

11.8.6 A detailed list of the construction phasing and the plant and equipment assumed for the various construction activities is presented in Appendix 11.4: Construction Noise Calculations of the Environmental Statement Appendices (TR010064/APP/6.3).

11.8.7 For the times of operation of the construction works themselves, activity time has been assumed to be 75% during each shift, allowing for breaks. Daytime working hours are assumed to be 07:00 to 19:00 hours between Monday and Friday, and 07:00 and 13:00 on Saturday. In addition, there may be an hour before or after these times for site set up and close down (this would include activities such as deliveries, movement to place of work and general preparation works, but would not involve operation of plant or machinery). During the summer months hours of working could extend to 07:00 to 21:00 hours in order to take advantage of longer daylight hours. Evening and night time works on the strategic road network would normally occur between the hours of 19:00 to 07:00 hours.

11.8.8 Calculations of noise from construction have been made for all receptors within 300m of construction works. This study area is indicated in Figure 11.1a: Noise Study Areas, Noise Important Areas and Existing Noise Barriers of the Environmental Statement Figures (TR010064/APP/6.2). The calculations assume that the noisiest items of plant will be working at the closest point to each receptor, and allows for spacing of other plant items away from receptors. In practice plant would be spread out over a wider area of work than has been assumed.

11.8.9 The predicted construction noise during each construction activity in the different working areas and phases are presented in full in Appendix 11.4: Construction Noise Calculations of the Environmental Statement Appendices (TR010064/APP/6.3). Table 11.18 provides a list of the main working phases in different areas, allowing the assessment to be broken down into the areas where different construction activities are taking place, as described in Appendix 11.5: Operational Noise Calculation Results of the Environmental Statement Appendices (TR010064/APP/6.3). The expected timing of the works in relation to day/night-time is also given as well as the expected time period of the works in each phase. Works phasing are subject to change during the construction phase, however the risk of changes to plant and/or methods resulting in material differing results is considered to be minimal due to early discussions with the Principal Contractor.

Table 11.18 Main construction working phases/areas and timescales

Working area ID	Description of phase and area	Time periods of works	Approximate time period
A	Mobilisation and demobilisation	Day and night	Q4 2025 Q1 2029 to Q2 2029
B	Online works M60 J17-J18 central reserve	Day and night	Q2 2028 to Q4 2028
C	Online works M60 J17-J18 CW hard shoulder (HS)	Day and night	Q1 2026 to Q2 2027
D	Online works M60 J17-J18 ACW HS	Day and night	Q1 2027 to Q2 2028
E	Online works M66 Central Reserve	Day and night	Q1 2026 to Q3 2026
F	Online works M66 verges	Day and night	Q3 2026 to Q2 2028
G	Online works M62 westbound (WB) to M60 SB	Day and night	Q3 2026 to Q4 2026
H	Online works M60 J18 ACW off-slip/free-flow link/mainline	Day and night	Q3 2028 to Q4 2028
I	Online works Central Reserve M60 J18-19	Day and night	Q1 2028 to Q3 2028
J	Online works M60 J18 roundabout	Night	Q3 2028 to Q4 2028
K	Offline works M66 southbound (SB) diverge	Day and night	Q1 2026 to Q2 2028
L	Offline works Northern Loop	Day	Q1 2026 to Q1 2028
M	Offline works M60 J18 north-west (NW) quadrant	Day	Q1 2026 to Q3 2028
N	Offline works M60 J18 south-west (SW) quadrant	Day and night	Q4 2026 to Q1 2028
O	Simister Pike Fold Bridge	Day	Q1 2027 to Q4 2027
P	Simister Pike Fold Viaduct	Day and night	Q2 2026 to Q3 2028

11.8.10 Working areas and construction activities for each phase, identifying the potential daytime construction impacts, are given in Tables 11.19 and 11.20. This excludes phase T as the works in this phase will be carried out only during the night-time. The key is provided at the top of the table for clarity. Details of the plant assumed to be operating in each working phase is given in Appendix 11.4: Construction Noise Calculations of the Environmental Statement Appendices (TR010064/APP/6.3).

11.8.11 In summer months working hours may be extended later into the evening period. The assessment of night-time noise for most working areas takes into account later working hours as the night-time period is assessed, and the threshold levels are lower. For the offline works at the Northern Loop and NW quadrant, and also structures works at Simister Pike Fold Bridge, the evening period has been additionally assessed, with impacts shown in Table 11.21.

Table 11.19 Summary of daytime construction phase impacts during mobilisation and online works

Construction activity*	Working phase and area								
	A	B	C	D	E	F	G	H	I
Establish temporary compounds [Mob1]	g	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Traffic management [Mob2, Mob16]	g	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Site clearance [Mob3, Mob13, On2]	r	r	r	r	r	a	a	g	g
Highways widening for compound access / egress [Mob4]	g	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Earthworks (various activities) [Mob5. On3]	g	g	r	g	a	g	g	g	g
Drainage [Mob6, On4]	g	g	r	g	a	g	n/a	g	g
Surface water channel [On5]	n/a	g	r	g	a	g	n/a	g	g
Lighting, kerbing, fencing [Mob7]	g	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Accommodation foundations and units [Mob8]	g	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Pavement and white lining [Mob9, On7]	g	g	n/a	g	g	g	r	n/a	g
Fencing [Mob12]	a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Utility diversions [Mob15]	r	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Demobilisation from site and reinstatement [Mob17]	g	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Concrete barrier [On6]	n/a	g	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Gantry works [On8, On15, On19, On21]	n/a	a	r	g	n/a	g	n/a	g	n/a
Retaining walls [On9]	n/a	n/a	r	r	n/a	n/a	n/a	n/a	n/a
Gravity wall [On10]	n/a	n/a	g	g	n/a	n/a	n/a	n/a	n/a
Technology [On11]	n/a	n/a	r	r	n/a	a	n/a	n/a	n/a
Street lighting [On13]	n/a	n/a	r	g	n/a	a	n/a	n/a	n/a
Traffic signs [On12]	n/a	n/a	n/a	g	n/a	a	g	n/a	n/a
Environmental barrier works [On18]	n/a	n/a	n/a	r	n/a	n/a	n/a	n/a	n/a

Construction activity*	Working phase and area								
	A	B	C	D	E	F	G	H	I
Topsoiling [On16]	n/a	n/a	r	g	n/a	n/a	n/a	n/a	n/a
Landscaping [On17]	n/a	n/a	r	a	n/a	a	n/a	n/a	n/a
Vehicle restraint system (VRS) [On14]	n/a	n/a	r	r	n/a	a	a	g	n/a

Key:

r	Predicted construction noise equal to or level above SOAEL +5dB (Major magnitude)
a	Predicted construction noise level equal to or above SOAEL and below SOAEL +5dB (Moderate magnitude)
g	Predicted construction noise level below SOAEL (Minor or Negligible magnitude)
n/a	Not applicable (construction activity outside of 300m from receptors)

*Activity numbers in square brackets correspond to those in Appendix 11.4: Construction Noise Calculations of the Environmental Statement Appendices (TR010064/APP/6.3)

Table 11.20 Summary of daytime construction phase impacts during offline works and structures

Construction activity*	Working phase and area					
	K	L	M	N	O	P
Temporary works [Off1]	a	g	a	g	n/a	n/a
Earthworks [Off2]	g	a	a	g	n/a	n/a
Ground improvement [Off3]	g	a	n/a	n/a	n/a	n/a
Ground monitoring equipment [Off4]	g	g	n/a	n/a	n/a	n/a
Install / remove temporary surcharge [Off5]	a	g	n/a	n/a	n/a	n/a
Temp works for Pike Fold Bridge structure [Off6]	g	n/a	n/a	n/a	n/a	n/a
Works outside of structures footprint [Off7]	g	a	a	n/a	n/a	n/a
Tie-in works at north/south diverge points [Off8]	g	n/a	n/a	n/a	n/a	n/a
Embankments [Off9]	a	n/a	a	g	n/a	n/a
Box cut, capping and subbase [Off10]	a	a	a	n/a	n/a	n/a
Topsoiling & verge [Off11]	a	a	r	a	n/a	n/a
Drainage [Off12]	g	a	g	g	n/a	n/a
Surface water channel [Off13]	g	a	g	n/a	n/a	n/a
VRS [Off14]	a	r	g	g	n/a	n/a
Pavement works [Off15]	a	r	r	n/a	n/a	n/a

