A1 in Northumberland: Morpeth to Ellingham

Scheme Number: TR010041

6.2 Environmental Statement – Chapter 6 Noise and Vibration

Part A

APFP Regulation 5(2)(a)

Planning Act 2008

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

June 2020

Infrastructure Planning

Planning Act 2008

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

The A1 in Northumberland: Morpeth to Ellingham

Development Consent Order 20[xx]

Environmental Statement

Regulation Reference:	APFP Regulation 5(2)(a)
Planning Inspectorate Scheme Reference	TR010041
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Author:	A1 in Northumberland: Morpeth to Ellingham Project Team, Highways England

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Rev 0	June 2020	Application Issue

CONTENTS

TABLES

6. NOISE AND VIBRATION

6.1. INTRODUCTION

6.1.1. This chapter presents the assessment of likely significant noise and vibration effects as a result of Part A: Morpeth to Felton (Part A) on sensitive receptors. It builds on the content of the **Scoping Report** (**Application Document Reference: TR010041/APP/6.10**) for Part A.

6.1.2. This chapter is intended to be read alongside the following technical appendices within **Volume 7** of this Environmental Statement (ES) (**Application Document Reference: TR010041/APP/6.7**):

a. **Appendix 6.1: Glossary of Acoustical Terminology**
b. **Appendix 6.2: Legislation, Policy and Guidance**
c. **Appendix 6.3: Noise and Airborne Vibration Nuisance Assessment**
d. **Appendix 6.4: Source Information and Assumptions for Construction Noise Assessment**
e. **Appendix 6.5: Source Information and Assumptions for Operational Road Traffic Noise Assessment**
f. **Appendix 6.6: Noise Survey Details**
g. **Appendix 6.7: Noise Monitoring Results**
h. **Appendix 6.8: Construction Noise and Vibration Mitigation Clauses**
i. **Appendix 6.9: Wider Network Noise Level Changes**

6.1.3. A glossary of acoustical terms used within this chapter is included in **Appendix 6.1: Glossary of Acoustical Terminology, Volume 7** of ES (**Application Document Reference: TR010041/APP/6.7**).

6.1.4. A full description of Part A, along with the Scheme as a whole is set out in **Chapter 2: The Scheme**, **Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**). An assessment of combined effects of Part A is set out in **Chapter 15: Assessment of Combined Effects** of this ES and combined and cumulative effects of the Scheme are set out in **Chapter 16: Assessment of Cumulative Effects**, **Volume 4** of this ES (**Application Document Reference: TR010041/APP/6.4**).

6.1.5. **Section 4.3** of **Chapter 4: Environmental Assessment Methodology**, **Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**) identifies any differences in the assessment methodology employed for Part A and Part B: Alnwick to Ellingham (Part B). Further to this, there are other differences between the chapters for Part A and Part B. All key differences include:

a. There are differences between Part A and Part B that relate to the scoping process, for example elements that are scoped in and out of the assessment. Refer to the **Scoping Report** (**Application Document Reference: TR010041/APP/6.10**) and **Scoping Opinion** (**Application Document Reference: TR010041/APP/6.12**) for Part A, and the

Scoping Report (**Application Document Reference: TR010041/APP/6.11**) and **Scoping Opinion** (**Application Document Reference: TR010041/APP/6.13**) for Part B.

b. Part A and Part B adopt different approaches to assessment of construction noise. The differences in assessment are a function of the different Study Areas and the differing number of receptors falling within each Study Area. The differences in assessment approach are not material to the outcome of the assessments. Refer to **Chapter 4: Environmental Assessment Methodology**, **Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**) for further details.

c. The construction and operational Study Areas for Part A and Part B are dependent on the geographic location of each part, therefore different baseline, construction and operational conditions are reported. Different sensitive receptors are present within each Study Area.

d. Slightly differing construction activities have been assessed for Part A and Part B. The construction activities, 'cycle path construction' and 'noise barrier construction' are included for Part A but not Part B. This is because neither a cycle path nor noise barrier are proposed for Part B.

6.1.6. The future traffic levels for the assessment of Part A are based upon an opening year predicted to be in 2023. Since the assessments reported in this ES were completed, the Part A opening year has been put back to 2024. The assessment is based on traffic modelling for an opening year of 2023 and reported on that basis. However, as explained in **Section 4.1** in **Chapter 4: Environmental Assessment Methodology**, **Volume 1** of this ES (**Application Document Reference: TR010041/APP6.1**) it is considered that the assessments remain valid for an opening year of 2024.

6.2. COMPETENT EXPERT EVIDENCE

6.2.1. **Table 6-1** below demonstrates that the professionals contributing to the production of this chapter have sufficient expertise to ensure the completeness and quality of this assessment.

Table 6-1 - Relevant Experience

Name	Role	Qualifications and Professional Membership	Relevant Experience
Michael Ashcroft	Author	- Bachelor of Science (Honours) - Incorporated Engineer (IEng)	Senior Consultant 5 years' experience in consultancy and impact assessment. Other recent relevant experience includes: - M27 junctions 4-11 Smart Motorway Environmental Assessment Report Noise

Name	Role	Qualifications and Professional Membership	Relevant Experience
		- Member of the Institute of Acoustics	and Vibration Chapter (2017 - 2018).
Sarah Whydle	Reviewer	- Bachelor of Science (Honours) - Post Graduate Diploma in Acoustics and Noise Control - Member of the Institute of Acoustics	Principal Consultant 9 years' experience in consultancy and impact assessment. Other recent relevant experience includes: - Noise lead for M27 junctions 4-11 Smart Motorway Environmental Assessment Report Noise and Vibration Chapter (2017 - 2018). - Noise lead for A1(M) junctions 6-8 Smart Motorway Environmental Assessment Report Noise and Vibration Chapter (2018-2019) - Noise lead for M62 junctions 20-25 Smart Motorway Environmental Assessment Report Noise and Vibration Chapter (2018-2019) - Preparation of Stubbington Bypass Noise and Vibration Report for Hampshire County Council (2013 – 2015) - Preparation of Lyminster Bypass Noise and Vibration Report for West Sussex County Council (2013 - 2015)
Steve Fisher	Reviewer	- Bachelor of Arts (Honours) - Post Graduate Diploma in Acoustics and Noise Control	Technical Director 35 years' experience in consultancy and impact assessment. Other recent relevant experience includes: - Preparation of A1 Birtley to Coal House Environmental Assessment Report Noise

Name	Role	Qualifications and Professional Membership	Relevant Experience
		- Member of the Institute of Acoustics	and Vibration Chapter (2016 – 2017). - Preparation of M3 junction 9 Environmental Assessment Report Noise and Vibration Chapter (2017 – 2018). - Overseeing M27 junctions 4-11 Smart Motorway Environmental Assessment Report Noise and Vibration Chapter (2017 – 2018).

6.3. LEGISLATIVE AND POLICY FRAMEWORK

6.3.1. This assessment has been undertaken in accordance with the following current legislation, along with national, regional and local plans and policies. Further details are provided in **Appendix 6.2: Legislation, Policy and Guidance**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**).

LEGISLATION

6.3.2. A summary of international and national legislation relevant to the potential effects on noise and vibration is presented below.

International

Environmental Noise Directive 2002/49/EC and Environmental Noise (England) Regulations 2006 (as amended) (Ref. 6.1)

6.3.3. This Directive relates to the assessment and management of environmental noise, and it is commonly referred to as the Environmental Noise Directive (END). It promotes the implementation of a three-step process:

a. Undertake strategic noise mapping to determine exposure to environmental noise.
b. Ensure information on environmental noise is made available to the public.
c. Establish Action Plans based on the strategic noise mapping results, to reduce environmental noise where necessary, and to preserve environmental noise quality where it is good.

Directive 2014/52/EU of the European Parliament, 2014 (Ref. 6.2)

6.3.4. This Directive published on 16 April 2014 amends Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment.

6.3.5. It was considered necessary to amend the 2011 Directive to strengthen the quality of the environmental impact assessment procedure, align that procedure with current best practice and other relevant legislation and policies developed by the European Union and Member States.

6.3.6. An ES prepared under this legislation should include, inter alia, a description of the likely significant effects of the project and the measures proposed to avoid, reduce or, if possible, offset any identified significant adverse effects on the environment.

National

The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (Ref. 6.3)

6.3.7. EU Directive 2014/52/EU has been transposed into UK law through the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (EIA Regulations).

Environmental Noise (England) Regulations 2006 (Ref. 6.4)

6.3.8. EU Directive 2002/49/EC has been transposed into UK law as the Environmental Noise (England) Regulations 2006 (as amended). As part of this process, noise mapping has been undertaken and Noise Important Areas (NIAs) have been identified at locations where the 1% of the population that are affected by the highest noise levels are located, in order to identify the areas which, require potential action.

Noise Insulation Regulations (NIR) 1975 (as amended) (Ref. 6.5)

6.3.9. Regulation 3 imposes a duty on highway authorities to undertake or make a grant in respect of the cost of undertaking noise insulation work in or to eligible buildings, subject to meeting certain criteria given in the Regulation, for new roads or carriageways.

6.3.10. Regulation 4 provides highway authorities with discretionary powers to undertake or make a grant in respect of the cost of undertaking noise insulation work in or to eligible buildings for an altered road. Regulation 5 provides highway authorities with discretionary powers to undertake or make a grant in respect of the cost of undertaking noise insulation work in or to eligible buildings during construction works for a substantial period of time, but in respect of which building no duty under Regulation 3 or power under Regulation 4 has arisen.

6.3.11. With respect to residential properties affected by noise from new or altered highways, to qualify for such an offer, four criteria must all be fulfilled at 1 m in front of the most exposed door or window of an eligible room in the façade of a property.

The Control of Pollution Act (CoPA) 1974 (Ref. 6.6)

6.3.12. The principal legislation covering demolition and construction noise is Part III of CoPA. Sections 60 and 61 of the CoPA give the Local Authority special powers for imposing control requirements on noise arising from construction and demolition works, regardless of whether a statutory nuisance has been caused or is likely to be caused.

The Environmental Protection Act 1990 (EPA) (Ref. 6.7)

6.3.13. Section 79 of the EPA presents a number of matters which may be statutory nuisances, including noise. Under the provisions of the EPA, the Local Authority is required to inspect its area periodically to detect any nuisance and, where a valid complaint of a statutory nuisance is made by a person living within its area, to take such steps as are reasonably practicable to investigate the complaint.

6.3.14. Section 80 of the EPA (Summary proceedings for statutory nuisances) provides Local Authorities with powers to serve an abatement notice requiring the abatement of a nuisance or requiring works to be executed to prevent their occurrence.

6.3.15. The provisions of the EPA have relevance to noise from construction activities including that generated by construction, vehicles, plant and machinery, but do not apply to noise generated by general road traffic.

NATIONAL AND LOCAL POLICY

6.3.16. A summary of national and local policy relevant to the potential effects on noise and vibration, and compliance with relevant policy, is presented in **Table 6-2** and **Table 6-3** below.

Table 6-2 - National Planning Policy Relevant to Noise and Vibration

National Policy	Relevant Policy Objectives	Significance of Part A on Policy Objective
National Policy Statement for National Networks (NPS NN), 2015 (**Ref. 6.8**)	"5.193 *Developments must be undertaken in accordance with statutory requirements for noise. Due regard must have been given to the relevant sections of the* Noise Policy Statement for England, *National Planning Policy Framework and the Government's associated planning guidance on noise.* 5.194 *The project should demonstrate good design through optimisation of scheme layout to minimise noise emissions and, where possible, the use of landscaping, bunds or noise barriers to reduce noise transmission. The project should also consider the need for the mitigation of impacts elsewhere on the road… networks that have been identified as arising from the development, according to Government policy.*" "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*." "5.196 *In determining an application, the Secretary of State should consider whether requirements are needed which specify that the mitigation measures put forward by the applicant are put in place to ensure that the noise levels from the project do not exceed those described in the assessment or any other estimates on which the decision was based.*"	As outlined below, in accordance with Paragraph 5.193 of the NPS NN, due regard has been given to the Noise Policy Statement for England (NPSE) (**Ref. 6.10**) and the National Planning Policy Framework (NPPF) (**Ref. 6.9**), as well as the associated guidance presented within Planning Practice Guidance: Noise (**Ref. 6.11**). In accordance with Paragraph 5.194 and 5.195 of the NPS NN, Part A has been designed as far as reasonably possible to avoid giving rise to significant observed adverse effect levels (SOAEL) for noise and vibration. Where possible, the alignment has been designed to avoid passing unnecessarily close to sensitive receptors. The surface of the road for the entire Part A would be laid with Low Noise Surface (apart from bridge decks where Hot Rolled Asphalt would be laid). An **Outline Construction Environmental Management Plan** (**Outline CEMP**) (**Application Document Reference: TR010041/APP/7.3**) containing measures to control noise and vibration during construction has been produced to accompany this ES. Consideration has been given to noise mitigation options where potential adverse impacts have been identified. Of these options, mitigation measures have been included where appropriate (refer to **Section 6.9**). Enhancement measures in the form of acoustic screening have been considered along the length of Part A and are included where appropriate.
National Planning Policy Framework (NPPF), 2019 (**Ref. 6.9**)	"170…*e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of…noise pollution*….". "180. *Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:* *a) mitigate and reduce to a minimum, potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*	In compliance with Paragraph 170 of the NPPF, Part A has been designed as far as reasonably possible to minimise the number of significant adverse noise and vibration impacts. In compliance with Paragraph 180 of the NPPF, measures to minimise adverse noise and vibration effects at each receptor above the lowest observed adverse effect level (LOAEL) have been investigated. Consideration has been given to noise mitigation options where potential adverse impacts have been identified. Of these options, mitigation measures have been included where appropriate (refer to **Section 6.9**). Enhancement measures in the form of acoustic screening have been considered along the length of Part A and are included where appropriate.

National Policy	Relevant Policy Objectives	Significance of Part A on Policy Objective
	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"	
Noise Policy Statement for England (NPSE), 2010 (**Ref. 6.10**)	Paragraph 1.7 "*Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:* *- Avoid significant adverse impacts on health and quality of life;* *- Mitigate and minimise adverse impacts on health and quality of life; and* *- Where possible, contribute to the improvement of health and quality of life"* *To assist in the understanding of the terms 'significant adverse' and 'adverse', the NPSE describes the following concepts that are currently being applied to noise impacts (paragraph 2.20):* "*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 noise*." "*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*." Values for NOEL, LOAEL and SOAEL are not stated. It is advised that "*It is not possible to have a single objective noise based-measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times.*"	In compliance with Paragraph 1.7 of the NPSE, Part A has been designed as far as reasonably possible to minimise the number of significant adverse noise and vibration effects. Consideration has been given to noise mitigation options where potential adverse impacts have been identified. Of these options, mitigation measures have been included where appropriate (refer to **Section 6.9**). Enhancement measures in the form of acoustic screening have been considered along the length of Part A. and are included where appropriate.

Table 6-3 - Local Planning Policy Relevant to Noise and Vibration

Local Policy	Relevant Policy Objectives	Significance of Impact of Part A on Policy Objective
Northumberland Consolidated Planning Policy Framework. May 2019 (Version 27) (**Ref. 6.12**)	Details the planning policy documents that are currently used to determine and guide planning applications in Northumberland. There are no relevant planning policies contained in this document.	N/A
Northumberland Local Plan, Publication Draft Plan (Regulation 19),	The Emerging Northumberland Local Plan – Publication Draft Plan (Regulation 19) Consultation (January 2019) is intended to replace all current District and County Council Local Plans and Core Strategy documents into a single document.	Part A has been designed as far as reasonably possible to minimise the noise and vibration impacts on potentially affected sensitive receptors.

Local Policy	Relevant Policy Objectives	Significance of Impact of Part A on Policy Objective
January 2019 (**Ref. 6.13**) and Schedule of Proposed Minor Modifications to the Publication Draft Plan (Regulation 19) (**Ref. 6.14**)	Neighbourhood Plans will not be replaced and will remain of relevance when determining planning applications. The document has a number of policies which seek to alleviate the potential for adverse noise or vibration effects. The Schedule of Proposed Minor Modifications to the Publication Draft Plan (Regulation 19) (May 2019) proposes minor modifications to the Publication Draft Plan which do not materially affect the substance of the plan or its overall soundness but provides points of clarification, factual updates and modifications to typographical or grammatical errors.	
Castle Morpeth District Local Pan 1991-2006. Adopted February 27th, 2003. Published July 2003 (**Ref. 6.15**) (Part of the Northumberland Consolidated Planning Policy Framework)	The Castle Morpeth District Local Plan have aims and objectives relating to reducing environmental impacts from roads and transport.	Part A has been designed as far as reasonably possible to avoid giving rise to SOAEL for noise and vibration. Where possible, the alignment has been designed to avoid passing unnecessarily close to sensitive receptors. The surface of the road for the entire Part A would be laid with Low Noise Surface (apart from bridge decks where Hot Rolled Asphalt would be laid). An **Outline CEMP** (**Application Document Reference: TR010041/APP/7.3**) containing measures to control noise and vibration during construction has been produced to accompany the Development Consent Order (DCO) application. The Outline CEMP would be developed into a CEMP by the main contractor. Consideration has been given to noise mitigation options where potential adverse impacts have been identified. Of these options, mitigation measures have been included where appropriate (refer to **Section 6.9**). Enhancement measures in the form of acoustic screening have been considered along the length of Part A and are included where appropriate.
Alnwick District Local Development Framework. Core Strategy Development Plan Document. Adopted October 2007[1] (**Ref. 6.16**) (Part of the Northumberland Consolidated Planning Policy Framework)	Policy S3 sets out sustainability criteria which the council would need to be satisfied are met before granting planning permission for new development. The fifth criterion (out of six) states that “there would be no significant adverse effects on the natural resources, environment, biodiversity, cultural, historic and community assets of the district.” Policy S16 sets out the strategic principles of good design which should be applied to all developments “Proposals should take full account of the need to protect and enhance local environment having regard to their layout, scale, appearance, access and landscaping…” Chapter 7; Objective 6: “assist in the delivery of a sustainable integrated transport system and enhance accessibility for all.”	Part A has been designed as far as reasonably possible to avoid giving rise to SOAEL for noise and vibration. Where possible, the alignment has been designed to avoid passing unnecessarily close to sensitive receptors. The surface of the road for the entire Part A would be laid with Low Noise Surface (apart from bridge decks where Hot Rolled Asphalt would be laid). An **Outline CEMP** (**Application Document Reference: TR010041/APP/7.3**) containing measures to control noise and vibration during construction has been produced to accompany the DCO Application. The **Outline CEMP** would be developed into a CEMP by the main contractor. The assessment has considered all residential properties within the Study Area, as well as other noise sensitive receptors. Part A has been designed to minimise the number of significant adverse effects once operational. Consideration has been given to noise mitigation options where potential adverse impacts have been identified. Of these options, mitigation measures have been included where appropriate (refer to **Section 6.9**). Enhancement measures in the form of acoustic screening have been considered along the length of Part A and are included where appropriate.

Local Policy	Relevant Policy Objectives	Significance of Impact of Part A on Policy Objective
Alnwick District Wide Local Plan. Adopted April 1997 (**Ref. 6.17**)	Aim TT1: “improve the accessibility of the residents and businesses of the District to the national transportation systems.” Aim TT3: “ameliorate the impact of the motor vehicle on the rural and built environment.” Aim TT6: “encourage the Highways Agency [now known as Highways England] to upgrade the A1 Truck Road to dual carriageway standard through the District at the earliest opportunity.” In the Community Development Chapter, Policy CD32 reinforces the requirement for development not to result in unacceptable environmental impacts or to cause harm to residential amenity: “*planning permission will not be granted for development which would cause demonstrable harm to the amenity of residential areas or to the environment generally as a result of releases to water, land or air, or of noise, dust, vibration, light or heat.”*	Part A has been designed to minimise the number of significant adverse noise and vibration effects including due regard to enhancement measures. The assessment has considered all residential properties within the Study Area, as well as other noise sensitive receptors. The appraisal of mitigation and enhancement has included consideration to both treatment at source (low noise road surface) and intermediate measures (acoustic screening). Construction stage mitigation would be secured through a CEMP. An **Outline CEMP** (**Application Document Reference TR010041/APP/7.3**) has been produced as part of the DCO application which would be developed into a CEMP by the main contractor.

HIGHWAYS ENGLAND POLICY

6.3.17. A summary of Highways England policy relevant to the potential effects on noise and vibration is presented in **Table 6-4**.

Table 6-4 - Highways England Policy

Highways England Policy	Relevant Policy Objectives	Significance of Part A on Policy Objective
Highways England Licence. Highways England, 2015 (**Ref. 6.18**)	Minimise the environmental impacts of operating, maintaining and improving its network and seek to protect and enhance the quality of the surrounding environment and ensure this is considered at all levels of operations. In exercising its functions, the licence holder must have due regard to relevant principles and guidance on good design, to ensure that the development of the network takes account of geographical, environmental and socio-economic context.	Part A has been designed as far as reasonably possible to minimise the number of significant adverse noise and vibration impacts. As detailed in the **Outline CEMP** (**Application Document Reference: TR010041/APP/7.3**), low noise road surface is a committed design measure for the majority of Part A and therefore has been accounted for within the assessment. NIAs have been considered including the potential for noise enhancement measures as part of the delivery of Part A.
Road Investment Strategy (RIS) for the 2015/16 – 2019/20 Road Period. Highways England, 2015 (**Ref. 6.19**)	Highways England aspire to be a better neighbour to communities, such that by 2040 over 90% fewer people will be impacted by noise from the strategic road network. The RIS (**Ref. 6.19**) identifies a capacity to improve noise levels through the management and redevelopment of Highways England assets, via low noise road surfacing, noise barriers etc. and commits to investigating and mitigating at least 1,150 NIAs by the end of	Part A has been designed as far as reasonably possible to minimise the number of significant adverse noise and vibration impacts. As detailed in the **Outline CEMP** (**Application Document Reference: TR010041/APP/7.3**), low noise road surface is a committed design measure for the majority of Part A and therefore has been accounted for within the assessment.

Highways England Policy	Relevant Policy Objectives	Significance of Part A on Policy Objective
	Road Period 1 (RP1), to help improve the quality of life of around 250,000 people living and working near the network. All new and improved road schemes will, therefore, be expected to utilise low noise road surfaces as a default and investigate noise attenuating barriers and other potential mitigation options, where practicable.	NIAs have been considered including the potential for noise enhancement measures as part of the delivery of Part A.

6.3.18. Each of the policy documents identified above is described in further detail in **Appendix 6.2: Legislation, Policy and Guidance**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**); however, a limited summary of key aspects of national policy is included below.

6.3.19. The NPS NN (**Ref. 6.8**) states that development consent should not be granted unless the proposals meet the following aims, which are also replicated in the NPSE (**Ref. 6.10**) and reflect the aims of the NPPF (**Ref. 6.9**):

a. Avoid significant adverse impacts on health and quality of life.
b. Mitigate and minimise other adverse impacts on health and quality of life.
c. Contribute to improvements to health and quality of life, where possible.

6.3.20. The Explanatory Note to the NPSE (**Ref. 6.10**) assists in the definition of significant adverse and adverse by describing the following concepts:

a. 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.
b. LOAEL – lowest observed adverse effect level. This is the level above which adverse effects on health and quality of life can be detected.
c. SOAEL – significant observed adverse effect level. This is the level above which significant adverse effects on health and quality of life occur.

6.3.21. Government policy and guidance does not state values for the NOEL, LOAEL and SOAEL, advising that they are different for different noise sources, for different receptors and at different times, and should be defined on a strategic or project basis accounting for the specific features of that area, source or project. The derived values for the effect levels that have been adopted for the assessment of Part A are set out in **Section 6.4**.

6.3.22. A key objective of this assessment is not only to determine whether Part A delivers the objectives stated within the Applicant's Licence and the RIS, but also whether it complies with national noise policy.

6.4. ASSESSMENT METHODOLOGY

SCOPE OF ASSESSMENT

6.4.1. As presented within the **Scoping Report** (**Application Document Reference: TR010041/APP/6.10**), the **Scoping Opinion** (**Application Document Reference: TR010041/APP/6.12**) and **Scoping Opinion Response Tracker** (**Appendix 4.1, Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**)), the following topics have been assessed in this chapter:

a. Temporary (i.e. construction noise and vibration) effects.
b. Permanent traffic noise effects (including night time noise effects).
c. Permanent traffic nuisance effects.
d. Permanent traffic induced vibration effects.
e. Cumulative effects (refer to Chapter 15: Assessment of Combined Effects of this ES and Chapter 16: Assessment of Cumulative Effects, Volume 4 of this ES (Application Document Reference: TR010041/APP/6.4)).

CONSULTATION

6.4.2. Northumberland City Council (NCC) was consulted prior to the undertaking of the environmental noise survey, with discussions surrounding proposed measurement locations and the proposed methodology for the noise and vibration assessment. A summary of this consultation is included within **Table 6-5** and relevant consultation correspondence provided in **Appendix 4.2: Environmental Consultation**, **Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**).

Table 6-5 – Summary of Consultation

Consultee	Type of Correspondence and Date	Summary of Consultation
NCC - Environmental Protection Officer	Email (08 November 2017)	It was proposed to undertake a detailed assessment in line with the Design Manual for Roads and Bridges (DMRB) HD 213/11 (**Ref. 6.20**), with consideration given to the aims of the NPSE (**Ref. 6.10**), in accordance with the calculation methodology contained within CRTN (**Ref. 6.21**). The methodology to derive the Study Area for Part A in accordance with the DMRB HD 213/11 (**Ref. 6.20**was also proposed.

Consultee	Type of Correspondence and Date	Summary of Consultation
		Proposed baseline noise monitoring locations were presented.
	Email (21 November 2017)	NCC were agreeable to the proposed methodology and noise monitoring locations.

METHODS OF BASELINE DATA COLLECTION

6.4.3. Baseline data for this assessment has been obtained through the following methods / sources:

a. Desk top review of online mapping and street scene photography.
b. Baseline noise survey.
c. Review of AddressBase Plus data[1].
d. Review of GIS databases to identify presence of designated sites.
e. Review of Public Rights of Way.

METHODOLOGY

Technical Guidance

6.4.4. The following technical guidance documents (**Table 6-6**) have been used during the preparation of this chapter. A summary of each document is presented in **Appendix 6.2: Legislation, Policy and Guidance**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**).

Table 6-6 - Technical Guidance

Document
DMRB Volume 11, Section 3, Part 7, HD 213/11 Noise and Vibration. Highways Agency, Transport Scotland, Welsh Government, The Department for Regional Development Northern Ireland. November 2011 (**Ref. 6.20**)
Calculation of Road Traffic Noise (CRTN). Department of Transport and Welsh Office. 1988 (**Ref. 6.21**)

[1] AddressBase Plus is a vector address dataset containing current properties using addresses sourced from Local Authorities, Ordnance Survey and Royal Mail. The data includes Unique Property Reference Numbers (UPRN) and contains local authority current addresses, classifications, and the OS MasterMap TOID (Topographic Identifier).

Document
Interim Advice Note (IAN) 185/15. Updated traffic, air quality and noise advice on the assessment of link speeds and generation of vehicle data into 'speed-bands' for users of DMRB, Volume 11, Section 3, Part 1 Air Quality and Volume 11, Section 3, Part 7 Noise. Highways Agency. 2015 (**Ref. 6.22**)
Converting the UK traffic noise index $L_{A10,18h}$ to EU noise indices for noise mapping. P G Abbott and P M Nelson (TRL Limited). Project Report PR/SE/451/02. 2002 (**Ref. 6.23**)
Guidelines for Community Noise. World Health Organisation. 1999 (**Ref. 6.24**)
Night Noise Guidelines for Europe. World Health Organisation, 2009 (**Ref. 6.25**)
British Standard (BS) 5228 Code of practice for noise and vibration control on construction and open sites. Part 1: Noise and Part 2: Vibration. BS 5228:2009+A1:2014. 2014 (**Ref. 6.26** and **Ref. 6.27**)
Planning Practice Guidance Noise (PPG), July 2019 (**Ref. 6.28**)

6.4.5. The principal guidance document for the assessment of both temporary construction and permanent operational impacts as a result of Part A is the relevant section of the DMRB. Volume 11, Section 3. Part 7 HD 213/11 revision 1 (November 2011) (**Ref. 6.20**). The assessment of temporary construction stage impacts is supplemented by guidance contained in BS 5228 (**Ref. 6.26** and **Ref. 6.27**).

6.4.6. However, the emergence of other guidance since the DMRB was published in 2011, based around the effects of noise on health and wellbeing, has necessitated an evolution in the approach to the assessment of road traffic noise, particularly with respect to the assessment of likely significant effects.

6.4.7. As detailed within **Table 6-2**, the aims of the NPSE (**Ref. 6.10**) are to avoid significant adverse noise effects. A noise level above the SOAEL would be noticeable and disruptive and/or can cause adverse health effects. A noise level above the LOAEL but below the SOAEL, depending on other factors (e.g. habituation, design of dwellings etc) would increasingly cause behavioural changes as a result of the noise level experienced.

6.4.8. The term significant environmental effect is also used within the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the EIA Regulations) (**Ref. 6.3**) to describe an environmental effect caused by a scheme that is of sufficient magnitude that it should be considered by the decision makers. Further information regarding significance is presented from **paragraph 6.4.78** onwards.

6.4.9. Consequently, this assessment which encompasses both the temporary construction stage and the permanent operational stage implications of Part A, makes a clear distinction as to whether Part A:

a. Complies with the NPSE (**Ref. 6.10**), NPPF (**Ref. 6.9**) and NPS NN (**Ref. 6.8**).
b. Gives rise to significant environmental effects under the EIA Regulations (**Ref. 6.3**) (i.e. whether an environmental effect is significant or not).

6.4.10. Notwithstanding the above, DMRB (**Ref. 6.20**) is still the principal guidance document for the assessment of road schemes and therefore it is appropriate that the requirements contained within this document are described first.

6.4.11. In accordance with DMRB HD 213/11 (**Ref. 6.20**), the operational road traffic noise assessment for Part A has been based on noise levels calculated using the methodology detailed in CRTN (**Ref. 6.21**) and Annex 4 of the DMRB HD 213/11 (**Ref. 6.20**). It is also appropriate to establish the baseline noise conditions by measurement and to this end noise measurements have been made at a sample of locations in the vicinity of Part A as agreed with the Environmental Protection Officer at NCC. The locations were chosen such that representative measurements were undertaken along the route of the A1 applicable to Part A and at distances from the road representative of noise sensitive receptors. **Figure 6.1: Noise and Vibration Assessment Extents**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**) shows the measurement locations. Details of the baseline noise survey are presented within **paragraphs 6.7.4** to **6.7.15**.

Updated DMRB Guidance

6.4.12. Since the assessments reported in this ES were completed, a number of DMRB guidance documents have been superseded and updated with revised guidance. The DMRB HD 213/11 **(Ref. 6.20**) guidance was current at the commencement of the assessment and throughout all the work to determine the noise and vibration effects of Part A. The consultation process described above, also refers to HD 213/11.

6.4.13. However, updated guidance in the form of DMRB LA 111 Noise and Vibration Revision 0 (LA 111) was released in November 2019 and subsequently superseded by Revision 1 in February 2020 and Revision 2 in May 2020 (**Ref. 6.28**). This new guidance supersedes DMRB HD 213/11 (**Ref. 6.20**) and Interim Advice Note 185/15 (IAN 185/15) (**Ref. 6.22**).

6.4.14. To determine the implications of the updated guidance to the conclusions of the ES, a sensitivity test has been undertaken to identify key changes in the assessment methodology and determine whether there would be changes to the significant effects reported in this ES if the updated guidance had been used for the assessment.

6.4.15. The findings of the sensitivity test are detailed in **Appendix 6.10: Noise and Vibration DMRB Sensitivity Test**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**) and summarised in **Section 6.10** of this chapter and in **Appendix 4.5: DMRB Sensitivity Test**, **Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**).

SENSITIVITY OF RECEPTORS

6.4.16. In accordance with the DMRB HD 213/11 (**Ref. 6.20**), examples of sensitive receptors include dwellings, hospitals, places of worship (including burial grounds), schools, community facilities and designated areas. The DMRB HD 213/11 (**Ref. 6.15**) also requires consideration of outdoor noise sensitive areas such as designated areas and Public Rights of Way (PRoW). For this assessment, there is one Site of Special Scientific Interest (SSSI) and one PRoW in the Study Area.[2]

6.4.17. Existing sensitive receptors within the Study Area have been identified using AddressBase Plus data, with receptors being allocated into one of the following categories (in accordance with the DMRB HD 213/11 (**Ref. 6.20**)):

a. Residential.
b. Other noise sensitive (including health, educational, religious and community uses and designated areas).

6.4.18. All other receptors were categorised as 'not noise sensitive' as the level or change in noise is unlikely to affect the behaviour of the people using these buildings or areas and have therefore not been included in this assessment.

6.4.19. Noise sensitive developments that are known to have been granted planning permission since the last update of the AddressBase dataset are addressed in **Chapter 16: Assessment of Cumulative Effects**, **Volume 4** of this ES (**Application Document Reference: TR010041/APP/6.4**).

6.4.20. Further consideration of human health impacts is provided in **Chapter 12: Population and Human Health** of this ES.

6.4.21. Ecological receptors have not been considered within this chapter but are considered within **Chapter 9: Biodiversity** of this ES.

ASSESSMENT OF CONSTRUCTION NOISE AND VIBRATION

6.4.22. **Chapter 2: The Scheme**, **Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**) provides detailed information regarding the proposed construction programme including working hours and the potential for night time, weekend and bank and public holiday working.