Construction activity*	Working phase and area					
	K	L	M	N	O	P
Surface course [Off16]	g	r	g	n/a	n/a	n/a
Traffic signs [Off17]	g	r	a	g	n/a	n/a
Road markings [Off18]	g	a	g	n/a	n/a	n/a
Lighting & motorway communications [Off19]	g	a	g	g	n/a	n/a
Landscaping (finishing) [Off20]	a	g	a	a	n/a	n/a
Vegetation clearance [Off21]	n/a	n/a	g	n/a	n/a	n/a
Piling [St1, St6]	n/a	n/a	n/a	n/a	g	a
Beam installation [St3]	n/a	n/a	n/a	n/a	g	n/a
Diaphragm walls [St4]	n/a	n/a	n/a	n/a	g	n/a
Bridge deck [St5]	n/a	n/a	n/a	n/a	g	n/a
Formwork reinforcement and concrete (FRC) to pile cap [St2]	n/a	n/a	n/a	n/a	g	a

Key:

r	Predicted construction noise level equal to or above SOAEL +5dB (Major magnitude)
a	Predicted construction noise level equal to or above SOAEL and below SOAEL +5dB (Moderate magnitude)
g	Predicted construction noise level below SOAEL (Minor or Negligible magnitude)
n/a	Not applicable (construction activity outside of 300m from receptors)

*Activity numbers in square brackets correspond to those in Appendix 11.4: Construction Noise Calculations of the Environmental Statement Appendices (TR010064/APP/6.3)

Table 11.21 Summary of evening construction phase impacts during offline works and structures

Construction activity*	Working phase and area		
	L	M	O
Temporary works [Off1]	g	r	n/a
Earthworks [Off2]	a	a	n/a
Ground improvement [Off3]	a	n/a	n/a
Ground monitoring equipment [Off4]	g	n/a	n/a
Install / remove temporary surcharge [Off5]	a	n/a	n/a
Works outside of structures footprint [Off7]	r	r	n/a

Construction activity*	Working phase and area		
	L	M	O
Embankments [Off9]	n/a	r	n/a
Box cut, capping and subbase [Off10]	r	r	n/a
Topsoiling & verge [Off11]	r	r	n/a
Drainage [Off12]	r	g	n/a
Surface water channel [Off13]	a	g	n/a
VRS [Off14]	r	g	n/a
Pavement works [Off15]	r	r	n/a
Surface course [Off16]	r	g	n/a
Traffic signs [Off17]	r	r	n/a
Road markings [Off18]	a	g	n/a
Lighting & motorway communications [Off19]	g	g	n/a
Landscaping (finishing) [Off20]	g	r	n/a
Vegetation clearance [Off21]	n/a	g	n/a
Piling [St1]	n/a	n/a	a
Formwork reinforcement and concrete (FRC) to pile cap [St2]	n/a	n/a	g
Beam installation [St3]	n/a	n/a	g
Diaphragm walls [St4]	n/a	n/a	g
Bridge deck [St5]	n/a	n/a	a

Key:

r	Predicted construction noise equal to or level above SOAEL +5dB (Major magnitude)
a	Predicted construction noise equal to or level above SOAEL and below SOAEL +5dB (Moderate magnitude)
g	Predicted construction noise level below SOAEL (Minor or Negligible magnitude)
n/a	Not applicable (construction activity outside of 300m from receptors)

*Activity numbers in square brackets correspond to those in Appendix 11.4: Construction Noise Calculations of the Environmental Statement Appendices (TR010064/APP/6.3)

11.8.12 A summary of the working areas and construction activities identifying the potential impacts from night-time works are given in Tables 11.22 and 11.23.

Table 11.22 Summary of night-time construction phase impacts during mobilisation and online works

Construction activity*	Working phase and area									
	A	B	C	D	E	F	G	H	I	J
Traffic management [Mob2, Mob14, Mob16, On1]	a	r	r	r	r	r	a	a	a	r
Site clearance [Mob3, Mob13, On2]	r	r	r	r	r	g	r	a	r	g
Highways widening for compound access / egress [Mob4]	g	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Earthworks (various activities) [On3]	n/a	r	r	r	r	n/a	n/a	g	g	n/a
Drainage [On4]	n/a	r	r	a	r	a	a	g	g	n/a
Surface water channel [On5]	n/a	r	r	r	r	a	a	g	g	n/a
Pavement and white lining [On7]	n/a	r	r	r	r	a	n/a	a	a	r
Utility Diversions [Mob15]	r	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Concrete barrier [On6, On22]	n/a	r	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Gantry works [On8, On15, On19, On21]	n/a	r	r	r	r	a	n/a	n/a	n/a	n/a
Retaining walls [On9]	n/a	n/a	r	r	n/a	n/a	n/a	n/a	n/a	n/a
Gravity wall [On10]	n/a	n/a	g	a	n/a	n/a	n/a	n/a	n/a	n/a
Technology [On11]	n/a	n/a	r	r	n/a	a	n/a	n/a	n/a	a
Street lighting [On13]	n/a	n/a	r	r	r	a	n/a	n/a	n/a	g
Traffic signs [On12]	n/a	n/a	n/a	a	n/a	n/a	n/a	n/a	n/a	n/a
Environmental barrier works [On18]	n/a	n/a	n/a	r	n/a	n/a	n/a	n/a	n/a	n/a
Topsoiling [On16]	n/a	n/a	n/a	r	n/a	n/a	n/a	n/a	n/a	n/a
Landscaping [On17]	n/a	n/a	n/a	n/a	n/a	r	n/a	n/a	n/a	g
VRS [On14]	n/a	n/a	n/a	n/a	n/a	a	n/a	r	n/a	n/a
Piling [On20]	n/a	n/a	n/a	n/a	n/a	a	n/a	n/a	n/a	n/a
Final surfacing and white lining [On23]	n/a	r	r	r	r	r	r	r	r	r

Construction activity*	Working phase and area									
	A	B	C	D	E	F	G	H	I	J
Key:										
r	Predicted construction noise level equal to or above SOAEL +5dB (Major magnitude)									
a	Predicted construction noise level equal to or above SOAEL and below SOAEL +5dB (Moderate magnitude)									
g	Predicted construction noise level below SOAEL (Minor or Negligible magnitude)									
n/a	Not applicable (construction activity outside of 300m from receptors)									
*Activity numbers in square brackets correspond to those in Appendix 11.4: Construction Noise Calculations of the Environmental Statement Appendices (TR010064/APP/6.3)										

Table 11.23 Summary of night-time construction phase impacts during offline works and structures

Construction activity*	Working phase and area		
	K	N	P
Landscaping [Off20]	r	r	n/a
Piling [St6]	n/a	n/a	r
Beam delivery [St7]	n/a	n/a	r
Diaphragm walls [St4]	n/a	n/a	r
Bridge deck construction [St5]	n/a	n/a	r
FRC to pile cap [St2]	n/a	n/a	r
Key:			
r	Predicted construction noise level equal to or above SOAEL +5dB (Major magnitude)		
a	Predicted construction noise level equal to or above SOAEL and below SOAEL +5dB (Moderate magnitude)		
g	Predicted construction noise level below SOAEL (Minor or Negligible magnitude)		
n/a	Not applicable (construction activity outside of 300m from receptors)		
*Activity numbers in square brackets correspond to those in Appendix 11.4: Construction Noise Calculations of the Environmental Statement Appendices (TR010064/APP/6.3)			

11.8.13 Where the SOAEL is predicted to be met or exceeded there are potential significant effects. Table 11.24 and Table 11.25 summarises the number of receptors predicted to experience each magnitude of change during the daytime and night-time respectively, based on the noisiest construction activity in each working study area.

Table 11.24 Potential daytime construction noise impacts

Magnitude	Working phase by number of receptors				Number of receptors in any phase
	Mobilisation and demobilisation	Online works	Offline works	Structures	
Major	60	23	30	0	79
Moderate	140	111	51	1	196
Minor	90	255	104	0	254
Negligible	215	2,229	114	168	2,089

11.8.14 As shown in Table 11.24, there are Moderate and Major magnitude impacts predicted at up to 275 noise sensitive receptors during daytime works, which are potential significant effects.

11.8.15 For those daytime works that may extend into later working hours during the summer months, there will be an additional 59 receptors that may experience construction noise levels above the evening SOAEL, which are potential significant effects.