6.4.23. At this stage, full details of construction activities, methods and timescales have not been finalised for Part A. The assessment of potential impacts therefore relies on outline construction information available at this stage. To adequately assess the potential impacts and associated mitigation measures, it is appropriate to undertake a quantitative

[2] Further explanation of the Study Area is provided in **Section 6.6.**

assessment based on a number of reasonable worst-case assumptions. A set of informed assumptions of expected construction stages and associated operations and plant to be employed have been generated. Consideration has been given to the programme of activities, and professional experience gained from other similar large infrastructure projects has been used to further inform the assessment. It is therefore considered that the adopted assessment approach is proportionate to the current stage of Part A.

6.4.24. The following activities, encompassing all anticipated key noise generative construction activities, have been considered in the construction stage assessment:

a. Site Clearance
b. Earthworks (including topsoil strip)
c. Road Construction
d. Bridge and Underbridge Construction (including piling)
e. Compound Operation
f. Noise Barrier Construction
g. Cycle Path Construction

6.4.25. The assessment of predicted construction noise impacts for the above activities has been undertaken, taking into account the guidance set out in the NPSE (**Ref**. **6.10**).

6.4.26. Calculation methodologies within BS 5228 have been used to predict noise and vibration levels from the above construction activities as well as the propagation of noise and vibration over distance. The purpose of this assessment is to determine where noise and vibration levels would exceed the relevant SOAELs. Where noise or vibration levels are above the SOAEL, there is the potential for significant effects and mitigation measures have been considered. **Table 6-8** presents the SOAELs used for this assessment. **Paragraph 6.4.63** onwards presents the SOAELs used for this assessment, and **paragraph 6.8.21** onwards discusses in greater detail the approach for determining construction noise and vibration significant effects.

Diverted Traffic Noise During Construction

6.4.27. A qualitative assessment of potential noise impacts arising from changes in road traffic noise levels during possible traffic diversions has also been carried out. Effect levels have been determined qualitatively, with consideration given to the regularity of anticipated diversions, their duration and the proposed diversion routes that would be adopted.

Construction Traffic Noise

6.4.28. A quantitative assessment of noise from construction traffic has been undertaken. This has considered anticipated noise level changes along routes expected to be used by construction traffic. Level changes of less than 1 dB are considered negligible. For predicted changes of greater than 1 dB, determination of final significance would consider the number and timing of construction vehicle movements, their duration and the overall magnitude of the change.

Construction Vibration

6.4.29. The assessment of construction related vibration associated with working areas involved the:

a. Identification of areas where piling may be required
b. Identification of areas where other worst-case activities (vibratory rollers) may be required
c. Calculation of possible ground-borne vibration levels associated with piling activities and use of vibratory rollers
d. Determination of a distance buffer within which significant adverse effects are predicted
e. Identification of vibration-sensitive receptors within the identified distance buffer
f. Identification of mitigation as appropriate

6.4.30. The calculation and assessment of potential construction vibration effects has been undertaken following the guidance presented within BS 5228-2 and other guidance documents referenced therein.

ASSESSMENT OF OPERATIONAL ROAD TRAFFIC NOISE AND VIBRATION

DMRB HD 213/11

6.4.31. All road traffic noise predictions have been completed in accordance with the calculation methodology presented in CRTN (**Ref. 6.21**) and Annex 4 of the DMRB HD 213/11 (**Ref. 6.20**). The guidance contained within IAN 185/15 (**Ref. 6.22**) published by Highway England (formerly the Highways Agency) has also been applied to the traffic data used in this assessment.

6.4.32. CRTN (**Ref. 6.21**) presents a methodology for the calculation of road traffic noise based on road related factors (such as gradient and surface type) and traffic related factors (such as flow, speed and the proportion of heavy duty vehicles). The propagation of noise is also covered in CRTN and can influence the noise levels at receptor locations.

6.4.33. The DMRB HD 213/11 (**Ref. 6.20**) is a comprehensive manual which provides guidance on the assessment of road traffic noise and vibration from new road projects.

Night time Noise Assessment

6.4.34. The DMRB HD 213/11 (**Ref. 6.20**) requires that the assessment considers not just the daytime period in terms of $L_{A10,18h}$, but also the night time period in terms of $L_{night,outside}$. The evaluation of $L_{night,outside}$ only applies to long-term changes and where the road traffic noise level is predicted to exceed 55 dB $L_{night,outside}$.

6.4.35. The $L_{night,outside}$ has been determined using method 3 identified in TRL report 'Converting the UK traffic noise index $L_{A10,18h}$ to EU noise indices for noise mapping' (**Ref. 6.23**). The TRL report presents methods for converting the $L_{A10,18h}$ noise index to L_{day}, $L_{evening}$ and L_{night} indices. The TRL report presents equations for three potential methods of conversion, depending on the traffic data available (further details are provided in **Appendix 6.2**:

Legislation, Policy and Guidance, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)).

6.4.36. Taking the methodology presented within the TRL report (refer to **Appendix 6.2**: **Legislation, Policy and Guidance**, **Volume 7** of this ES), and given that detailed hourly traffic data is not available, method 3 has been adopted as being the most appropriate for adoption within noise level calculations. The TRL report identifies conversion equations for two different road types: motorway and non-motorway. In this case, as none of the roads in the Study Area (including Part A), are motorways, all calculations to determine the $L_{night,outside}$ have utilised the non-motorway correction.

Level of Assessment

6.4.37. DMRB HD 213/11 (**Ref. 6.20**) states (in paragraph 3.5) that the determination of the appropriate level of assessment for operational road traffic noise effects should be undertaken with reference to the following thresholds:

a. A permanent change in daytime road traffic noise of ±1 dB $L_{A10,18h}$ in the short-term (i.e. on opening).
b. A permanent change in daytime road traffic noise of ±3 dB $L_{A10,18h}$ in the long-term (typically 15 years after project opening).
c. A permanent change in night time road traffic noise of ±3 dB $L_{night,outside}$ in the long-term, where the predicted level also exceeds 55 dB $L_{night,outside}$.

6.4.38. For this assessment, a 'Detailed' assessment has been undertaken in line with DMRB HD 213/11 (**Ref. 6.20**) requirements.

Representative Noise Levels at Buildings

6.4.39. The noise levels calculated are façade levels for buildings during the 18-hour period 06:00 to midnight (1.0 m from the external façade) and free-field levels incident on the façade of buildings during the 8-hour night time period 23:00 to 07:00. All levels are calculated at a default height of 4.0 m relative to the surrounding ground level. However, for single-storey buildings, the noise level has been calculated at a height of 1.5 m relative to the surrounding ground level. Open spaces are assessed in terms of the free-field noise level at 1.5 m above the ground.

6.4.40. Where a building is predicted to experience different changes in noise level on different façades, the least beneficial change in noise has been reported. Hence:

a. When all façades show a decrease in noise level, the smallest decrease has been reported.
b. When all façades show an increase in noise level, the largest increase has been reported.

c. Should the same least beneficial change in noise level arise on two or more façades, then the change on the façade with the highest level in the opening year (2023) Do-minimum[3] (without Part A) scenario has been reported.

6.4.41. DMRB HD 213/11 (**Ref. 6.20**) acknowledges that the results produced by this assessment would usually present a worst case and highlight the adverse impacts of Part A. Furthermore, it is also possible that the assessment may potentially mask beneficial effects of Part A.

6.4.42. For assessment of Part A in line with national noise policy, the highest noise level predicted on any façade of a building has been reported.

Existing Noise Barriers and Bunds

6.4.43. No existing noise barriers or bunds were identified along the existing A1 and as such, no existing noise mitigation was modelled in the Do-minimum opening or design year assessments.

Other Developments Represented in Traffic Data

6.4.44. The following other developments were represented in all the traffic data scenarios (Do-minimum (without Part A) and Do-something (with Part A)) used in the noise assessment (further details are provided in **Chapter 4** of the **Case for the Scheme** (**Application Document Reference: TR010041/APP/7.1**)):

a. A1 Coal House to Metro Centre.
b. A1 Scotswood to North Brunton.
c. A1 Birtley to Coal House.
d. A19/A1058 Coast Road.
e. A19/A184 Testo's and Downhill Lane.
f. A19 Norton to Wynyard.
g. Morpeth Northern Bypass.
h. Reopening of B6342 bridge over River Coquet in Rothbury.
i. Blyth Relief Road.
j. Junction 12 A1 North Brunton roundabout improvements, extra lanes and Rotary Way widening.

Traffic Vibration

6.4.45. Traffic vibration is a low frequency disturbance producing physical movement in buildings and their occupants. Vibration can be transmitted through the air or through the ground. Airborne vibration from traffic can be produced by the engines or exhausts of road vehicles

[3] The Do-minimum traffic scenarios are the opening and future year traffic data sets without Part A. These are described in more detail from **paragraph 6.4.57**.

and these are dominant in the audible frequency range of 50-100 Hz. Ground-borne vibration is often in the 8-20 Hz range and is produced by the interaction between rolling wheels and the road surface.

6.4.46. Ground-borne vibration can be measured in terms of Peak Particle Velocity (PPV). For vibration from traffic, a PPV of 0.3 mms^{-1} measured on a floor in the vertical direction is considered likely to be perceptible and structural damage to buildings can occur when levels are above 10 mms^{-1}. The level of annoyance caused would also depend on building type and usage.

6.4.47. DMRB HD 213/11 (**Ref. 6.20**) adopts 0.3 mms^{-1} as the threshold criterion for traffic induced vibration, either where the PPV is predicted to rise above this level or where existing vibration above this level is predicted to increase.

6.4.48. DMRB HD 213/11 notes (in paragraph 3.32) that PPVs in the structure of buildings close to heavily trafficked roads rarely exceed 2 mms^{-1} and typically are below 1 mms^{1}. Normal use of a building such as closing doors, walking on suspended wooden floors and operating domestic appliances can generate similar levels of vibration to those from road traffic.

Noise and Airborne Vibration Nuisance Assessment

6.4.49. The methodology and results for the noise and airborne vibration nuisance assessments are presented in **Appendix 6.3: Noise and Airborne Vibration Nuisance Assessment**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**). A summary of the two assessment methodologies is presented below within **paragraphs 6.4.50** to **6.4.54**.

Traffic Noise Nuisance Assessment

6.4.50. The DMRB HD 213/11 (**Ref. 6.20**) notes that the nuisance caused by road traffic noise mainly affects people in their homes. Nuisance, as defined in DMRB HD 213/11 (**Ref. 6.20**) is measured in terms of the percentage of the population as a whole that is bothered “very much” or “quite a lot” by virtue of a specific traffic related noise level. The correlation between specific levels and the percentage of the population bothered for the purposes of the assessment has been developed from studies that focused on reported nuisance where traffic related noise has changed over a relatively long period of time.

6.4.51. In line with the DMRB HD 213/11, the noise nuisance assessment considers:

a. The degree of bother based on a ‘steady state’ or ‘before noise change’ level (DMRB HD 213/11 Figure A6.1).
b. The abrupt change in bother that arises from a change in noise level (DMRB HD 213/11 Figure A6.2).

6.4.52. The noise nuisance assessment considers both the Do-minimum and Part A Do-something long-term comparisons, with the noise nuisance level changes being directly calculated from the predicted noise level changes.

Traffic Airborne Vibration Nuisance Assessment

6.4.53. As required by DMRB HD 213/11 (**Ref. 6.20**), the predicted residential receptor noise levels have also been used as the basis for an appraisal of the change in airborne vibration nuisance that would arise as a result of. This assessment has been undertaken for all residential receptors within 40 m of the roads within the Calculation Area (described below in **paragraph 6.6.5**).

6.4.54. The assessment has been undertaken applying the DMRB HD 213/11 (**Ref. 6.20**) guidance which states that the percentage of people bothered by airborne vibration is 10% lower than for noise, with, on average, traffic induced vibration nuisance tending to zero at a noise level of 58 dB $L_{A10,18h}$. Nuisance levels used within this assessment are directly calculated from the predicted noise levels.

Human Health

6.4.55. Consideration of human health impacts is set out in **Chapter 12: Population and Human Health** of this ES.

Significance of Effects

Magnitude of Noise Change

6.4.56. For the assessment of operational road traffic noise and airborne vibration impacts, DMRB HD 213/11 (**Ref. 6.20**) considers the noise level changes that would arise both in the short-term and the long-term.

6.4.57. The short-term scheme impacts are derived by comparing the 'Do-minimum' scenario (without a scheme) in the 'opening year' (DM2023), with the 'Do-something' scenario (with a scheme) in the same year (DS2023).

6.4.58. The long-term impacts of Part A are derived by comparing the 'Do-minimum' scenario in the 'opening year' (DM2023) with the 'Do-something' scenario in the future 'design year' (DS2038). The 'design year' is typically taken as the 15th year after opening.

6.4.59. DMRB HD 213/11 also requires a third comparison, the 'Do-minimum' scenario in the 'opening year' (DM2023) with the 'Do-minimum' scenario in the 'design year' (DM2038), this comparison is used to determine long-term impact without Part A.

6.4.60. **Table 6-7** below summarises the classification of magnitude of noise impacts associated with short and long-term changes in noise levels, as set out in DMRB HD 213/11 (Tables 3.1 and 3.2 of DMRB HD 213/11 combined). Both adverse and beneficial changes are considered in the assessment.

Table 6-7 - Classification of Magnitude of Noise Impacts (DMRB HD 213/11)

Magnitude of Impact	Noise Change, dB ($L_{A10,18h}$)	
	Short-term	**Long-term**
No change	0	0
Negligible	0.1 – 0.9	0.1 – 2.9
Minor	1.0 – 2.9	3.0 – 4.9
Moderate	3.0 – 4.9	5.0 – 9.9
Major	>5.0	>10.0

6.4.61. DMRB HD 213/11 notes (in paragraph 3.36) that a methodology has not yet been developed to assign significance according to both the value of a resource and the magnitude of impact. Instead, the DMRB concentrates on the magnitude of traffic noise impact, as described above.

6.4.62. For the assessment of significance, direction is drawn from other guidance and policy documents, starting with the NPSE (**Ref. 6.10**), which describes the concepts of SOAEL and LOAEL.

Compliance with National Policy

Defining SOAELs and LOAELs

6.4.63. Key to the consideration of compliance with the NPSE (**Ref. 6.10**) is defining the SOAEL and LOAEL for construction noise and vibration, and operational road traffic noise and airborne vibration.

6.4.64. LOAELs and SOAELs should be set for all receptors[4]. However, for many, relevant acoustic criteria are broadly similar to those criteria relating to residential uses. Therefore, the LOAELs and SOAELs identified in **Table 6-8** and **Table 6-9**, which relate primarily to residential receptors, have been applied to all noise-sensitive receptors.

[4] DMRB HD 213/11 provides (in paragraph A1.13) examples of sensitive receptors, which include dwellings, hospitals, schools, community facilities, designated areas and public rights of way.

6.4.65. LOAELs and SOAELs have only been considered for the period when the receptor is sensitive. So, for example, schools are not sensitive at night when they are closed, so the night time LOAEL and SOAEL would not be applicable for this type of receptor.

6.4.66. **Table 6-8** (adapted from Table E.1 in Annex E of BS 5228:2009+A1:2014 - Part 1 Noise (**Ref. 6.26**)), presents the noise level thresholds adopted for the LOAEL and SOAEL for the construction noise assessment.

Table 6-8 - SOAEL and LOAEL Thresholds for Construction Noise at Receptors

Period	Time (hh:mm)	SOAEL	LOAEL
Daytime weekday Saturday mornings	07:00 – 19:00 07:00 – 13:00	65 dB $L_{Aeq,T}$	49 dB $L_{Aeq,T}$
Night time	23:00 – 07:00	50 dB $L_{Aeq,T}$	43 dB $L_{Aeq,T}$
Evenings Weekend periods not covered above	19:00 – 23:00 N/A	55 dB $L_{Aeq,T}$	43 dB $L_{Aeq,T}$

Notes:

If the ambient noise level exceeds the SOAEL given in the table, then a potential significant effect is indicated if the total $L_{Aeq,T}$ noise level for the period increases by more than 3 dB due to site noise.

The SOAELs are set based on the ABC method as detailed within Section E3.2 (ABC assessment method) of BS 5228-1. The ABC method involves an assessment category of A, B or C being applied according to the prevailing noise level for the period of assessment. The applicable ABC assessment criteria have therefore been used to define the above SOAELs.

The LOAELs are set at the existing ambient noise level during the relevant period, as construction noise levels below the existing level are unlikely to cause adverse effects on health or quality of life.

In order to provide a robust worst-case assessment, the SOAELs and LOAELs have been set based on noise measurements undertaken at LT2 (further details of the noise survey are presented from **paragraph 6.7.4** onwards) which was located approximately 600 m from the A1 in order to be representative of the existing noise climate close to the offline section of Part A . As noise levels are lower further from the existing A1, the potential construction impacts are greater.

6.4.67. A qualitative assessment of potential noise impacts arising from changes in road traffic noise levels during possible traffic diversions has also been carried out applying professional judgement. Effect levels have been determined qualitatively, with consideration

given to the regularity of anticipated diversions, their duration and the proposed diversion routes that would be adopted.

6.4.68. A quantitative assessment of noise from construction traffic has been undertaken using available construction traffic movement data. This has included calculation of anticipated noise level changes along routes anticipated to be worst affected by construction traffic. Level changes of less than 1 dB are considered to be insignificant.

6.4.69. **Table 6-9** (adapted from Table B.1 in Annex B of BS 5228:2009+A1:2014 - Part 2 Vibration (**Ref. 6.27**)), presents the PPV vibration level thresholds adopted for LOAEL and SOAEL for the construction vibration assessment.

Table 6-9 - LOAEL and SOAEL Thresholds for Construction Vibration at Receptors

Period	Time (hh:mm)	LOAEL	SOAEL
Daytime and Night time	N/A	0.3 PPV mms^{-1}	1.0 PPV mms^{-1}

Notes:

The SOAEL and LOAEL are set in accordance with guidance within BS 5228-2 (**Ref. 6.27**) which includes guidance on effects of vibration levels.

The effect of a vibration level of 0.3 PPV mms^{-1} is stated as: "Vibration might just be perceptible in residential environments"

The effect of a vibration level of 1.0 PPV mms^{-1} is stated as: "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"

In light of the above guidance within BS 5228-2, the SOAEL and LOAEL have been set at 1.0 PPV mms^{-1} and 0.3 PPV mms^{-1} respectively.

6.4.70. Whilst LOAELs have been set for the construction noise and vibration assessments, specific mitigation requirements for the construction of Part A are dependent on the SOAEL and whether properties are located within the Construction Stage Study Area[5] (further detail is provided in **Section 6.9**). Whilst the NPSE strictly requires the consideration of the LOAEL for construction noise and vibration, the approach taken for this assessment is to mitigate all

[5] The Construction Stage Study Area is defined in full in **Section 6.6** and shown on **Figure: 6.1 Noise and Vibration Assessment Extents, Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**).

construction activities within the Construction Stage Study Area rather than just those causing levels above the LOAEL.

6.4.71. **Table 6-10** presents the noise level thresholds adopted for LOAEL and SOAEL for the operational road traffic noise assessment.

Table 6-10 – LOAEL and SOAEL Thresholds for Operational Road Traffic Noise at Dwellings

Time Period	LOAEL	SOAEL	Notes
Day (06:00-24:00)	55 dB $L_{A10,18h}$ (façade) 50 dB $L_{Aeq,16h}$ (free-field)	68 dB $L_{A10,18h}$ (façade) 63 dB $L_{Aeq,16h}$ (free-field)	[1], [2]
Night (23:00-07:00)	40 dB $L_{night,outside}$ (free-field)	55 dB $L_{night,outside}$ (free-field)	[3], [4]

Notes:

[1] The daytime LOAEL is based on the onset of moderate community annoyance, (ref. WHO Guidelines for Community Noise (**Ref. 6.24**))

[2] The daytime SOAEL is based on the NIR (**Ref. 6.5**) threshold and the onset of cardiovascular health effects (ref. WHO Guidelines for Community Noise (**Ref. 6.24**)).

[3] The night time LOAEL is defined in the WHO Night Noise Guidelines for Europe (**Ref. 6.25**)

[4] The night time SOAEL is equivalent to the levels above which cardio vascular health effects become the major public health concern (ref. WHO Night Noise Guidelines for Europe (**Ref. 6.25**))

6.4.72. The response to operational airborne induced vibration is closely linked to the response to operational road traffic noise. Therefore, the assessment of operational road traffic noise levels against the LOAEL and SOAEL has been used as a surrogate for the assessment of operational airborne vibration levels. Consideration has also been given to nuisance from airborne vibration as noted in **paragraph 6.4.49**.

Determining Compliance with National Policy

6.4.73. Compliance with the NPSE (**Ref. 6.10**) is determined by considering whether the level of noise at each noise sensitive receptor lies above the LOAEL or SOAEL.

6.4.74. To determine whether a scheme complies with the NPSE (Ref**. 6.10**), the aims of the NPSE, as set-out in **Table 6-2** have to be tested. The NPS NN **(Ref. 6.8**) (section 5.195) states that the Secretary of State for Transport should not grant development consent unless satisfied that the Scheme will meet, within the context of Government policy on sustainable development, the three aims set out in both the NPSE and NPS NN.

6.4.75. **Table 6-11** reproduces the three policy aims of the NPSE (**Ref. 6.10**) and the process that has been adopted to test compliance.

Table 6-11 – NPSE Aims and Process to Test Compliance

Policy Aim [1]	Noise Level	Process Adopted to Test Policy Compliance
[1] to avoid significant adverse noise and vibration effects	Above or equal SOAEL	The mitigation measures that could be used to reduce noise and vibration exposure to below SOAEL at each receptor or group of receptors have been investigated. Where noise and vibration levels could not practicably be reduced to below the SOAEL, the reason(s) have been explained.
[2] to mitigate and minimise adverse noise and vibration effects	Between LOAEL and SOAEL	The requirement or otherwise for mitigation measures used to minimise adverse noise and vibration effects at each receptor or group of receptors above LOAEL have been identified. Any measures that were considered to reduce noise and vibration levels, but were not ultimately included within Part A, have been identified along with an explanation why.
[3] to improve the noise and vibration environment where possible	Applies to all levels	Mitigation and enhancement measures used to improve the noise and vibration environment have been identified and, where appropriate, reference to measures listed under Aims 1 and 2 have been included

Note:

[1] The objective is to meet all aims within the context of Government policy on sustainable development.

6.4.76. Compliance testing of Part A against national policy requires a thorough and comprehensive evaluation of the need for mitigation and enhancement along the entire length of Part A to reduce the overall environmental effects. For operational effects, these measures include the design and alignment of Part A as well as noise barriers and low noise surfaces.

6.4.77. It is important to note that:

a. Part A should be assessed as a whole against the aims of the NPSE (**Ref. 6.10**).
b. A noise level above SOAEL does not automatically result in a significant effect as defined by the EIA Regulations (**Ref. 6.3**).

SIGNIFICANT EFFECTS UNDER THE EIA REGULATIONS

Construction Noise and Vibration

6.4.78. The thresholds defined adopting the approach presented in **Table 6-8** and **Table 6-9** indicate where there could be an adverse impact in terms of the NPSE (**Ref. 6.10**) as a result of the level of construction noise and vibration respectively. However, the context and duration of the impact also needs to be considered when determining the significance of effect in terms of the EIA Regulations (**Ref. 6.3**). Where the existing ambient noise level is already above the SOAEL, threshold levels may be permitted to be higher (refer to the foot notes to **Table 6-8**).

6.4.79. Within Section E4 of BS 5228-1 (**Ref. 6.26**), in relation to example thresholds to determine eligibility for noise insulation, a duration for exceedance of threshold levels is also stated as follows:

"…for a period of 10 or more days of working in any 15 consecutive days or for a total number of days exceeding 40 in any 6 consecutive months."

6.4.80. A significant effect in the context of the EIA Regulations (**Ref. 6.3**) has therefore been defined where a sensitive receptor exceeds the noise or vibration SOAEL for longer than a period of 10 or more days of working in any 15 consecutive days, or for a total number of days exceeding 40 in any six consecutive months.

Operational Road Traffic Noise

6.4.81. The process for determining whether significant effects are likely to arise begins with determining the magnitude of noise change in the short-term. This comparison uses the predicted noise levels in the Do-minimum and the Do-something scenarios in the opening year (DM2023 and DS2023). This magnitude of change is compared against the scale in **Table 6-7** (middle column) to provide an initial assessment of likely significant effects, which has then been modified, if necessary, through consideration of a combination of other factors or indicators that provide context to the initial assessment.

6.4.82. **Table 6-12** presents the approach to the initial assessment of likely significant effects.

Table 6-12 - Initial Assessment of Likely Significant Effects

Magnitude of Impact in the Short Term	Short Term Noise Change, dB $L_{A10,18h}$	Likely Significant Effect [1]
No change or negligible	0.0 – 0.9	Not significant
Minor	1.0 – 2.9	Likely not to be significant
Moderate	3.0 – 4.9	Likely to be significant

Magnitude of Impact in the Short Term	Short Term Noise Change, dB $L_{A10,18h}$	Likely Significant Effect [1]
Major	5.0+	Probably significant
Note: [1] Subject to consideration of a number of other factors / indicators		

6.4.83. The other factors that have been considered in the contextual assessment are as follows:

a. Whether the short-term change is towards the bottom or top of the noise band range.
b. The long-term change, with Part A (DM2023 and DS2038) and without (DM2023 and DM2038).
c. Whether the absolute noise level is above or below the SOAEL.
d. Receptor specific circumstances such as:

i. Whether the highest changes affect a blank façade or a façade without a habitable room window.
ii. The length of façade affected, relative to the whole building.
iii. Whether benefits affect some façades to off-set adverse effects elsewhere (and vice versa).

e. Whether Part A is likely to alter the acoustic character of the area.
f. The likely perception of residents to include factors other than noise such as changes to the landscape or setting.

6.4.84. The number of properties affected has not been considered as a factor in final evaluation of significant effects, significance of effects has instead been considered for each individual receptor or group of receptors. Although, if significant environmental effects are predicted for a small number of properties this could be taken into account by the Secretary of State for Transport when balancing overall the relative merits of Part A.

6.4.85. The emphasis when considering these contextual factors is whether the changes in noise would likely lead to changes in behaviour and response. Noise level predictions have been made for every receptor in the Calculation Area, however, in order to provide a concise summary of the predicted beneficial and adverse effects of Part A, receptors are grouped together based on the predicted noise change, and contextual factors.

6.4.86. For designated sites and noise-sensitive areas (i.e. those not associated with a building), the proportion of the site that is affected by different noise bands has been determined. The overall judgement of significance has been assessed by balancing the predicted noise levels with the importance of the site and the duration of exposure.

Operational Road Traffic Airborne Vibration

6.4.87. The DMRB HD 213/11 (**Ref. 6.20**) provides a methodology for calculating airborne vibration nuisance as a result of Part A. Consideration is given from **paragraph 6.8.55** onwards to the potential significance of the results of this analysis.

6.4.88. Consideration has also been given within **paragraph 6.8.54** to the potential effect of operational ground-borne vibration.

NOISE INSULATION REGULATIONS

6.4.89. It is the Applicant's policy to exercise its powers under the NIR (**Ref. 6.5**). To qualify for compensation under the NIR (**Ref. 6.5**), the following four criteria must all be fulfilled at 1 m in front of the most exposed door or window of an eligible room (including living rooms and bedrooms) in the façade of a property:

a. Be within 300 m of Part A.
b. Show a relevant noise level (the noise level in the future year with Part A) of at least 68 dB $L_{A10,18h}$ (façade).
c. Show a noise increase between the relevant noise level and the prevailing noise level of at least 1 dB(A).
d. The contribution to the increase in the relevant noise level from Part A must be at least 1 dB(A).

6.4.90. The prevailing noise level is that caused by traffic using any highway immediately before works to construct or alter the highway are commenced. However, due to the relatively short duration of the construction works for Part A, the prevailing noise level is taken to be equivalent to the noise level in the Do-minimum opening year scenario. **Table 6-13** shows the parameters used to determine eligibility under the NIR whilst **Table 6-14** shows the NIR eligibility conditions.

Table 6-13 - Noise Levels Predicted for the NIR

NIR Definition [1]	Parameter used in this Section
Prevailing noise level (PNL)	$L_{A10,18h}$ Do-minimum opening year 2023 [2]
Relevant noise level (RNL)	$L_{A10,18h}$ Do-something future year 2038
Maximum noise level from altered highways within 15 years (L'A)	$L_{A10,18h}$ Do-something future year 2038 from Part A
Maximum noise level from all other highways within 15 years (L'B)	$L_{A10,18h}$ Do-something future year 2038 from all the roads outside Part A
Notes: [1] The associated acronyms are included for the NIR definitions.	

NIR Definition [1]	Parameter used in this Section
[2] Strictly the prevailing level relates to the time immediately before the works to construct or improve the highway were begun, not the year of opening. Consequently, any assessment of eligibility in terms of the NIR must be seen as preliminary. Source: Noise Insulation Regulations 1975 (as amended)	

Table 6-14 - Criteria to Define whether a Property Qualifies for Insulation under the NIR

Provision	Criteria [1]
NIR 7(1)	Distance ≤ 300 m from the nearest point of the carriageway to alter
NIR 2(1) / 4(1)	RNL ≥ 68 dB $L_{A10,18h}$ façade (with 67.5 dB rounded up)
NIR 3(2)a / 4(2)b	RNL – PNL ≥ +1 dB(A)
NIR 3(2)b / 4(2)b	RNL – L'B ≥ +1 dB(A)
Notes: [1] For the acronyms refer to CRTN, Annex 1. Source: Noise Insulation Regulations 1975 (as amended).	

6.5. ASSESSMENT ASSUMPTIONS AND LIMITATIONS

6.5.1. A number of assumptions and limitations have been identified during the assessment. The uncertainty associated with each limitation has been reduced as far as possible.

CONSTRUCTION NOISE

6.5.2. The methods and scheduling of construction works would be subject to change during the construction period to deal with situations arising on-site. A risk-based assessment has therefore been undertaken at this stage, based on typical construction road activities and plant noise levels presented in BS 5228-1 (**Ref. 6.26**).

6.5.3. **Appendix 6.4: Source Information and Assumptions for Construction Noise Assessment**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**) provides details of the construction noise assumptions and the source of the information used in the construction noise calculations. These assumptions have been generated based on information provided by the Buildability Advisor regarding outline construction methodology and the construction programme as well as experience gained

from other similar projects. **Table 6-15** details the limitations related to each element of the construction assessment.

Table 6-15 - Limitations in Relation to the Construction Noise Assessment

Limitation	Description
Road traffic diversions	No traffic data have been used in assessing the temporary road traffic noise effects of diversions during the works. These have been assessed qualitatively in **Section 6.8**.
Construction stages	Construction stages have been based on methodology within BS 5228-1 (**Ref. 6.26**), previous road scheme experience and information provided within Part A construction methodology and programme. The worst-case approach is considered to adequately account for simultaneous construction stages as equipment cannot all be positioned at the closest point to the receptor.
Construction plant and methods	Standard construction methods using plant and equipment detailed in BS 5228-1 (**Ref. 6.26**).
Construction timings and duration	Detailed timings (hour-by-hour) and durations of construction works including specific activities and exact locations are required to provide an accurate assessment of potential impacts. This information will not be available until the main contractor is appointed.
Noise sensitive receptors	Sensitive receptors identified through OS AddressBase data.

6.5.4. Precise details of construction plant, methods and scheduling will not be known until the main contractor has been appointed and all relevant surveys have been completed and all other engineering and environmental constraints have been fully accounted for. Even then, the proposed works would be subject to change during the construction period to deal with situations arising on site. The assumptions adopted within the construction noise assessment therefore aim to represent a realistic worst-case scenario based on knowledge gained from other, similar schemes.

6.5.5. At this stage, it is considered appropriate to adopt a cautious approach to the assessment whereby no screening between construction works and nearby sensitive receptors has been considered; the actual topography and intervening buildings would be likely to reduce the potential impacts from noise. Where properties are completely screened from the works it would be expected that noise levels could be up to 10 dB lower. Furthermore, the SOAELs presented in **Table 6-8** are the most cautious (i.e. based on the lowest ambient noise

measurements) and have been adopted universally, irrespective of the ambient noise levels across the Construction Stage Study Area

6.5.6. Although cautious assumptions have been made, the quantitative construction noise assessment conventionally considers a full range of typical road construction activities, taking into account the preliminary works programme and design and plant noise levels presented in BS 5228-1 (**Ref. 6.26**). The specific plant item, number of and percentage on-times assumed for the construction noise predictions are presented in **Appendix 6.4**: **Source Information and Assumptions for Construction Noise Assessment**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**).

6.5.7. Noise levels have been predicted over acoustically absorbent ground, given the predominantly rural nature of Part A.

6.5.8. Notwithstanding the assumptions that have been made, the approach to the assessment is considered proportionate and suitable for the objective of identifying where potentially significant effects are likely to arise. Once appointed the main contractor would produce a Noise and Vibration Management Plan (NVMP) and ensure that appropriate mitigation measures are employed to avoid significant effects where possible.

CONSTRUCTION VIBRATION

6.5.9. It has been assumed that percussive piling may be required during the construction stage, with specific relevance to bridge construction. This presents a worst-case appraisal of the potential vibration impacts. Alternative methods of piling that generate less vibration, e.g. continuous flight auger piling, would be considered on a case-by-case basis where there are particular sensitivities in the surrounding area. **Table 6-16** below provides a summary of limitations relating to the construction vibration assessment.