Table 11.25 Potential night-time construction noise impacts

Magnitude	Working phase by number of receptors				Number of receptors in any phase
	Mobilisation and demobilisation	Online works	Offline works	Structures	
Major	233	198	2	1	367
Moderate	89	305	21	2	280
Minor	112	369	42	26	383
Negligible	71	1,746	234	140	1,588

11.8.16 As shown in Table 11.25, there are Moderate and Major magnitude impacts predicted at up to 647 noise sensitive receptors during night-time works, which are potential significant effects.

Construction vibration

11.8.17 A review of construction activities identified the following activities that were likely to generate levels of vibration with the potential to create vibration effects for receptors:

- Online works - gantry foundation piling
- Online works – retaining walls piling
- Online and offline works – vibratory compaction during paving
- Structures – piling of piers

- Structures piling of abutments

11.8.18 Contained with BS 5228-2:2009+A1:2014 (BSI, 2014b) are equations to predict the expected level of vibration from various activities. These have been used to predict the expected impact from vibration from piling and compaction activities required for paving works.

11.8.19 The gantry foundations are expected to be installed by continuous flight auger concrete piles or by steel screw piles using an excavator with a screw attachment. The piling of the structures abutments and piers are also expected to be carried out using rotary bored piles. These piling methods are not vibration generating, as they do not involve impacts.

11.8.20 The piling method for retaining walls is expected to be vibratory sheet steel, and calculations of vibration around the retaining walls have been based on this method. During paving a large 2.1m wide vibratory roller has been assumed. Table 11.26 shows the number of sensitive receptors expected to experience potentially significant levels of vibration from these activities. The calculations are based on a 5% probability of the predicted value being exceeded (giving 95% confidence).

Table 11.26 Potential construction vibration impacts

Magnitude	Number of sensitive receptors		Number of receptors in any phase
	Piling	Compaction	
Major	0	0	0
Moderate	117	155	207
Minor	312	390	419

11.8.21 A construction vibration magnitude of impact of Moderate or Major is a likely significant effect. As shown in Table 11.26, there are no predicted Major magnitude impacts during either piling or compaction and Moderate magnitude impacts predicted at up to 207 sensitive receptors.

11.8.22 There are 117 receptors with a predicted Moderate magnitude of impact where vibration during the sheet piling of retaining walls is predicted to meet or exceed SOAEL. The maximum level of vibration during piling is calculated to be 1.2mm/s PPV at Prestfield Court.

11.8.23 There are 155 receptors with a predicted Moderate magnitude of impact where vibration during compaction is predicted to meet or exceed SOAEL. The maximum level of vibration during pavement works compaction is calculated to be 1.9mm/s PPV at Droughts Lane.

11.8.24 The highest predicted level of 1.9mm/s is just above the SOAEL of 1.0mm/s, where Table 1.5 of Appendix 11.2: Noise and Vibration Assessment Guidance and Standards of the Environmental Statement Appendices (TR010064/APP/6.3) advises the following effect: *'It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.'*

Construction traffic and diversion routes

11.8.25 The impact from construction traffic on the motorways and the local road network has been examined to determine whether this could impact upon sensitive receptors. This has been undertaken for the construction years of 2026, 2027, 2028 and 2029. The amount of construction traffic compared to the existing traffic on the majority of the roads is low, and any increases in noise would be negligible and of less than 1dB(A) on all roads.

11.8.26 During certain construction activities (e.g. piling of retaining walls and gantries and bridge span installation), it would be necessary to implement full closures of different parts of the motorway. Table 11.27 presents a summary of the full carriageway closures that would result in traffic diversions onto local road network that would normally experience lower traffic levels at night. The sudden change of traffic levels onto diversion routes as a result of night-time closures is likely to cause disturbance to receptors next to (within 25m of) the road.

Table 11.27 Summary of carriageway closures and traffic diversion routes

Road closure	Diversion route description	No. dwellings within 25m
M60 J17-18 ACW full closure	From M60 J17 south along A56 Bury New Road to A6044 Scholes Lane turning east to A576 Middleton Road then north-east to M60 J19, then north to M60 J18. This route would be the same for both directions of travel.	258
M60 J17-18 CW full closure	As above in counter direction, leaving M60 at J19 west onto A576 Middleton Road to A6044 Scholes Lane, then north onto A56 Bury New Road re-joining M60 at J17.	258
M66 northbound and southbound closure J3 to J4	The eastern diversion takes traffic from M66 J3 along Pilsworth Road/Moss Haul Road to Rochdale Link Road, joining M62 westbound at J19. The western diversion takes traffic onto Pilsworth Road then Croft Lane and onto A56 through Whitefield to join M60 CW at J17.	377
M60 J18-J19 full closure	Leaving M60 at J19 west onto A576 Middleton Road to A6044 Scholes Lane, then north onto A56 Bury New Road re-joining M60 at J17	258

11.8.27 DMRB LA 111 states that the use of any diversion route during night-time hours (23:00 to 07:00 hours) would be considered as a Major magnitude impact. This would be a significant effect if these occur for 10 or more nights in any consecutive 15 nights, or a total of more than 40 nights in any consecutive six-month period.

Operation

11.8.28 The level of road traffic noise affecting any receptor is dependent on several variables, all of which are accounted for within the road traffic noise prediction methodology. In summary these are:

- Traffic related factors: volume, speed and composition of vehicles

- Road related factors: surface (e.g. concrete, bituminous) and gradient
- Propagation factors: distance, the presence of screening and type of ground cover intervening between the road and any receptor
- Receptor specific factors: view of the road

11.8.29 The Scheme would result in changes in some or all of these factors alter, either through changes on or to an existing road or with the introduction of a new section of road. As a result, noise levels are also likely to change. Individually these variables might cause noise levels to increase or decrease for any receptor. Given the proximity of sensitive receptors to the Scheme, it is likely that some sensitive receptors would experience adverse impacts. This section describes the potential impacts along the route including embedded mitigation, but not essential mitigation.

11.8.30 Either side of the M60 between J17 and J18 the edge of the running lane of traffic would move closer to noise sensitive receptors both to the north and the south of the M60. Noise modelling indicates that this physical change together with changes in road traffic flows and speeds have the potential to result in noise changes of a Minor magnitude noise increase of 1dB to 2.9dB. This is predicted to occur at receptors adjacent to the M60 on roads such as Kenilworth Avenue, Warwick Close, Warwick Avenue and Peveril Close to the south, Balmoral Avenue, Kensington Street, Glendevon and Conisborough Place, Duddon Close and Derwent Avenue, to the north, and closer to J18 at Brathay Close, Rothay Close, Marston Close and parts of Parrenthorn Road and Corday Lane. These changes are potential significant effects because existing levels of road traffic noise are above SOAEL.

11.8.31 Close to M60 J17, in the areas of Bury New Road, Bury Old Road and Nursery Road noise modelling indicates Negligible magnitude increases and decreases of less than 1.0dB.

11.8.32 Around M60 J18 and south of J18 in the area of Simister and Haywood Road noise modelling indicates Negligible magnitude increases and decreases of less than 1.0dB.

11.8.33 Either side of the M66 in the area of Unsworth and close to Pike Fold Golf Club noise modelling indicates Negligible magnitude increases and decreases of less than 1.0dB.

11.8.34 Many of the predicted increases of 1dB or more are in areas where the existing road traffic noise level is above the SOAEL, which indicates a potential significant effect. Additional essential mitigation for operational road traffic noise has therefore been considered.

11.8.35 There are no roads outside of the area physically changed or bypassed by the Scheme that are predicted to experience a short term BNL change of 1.0dB or more, or a long term change of 3.0dB or more, as a result of the Scheme.

11.9 Design, mitigation and enhancement measures

11.9.1 Mitigation is included in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5). This will be developed into a Second Iteration EMP for implementation during the construction phase, and secured by Requirement 4 of the draft DCO (TR010064/APP/3.1).

Embedded mitigation

11.9.2 The environment team has worked in close collaboration with the infrastructure design team to avoid or reduce environmental impacts through the Scheme design. This is referred to as embedded (or design) mitigation. Chapter 3: Assessment of Alternatives of this Environmental Statement (TR010064/APP/6.1) details the design alternatives that have been considered, including the environmental factors which have influenced the decision-making.