Table 6-16 - Limitations in Relation to the Construction Vibration Assessment

Parameter	Description
Piling	Piling methods have yet to be determined. The assessment presented assumes percussive piling, which is likely to be worst-case. The **Outline CEMP** (**Application Document Reference: TR010041/APP/7.3**) sets out a methodology for managing potential impacts due to piling.

6.5.10. The local geology is varied along the length of Part A. Given it is not known exactly where all piling operations will be undertaken and therefore what the exact ground conditions applicable to piling are, it is appropriate to make some worst-case assumptions in terms of propagation which have been informed by available knowledge of general ground conditions along the length of Part A. The Kp factor (a correction applied to account for the

geological conditions of the local area) is a coefficient in the formulae to calculate the predicted vibration levels.

6.5.11. Based on information presented within **Chapter 11: Geology and Soils** of this ES, it is expected that, as a worst-case the general ground conditions along Part A comprise stiff soils. As such, a correction of three has been assumed for Part A. Once final piling locations are known, it is possible that in some areas the Kp factor would be 1.5, in which case the area within which potentially significant effects may occur would reduce. All pile depths have been assumed to be 15 m and the piling energy 60,000 joules. This information was provided by the Buildability Advisor for the Scheme.

OPERATIONAL ROAD TRAFFIC NOISE AND AIRBORNE VIBRATION

6.5.12. **Appendix 6.5: Source Information and Assumptions for Operational Road Traffic Noise Assessment**, **Volume 7** of this ES (**Application Document Reference: TR0141/APP/6.7**) provides details of the assumptions and the source of the information used in the operational road traffic noise model which has been generated using CadnaA noise modelling software. **Table 6-17** provides a summary of limitations relating to the operational road traffic assessment.

Table 6-17 Limitations in Relation to the Operational Road Traffic Assessment

Parameter	Description
Future development	The impact of Part A on future developments within the operational Calculation Area has been considered in **Section 6.10**.
Pavement	Pavement corrections are dependent on road surface type, speed and number of lanes of coverage (further detail is provided in **paragraphs 6.5.16** and **6.5.18**). The corrections adopted are limited by the information available on existing and proposed road surface type.
Road speeds	It is recognised that the correction for speed within the CRTN method (**Ref. 6.21**) is only valid within the range 20 – 130 km/h. Based on the guidance in DMRB HD 213/11 (**Ref. 6.20**), the speeds associated with the provided traffic data have therefore been limited to this range.
Traffic flows	Roads with flows in all of the assessment scenarios that fall below 1,000 18-hour Annual Average Weekday Traffic (AAWT) have been excluded from the prediction exercise. This is based on the guidance in CRTN (**Ref. 6.21**).
	The results of the traffic modelling undertaken to inform the design of Part A have been used as the basis for assessment of road traffic noise. In applying these figures, a number of assumptions have been incorporated, the details of these assumptions are presented in **Appendix 6.5: Source Information and Assumptions for**

Parameter	Description
	Operational Road Traffic Noise Assessment, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)

Existing and Future Pavement

6.5.13. The noise levels produced by a particular section of road are dependent to an extent on the road surface that is present. A 'road surface correction' is applied to each road segment, which is dependent on the speed of the road and the road surface type and its condition.

6.5.14. Where the speed of a road is less than 75 km/h, the noise produced is less dominated by tyre noise and, therefore, the road surface correction is not dependent on the road surface type.

6.5.15. Conversely, where the speed of the road is greater than 75 km/h, tyre noise becomes more dominant and, therefore, the road surface correction is dependent on the type and condition of surface.

6.5.16. For the existing Do-minimum scenario, in line with **Chapter 2: The Scheme**, **Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**), the following has been assumed:

a. Road surface information for the A1 included sections of Hot Rolled Asphalt (HRA) and Low Noise Surface (LNS). This information was provided via Highways England Pavement Management System (HAPMS).

b. The local road network (the road network maintained by the Local Authority) would be surfaced with HRA. Detailed information of the road surface on the wider road network was not available and was therefore assumed to be HRA, as this is the most widely applied road surface[6].

6.5.17. In line with standard maintenance practices, by the future Part A Do-minimum year (2038), all areas of LNS are assumed to have been replaced and well maintained.

6.5.18. In line with **Chapter 2: The Scheme**, **Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**), for the Do-something scenarios, the following has been assumed:

[6] Assessment of noise levels from the wider road network is predominantly based on the noise level change between scenarios. Therefore, provided the road surface does not change between the scenarios it is not of great consequence to the overall assessment.

a. The entire length of the A1, between the north and south extent of Part A, would be laid with a LNS, apart from on structures (River Coquet Bridge, Parkwood Subway and Burgham Park Underbridge) where HRA would be laid.
b. All existing sections of LNS on the A1 would be replaced with a new LNS (and if necessary, replaced again by the future year such that they can be considered to be well maintained).
c. Where the 'de-trunked' A1 would become NCC's responsibility, the road surface type would remain the same as existing for the Do-something opening and future years.
d. The road surface type on the local authority road network would not change.

6.5.19. An LNS has higher noise absorption characteristics than alternative surfaces such as HRA and as such absorbs a proportion of the tyre noise. For this reason, it is only effective where tyre noise is dominant over engine noise.

6.5.20. The surface corrections that have been applied within the assessment are those stated for use within Annex 4 of the DMRB HD 213/11 (**Ref. 6.20**). The low noise characteristic of a surface is defined by its 'Road Surface Influence' (RSI) value. The DMRB advises that for calculations undertaken using CRTN (**Ref. 6.21**), the surface correction for thin surfacing systems should be assumed to be 0.7*RSI and its performance capped at a maximum of -3.5dB. It then goes on to say that if there is no information available for a specific surface, then a -2.5dB correction should be applied for existing low noise road surfaces and -3.5dB correction applied for a new low noise road surface. The effectiveness of LNS is dependent upon wear to and clogging of the surface and as such requires more cleaning and maintenance than alternative surfaces.

6.6. STUDY AREA

CONSTRUCTION NOISE AND VIBRATION

6.6.1. Construction noise and vibration effects are expected to encompass a smaller area than that applicable to the operational stage assessment. This is because, based on available guidance and professional judgement, temporary construction noise and vibration is not expected to generate significant effects beyond 300 m from the area of activity. At greater distances other factors, such as meteorological conditions, have increasing influence and construction noise level predictions are considered less robust.

6.6.2. DMRB HD 213/11 (**Ref. 6.20**) states that:

"*As there is an expectation that disruption due to construction is a temporary issue, the area in which it is considered to be a nuisance is generally more localised than where the impacts of the road project are likely to be a cause of concern once it has opened to traffic. It has been shown that the impact of construction nuisance in one form or another diminishes rapidly with distance*."

6.6.3. Within BS5228-1 (**Ref. 6.26**) Appendix F: Methods of Calculation it is stated "*At distances over 300m noise predictions have to be treated with caution, especially where a soft ground*

correction factor has been applied, because of the increasing importance of meteorological effects".

6.6.4. The Construction Stage Study Area has therefore been set at 300 m from the boundary of any construction activity associated with Part A. In addition, where necessary, temporary sources outside of the 300 m Study Area such as construction traffic routes and diversions have also been considered.

OPERATIONAL ROAD TRAFFIC NOISE

6.6.5. The Operational Road Traffic Noise Study Area and Calculation Area have been defined in accordance with DMRB HD 213/11 (**Ref. 6.20**), taking into account the findings of the options selection stage noise assessment.

a. Identify the start and end points of the physical works associated with Part A
b. Define a boundary 1 km from the carriageway edge of the routes identified in (a) above
c. Define a boundary 600 m from the carriageway edge around the route identified in (a) above and 600 m from any other affected routes within the boundary defined in (b) above. The total area within these 600 m boundaries is termed the Calculation Area
d. Identify any affected routes beyond the boundary defined in (c) above

6.6.6. DMRB HD 213/11 also requires that the Basic Noise Level[7] (BNL) is calculated for the wider network roads. The area considered has been informed by the Traffic Reliability Area (TRA) 8. A 50 m buffer (from the edge of the carriageway) in line with DMRB HD 213/11 is defined around identified affected routes.

6.6.7. An affected route is one where there is a possibility of a change in the BNL of at least 1 dB $L_{A10,18h}$ in the short-term (on opening), or 3 dB $L_{A10,18h}$ in the long term (assessed between the opening year (2023) and the future year (2038))[9].

6.6.8. In accordance with the DMRB HD 213/11 (**Ref. 6.20**) the Operational Road Traffic Noise Study Area has been determined on the basis of the definition of Part A and affected roads identified within and outside the main 1 km boundary. The detailed noise Calculation Area has been defined as within 600 m of the A1 (existing and proposed alignments) and any affected routes that lie within 1 km of Part A.

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7 The Basic Noise Level is described in the CRTN. It does not relate to any specific receptor, but rather is a measure of source noise, at a reference distance of 10 m from the nearside carriageway edge of a specific length of highway. It is determined by obtaining the estimated noise level from the 18-hour traffic flow and then applying corrections for vehicle speed, percentage of heavy vehicles, gradient and road surface as described in CRTN.

8 IAN 185/15 (**Ref. 6.22)** defines the TRA as "The TRA defines the sub-set of traffic data from the traffic model, that has been identified as suitable for informing the Environmental Assessment."

9 Where a change above 1 dB $L_{A10,18h}$ in the short-term and 3 dB $L_{A10,18h}$ in the long-term is due to physical changes to the infrastructure surrounding the road (e.g. re-surfacing) or changes to the way in which the existing road is used, then DMRB HD 213/11 states that this should not be included as an 'affected road link' nor inform the Calculation Area.

6.6.9. The Operational Road Traffic Noise Study Area has also been defined by the extent of the TRA such that any sensitive receptors that lie outside of the TRA have been excluded from the assessment as the noise levels and associated changes at these receptors would be considered unreliable.

6.6.10. **Figure 6.1: Noise and Vibration Assessment Extents**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**) shows the extent of the 1 km boundary, Construction Stage Study Area and the operational Calculation Area.

OPERATIONAL AIRBORNE VIBRATION

6.6.11. In accordance with DMRB HD 213/11 (**Ref. 6.20**), the Operational Airborne Vibration Study Area is defined as being within 40 m of any roads identified in the Operational Road Traffic Noise Study Area.

6.7. BASELINE CONDITIONS

6.7.1. The Study Area covers the existing A1 between Morpeth in the south to Felton in the north, running through a rural landscape with predominantly agricultural land uses either side of the road. There are relatively few dwellings in close proximity to the A1, and where these do exist, they are typically isolated or grouped in small clusters.

6.7.2. Part A passes through a rural area and so, away from the existing A1, the existing baseline noise and vibration climate is likely to be relatively low. As well as road traffic noise from the A1, other arterial roads in the area (such as the A697, B6345 and B1340) are expected to dominate the existing noise and vibration environment for sensitive receptors in the vicinity. The contribution of road traffic noise to existing baseline noise and vibration levels would be dependent on the separation distance between roads and receptor, and the traffic flow, composition and speed of vehicles on those roads. Eshott Airfield lies towards the northern end of Part A, immediately to the east of the A1.

6.7.3. The existing road traffic noise climate has primarily been determined using a 3D noise model populated with traffic flow data. Details of the data used in the noise model are provided in **Appendix 6.5: Source Information and Assumptions for Operational Road Traffic Noise Assessment**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**). However, a noise survey has been undertaken, the results from which are described in the following section.

NOISE SURVEY

6.7.4. In accordance with DMRB HD 213/11 (**Ref. 6.20**) the operational road traffic noise assessment has been based on calculated noise levels using the methodology detailed in CRTN (**Ref. 6.21**) and Annex 4 of the DMRB HD 213/11. However, it is also appropriate to establish the baseline conditions by measurement at a sample of locations in the vicinity of Part A. A baseline noise survey has therefore been undertaken to inform the assessment of potential construction and operational stage noise effects. The results obtained during the

baseline noise survey have been used to inform the selection of appropriate construction noise assessment criteria.

6.7.5. The baseline noise survey comprised attended and unattended monitoring at various locations in the vicinity of Part A (refer to **Figure 6.1: Noise and Vibration Assessment Extents**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**)). The survey commenced at approximately 11:00 on Tuesday 20 March 2018 and concluded on Wednesday 21 March at approximately 12:00.

Weather Conditions

6.7.6. Meteorological measurement data for the survey period have been obtained from www.wunderground.com for a weather station at Morpeth (IMORPETH13), which is that closest to Part A.

6.7.7. The relevant data are presented in **Appendix 6.6: Noise Survey Details**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**).

Measurement Equipment

6.7.8. The Class 1 sound pressure level measurement systems and handheld acoustic calibrators as detailed within **Appendix 6.6: Noise Survey Details**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**) were used.

6.7.9. Each of the measurement systems had been calibrated to traceable standards within the previous 24 months, and the handheld calibrators within the previous 12 months. Using the paired hand-held calibrator for each system, the measurement chain was subject to field calibration at the beginning and end of each measurement. No significant calibration drifts arose.

6.7.10. At each measurement location, the microphone of the installed measurement system was fitted with a windshield.

Measurement Locations

6.7.11. The adopted measurement locations are shown in **Figure 6.1: Noise and Vibration Assessment Extents**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**).

Survey Results

6.7.12. The baseline noise survey results for long-term unattended monitoring and short-term attended monitoring and are presented in **Table 6-18** and **Table 6-19** respectively.

6.7.13. Long-term unattended monitoring was undertaken at locations for which suitably secure or concealed measurement locations could be adopted. Shorter term measurements were undertaken at locations which were less secure, thus necessitating shorter and in some cases, attended measurements.

6.7.14. Details of the equipment used for the noise survey, as well as details such as the time periods covered, and weather conditions are presented in **Appendix 6.6: Noise Survey Details**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**).

Table 6-18 – Long-term Unattended Noise Measurements

Location		Start Date and Time (mm:ss)	Duration (hh:mm)	Measured Noise Level (dB)			
				$L_{A10,18h}$ (06:00 – 00:00 hrs)	$L_{Aeq,16h}$ (07:00 – 23:00 hrs)	$L_{Aeq,8h}$ (23:00 – 07:00 hrs)	$L_{Amax,8h}$ (23:00 – 07:00 hrs)
LT1	Priest Bridge House	20-Mar-18, 11:00	24:00	57.5	55.9	51.9	92.4
LT2	New Houses Farm	20-Mar-18, 12:15	23:45	47.8	48.6	42.7	75.1
LT3	The Bungalow	20-Mar-18, 11:00	24:00	54.5	52.9	46.6	77.2
LT4	West Moor House	20-Mar-18, 11:30	24:00	56.5	56.3	47.7	91.6

6.7.15. A detailed breakdown of noise levels at all four long-term unattended noise measurement locations is provided in **Appendix 6.7: Noise Monitoring Results**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**).

Table 6-19 – Short-term Attended Noise Measurements

Location		Start Date and Time (mm:ss)	Duration (hh:mm)	Measured Noise Level (dB)			
				$L_{Aeq,T}$	$L_{Amax,T}$	$L_{A90,T}$	$L_{A10,T}$
ST5	Blackwood Hall	20-Mar-18, 13:24	30:01	63.2	78.7	50.1	66.6
ST4	The Helm	20-Mar-18, 14:08	30:02	59.0	84.3	47.2	59.8

Location		Start Date and Time (mm:ss)	Duration (hh:mm)	Measured Noise Level (dB)			
				$L_{Aeq, T}$	$L_{Amax, T}$	$L_{A90, T}$	$L_{A10, T}$
ST5	Blackwood Hall	20-Mar-18, 23:28	15:01	56.9	75.1	34.0	57.6
ST4	The Helm	20-Mar-18, 23:49	16:00	52.2	72.5	35.5	55.2
ST3	Easden Cottage	21-Mar-18, 00:10	01:08	56.7	81.7	36.0	51.9
ST3	Easden Cottage	21-Mar-18, 00:11	15:03	60.3	77.5	37.7	61.5
ST1	The Orchard	21-Mar-18, 00:35	15:01	41.2	56.6	35.8	43.9
ST2	Strafford House	21-Mar-18, 00:55	15:01	58.2	78.5	35.2	57.5
ST7	Northgate Farm	21-Mar-18, 01:12	09:06	69.6	92.0	35.3	67.6
ST7	Northgate Farm	21-Mar-18, 01:22	06:05	67.5	85.9	31.7	63.8
Note: Results are presented in chronological order. Measurement location ST6 was not used due to lack of suitable access to location.							

ACOUSTIC MODEL BACKGROUND NOISE

6.7.16. To account for the potential contribution from sources not included in the acoustic model or excluded from the calculation (for example, as a result of the vehicle flow falling below the threshold for valid calculations of $L_{A10,18h}$), a correction for existing ambient noise has been applied. This is especially relevant for more remote locations away from existing roads, where the noise model may be less accurate, (e.g. due to lower road traffic noise levels and the contribution of noise sources other than road traffic which are not incorporated within the noise model) and there is potential to under-estimate noise levels.