11.9.3 Embedded mitigation measures to reduce and if possible avoid likely significant adverse environmental effects during construction, and minimize any adverse environmental effects, for this aspect comprise the following commitments in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5):

- Commitment NV1 – The use of Best Practicable Means (BPM) during construction in accordance with an NVMP which will be developed and implemented based on Appendix B: Outline NVMP of the First Iteration (TR010064/APP/6.5). The NVMP will detail the management and monitoring processes to be introduced across all construction sites and compounds. This is standard sector practice in accordance with British Standard 5228- 1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise (BSI, 2014a); and British Standard 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration (BSI, 2014b). Examples of these BPM are as follows:
    - Appropriate selection of plant and construction methods: only plant conforming with or better than relevant national or international standards, directives or recommendations on noise or vibration emissions will be used. Construction plant will be maintained in good condition with regard to minimising noise and vibration output.
    - Construction plant will be operated and maintained appropriately, following manufacturer's written recommendations or using other appropriate operation and maintenance programmes that reduce noise and vibration emissions.
    - Use of audible reversing warning systems on mobile plant and vehicles will be of a type which, whilst ensuring that they give proper warning, have a minimum noise impact.
    - Choice of routes and timings for the transport of construction materials, waste materials and personnel to reduce the risk of increased noise and vibration impacts due to the construction of the Scheme.

- Haul roads will be well maintained and avoid, where feasible, the use of steep gradients.
- All site employees will be reminded of their obligation to minimise noise on site.
- Community liaison will keep residents updated about upcoming works that will directly impact them via letter, email or a virtual information hub.
- Where possible, the Principal Contractor will consider the use of the quietest commercially available plant that is suitable for each specific operation.

11.9.4 Embedded mitigation relevant to operational road traffic noise includes the following commitments in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5):

- Commitment NV3 – A conventional LNS with a Road Surface Influence (RSI) of -3.5dB will be laid on all sections of carriageway within the pavement works for the Scheme.
- Commitment NV5 – The like-for-like replacement of the existing 1m high noise barrier EB07 alongside the M60 J18 CW off-slip road which will be removed to allow for the construction of the new M60 J18 CW free-flow link to the M66.

Essential mitigation

11.9.5 Essential mitigation measures to reduce and if possible avoid likely significant adverse environmental effects during construction for this aspect comprise the following commitments in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5):

- Commitment NV1 – By way of inclusion in the NVMP, to be developed from Appendix B: Outline NVMP in the First Iteration EMP (TR010064/APP/6.5), examine measures to limit the magnitude of vibration during piling of retaining walls, and implement a framework to determine eligibility for noise insulation and temporary re-housing, where not practicable to mitigate airborne noise or reduce exposure to levels that are tolerable during certain intensive construction phases. This will include the noise limits used for determining eligibility and the frequency of such assessments.
- Commitment NV2 – During the noisiest phases of night-time works the Principal Contractor will review the temporal scope and aim to reduce adverse impacts to be below 10 or more nights in any consecutive 15 nights, or below a total of more than 40 nights in any consecutive six-month period for noise levels above SOAEL at receptors, where practicable.

- Commitment NV7 – Works will be planned to minimise the overall number of full carriageway closures required (whilst ensuring a safe working environment for road workers) by aiming to carry out multiple works within planned carriageway closures. When planning and implementing carriageway closures needing the use of the local road network, consideration will be given to both the impacts for communities alongside the diversion route as well as aiming to avoid strategic traffic diverting through communities alongside the M60 between Junctions 17, 18 and 19 and M66 Junction 3 to achieve an appropriate balance. For diversion routes used during construction the Principal Contractor will keep the timetable for full carriageway closures under review and aim to keep the number of night closures to below the temporal scope of 10 or more nights in any consecutive 15 nights, or a total of more than 40 nights in any consecutive six-month period.

- Commitment NV8 – During preparation of areas for compounds and ponds there is often a layer of topsoil that needs to be stripped off before the location can be used. Where practicable, this material will be stockpiled in appropriate locations so it can act as noise screening for nearby receptors.

- Commitment NV9 –Temporary noise screening will be provided at the edge of working areas where an existing road traffic noise barrier needs to be temporarily removed to allow access to construction plant to working areas.

- Commitment G3 – The Principal Contractor will inform the public of the nature, timing and duration of particular construction activities and the duration of the construction works, for example, by newsletters, letter drops and liaison with the relevant planning authority. A Communication Plan (that includes community engagement) will be developed before work commences on site.

11.9.6 For operation there is one form of essential mitigation for the Scheme (commitment NV4 in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5)). This is the provision of a road surface with better noise reducing properties than a conventional LNS. This surface will provide additional noise reduction that is better than that provided by a conventional LNS. This surface will have a RSI of at least -6.0dB(A) in the short term, assumed to reduce to that of a conventional LNS over the long term by 2044. Use of this surfacing is identified in order to remove or reduce potential significant adverse effects and will be applied across the following areas as shown in the Environmental Masterplan (Figure 2.3 of the Environmental Statement Figures (TR010064/APP/6.2))):

- All lanes of the M60 WB carriageway between M60 J18 to M60 J17 where there will be re-surfacing.

- All lanes of the M60 EB carriageway between M60 J17 to M60 J18 where there will be re-surfacing.

- The free-flow link from M60 EB to M66 NB.

Enhancement

11.9.7 Whilst the provision of a road surface with better noise reducing properties than a conventional LNS (in accordance with commitment NV4 in the REAC contained within the First Iteration EMP (TR010064/APP/6.5)) is required as essential mitigation for sensitive receptors where potential significant effects are likely, this will also provide road traffic noise reduction for other receptors within the study area where potential significant effects are not likely (with standard low noise surfacing). The surfacing with better noise reducing properties than a conventional LNS will therefore constitute an enhancement for those receptors.

11.10 Assessment of likely significant effects

11.10.1 This section provides a receptor-based assessment of the significance of effect after embedded and essential mitigation. This focuses on effects which have the potential to be significant.

Construction

11.10.2 In Section 11.8 of this chapter construction activities were identified where the SOAEL is reached or exceeded (i.e. moderate or major magnitude impacts) and are therefore potential significant effects. These activities have been considered against the temporal thresholds given in DMRB LA 111 to determine if there are any likely significant effects. As defined earlier in the chapter the temporal durations are:

- 10 or more days or nights in any 15 consecutive days or nights; or
- A total number of days or nights exceeding 40 in any consecutive six-month period.

Construction noise

11.10.3 Instances of where the threshold for likely significant effects would occur are shown in Tables 11.28 to 11.31. There are some activities, such as site clearance and de-vegetation, fencing, road surfacing (pavement works) and white lining, that move along their working areas from one end to the other, so that the noisiest period of activity is limited to the duration of the activity at the closest point to a given receptor. Although the moderate or major impact for some of the noisiest activities (such as de-vegetation) would be for a shorter period than the temporal scope outlined above, a significant effect at receptors cannot be ruled out overall due to the continuous 3-year programme of works, where different construction phases follow on from one to another.

11.10.4 A summary of the number of receptors where the SOAEL is predicted to be met or exceeded during separate construction activities in each of the main work phases is given in Tables 11.28 through to 11.32. The total number of receptors impacted in each phase should not be added together to give an overall total of receptors impacted as there will be some receptors impacted by more than one construction activity.

Mobilisation and de-mobilisation

Table 11.28 Summary of construction significant effects at receptors during mobilisation and de-mobilisation

Activity	Timing of works	Number of receptors above or equal to SOAEL
Fencing [Mob12]	Day	7
Site clearance [Mob13]	Day	206
	Night	328
Traffic management [Mob14]	Night	1
Utility diversions [Mob15]	Day	19
	Night	35

11.10.5 Locations of daytime SOAEL exceedances for mobilisation and de-mobilisation works are indicated in Figure 11.3a: Construction Noise – Magnitude of Impact During Mobilisation and Demobilisation (Daytime) of the Environmental Statement Figures (TR010064/APP/6.2). The SOAEL is predicted to be met or exceeded at receptor on Simister Lane, Corday Lane and Marston Close during daytime fencing works. During daytime site clearance and utility diversions, the SOAEL is predicted to be met or exceeded at a larger number of receptors over a wider area in the area around Rothay Close and Parrenthorn Road. These are **significant adverse effects**.

11.10.6 Locations of night-time SOAEL exceedances for mobilisation and de-mobilisation works are indicated in Figure 11.3b: Construction Noise – Magnitude of Impact During Mobilisation and Demobilisation (Night-time) of the Environmental Statement Figures (TR010064/APP/6.2). During night-time traffic management the SOAEL is predicted to be met or exceeded at Cowl Gate Farm. During night-time site clearance and utility diversion works the SOAEL is predicted to be met or exceeded for a larger number of receptors across a wider area than the daytime works. These are **significant adverse effects**.

Online works

Table 11.29 Summary of construction significant adverse effects at receptors during online works (Table 1 of 2)

Activity	Timing of works	Number of receptors above or equal to SOAEL				
		(B) M60 J17-J18 central reserve	(C) M60 J17-J18 CW HS	(D) M60 J17-J18 ACW HS	(E) M66 Central Reserve	(F) M66 Verges
Traffic management [On1]	Night	121	99	30	49	18

Activity	Timing of works	Number of receptors above or equal to SOAEL				
		(B) M60 J17-J18 central reserve	(C) M60 J17-J18 CW HS	(D) M60 J17-J18 ACW HS	(E) M66 Central Reserve	(F) M66 Verges
Site clearance [On2]	Day	63	78	31	19	7
	Night	15	61	155	7	0
Earthworks [On3]	Day	0	2	0	3	-
	Night	35	42	15	28	-
Drainage [On4]	Day	0	18	0	3	-
	Night	28	68	24	28	3
Surface water channel [On5]	Day	0	28	0	3	-
	Night	27	110	40	29	1
Concrete barrier [On6]	Night	33	-	-	-	-
Pavement and white lining [On7]	Night	57	49	26	20	1
Gantry demolition [On18]	Night	-	-	-	53	-
Gantry foundation works [On8]	Day	4	6	0	-	-
	Night	44	52	14	-	-
New gantry installation [On15]	Night	-	38	9	-	-
Retaining wall [On9]	Day	-	18	4	-	-
	Night	-	131	120	-	-
Technology [On11]	Day	-	13	2	-	1
	Night	-	106	95	-	1
Traffic signs [On12]	Day	-	16	0	-	1
	Night	-	53	2	-	-
Street lighting [On13]	Day	-	18	0	2	6
	Night	-	64	8	29	59
VRS [On14]	Day	-	75	7	-	4
	Night	-	-	-	-	29

Activity	Timing of works	Number of receptors above or equal to SOAEL				
		(B) M60 J17-J18 central reserve	(C) M60 J17-J18 CW HS	(D) M60 J17-J18 ACW HS	(E) M66 Central Reserve	(F) M66 Verges
Topsoiling [On16]	Day	-	9	-0	-	-
	Night	-	-	71	-	-
Landscaping [On17]	Day	-	141	18	-	15
	Night	-	-	-	-	43
Environmental barrier [On18]	Day	-	-	2	-	-
	Night	-	-	164	-	-
Piling for piers [On20]	Night	-	-	-	-	16
Final surfacing and white lining	Night	188	188	188	20	20

11.10.7 Locations of daytime SOAEL exceedances during online works are indicated in Figure 11.4a: Construction Noise – Magnitude of Impact During Online Works (Daytime) of the Environmental Statement Figures (TR010064/APP/6.2). During works on the mainline between M60 J17 and J18 the SOAEL is predicted to be met or exceeded during multiple daytime activities. The construction of retaining walls is one of the noisiest when the SOAEL will be met or exceeded at up to 18 receptors. Alongside the M66 works exceedances of daytime SOAEL are predicted for a smaller number of receptors during several M66 working phases, with Major magnitude impacts predicted at receptors in the area of Rothay Close and also Prestfield Court. These are **significant adverse effects**.

11.10.8 Locations of night-time SOAEL exceedances during online works are indicated in Figure 11.4b: Construction Noise – Magnitude of Impact During Online Works (Night-time) of the Environmental Statement Figures (TR010064/APP/6.2). The activity with the highest number of receptors where the SOAEL is predicted to be met or exceeded alongside the M60 is site clearance during which the SOAEL will be met or exceeded for up to 155 receptors. Alongside the M66 up to 59 receptors are predicted to meet or exceed SOAEL during the installation of street lighting. There are Major magnitude impacts predicted at receptors either side of the M60 between J17 and J18. These are **significant adverse effects**.

Table 11.30 Summary of construction significant effects at receptors during online works (Table 2 of 2)

Activity	Timing of works	Number of receptors exceeding SOAEL			
		(G) M62 WB to M60 SB	(H) M60 ACW J18 off-slip/free flow link/ mainline	(I) M60 Central reserve J18-19	(J) M60 J18 roundabout
Traffic management [On1]	Night	18	16	16	20
Site clearance [On2]	Day	13	0	0	-
	Night	21	4	39	0
Surface water channel [On5]	Night	18	0	0	-
Drainage [On4]	Night	18	0	0	-
VRS [On14]	Day	13	0	-	-
	Night	-	39	-	-
Pavement and white lining [On7]	Day	13	-	0	-
	Night	-	1	1	17
Technology [On11]	Night	-	-	-	33

11.10.9 During works on the M62 WB to M60 SB and M60 WB on the slip road, free-flow link and mainline works the SOAEL is predicted to be met or exceeded at parts of Simister Lane, Wilton Court and Droughts Lane. During works on the M60 J18-J19 central reserve and on the M60 J18 roundabout the night-time SOAEL is predicted to be met or exceeded during three phases, in parts of Simister Lane, Wilton Court, Corday Lane and Droughts Lane. These are **significant adverse effects**.

Offline works

Table 11.31 Summary of construction significant effects at receptors during offline works

Activity	Timing of works	Number of receptors exceeding SOAEL			
		(K) M66 SB Diverge	(L) Northern Loop	(M) NW Quadrant	(N) SW Quadrant
Temporary works [Off1]	Day	1	-	6	0
	Evening	N/A	1	28	N/A

Activity	Timing of works	Number of receptors exceeding SOAEL			
		(K) M66 SB Diverge	(L) Northern Loop	(M) NW Quadrant	(N) SW Quadrant
Earthworks [Off2, Off7]	Day	-	1	6	0
	Evening	N/A	1	28	N/A
Ground improvement [Off3]	Day	-	1	-	-
	Evening	N/A	1	-	N/A
Surcharge [Off5]	Day	1	0	-	-
	Evening	N/A	1	-	N/A
Box capping and subbase [Off9, Off10]	Day	1	1	18	0
	Evening	N/A	1	35	N/A
Drainage [Off12]	Day	-	1	0	0
	Evening	N/A	1	0	N/A
Surface water channel [Off13]	Day	0	1	0	
	Evening	N/A	1	0	N/A
Landscaping [Off20]	Day	1	0	17	1
	Evening	N/A	1	35	N/A
	Night	46	-	-	24
VRS [Off14]	Day	1	1	0	0
	Evening	N/A	1	3	N/A
Pavement works [Off15]	Day	1	1	89	-
	Evening	N/A	1	140	N/A
Surface course [Off16]	Day	-	1	0	-
	Evening	N/A	1	11	N/A
Traffic signs [Off17]	Day	-	1	13	0
	Evening	N/A	1	28	N/A
Road lighting & communications [Off19]	Day	-	1	-	1
	Evening	N/A	1	1	N/A
Topsoiling [Off11]	Day	1	1	34	3
	Evening	N/A	1	68	N/A

Activity	Timing of works	Number of receptors exceeding SOAEL			
		(K) M66 SB Diverge	(L) Northern Loop	(M) NW Quadrant	(N) SW Quadrant
Vegetation clearance [Off21]	Evening	N/A	0	1	N/A

11.10.10 Locations of daytime and night-time SOAEL exceedances during offline works are indicated on Figure 11.5a: Construction Noise – Magnitude of Impact During Offline Works (Daytime) and Figure 11.5b: Construction Noise – Magnitude of Impact During Offline Works (Night-time) of the Environmental Statement Figures (TR010064/APP/6.2), respectively. The day and night-time SOAEL is predicted to be met or exceeded during construction of the M66 diverge are located at Cowl Gate Farm and in the village of Simister. The predicted daytime exceedances of SOAEL during the five working phases on the Northern Loop are at Cowl Gate Farm, extending to areas around Marston Close, Hodder Way and Heybrook Walk when these works continue into evening hours during summer months. The predicted exceedances during pavement works and topsoiling of the NW quadrant are located in parts of Marston Close, Rothay Close and Brathay Close. These are **significant adverse effects**.