6.7.17. Measurement position LT2 was located over 500 m from the A1 and any other major road noise sources. To avoid overestimating the contribution of general ambient noise, the underlying background noise levels were determined for day and night time periods and the following noise levels were subsequently added to the noise model: 39 dB for the daytime

and 29 dB for the night time (after converting to $L_{night,outside}$ using TRL (**Ref. 6.23**) method 3). These underlying levels are sufficiently low not to affect the noise levels in areas where road traffic noise is dominant but were applied to help ensure that the existing noise levels in more remote areas are not under-estimated and hence that the future changes in noise levels are not over-estimated.

SENSITIVE RECEPTORS

AddressBase Receptors

6.7.18. **Table 6-20** details the number of receptors that have been identified within the Calculation Area, as well as the names of the non-residential receptors.

Table 6-20 - Noise Sensitive Receptors within the Calculation Area

Receptor Type	Number of Receptors within Calculation Area	Receptor Name / Description
Residential	383	N/A
Other noise sensitive - Medical	2	Northgate Hospital (two buildings) [1]
Other noise sensitive - Educational	1	Tritlington Church of England First School
Other noise sensitive - Religious/ place of worship	1	Saint Cuthbert's Church
Other noise sensitive – Holiday Let	2	Oakwood Holiday Cottages
Other noise sensitive - Burial Ground[2]	1	Burial Ground west of Eshott Airfield and east of the A1 (Northumberland Woodland Burials)

Note [1]: Whilst Northgate Hospital consists of a number of separate buildings, as it is unclear which of these buildings are in use, noise levels for the purpose of this assessment have only been predicted at the two buildings with AddressBase postal records. The noise level predictions for these two buildings are deemed representative of the entire Northgate Hospital campus.

Note [2]: As the Burial Ground is an external area with no building to predict noise levels at, the site is not included in the results tables which follow and is instead discussed in terms of the noise levels predicted to affect the whole area.

Noise Important Areas

6.7.19. The current Noise Action Plan for roads (**Ref. 6.29**) outlines numerous NIAs at Round 3 of the UK noise mapping project, identified in accordance with the requirements of the EU Environmental Noise Directive (**Ref. 6.1**) and associated English Regulations (**Ref. 6.4**). NIAs are locations where it has been identified that the 1% of the population that are affected by the highest noise levels are located, in order to identify the areas that require potential action to reduce noise levels.

6.7.20. The Round 3 NIAs within or partially within the Operational Road Traffic Noise Study Area are tabulated below in **Table 6-21** and shown on **Figure 6.1: Noise and Vibration Assessment Extents**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**).

Table 6-21 - Noise Important Areas

NIA ID	Description	Owner/Responsible Body
IA_ID 10003	Northgate Farm	Highways England
IA_ID 10002	Causey Park	Highways England

Designated Areas and Footpaths

6.7.21. **Table 6-22** details the designated area receptors, for example, SSSI and key rights of way[10] that are located within the Operational Road Traffic Noise Study Area.

Table 6-22 Designated Areas and Key Public Rights of Way

Receptor Type	Category	Name and Location
Designated Areas	SSSI	River Coquet and Coquet Valley Woodlands
Public Right of Way	Long distance path	St Oswald's Way

[10] A 'key' right of way has been defined as a national trail or long-distance path as identified from OS LandRanger mapping. It does not include other rights of way such as footpaths, bridleways or footways (pavements) etc.

6.7.22. Ecological receptors have not been considered within this chapter but are considered within **Chapter 9: Biodiversity** of this ES.

Felmoor Park and Bockenfield Holiday Park

6.7.23. South of Eshott Airfield lies Bockenfield Holiday Park and Felmoor Park with approximately 180 units, based on satellite imagery. From an online internet search, a number of these homes are rented-out as holiday homes. However, AddressBase information identified that several of the units serve as first or second homes.

FUTURE BASELINE

Opening Year (2023), Without Part A

6.7.24. The operational stage road traffic noise assessment relies primarily on an appraisal of predicted road traffic noise levels. A detailed noise modelling exercise has therefore been undertaken for the required scenarios. **Table 6-1** in **Appendix 6.5: Source Information and Assumptions for Operational Road Traffic Noise Assessment**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**), details the approach adopted in the completion of this noise modelling and prediction work. The road traffic data adopted within the noise model is set out in **Chapter 4** of the **Case for the Scheme** (**Application Document Reference: TR10041/APP/7.1**).

Future Year (2038), Without Part A

6.7.25. The DM2038 noise model has been used to determine the future baseline noise levels.

6.7.26. **Table 6-23 - Comparison of the Number of Noise Sensitive Receptors above** the LOAEL and SOAEL Thresholds in DM2023 and DM2038 compares the number of noise sensitive receptors in the DM2023 scenario that are above the LOAEL and SOAEL thresholds with those in the DM2038 scenario.

Table 6-23 - Comparison of the Number of Noise Sensitive Receptors above the LOAEL and SOAEL Thresholds in DM2023 and DM2038

Noise Level	Daytime			Night Time		
	DM2023	DM2038	Difference	DM2023	DM2038	Difference
Equal to / greater than SOAEL	42 (2)	44 (2)	+2 (0)	44 (2)	47 (2)	+3 (0)
Between LOAEL and SOAEL	222 (2)	239 (4)	+17 (+2)	331 (2)	329 (2)	-2 (0)
Below LOAEL	123 (2)	104 (0)	-19 (-2)	12 (0)	11 (0)	-1 (0)

Noise Level	Daytime			Night Time		
	DM2023	DM2038	Difference	DM2023	DM2038	Difference

Note: Bracketed values represent other sensitive receptors, unbracketed values represent residential dwellings.

As Tritlington Church of England First School and Saint Cuthbert's Church are understood not to be in use during the night time, these receptors have been excluded from the night time columns. Results are only presented for the two Northgate Hospital buildings and the two Oakwood Holiday Cottages.

6.7.27. Without Part A, the future year shows a very slight worsening in noise levels at a small number of receptors. Whilst during the daytime, two additional properties are predicted to experience noise levels above the SOAEL and 19 additional properties above the LOAEL, the actual predicted noise level increase at these properties is small (further detail is provided on this in the following paragraphs). This is caused by increasing traffic flows due to predicted natural growth and changes in predicted road speed.

6.7.28. In line with the guidance in DMRB HD 213/11 (**Ref. 6.20**), consideration has been given to the change in noise levels that would arise at identified receptors, in the long-term, without Part A (i.e. DM2023 and DM2038).

6.7.29. **Table 6-24** presents the numbers of receptors within the Calculation Area subject to different noise level changes for the long-term change without Part A.

6.7.30. It should be noted that for any given dwelling or building, different noise level changes would arise on different façades. In accordance with DMRB HD 213/11 (**Ref. 6.20**), the assessment has been based on the façade point that is subject to the least beneficial change in noise, thereby representing an overall worst-case assessment.

Table 6-24 - Noise Sensitive Receptors, Long-term Noise Changes without Part A

Change in Noise Level		Magnitude of Impact	Daytime		Night Time
			Number of Dwellings	Number of other Noise Sensitive Receptors	Number of Dwellings
Increase in noise level $L_{A10,18h}$	0.1 – 2.9	Negligible	379	6	49
	3 – 4.9	Minor	1	0	0
	5 – 9.9	Moderate	0	0	0

Change in Noise Level		Magnitude of Impact	Daytime		Night Time
			Number of Dwellings	Number of other Noise Sensitive Receptors	Number of Dwellings
	>=10	Major	0	0	0
No change	= 0	No change	3	0	0
Decrease in noise level $L_{A10,18h}$	0.1 – 2.9	Negligible	0	0	2
	3 – 4.9	Minor	0	0	0
	5 – 9.9	Moderate	0	0	0
	>=10	Major	0	0	0

6.7.31. **Table 6-24** above shows that a small number of properties show a slight decrease or no change in noise levels in the future year. The remaining, majority of properties are predicted to experience a small increase in noise level as a result of natural traffic growth. However, this is predicted to be a negligible increase for all bar a single dwelling located on the road to the west of the proposed West Moor junction. As the traffic flow on this road is low (the annual average weekly traffic (AAWT) 18 hour flow is 1,327 in the DM2023 scenario), a small increase in vehicle numbers has resulted in a relatively large increase in noise level[11].

6.7.32. Traffic noise and airborne vibration nuisance assessments have been undertaken for the future year Do-minimum scenario and are presented in **Appendix 6.3: Noise and Airborne Vibration Nuisance Assessment**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**).

6.8. POTENTIAL IMPACTS

CONSTRUCTION

6.8.1. For the pre-mitigation construction noise and vibration assessment, predictions have been made which have been used to identify SOAEL zones (areas within which the noise level

[11]A small uplift in vehicle numbers on roads with a low flow can result in a large increase in proportional terms (e.g. an additional 100 vehicles on a road with 1000 18-hr AAWT is a 10% increase) and this, in turn, could result in a large increase in noise. However, with such low flows the absolute noise level is likely to be low, and so any increase does not necessarily result a significant effect. This is explored in more detail in **Section 6.8.**

from the construction activity is expected to exceed the SOAEL) for each activity. The SOAEL zone has been calculated using the assumed sound pressure levels of the plant items and their percentage on times presented in **Appendix 6.4**: **Source Information and Assumptions for Construction Noise Assessment**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**) for the noise assessment and assumptions described in **paragraph 6.5.10** for the vibration assessment (further details are provided from **paragraph 6.8.17**onwards).

6.8.2. For the construction noise SOAEL zones, the total sound power level of all the plant items (taking into account the assumed percentage on-times) is calculated by summing the noise levels of each item of plant. The propagation of noise over distance is predicted (in accordance with the calculation methodology within BS 5228-1 (**Ref. 6.26**)) assuming acoustically absorbent[12] ground to determine the distance at which the SOAEL would no longer be exceeded. This is referred to as the SOAEL zone.

6.8.3. It is understood that some construction activities have the potential to be undertaken at night during road closures for safety reasons. Therefore, the construction noise and vibration assessment has assumed both daytime and night time working.

Construction Noise

6.8.4. Indicative noise levels have been predicted for each of the construction activities identified in **paragraph 6.4.24** above in accordance with the guidance in BS 5228-1 (**Ref. 6.26**). The predicted noise levels and respective SOAEL zones for each of the activities for both daytime and night time periods are shown in **Table 6-25**.

Table 6-25 – Daytime and Night time SOAEL Zones for Construction Activities

Construction Activity	Daytime		Night time	
	Total Activity Sound Power Level, dBA	Daytime SOAEL Zone (m)	Total Activity Sound Power Level, dBA	Night time SOAEL Zone (m)
Site clearance	112	69	111	262
Earthworks	109	52	108	194
Bridge construction	112	69	112	264

[12] Given the predominantly rural nature of Part A, it is appropriate to assume acoustically absorbent ground in these calculations.

Construction Activity	Daytime		Night time	
	Total Activity Sound Power Level, dBA	Daytime SOAEL Zone (m)	Total Activity Sound Power Level, dBA	Night time SOAEL Zone (m)
Road construction	108	47	107	179
Compound operation	105	35	104	133
Noise Barrier Construction	109	51	108	195
Cycle path construction	106	41	106	155

Notes:

The specific plant items and their respective on-times used in the SOAEL zone calculations are presented in Appendix 6.4: Source Information and Assumptions for Construction Noise Assessment, Volume 7 of this ES (Application Document Reference: TR010041/APP/6.7). The total activity sound power levels vary slightly for the daytime and night time as it is common practice for contractors to work 10 out of 12 hours in the daytime and six out of eight hours in the night time. As such, the assumed percentage on-times have been further corrected for these hours.

6.8.5. A list of the equipment, source noise levels and percentage on-times assumed to be used for the purposes of this assessment is provided in **Appendix 6.4**: **Source Information and Assumptions for Construction Noise Assessment**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**).

Construction Traffic Noise

6.8.6. The **Construction Traffic Management Plan** (**CTMP**) (**Application Document Reference: TR010041/APP/7.4**) provides information regarding the predicted traffic movements associated with the construction of Part A. The CTMP notes that primarily construction vehicle routes would follow the A1 and avoid use of side roads. It also notes that construction traffic movements would normally take place between the hours of 07:00 – 19:00. The two main construction compounds shown on **Figure 2.5: Temporary Construction Works: Part A**, **Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**) are located such that construction vehicles can travel either from the north or south on the A1 and enter the compound via a side road without passing within 50 m of a residential property on the side road. The use of minor roads by construction

vehicles would be minimised as far as possible. Where required, due consideration would be given to noise levels from the construction vehicles using these routes.

6.8.7. The predominant demand for construction vehicles is associated with the import of materials. Based on currently available estimates of expected movements, the maximum traffic applicable to imported materials is 112 lorries per day for the third quarter of the construction stage. This is the average number per day spread over the full quarter. There would be peaks and troughs within this period where some days and weeks the movements would approach the maximum figure (200 movements per day) whilst on other days and weeks movements would be minimal.

6.8.8. For the Main Compound, a total of 91 daily movements are predicted for Part A, with approximately 82% of these movements being from 4x4 / transit vehicles and 18% from lorries.

6.8.9. For the satellite compound adjacent to the proposed Fenrother Junction all movements would occur during daytime hours and would total 57 movements per day, with 72% being 4x4 / transit movements and 28% being lorry movements.

6.8.10. For the compound south of the River Coquet all movements would occur during daytime hours and would total 16 movements per day, with 63 % being 4x4 / transit movements and 37 % being lorry movements.

6.8.11. Given that the majority of construction traffic associated with Part A would be routed along the A1, which has comparatively high existing traffic flows, including a substantial proportion of heavy vehicles, it is evident that additional vehicle movements associated with construction operations would be well diluted within the overall flow. This coupled with a proposed speed reduction from 70 mph to 40 mph through the roadworks on the A1 during the construction stage, indicates that associated changes in road traffic noise levels would be unlikely to result in a 1 dB increase, or greater, from current levels. Therefore, effects as a result of Part A construction traffic movements are expected to be insignificant.

Road Traffic Diversions During Construction

6.8.12. Temporary diversions would be required to facilitate the efficient delivery of Part A (refer to the **CTMP** (**Application Document Reference: TR10041/APP/7.4**)). The diversion route for the closure of the A1 between St. Leonard's Junction and Thunderbourne Interchange is split into northbound and southbound diversions. The northbound diversion would be via the A197, A198 and A1068 and the southbound diversion route for cars and local traffic would be via the B6346, B6341 and A697, while the southbound diversion for heavy goods vehicles and long-distance traffic would be via the A698 and A697. Some of these diversion routes pass existing noise-sensitive receptors such as those at Ashington, Ellington, Widdrington, Hadston, Amble, Warkworth, Hipsburn, Lesbury and Alnwick (northbound route) and Cornhill-on-Tweed, Milfield, Wooler, Powburn, Alnwick, Longframlington and Longhorsley (southbound routes). There is therefore the potential for temporary impacts to arise.

6.8.13. A key principle in the development of the **CTMP** (**Application Document Reference: TR10041/APP/7.4**) has been to maintain single lane traffic in each direction on the A1 for the majority of the construction period, with the exception of carriageway closures for tie-in works, surfacing, bridge beam installations and installation of some of the traffic management. The majority of carriageway closures would be overnight (typically 21:00 or 22:00 to 05:00) but some closures may also occur between 20:00 Saturday to 14:00 Sunday or 22:00 Friday to 05:00 Monday. It is noted that only four extended closures for each tie-in (north and south) would be required.

6.8.14. When closures are required these would follow the diversion routes presented in **Appendix 7** of the **CTMP** (**Application Document Reference: TR010041/APP/7.4**), which identifies the southbound and northbound routes described in **paragraph 6.8.12**.

6.8.15. It is not possible to accurately predict noise impacts from road diversions associated with the construction of Part A without detailed information on traffic flows with and without the diversion in place. However, in order to minimise the potential impacts from road diversions, noise mitigation and management measures have been included for Part A. These are described within **paragraphs 6.9.4** to **6.9.18** and are presented within the **Outline CEMP** (**Application Document Reference TR010041/APP/7.3**).

6.8.16. It is anticipated that there would be 23 nights of southbound diversions and 23 nights of northbound diversions required during the construction of Part A, however, details of specific dates for A1 carriageway closures are to be developed. It is however expected that diversion conditions on any given local route would constitute only a very small proportion of the full construction programme. Therefore, provided that the management measures set out within the **Outline CEMP** (**Application Document Reference TR010041/APP/7.3**) are adhered to, effects as a result of traffic diversions are expected to not be significant.

Construction Vibration

6.8.17. Percussive piling may be used during the signage works and noise barrier construction and bridge construction works for Part A.