Structures works

Table 11.32 Summary of construction significant effects at receptors during structures works at (P) Simister Pike Fold Viaduct

Activity	Timing of works	Number of receptors exceeding SOAEL
Piling to Abutments and Piers [St1, St6]	Day	1
	Night	3
FRC to pile caps and walls [St2]	Day	1
	Night	3
Beam delivery, fit out and installation [St7]	Night	3
Diaphragm walls [St4]	Night	3
Bridge deck construction [St5]	Night	3

11.10.11 Locations of the daytime and night-time SOAEL exceedances during structures works are indicated on Figure 11.6a: Construction Noise – Magnitude of Impact During Structures Works (Daytime) and Figure 11.6b: Construction Noise – Magnitude of Impact During Structures Works (Night-time) of the Environmental Statement Figures (TR010064/APP/6.2), respectively. The night-time SOAEL is predicted to be met or exceeded during construction of the M66 diverge are located at Cowl Gate Farm and Droughts Lane in the village of Simister. These are **significant adverse effects**.

11.10.12 Although there are no predicted exceedances of construction SOAEL during the day-time works associated with Simister Pike Fold Bridge, there are predicted exceedances of the evening SOAEL at Cowl Gate Farm during piling of abutments and deck construction when these works are undertaken during longer working hours in the summer months. These are **significant adverse effects**.

Cumulative impacts

11.10.13 There will be some overlap of the main working phases, as described in Table 11.18. There is therefore the potential for noise from different working phases to result in higher noise levels at some receptors that would be below SOAEL during one of the working phases. The noisiest construction activity from each phase and working area listed in Table 11.18 have been combined based on periods of program overlap to establish whether there are additional receptors where the SOAEL would be met or exceeded.

11.10.14 During the daytime there would be an additional 41 receptors that would meet or exceed the SOAEL due to cumulative impacts, and in the night-time period an additional 73 receptors during 2027 Q1 to Q4 when the most construction phases would be occurring at the same time. This is a worst-case assessment as it assumes the noisiest construction activities would be occurring at all times in each phase. In practice the construction activities would not occur concurrently within each phase, resulting in fewer exceedances of SOAEL than have been predicted.

Summary

11.10.15 There are a total of 275 receptors where the SOAEL would be met or exceeded in the daytime and 647 receptors in the night-time periods. As the construction period is over several years, then the temporal scope is likely to be exceeded at these receptors, indicating **significant adverse effects**.

11.10.16 The First Iteration EMP (TR010064/APP/6.5) contains control measures to remove or reduce identified likely significant adverse effects. Commitment NV1 of the REAC, contained within the First Iteration EMP (TR010064/APP/6.5) includes the establishment of procedures to determine if any dwellings are eligible for noise insulation or the temporary re-housing of residents during construction within an NVMP. See Section 11.9 of this chapter for further details regarding mitigation measures.

Construction vibration

11.10.17 There are 207 receptors during compaction during paving and piling works where vibration is predicted to meet or exceed SOAEL, and these are shown on Figure 11.7a: Construction Vibration – Magnitude of Impact During Compaction and Figure 11.7b: Construction Vibration – Magnitude of Impact During Piling of the Environmental Statement Figures (TR010064/APP/6.2), respectively. For all of these the magnitude of impact is of Moderate, which may indicate a significant vibration effect. The duration of the activity is also considered, and the duration of compaction during paving is expected to be less than the temporal criteria of 10 days or nights in a consecutive 15-day period, as it is a transient activity that would pass the closest sensitive receptors in a period of time that is shorter than the temporal criteria.

11.10.18 The duration of the piling of the retaining walls is scheduled for periods that exceed the temporal criteria, but this is also a transient activity that will move along the length of the wall. Given that the highest predicted level of vibration is only just above the SOAEL when piling is at its closest location to a given receptor, it is considered that as the progression of the wall moves along then the temporal criteria is unlikely to be met.

11.10.19 Further to this there is a commitment (commitment NV1) to examine measures to limit the magnitude of vibration is in the REAC within the First Iteration EMP (TR010064/APP/6.5). Therefore, **no significant adverse effects** are predicted from vibration during construction.

Diversion routes

11.10.20 There is a commitment (commitment NV7) in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5), to plan the works to minimise the overall number of full carriageway closures, and to keep the total number of full carriageway closures to below the temporal threshold of 10 or more days in any 15 consecutive nights, or a total number of nights exceeding 40 in any consecutive six-month period. Therefore, **no significant adverse effects** are predicted from construction diversion routes onto the local road network.

Operation

Short-term noise change

11.10.21 The change in road traffic noise that would arise at individual receptors within the study area for the opening year of 2029, including the application of essential mitigation, is presented in Table 11.33. The changes are also indicated in Figure 11.8a: Road Traffic Noise – Magnitude of Change in the 2029 Opening Year (Daytime) and Figure 11.8b: Road Traffic Noise – Magnitude of Change in the 2029 Opening Year (Night-time) of the Environmental Statement Figures (TR010064/APP/6.2). The only ‘other sensitive receptor’ in use at night is Prestwich Hospital, and is the only receptor included in the final column of Table 11.33.

Table 11.33 Operational road traffic noise (with essential mitigation) short-term change summary, Do-Minimum 2029 to Do-Something 2029

Change in noise level dB(A)		Daytime		Night-time	
		Number of dwellings	Number of other sensitive receptors	Number of dwellings	Number of other sensitive receptors
Increase in noise level dB $L_{A10,18h}$ / L_{night}	<1.0	326	4	220	0
	1.0-2.9	0	1	0	0
	3-4.9	0	0	0	0
	>5	0	0	0	0
No change	0	27	2	323	0
Decrease in noise level dB $L_{A10,18h}$ / L_{night}	<1.0	1,789	25	2,036	1
	1.0-2.9	3,011	13	3,351	0
	3-4.9	1,549	7	808	0
	>5	36	0	0	0

11.10.22 There are predicted to be more road traffic noise decreases than increases with the implementation of the Scheme with essential mitigation.

11.10.23 A Minor magnitude noise increase of +1.4dB is indicated on the public right of way (6WHI) adjacent to the M66 southbound. It should be noted that with increased distance from the road the level of increase in noise can be expected to be lower, as exposure would be reduced. With increased distance from the road the change in noise would become no change.

11.10.24 There are Negligible magnitude noise increases of less than 1dB predicted at a relatively small number of receptors. These receptors are located in the area of M60 J17 along Bury New Road and Bury Old Road and also around M60 J18 in Simister and either side of the M60 and M66 south and north of M60 J18. This negligible magnitude of change would not be expected to be noticeable and is not a significant effect.

11.10.25 Most of the predicted road traffic noise decreases for dwellings and other sensitive receptors would be in the Negligible magnitude range of <1.0dB and the Minor magnitude range of 1dB to 2.9dB, which are not considered to be a significant effect.

11.10.26 There are Moderate magnitude noise decreases of 3dB to 4.9dB predicted for 1,549 residential dwellings and seven other sensitive receptors, which indicates a likely **significant beneficial effect**. These receptors are located both north and south of the M60 between J17 and J18 and are due to the use of a road surface with better noise reducing properties than a conventional LNS across the Scheme (commitment NV4 in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5)). A proportion of these receptors are located within NIAs, as outlined in Table 11.34.

11.10.27 There are also Major magnitude noise decreases of >5.0dB predicted for 36 residential dwellings indicating a likely **significant beneficial effect**. These receptors are also located both north and south of the M60 between J17 and J18, around Barnard Avenue and Warwick Avenue.

Noise Important Areas

11.10.28 The locations of each of the NIAs that are within or partially within the study area are shown on Figure 11.1a: Noise Study Areas, Noise Important Areas and Existing Noise Barriers of the Environmental Statement Figures (TR010064/APP/6.2), and the expected change in noise at each NIA is presented in Table 11.34. As required by DMRB LA 111, Table 11.34 also lists the noise mitigation the Scheme would deliver for each NIA. The change in noise provided in the third column of Table 11.34 is in relation to the change in noise on the façade of the dwelling(s) that would have been used to define the location as an NIA.

Table 11.34 Predicted noise level change at NIAs

NIA number	Essential noise mitigation	Predicted noise change, dB	Magnitude	Effect
1406	None identified.	No assessed receptors are within the NIA. Nearby changes are noise increases and decreases of <1dB	Negligible	Not significant
1670	None identified.	Noise increases and decreases of <1dB	Negligible	Not significant
1671	Resurfacing along the M60 using a surface with better noise reducing properties than a conventional LNS (commitment NV4 in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5)).	Noise increases and decreases of <1dB	Negligible	Not significant
		Short-term noise decreases of up to -5.1dB at some receptors within the NIA north and south of the M60.	Up to Major beneficial	Significant beneficial
8188	Resurfacing along part of the M60 within this NIA using a surface with better noise reducing properties than a conventional LNS (commitment NV4 in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5)).	Noise increases and decreases of <1dB	Negligible	Not significant
10718	None identified.	Noise increases and decreases of <1dB	Negligible	Not significant
10719	None identified.	Noise increases of <1dB	Negligible	Not significant

11.10.29 There are predicted reductions of up to 5.1dB in road traffic noise levels for some receptors within NIA 1671 that, in the short-term, would be noticeable and considered to be a likely **significant beneficial effect**.

11.10.30 There are no other changes in road traffic noise of greater than 1dB predicted within other NIAs.

Long-term noise change

11.10.31 The change in road traffic noise that would arise at individual receptors within the study area in the future year assessment with the Scheme is presented in Table 11.35. This is the change over 15 years after opening. The changes are also shown on Figure 11.9a: Road Traffic Noise – Magnitude of Change in the 2044 Future Year (Daytime) and Figure 11.9b: Road Traffic Noise – Magnitude of Change in the 2044 Future Year (Night-time) of the Environmental Statement Figures (TR010064/APP/6.2). The only 'other sensitive receptor' in use at night is Prestwich Hospital, and is the only receptor included in the final column in Table 11.35.

Table 11.35 Operational road traffic noise (with essential mitigation) long-term change summary, Do-Minimum 2029 to Do-Something 2044

Change in noise level dB(A)		Daytime		Night-time	
		Number of dwellings	Number of other sensitive receptors	Number of dwellings	Number of other sensitive receptors
Increase in noise level dB $L_{A10,18h}$ / L_{night}	<3.0	1,753	22	1,720	0
	3.0-4.9	0	0	0	0
	5-9.9	0	0	0	0
	>10	0	0	0	0
No change	0	302	2	372	0
Decrease in noise level dB $L_{A10,18h}$ / L_{night}	<3.0	4,638	28	4,646	1
	3.0-4.9	0	0	0	0
	5-9.9	0	0	0	0
	>10	0	0	0	0

11.10.32 There are no predicted changes in road traffic noise that would exceed +/- 3dB over the long term at any receptor. This is a Negligible magnitude of impact, which indicates **no significant effects**.

11.10.33 The significant beneficial effects that are predicted in the short-term upon Scheme opening (paragraphs 11.10.26 to 11.10.27 of this chapter) would not be experienced at receptors over the long-term (i.e. 15 years after opening), due to gradual increases in traffic growth over the time period, and an assumed reduction in performance of low noise road surfaces. The identified likely significant beneficial effects in the short term are therefore **not considered to be overall operational significant beneficial effects**, in consideration of the factors listed in paragraph 11.4.40 of this chapter.

‘Non-project’ noise change

11.10.34 The change in road traffic noise that would arise at individual receptors within the study area in the future year assessment without the Scheme is presented in Table 11.36. This enables a long-term comparison of changes in road traffic noise both with and without the Scheme. The only ‘other sensitive receptor’ in use at night is Prestwich Hospital, and is the only receptor included in the final column in Table 11.36.

Table 11.36 ‘Non-project’ summary of changes in road traffic noise over the long-term, Do-Minimum 2029 to Do-Minimum 2044

Change in noise level dB(A)		Daytime		Night-time	
		Number of dwellings	Number of other sensitive receptors	Number of dwellings	Number of other sensitive receptors
Increase in noise level dB $L_{A10,18h}$ / L_{night}	<3.0	2,326	20	2,332	0
	3.0-4.9	0	0	0	0
	5-9.9	0	0	0	0
	>10	0	0	0	0
No change	0	3,884	17	3,919	0
Decrease in noise level dB $L_{A10,18h}$ / L_{night}	<3.0	528	15	487	1
	3.0-4.9	0	0	0	0
	5-9.9	0	0	0	0
	>10	0	0	0	0

11.10.35 The predicted ‘non-project’ changes in road traffic noise over the long term are all below +/- 3dB at all receptors, which is a Negligible magnitude of change and **no significant effects**.

11.10.36 There are predicted to be more receptors with a negligible increase in road traffic noise over the long term without the Scheme (Table 11.36) than with the Scheme (Table 11.35).

Noise Insulation Regulations

11.10.37 An initial assessment of possible eligibility for Part 2 of the NIR has identified that there are no dwellings where the road traffic noise criteria for eligibility for the provision of noise insulation would be met. This will be re-confirmed during detailed design and prior to the start of construction. Commitment NV6 in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5), is a commitment to undertake an assessment of eligibility of residential dwellings for sound insulation measures in accordance with the NIR (commitment NV6). The eligibility criteria for NIR are defined within paragraph 1.2.12 of Appendix 11.2: Noise and Vibration Assessment Guidance and Standards of the Environmental Statement Appendices (TR010064/APP/6.3).

Summary of residual effects

11.10.38 Tables 11.37 and 11.38 summarise the likely significant residual effects of the Scheme on noise and vibration during construction and operation. All effects have been quantitatively assessed based on the guidance and threshold criteria given within DMRB LA 111. The mitigation and enhancement measures listed in Tables 11.37 and 11.38 are described in Section 11.9 of this chapter and included in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5).

Table 11.37 Assessment of likely significant effects during construction

Receptor	Description of potential impact	Summary of mitigation / enhancement in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5)	Magnitude of impact	Scale of impact	Significance of residual effect
Receptors in the vicinity of mobilisation works	Daytime construction noise during the activities of fencing, site clearance and utility diversions Night-time construction noise during the activities of site clearance, utility diversions and traffic management	BPM and the use of quietest available plant (commitment NV1).	Major and Moderate	Temporary short term	**Significant adverse**
Receptors in the vicinity of demobilisation works	Daytime construction noise during demobilisation	BPM and the use of quietest available plant (commitment NV1).	Minor	Temporary short term	Not significant
Receptors in the vicinity of M60 online works	Daytime construction noise during the activities of site clearance, earthworks, drainage. Surface water channel, gantry works, retaining walls, technology/traffic signs/street lighting, VRS, topsoiling & landscaping and environmental barrier works. Night-time construction noise during the activities of traffic management, site clearance, earthworks, drainage. Surface water channel, concrete barrier, paving and white lining, gantry works, retaining walls, technology/traffic signs/street lighting, topsoiling, environmental barrier, final surfacing and white lining	BPM and the use of quietest available plant (commitment NV1).	Major and Moderate	Temporary short term	**Significant adverse**

Receptor	Description of potential impact	Summary of mitigation / enhancement in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5)	Magnitude of impact	Scale of impact	Significance of residual effect
Receptors in the vicinity of M66 online works	Daytime construction noise during the activities of site clearance, earthworks, drainage. Surface water channel, street lighting, paving & white lining. Night-time construction noise during the activities of traffic management, site clearance, earthworks, drainage. Surface water channel, paving and white lining, gantry works, technology, street lighting, VRS, landscaping, piling, final surfacing and white lining.	BPM and the use of quietest available plant (commitment NV1).	Major and Moderate	Temporary short term	**Significant adverse**
Receptors in the vicinity of J18 online works	Night-time construction noise during the activities of traffic management, site clearance, VRS, technology and paving & white lining.	BPM and the use of quietest available plant (commitment NV1).	Major and Moderate	Temporary short term	**Significant adverse**
Receptors in the vicinity of Northern Loop works	Daytime construction noise during the activities of earthworks, ground improvement, box capping & subbase, drainage, surface water channel, VRS, pavement & surface course, traffic signs, road lighting & communications and topsoiling. Evening construction noise during the same activities as daytime, and also surcharge works, motorway communications, landscaping, VRS and vegetation clearance.	BPM and the use of quietest available plant (commitment NV1).	Moderate	Temporary short term	**Significant adverse**