6.8.18. **Table 6-26** presents the extent of the SOAEL zone for any activity involving percussive piling. The SOAEL zone is applicable to both day and night time working. The vibration levels have been calculated in accordance with the formulae contained in BS 5228-2, Table E.1 (**Ref. 6.27**) and presents a worst-case. In reality, it is likely that working practices and ground conditions would result in lower vibration levels and thus a smaller SOAEL zone.

6.8.19. For the construction vibration SOAEL zone, the predicted PPV at ground level from percussive piling is calculated. The propagation of vibration over distance is predicted (in accordance with calculation methodology within BS 5228-2 (**Ref. 6.27**)) to determine the distance at which the SOAEL would no longer be exceeded. This is referred to as the SOAEL zone.

6.8.20. Although percussive piling presents the construction activity expected to generate the greatest levels of ground borne vibration, additional calculations have been undertaken for

the use of vibratory rollers which may be used during road construction works and therefore may have a wider ranging use along the length of Part A when compared to the more localised piling associated with bridge construction. The vibration levels have been calculated in accordance with the formulae contained within BS 5228-2 (**Ref. 6.27**) and the associated SOAEL zones (with a threshold of 1.0 mms^{-1} PPV) are presented within **Table 6-26**.

Table 6-26 – SOAEL Zones for Percussive Piling and Vibratory Rollers

Construction Activity	SOAEL Zone (m)
Percussive piling[1]	160
Vibratory rollers[2]	23

Note [1]: The calculated SOAEL zone distance is outside the prediction range of the calculation in BS:5228-2 (**Ref. 6.27**). However, in order to present a worst-case approach at this stage the calculated distance has not been limited. Once more detail on the geology of the area and the exact piling technique is known, a more detailed vibration assessment should be undertaken prior to construction works commencing.

Note [2]: Assumes 2 drums, 0.4 mm amplitude, drum width of 1.3 m, e.g. small ride on roller. The calculation incorporates a 5% chance of exceeding the criterion and is applicable to the start up and run down of machinery. During steady state operation, vibration levels would be lower.

Potential Construction Effects

6.8.21. Where noise sensitive receptors are located within the SOAEL zones identified above, they are non-compliant with the NPSE (**Ref. 6.10**).

6.8.22. A significant construction effect in the context of the EIA Regulations (**Ref. 6.3**) would only arise where noise or vibration levels are predicted to be above the SOAEL thresholds for more than 10 out of 15 days/nights, or any 40 days/nights in six consecutive months.

6.8.23. It is expected that the majority of construction work for the offline section of Part A would be undertaken during the daytime and therefore, significant effects due to night time working for this section are not anticipated.

6.8.24. However, at this point it is appropriate to identify the receptors which are most at risk from the effects of construction noise and vibration.

6.8.25. The majority of the construction activities for Part A are linear activities (i.e. road and cycle path construction) or short-term activities (i.e. noise barrier construction), which are unlikely to impact individual receptors for sustained periods of time.

6.8.26. As the construction compounds would remain in place for the duration of the works there is the potential for sensitive receptors to be affected by noise levels for a sustained period. It is therefore appropriate to consider when any receptors are within the SOAEL zone for the operation of any of the construction compounds. The Main Compound, satellite compound adjacent to the proposed Fenrother Junction and the compound south of the River Coquet do not have any noise sensitive receptors within the daytime SOAEL zone for compound operation (35 m). The National Grid compound required to facilitate the diversion of the National Grid pipeline does have one receptor (one of the Holiday cottages at Causey Park) within 35 m, albeit only just. As this receptor is between 30-35 m from the construction compound, all the plant items assumed to be operating in the compound would have to be located at the very edge of the compound closest to the receptor for the SOAEL to actually be exceeded at this receptor[13]. Therefore, whilst there might be a notional exceedance of the SOAEL at this receptor for periods when plant items are operating close by, it is highly unlikely that this would occur more regularly than the durations stated above in **paragraph 6.8.22**. Therefore, predicted noise levels from the operation of the construction compounds are not expected to cause any significant adverse effects and are therefore not considered further in this chapter.

6.8.27. The two activities which have been identified as likely to represent the highest risk (i.e. the most likely to cause potentially significant effects) are bridge construction and earthworks.

6.8.28. Bridge construction is a high-risk activity as the construction works are contained within a small area and properties within close proximity could potentially be adversely affected for sustained periods of time.

6.8.29. Earthworks is a high-risk activity, due to the scale of the earthworks potentially required in some areas.

6.8.30. Both bridge construction and earthworks could potentially affect properties for a period exceeding the durations of work identified in the Level 2 mitigation (further detail is provided below in **Section 6.9**). Where works extend beyond these durations, consideration would need to be given to temporary re-housing.

6.8.31. In order to identify the properties that have the potential to be significantly adversely affected by bridge construction and earthworks, the relevant SOAEL zones are shown in **Figure 6.4: Receptors Affected by Earthworks and Bridge Construction**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**). In terms of activity locations, bridge construction has been marked as anywhere a new bridge is currently proposed to be constructed or where an existing bridge requires alterations. Earthworks

[13] The SOAEL zone is calculated by assuming that all the operational plant items are at the very edge of the construction activity location closest to the receptor. This represents a worst-case calculation method as it is unlikely this would occur in practice.

have been assumed to be required within the Order Limits (excluding easements). Whilst this is a worst-case approach, the purpose of this figure is to identify the at-risk properties rather than to identify likely significant effects. Where residential properties are known to be within one of the SOAEL zones, they have been marked clearly on **Figure 6.4: Receptors Affected by Earthworks and Bridge Construction**, **Volume 5** this ES (**Application Document Reference: TR010041/APP/6.5**).

6.8.32. **Figure 6.4: Receptors Affected by Earthworks and Bridge Construction**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**) also shows all the residential receptors within the Construction Stage Study Area.

OPERATION

Operational Noise

6.8.33. Detailed pre-mitigation noise predictions have been carried out for 383 residential receptors and six non-residential noise sensitive receptors, including a school, a hospital (two buildings), a church, two Holiday Lets. This is in addition to three receptors that extend over a wide area, which are a Burial Ground (Northumberland Woodland Burials), River Coquet and Coquet Valley Woodlands and St Oswald's Way.

6.8.34. All noise levels and noise changes are presented for both the short-term and the long-term. For the long-term noise impacts, a comparison has been made between the noise levels with Part A in the design year (DS 2038) and the noise levels without Part A in the opening year (DM 2023). This comparison includes the change in noise level as a result of Part A as well as general traffic growth.

6.8.35. **Figure 6.2: Do-Something Short Term Noise Level Change** and **Figure 6.3: Do-Something Long Term Noise Level Change**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**), present noise level change contour maps for the short-term and long-term respectively.

Comparison of the Operational Road Traffic Noise Effects with the aims of the NPSE

6.8.36. **Table 6-27** and **Table 6-28** show the comparison between the number of noise sensitive receptors above and below the operational LOAEL and SOAEL in the short-term and the long-term respectively. This comparison has been based on the highest noise level predicted on any façade being representative of a particular sensitive receptor. This is considered appropriate as it represents a worst-case for potential health effects.

Table 6-27 – Short-term NPSE Summary – Number of Receptors

Noise Level	Daytime			Night Time		
	DM2023	DS2023	Difference	DM2023	DS2023	Difference
Equal to / greater than SOAEL	42 (2)	32 (0)	-10 (-2)	44 (2)	33 (0)	-11 (-2)
Between LOAEL and SOAEL	222 (2)	223 (5)	+1 (+3)	331 (2)	335 (4)	+4 (+2)
Below LOAEL	123 (2)	132 (1)	+9 (-1)	12 (0)	19 (0)	+7 (0)

Note: Bracketed values represent other sensitive receptors, unbracketed values represent residential dwellings.

As Tritlington Church of England First School and Saint Cuthbert's Church are understood not to be in use during the night time, these receptors have been excluded from the night time columns. Results are only presented for the two Northgate Hospital buildings and the two Oakwood Holiday Cottages.

6.8.37. In the short-term, Part A is predicted to decrease the number of properties equal to or above the SOAEL which indicates a slight beneficial effect as a result of Part A. This is due to the offline section of the A1 moving away from a number of properties.

Table 6-28 – Long-term NPSE Summary – Number of Receptors

Noise Level	Daytime			Night Time		
	DM2023	DS2038	Difference	DM2023	DS2038	Difference
Equal to / greater than SOAEL	42 (2)	41 (0)	-1 (-2)	44 (2)	43 (0)	-1 (-2)
Between LOAEL and SOAEL	222 (2)	247 (5)	+25 (+3)	331 (2)	331 (4)	0 (+2)
Below LOAEL	123 (2)	99 (1)	-24 (-1)	12 (0)	13 (0)	+1 (0)

Noise Level	Daytime			Night Time		
	DM2023	DS2038	Difference	DM2023	DS2038	Difference

Note: Bracketed values represent other sensitive receptors, unbracketed values represent residential dwellings.

As Tritlington Church of England First School and Saint Cuthbert's Church are understood not to be in use during the night time, these receptors have been excluded from the night time columns. Results are only presented for the two Northgate Hospital buildings and the two Oakwood Holiday Cottages.

6.8.38. In the long-term, Part A is predicted to have one less property experiencing a noise level equal to or above the SOAEL than in the Do-minimum opening year. It can be seen that, in the daytime, fewer properties are predicted to experience noise levels below the LOAEL in the long term. This increase is due to both Part A and natural traffic growth in the area.

6.8.39. Overall, in terms of the LOAEL and SOAEL threshold levels, Part A is not expected to change the category into which most receptors would fall. Part A has a slight beneficial effect in the short-term and a slight adverse effect in the long-term (mainly due to the number of properties exceeding the LOAEL).

6.8.40. Four of the five properties within the two NIAs along Part A are above SOAEL in both the Do-minimum and Do-something scenarios in both the opening and future years during the daytime and night time. The other property in NIA 10002 at Causey Park is predicted to be below the SOAEL (but above the LOAEL) in the Do-something opening year, but above the SOAEL in all other scenarios during the daytime and night time.

Operational Road Traffic Noise – DMRB HD 213/11 Assessment

6.8.41. Whilst the above summary of pre-mitigation noise levels in terms of the LOAEL and SOAEL suggests that Part A would have a slightly beneficial impact in the short-term and a slightly adverse impact in the long-term, this is not the case when the changes in noise levels at individual receptors are considered. This is because noise levels could change, but still fall in the same noise threshold band (i.e. remain within the above SOAEL band).

6.8.42. Given that Part A re-aligns a section of the A1 up to around 500 m to the west of the current line and improves several junctions, it is unsurprising that the noise changes at individual properties present more varied impacts.

6.8.43. **Table 6-29** shows the predicted short-term change in noise level for all modelled receptors within the Calculation Area, sorted into the noise change bands following the DMRB HD 213/11 (**Ref. 6.20**) magnitude of impact categories. Although negligible noise changes are referred to in the tables and discussion, it should be noted that these changes would most likely be imperceptible to sensitive receptors.

Table 6-29 – Short-Term Traffic Noise Changes (DMRB HD 213/11 Table A1.1)

Change in Noise Level		Magnitude of Impact	Daytime	
			Number of Dwellings	Number of other Sensitive Receptors
Increase in noise level $LA_{10,18h}$	0.1 – 0.9	Negligible	290	2
	1 – 2.9	Minor	26	1
	3 – 4.9	Moderate	1	0
	>=5	Major	3	0
No change	= 0	No change	4	0
Decrease in noise level $L_{A10,18h}$	0.1 – 0.9	Negligible	34	0
	1 – 2.9	Minor	12	0
	3 – 4.9	Moderate	4	1
	>=5	Major	9	2

6.8.44. It is clear that Part A ranges from major adverse impacts to major beneficial impacts due to re-aligning the A1 in the Part A Do-something scenario and in the absence of mitigation. The majority of noise sensitive receptors are predicted to experience a negligible increase in noise level (i.e. an increase which they are unlikely to perceive). Major beneficial impacts are predicted at nine properties located close to the existing section of A1 which would be re-classified. Major adverse impacts are predicted at three properties and a moderate adverse impact is predicted at a single property. These impacts are a consequence of the A1 moving closer to the receptor.

6.8.45. **Table 6-30** shows the predicted long-term changes in noise level for all modelled receptors within the Calculation Area, sorted into the noise change bands following the DMRB HD 213/11 (**Ref. 6.20**) magnitude of impact categories.

6.8.46. The long-term impacts are similar to those anticipated in the short-term with the majority of properties experiencing a negligible change in noise level.

Table 6-30 – Long-term Traffic Noise Changes (DMRB HD 213/11 Table A1.2)

Change in Noise Level		Magnitude of Impact	Daytime		Night Time
			Number of Dwellings	Number of other Sensitive Receptors	Number of Dwellings
Increase in noise level $L_{A10,18h}$	0.1 – 2.9	Negligible	344	3	38
	3 – 4.9	Minor	6	0	0
	5 – 9.9	Moderate	2	0	0
	>=10	Major	1	0	0
No change	= 0	No change	0	0	0
Decrease in noise level $L_{A10,18h}$	0.1 – 2.9	Negligible	18	0	1
	3 – 4.9	Minor	3	3	0
	5 – 9.9	Moderate	7	0	10
	>=10	Major	2	0	2

Traffic Noise Nuisance Assessment

6.8.47. The results of traffic noise nuisance assessment are presented in **Appendix 6.3: Noise and Airborne Vibration Nuisance Assessment**, **Volume 7** of this ES **(Application Document Reference: TR010041/APP/6.7**).

6.8.48. For situations where noise increases are predicted, the noise nuisance calculations, as described in the DMRB HD 213/11 (**Ref. 6.20**), give greater weight to the potential abrupt short-term change in noise nuisance as a result of the opening of Part A.

6.8.49. As described above in **Table 6-12**, with regard to the operational road traffic noise changes, a change of 3 dB or more in the short-term, as a result of Part A, would give at least a moderate adverse impact which is likely to be significant. Following the road traffic noise nuisance calculation methodology described in **Appendix 6.3: Noise and Airborne**

Vibration Nuisance Assessment, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**), a change of 3 dB in the short-term corresponds to a 30% increase in bother as a result of Part A. As shown in **Table 6-1** of **Appendix 6.3: Noise and Airborne Vibration Nuisance Assessment**, **Volume 7** of this ES, four properties have an increase in nuisance level of 30% or greater. This directly corresponds to the four properties shown in **Table 6-29** of this chapter which have a short-term impact of moderate magnitude or greater. The potential significance of these properties is discussed below.

6.8.50. It is clear that the results of the road traffic noise nuisance assessment are directly relatable to the operational road traffic noise assessment provided from **paragraph 6.8.41** onwards. Therefore, as these assessments are intrinsically linked, no further consideration of operational road traffic noise nuisance is presented in this chapter.

Designated Sites and Burial Ground

6.8.51. Whilst the two designated sites (River Coquet and Coquet Valley Woodlands SSSI and St Oswald's Way) and the Burial Ground (Northumberland Woodland Burials) are considered as 'other sensitive' receptors, it is not appropriate to include them in the above tables as they cover a vast area where it would be inappropriate to select a single point as representative of the area as a whole. From analysis of the predicted noise change (refer to **Figure 6.2: Do-Something Short Term Noise Level Change** and **Figure 6.3: Do-Something Long Term Noise Level Change**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**), the following conclusions have been identified for the three areas:

a. River Coquet and Coquet Valley Woodlands SSSI – In a small area of this site to the east of the new River Coquet Bridge, noise levels in the short-term are predicted to result in a minor adverse magnitude of impact. There are also some very small areas of moderate adverse impact in the short-term. However, combined these make up a very small percentage of the designated site as a whole. For the majority of the site in the Calculation Area the short-term change is predicted to be of negligible magnitude. The predicted long-term change in noise level follows a similar pattern, with a small area of minor adverse impact, but predominantly a change of negligible magnitude. Therefore, the change in noise level caused by Part A is deemed not significant for the River Coquet and Coquet Valley Woodlands SSSI.
b. St Oswald's Way – This PRoW covers a similar area to the River Coquet and Coquet Valley Woodlands SSSI and the potential impacts are very similar to those described above. Whilst a small section of the route is predicted to experience a minor adverse increase in noise level in the short- and long-term, the majority of the route within the Calculation Area is predicted to experience a noise change of negligible magnitude. As the area of minor increase makes up a very small percentage of the whole PRoW, the change in noise level caused by Part A is deemed not significant for St Oswald's Way.
c. Burial Ground (Northumberland Woodland Burials) – The site immediately bounds the A1 to the east. In both the short and long-term, the noise levels as a result of Part A are

predicted to cause minor adverse impacts in limited areas of the site which are very close to the A1. However, for the majority of the site, the noise level increases are predicted to be no greater than of negligible magnitude. Therefore, the change in noise level caused by Part A is deemed not significant for the Burial Ground.