Receptor	Description of potential impact	Summary of mitigation / enhancement in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5)	Magnitude of impact	Scale of impact	Significance of residual effect
Receptors in the vicinity of offline works in SW quadrant, NW quadrant and M66 SB diverge works	Daytime construction noise during the activities of temp haul routes, earthworks, landscaping, box capping and subbase, VRS, pavement, traffic signs and topsoiling. Night-time construction noise during landscaping.	BPM and the use of quietest available plant (commitment NV1).	Major and Moderate	Temporary short term	**Significant adverse**
Cowl Gate Farm during Simister Pike Fold Bridge works	Evening construction noise during the summer months during piling of abutments and bridge deck construction.	BPM and the use of quietest available plant (commitment NV1).	Moderate	Temporary short term	**Significant adverse**
Receptors in the vicinity of Simister Pike Fold Viaduct works	Daytime construction noise during piling to abutments and FRC to pile caps and walls. Night-time construction noise during piling, FRC and beam delivery, diaphragm walls and fit out and construction.	BPM and the use of quietest available plant (commitment NV1).	Major	Temporary short term	**Significant adverse**
Dwellings vibratory compaction Dwellings in the vicinity of retaining walls piling	Construction vibration during paving and sheet piling of retaining walls.	N/A. Temporal scope of 10 or more nights in any consecutive 15 nights, or a total of more than 40 nights in any consecutive 6-month period is not exceeded.	Moderate	Temporary short term	Not significant

Receptor	Description of potential impact	Summary of mitigation / enhancement in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5)	Magnitude of impact	Scale of impact	Significance of residual effect
Residential dwellings within 25m of diversion routes	Night-time traffic diversion routes.	For diversion routes used during construction the Principal Contractor will keep the timetable for full carriageway closures under review and aim to keep the number of night closures to below the temporal scope of 10 or more nights in any consecutive 15 nights, or a total of more than 40 nights in any consecutive six-month period (commitment NV7).	n/a	Temporary short term	Not significant

Table 11.38 Assessment of likely significant effects during operation

Receptor	Description of potential impact	Summary of mitigation / enhancement in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5)	Magnitude of impact (short-term)	Scale of impact	Significance of residual effect
One other sensitive receptor (Footpath 6WHI)	Increase in road traffic noise	Installation of surface with better noise reducing properties than a conventional LNS (commitment NV4).	Minor increase	Permanent	Not significant

Receptor	Description of potential impact	Summary of mitigation / enhancement in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5)	Magnitude of impact (short-term)	Scale of impact	Significance of residual effect
326 residential dwellings and four other sensitive receptors	Increase in road traffic noise	Installation of surface with better noise reducing properties than a conventional LNS (commitment NV4).	Negligible increase	Permanent	Not significant
27 residential dwellings and two other sensitive receptors	No change in road traffic noise	Installation of surface with better noise reducing properties than a conventional LNS (commitment NV4).	No change	Permanent	Not significant
1,789 residential dwellings and 25 other sensitive receptors	Decrease in road traffic noise	Installation of surface with better noise reducing properties than a conventional LNS (commitment NV4).	Negligible decrease	Permanent	Not significant
3,011 residential dwellings and 13 other sensitive receptors	Decrease in road traffic noise	Installation of surface with better noise reducing properties than a conventional LNS (commitment NV4).	Minor decrease	Permanent	Not significant
1,549 residential dwellings and seven other sensitive receptors	Decrease in road traffic noise	Installation of surface with better noise reducing properties than a conventional LNS (commitment NV4).	Moderate decrease	Permanent	Not significant as magnitude over the long term reduces to Negligible

Receptor	Description of potential impact	Summary of mitigation / enhancement in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5)	Magnitude of impact (short-term)	Scale of impact	Significance of residual effect
36 residential dwellings	Decrease in road traffic noise	Installation of surface with better noise reducing properties than a conventional LNS (commitment NV4).	Major decrease	Permanent	Not significant as magnitude over the Long Term reduces to Negligible

11.11 Monitoring

11.11.1 The identified likely significant environmental effects from noise and/or vibration during construction will be monitored (commitment NV1 in the REAC, contained within the First Iteration EMP (TR010064/APP/6.5)). The monitoring of likely significant effects will include one or more of the following:

- Verification that the identified noise and vibration mitigation measures are in place for activities where there is potential for likely significant effects to occur i.e. the specification of mitigation measures is checked and confirmed
- Measurement of noise and/or vibration
- Checking that noise and vibration management procedures and practices will ensure that adverse effects are no worse than those predicted

11.11.2 Details of the monitoring regime will be included within the Second Iteration EMP, which will be developed from the First Iteration EMP (TR010064/APP/6.5) and is secured through Requirement 4 of the draft DCO (TR010064/APP/3.1). This will include the locations where monitoring is to take place, the duration of monitoring, the specification for any noise and/or vibration measurements and the reporting requirements. Discussions are likely to be required with the relevant planning authority to agree the monitoring programme.

11.11.3 Post-construction noise monitoring (i.e. measurements) cannot provide a reliable indication of whether the predicted magnitude and extent of operational effects are greater or less than those predicted in the assessment. This is because the assessment is based on annual average conditions with and without the Scheme to ensure a like for like comparison, which is not possible to replicate with monitoring within a reasonable timescale. Therefore, no noise measurements are proposed following the opening of the Scheme. The prediction and assessment methodologies set out in Section 11.5 of this chapter would be used to determine the effectiveness of mitigation measures. This would be carried out as part of National Highways' POPE procedures, which review how highway schemes are delivering on environmental predictions.

11.12 Summary

11.12.1 During construction there would be **significant adverse effects** during some activities.

11.12.2 During operation there would be significant beneficial effects for some receptors in the short-term. This is due to the use of a road surface with better noise reducing properties than a conventional LNS. However, in the long-term the reduction in noise does not translate to significant beneficial effects and it is therefore concluded that there are **no significant effects** from the operation of the Scheme.

11.12.3 Table 11.39 summarises residual significant effects identified for the noise and vibration aspect.

Table 11.39 Summary of residual significant effects for noise and vibration

Summary of residual significant effects	
Construction	**Operation**
• Temporary significant adverse effect for up to 275 receptors during daytime construction works • Temporary significant adverse effect for up to 647 receptors during night-time construction works	• No overall permanent significant beneficial effects identified. • No significant adverse effects identified.

11.12.4 This noise and vibration assessment has demonstrated that compliance with the aims of the NPS NN (DfT, 2014) (Table 11.2, paragraph reference 5.195), the draft NPS NN (DfT, 2023) (Table 11.3, paragraph reference 5.232) and the NPSE (Defra, 2010) are achieved:

- Aim 1: Likely significant adverse impacts from the Scheme have been avoided. This has been achieved using the provision of a surface with better noise reducing properties than a conventional LNS.
- Aim 2: Adverse impacts from the Scheme have been minimised through the choice of alignment.
- Aim 3: The use of measures to reduce the noise at source (a surface with better noise reducing properties than a conventional LNS) has provided widespread reductions in noise for communities living alongside the Scheme.

Acronyms and initialisms

Acronym or initialism	Term
3D	3-Dimensional
AAWT	Annual Average Weekday Traffic
ACW	Anti-clockwise
BNL	Basic Noise Level
BPM	Best Practicable Means
BS	British Standard
BSI	British Standards Institution
CRTN	Calculation of Road Traffic Noise
CW	Clockwise
DALY	Disability Adjusted Life Year
dB	Decibel
DCO	Development Consent Order
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DLUHC	Department for Levelling Up, Housing and Communities
DMRB	Design Manual for Roads and Bridges
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
FRC	Formwork Reinforced and Concrete
GIS	Geographical Information System
HGV	Heavy goods vehicle
LOAEL	Lowest Observed Adverse Effect Level
LNS	Low Noise Surface
MHCLG	Ministry of Housing, Communities and Local Government (now called the Department for Levelling Up, Housing and Communities)
NIA	Noise Important Area
NIR	Noise Insulation Regulations
NPPF	National Planning Policy Framework
NPPG	National Planning Practice Guidance

Acronym or initialism	Term
NPSE	Noise Policy Statement for England
NPS NN	National Policy Statement for National Networks
NSIP	Nationally Significant Infrastructure Project
NVMP	Noise and Vibration Management Plan
NW	North-west
OS	Ordnance Survey
PEIR	Preliminary Environmental Information Report
PPV	Peak Particle Velocity
POPE	Post Opening Project Evaluation
REAC	Register of Environmental Actions and Commitments
RSI	Road Surface Influence
SB	South-bound
SOAEL	Significant Observed Adverse Effect Level
SW	South-west
TAG	Transport Assessment Guidance
TfN	Transport for the North
UAEL	Unacceptable Adverse Effect Level
UKHSA	UK Health Security Agency
VRS	Vehicle Restraint System

Glossary

A glossary of terms used in the noise and vibration assessment is included in Appendix 11.1: Introduction to Acoustics of the Environmental Statement Appendices (TR010064/APP/6.3).

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