Felmoor Park and Bockenfield Holiday Park

6.8.52. In light of the ambiguity regarding the number of receptors in this area, the noise changes are presented in the form of noise contours in **Figure 6.5: Do-Something Short Term Noise Level Change for Felmoor Park and Bockenfield Holiday Park**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**), rather than at specific receptor locations.

6.8.53. Part A is predicted to decrease noise levels across the area. However, the majority of the sensitive receptors are likely to be above the LOAEL and therefore mitigation measures have been considered.

Operational Vibration

Ground-borne Vibration

6.8.54. Older roads that experience a high traffic flow (such as the existing A1), are likely to have an uneven surface due to deterioration over time. As new highways are likely to have a smoother surface, the level of road traffic ground-borne vibration is likely to be reduced as the effects of potholes and cracks are eliminated. Furthermore, DMRB HD 213/11 (**Ref. 6.20**) states "*no evidence has been found to support the theory that traffic induced vibrations are a source of significant damage to buildings…Such vibrations are unlikely to be important when considering disturbance from new roads and an assessment will only be necessary in exceptional circumstances*". Consequently, ground-borne vibration at receptors as a result of operational road traffic from Part A is considered unlikely to be significant.

Traffic Airborne Vibration Assessment

6.8.55. The DMRB HD 213/11 (**Ref. 6.20**) states (in paragraph A6.21) that:

"*The relationship between the percentage of people bothered by largely airborne vibration and this noise exposure index* [the $L_{10,\ 18hr}$ noise level] *is similar to that for noise nuisance except that the percentage of people bothered by vibration is lower at all exposure levels.*"

6.8.56. The DMRB HD 213/11 also notes that the consideration of airborne vibration nuisance is only appropriate for dwellings within 40 m of a carriageway. It is also noted that noise levels below 58 dB $L_{10,\ 18hr}$ should be considered not to cause any bother to residents.

6.8.57. The results of the road traffic airborne vibration nuisance assessment are presented in **Appendix 6.3: Noise and Airborne Vibration Nuisance Assessment**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**).

6.8.58. As described in the DMRB HD 213/11 (**Ref. 6.20**) the assessment of airborne road traffic vibration nuisance is based on the results of the road traffic noise nuisance assessment. As

highlighted above in **paragraph 6.8.49** in relation to noise, only four properties are predicted to experience a percentage increase in bother which relates to a short-term magnitude of impact of moderate or major adverse. These four properties are all over 40 m from the carriageway of the road and accordingly, are not included in the airborne vibration nuisance assessment. Therefore, as shown in **Table 6-2** of **Appendix 6.3: Noise and Airborne Vibration Nuisance Assessment**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**), no properties are expected to experience a percentage change in bother which would relate to a moderate impact (i.e. a likely significant adverse or beneficial effect). As such, it is deemed that no operational road traffic airborne vibration nuisance significant effects would occur as a result of Part A and this is given no further consideration in this chapter.

Noise Insulation Regulations

6.8.59. In order to qualify for compensation under the NIR (**Ref. 6.5**), four criteria must be fulfilled as presented in **paragraph 6.4.89**.

6.8.60. There are 246 properties within 300 m of Part A. Northgate Farm is the only property which is predicted to experience a noise level above 67.5 dB $L_{A10,18h}$ within the first fifteen years of use of Part A and an increase of at least 1 dB (i.e. where the Relevant Noise Level in the design year is greater than the Prevailing Noise Level in the year of opening by 1 dB or more[14]). This receptor is discussed in greater detail below as a noise barrier is proposed which would reduce noise levels at Northgate Farm. Should this barrier be built, there would be no eligibility for noise insulation under the NIR.

6.8.61. As only a preliminary assessment can be undertaken at this stage eligibility would be reviewed at the detailed design stage.

Requirement for mitigation

6.8.62. Whilst the impact magnitudes described above are a guide as to where significant effects might occur and therefore mitigation may or may not be required, it is appropriate to consider the context of the predicted noise changes.

6.8.63. **Table 6-31** along with **Figure 6.6: Receptor Groups**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**) set out groups of receptors based initially on their daytime short-term magnitude of impact. Other contextual factors have also been included, which together with the short-term magnitude of impact have been used to

[14] It should be noted that an assessment of NIR eligibility requires a comparison between the noise levels in the year immediately before construction commences and within the 15 years after the opening of Part A. As data are not available for the year prior to construction commencing, the opening year of 2023 has been used for this preliminary assessment.

determine whether a significant effect is anticipated and therefore whether mitigation is required.

6.8.64. Given that Part A results in major changes to the existing road layout, it is appropriate to give the most weight to the short-term changes as this would be the most noticeable change for residents in the area.

Table 6-31 – Specific Noise Sensitive Receptor Summary and Determination of Significance – Operational Road Traffic Noise

Receptor Group[1]	Number of Receptors	Short-term Magnitude of Impact (and Contextual Factors)	Justification of Significance	Significance
Group 1 	13 (3 – Tritlington Church of England School and Oakwood Holiday Cottages)	Major and Moderate (Decrease)	Part A would improve the noise climate at these properties. As the magnitudes of impact are predicted to be moderate or major, the noise level changes are deemed significant.	Significant (beneficial)
Group 2 	46	Minor and Negligible (Decrease)	Part A would improve the noise climate at these properties. As the magnitudes of impact are predicted to be minor or negligible, the noise level changes are deemed not significant.	Not Significant
Group 3 	294 (2 – Northgate Hospital Buildings)	No change/ Negligible (Increase)	Part A either does not alter the noise level at receptors or the increases are considered unlikely to be perceptible. Consequently, the noise level changes are deemed not significant.	Not Significant
Group 4 	4	Minor (Increase) (noise levels are dominated by the A1)	Although Part A is predicted to result in a minor increase in noise levels at these receptors, the absolute noise level remains below the SOAEL at these four properties. In addition, the noise level increases are unlikely to cause residents to change their behaviour (with respect to noise) in any way. Therefore, the noise level changes are deemed not significant.	Not Significant
Group 5 	22 (1 – Saint Cuthbert's Church)	Minor (Increase) (noise levels are not dominated by the A1)	Part A is predicted to give a potentially perceptible increase in noise levels at these receptors. However, the magnitude of impact of the long-term changes is predicted to be no greater than minor.	Not Significant

Receptor Group[1]	Number of Receptors	Short-term Magnitude of Impact (and Contextual Factors)	Justification of Significance	Significance
			The dominant noise source for these properties is the wider road network (including the de-trunked A1) to which these receptors are adjacent. These receptors are likely to experience a reduction of congestion and improved road layouts. In addition, the noise level increases are unlikely to cause residents to change their behaviour (with respect to noise) in any way. Therefore, these noise level changes are deemed not significant.	
Group 6 	1	Moderate (Increase)	This property is predicted to experience noise increases of a moderate magnitude of impact in the short term. However, the daytime noise level is predicted to be below the LOAEL and the night time level only 2 dB above the LOAEL. The majority of the façades on this property would experience a beneficial change in noise levels as a result of Part A. Therefore, the noise level change is not deemed significant.	Not Significant
Group 7 	2	Major (Increase)	These properties (The Cottage and Joiners Cottage, Causey Park Loop Road) are predicted to experience noise increases of a major magnitude of impact as a direct result of Part A and this noise level change is, therefore, deemed significant. Whilst they are predicted to experience a major magnitude of impact on one façade, at least one other façade would also experience a beneficial reduction in noise level.	Significant (adverse)

Receptor Group[1]	Number of Receptors	Short-term Magnitude of Impact (and Contextual Factors)	Justification of Significance	Significance
Group 8	1	Major (Increase)	This property (New Houses Farm) is predicted to experience a noise increase of major magnitude of impact as a direct result of Part A (the A1 is moving around 500 m closer to this property) and this noise level change is, therefore, deemed significant.	Significant (adverse)

Note [1] – Refer to **Figure 6.6: Receptor Groups**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**) for receptor locations.

Note: Bracketed values represent other sensitive receptors, unbracketed values represent residential dwellings.

6.9. DESIGN, MITIGATION AND ENHANCEMENT MEASURES

DESIGN

6.9.1. Where possible the offline alignment avoids passing unnecessarily close to sensitive receptors. The vertical alignment was lowered as far as practicable given other design constraints (this generally ensures lower noise levels as the receptor would have greater screening from the road).

6.9.2. The surface of the road for Part A in its entirety would be laid with LNS (apart from on structures, where HRA would be laid) which is the quietest road surface type.

6.9.3. An **Outline CEMP** (**Application Document Reference: TR010041/APP/7.3**) has been produced in support of the DCO application. This contains measures to control noise and vibration during construction. The Outline CEMP sets out best practice measures aimed at reducing and / or mitigating noise levels generated during construction activities. The Outline CEMP would be developed into a CEMP by the main contractor. The associated noise mitigation measures are presented within **Appendix 6.8: Construction Noise And Vibration Mitigation Clauses**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**).

MITIGATION

Construction Noise

6.9.4. As discussed in **Section 6.4**, where there are sensitive receptors within the identified SOAEL zones for different construction activities, there is the potential for a significant effect (in terms of the EIA Regulations (**Ref. 6.3**)) to occur.

6.9.5. A significant effect would occur if construction noise or vibration levels exceed the SOAEL for more than 10 out of 15 days/nights or 40 days/nights in any six consecutive months. Therefore, in order to avoid significant construction effects, mitigation measures would be required.

6.9.6. As detailed within **Appendix 6.8: Construction Noise And Vibration Mitigation Clauses**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**), mitigation has been considered in terms of two ‘levels’ within 300 m of the activity (the Construction Stage Study Area). Level 1 mitigation is applicable for any construction activity where there are no receptors within the SOAEL zone for that specific activity. Level 1 and 2 mitigation is applicable for any construction activity where there are receptors within the SOAEL zone for that specific activity. This approach is set out in **Table 6-32** below.

Table 6-32 – Construction Mitigation Measures

	Are there Sensitive Receptors within the SOAEL Zone?	Required Mitigation Measures
	NO	Level 1 (within 300 m of the activity)

	Are there Sensitive Receptors within the SOAEL Zone?	Required Mitigation Measures
Each construction activity	YES	Level 1 and Level 2

6.9.7. Note that where activities are linear along the length of Part A, such as road surfacing, it is appropriate to split the activity into individual segments. There are likely to be some segments where no sensitive receptors are within the SOAEL zone and therefore only Level 1 mitigation is required, but also some sections where sensitive receptors are within the SOAEL zone and therefore, Level 1 and 2 mitigation is applicable.

Level 1 Mitigation Measures

6.9.8. The Level 1 mitigation measures which are required for all construction activities are listed in full in **Appendix 6.8: Construction Noise and Vibration Mitigation Clauses**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**). As a summary, the Level 1 mitigation measures include, but are not limited to the use of best practicable means (BPM), as set out within the **Outline CEMP** (**Application Document Reference: TR010041/APP/7.3**), at all times. The use of BPM to control emissions can constitute a ground of defence against charges that a nuisance is being caused under Part III of the CoPA 1974 or Part III of the EPA 1990 (**Ref. 6.7**). Such measures may include but not be limited to the following:

a. The main contractor and their sub-contractors shall at all times apply the principle of Best Practicable Means as defined in Section 72 of the CoPA 1974 and carry out all work in such a manner as to avoid or reduce any disturbance from noise (and vibration) as far as is practicable.
b. Guidance given in BS 5228-1 (Section 8 - Control of noise and Annex B - Noise sources, remedies and their effectiveness) should be followed as far as is practicable and advice and training on noise minimisation given to staff during Site induction procedures.
c. All plant brought on to Site should comply with the relevant EC/ UK noise limits applicable to that equipment or should be no noisier than would be expected based on the noise levels quoted in BS 5228-1.
d. Each plant item should be well maintained and operated in accordance with manufacturers' recommendations and in such a manner as to minimise noise emissions.
e. Items of plant operating intermittently should be shut down in the periods between use.
f. Where feasible, all stationary plant should be located so that the noise effect at receptors is minimised and, if practicable, every item of static plant when in operation should be sound attenuated using methods based on the guidance and advice given in BS 5228-1.

g. Careful selection of construction methods and plant should be investigated and utilised, for example, breaking-out of concrete structures using, if required, low noise methods such as munching or similar, rather than percussion breaking.
h. Where practicable, works (including deliveries) would be programmed to minimise working outside of normal working hours.
i. Maintaining good public relations with residents that may be affected by noise from construction works.

6.9.9. Unless for safety or engineering reasons the number of instances of a particular diversion route being used would be limited to:

a. Less than 10 days/nights in any 15 consecutive days/nights.
b. Less than 40 days/nights in any consecutive 6 month period.

6.9.10. Where more than one construction activity is undertaken in the same area at the same time, the cumulative effects of those activities need to be considered such that the SOAEL is not exceeded regardless of the number of construction activities taking place.

Level 2 Mitigation Measures

6.9.11. Level 1 and Level 2 mitigation measures are required where noise or vibration levels at sensitive receptors are predicted to exceed the SOAEL and there is the potential for a significant adverse effect to occur.

6.9.12. The full Level 2 mitigation measures, which are required for all construction activities where sensitive properties are within the SOAEL zone, are listed in full in **Appendix 6.8: Construction Noise and Vibration Mitigation Clauses**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**). As a summary, the Level 2 mitigation measures include but are not limited to:

a. Unless for safety or engineering reasons, construction works that cause noise or vibration levels at sensitive receptors above the relevant SOAEL would not exceed the following durations:
    i. 10 days/nights in any 15 consecutive days/nights.
    ii. 40 days/nights in any consecutive six months.

6.9.13. If the above durations need to be exceeded, temporary re-housing would be offered to residents for the duration of relevant works. Such offers would be made following further, more detailed, assessment adopting detailed construction methodologies and phasing information to be provided by the main contractor. The updated assessment would be undertaken as part of the detailed design and any required measures would be included within the CEMP. The requirement or otherwise for the offer of temporary re-housing would be determined based on the outcome of this assessment.

6.9.14. Temporary acoustic barriers and other noise containment measures such as screens and acoustic hoarding at the Part A boundary should be erected where appropriate to minimise noise breakout and reduce noise levels at potentially affected receptors.

6.9.15. Notwithstanding the above advice, where identified as being necessary, the construction process would be monitored closely to ensure noise effects are minimised, so far as is reasonably practicable, as set out in the **Outline CEMP** (**Application Document Reference: TR010041/APP/7.3**). Any such monitoring protocols would also be incorporated into the construction method statements prepared by the main contractor.

Construction Vibration

6.9.16. The mitigation measures presented within **paragraphs 6.9.8** to **6.9.15** are also pertinent to the mitigation of construction generated vibration, and would be adhered to at all times.

6.9.17. Where practicable, those activities which, by their very nature, can impart significant levels of vibration into the ground, should be substituted with alternatives that generate less vibration. If alternative plant cannot be sourced, then efforts should be made to minimise the use of such plant.

6.9.18. Notwithstanding the above advice, where identified as being necessary, the construction process would be monitored closely to ensure vibration effects are minimised, so far as is reasonably practicable, as set out in the **Outline CEMP** (**Application Document Reference: TR010041/APP/7.3**). Any such monitoring protocols should also be incorporated in construction method statements prepared by the main contractor.

Operation

Mitigation for Significant Noise Effects

6.9.19. **Table 6-32** identifies that Part A gives rise to significant adverse noise effects at three receptors. As such, mitigation must be considered for these properties.

6.9.20. Significant adverse effects in the context of the EIA Regulations (**Ref. 6.3**) need to be mitigated where possible.

6.9.21. Notwithstanding the above, it is not appropriate to include noise barriers regardless of the benefits they provide. As such, noise barriers would only be considered for mitigation in terms of EIA significance where they provide a meaningful benefit of at least 3 dB.

6.9.22. The predicted noise level change at the following two groups is deemed to be significant, and mitigation has been considered as follows:

a. Group 7 – A reflective noise barrier is proposed at a height of 4 m, the location of this barrier is shown on **Figure 6.1: Noise and Vibration Assessment Extents**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**) (PNB2).

b. Group 8 – An absorptive noise barrier is proposed at a height of 4 m, the location of this barrier is shown on **Figure 6.1: Noise and Vibration Assessment Extents**, **Volume 5** of this ES (PNB3).

6.9.23. Both PNB2 and PNB3 are proposed at a height of 4 m. 3 m high barriers were tested in these locations but were not predicted to achieve the 3 dB threshold for a meaningful

benefit at the residential properties. Therefore, the proposed barriers have been included at a height of 4 m.

6.9.24. The benefits from the above mitigation are considered in **Section 6.10**.

Mitigation for Other Environment Topics

6.9.25. Environmental bunds have been proposed to mitigate landscape and visual effects. These nine bunds (further details of which are provided in **Section 2.6** of **Chapter 2: The Scheme**, **Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**)) would also serve as mitigation for noise. As such, these nine bunds have been modelled with the proposed noise mitigation presented above. Refer to **Figure 7.8: Landscape Mitigation Masterplan**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**) for their locations.

ENHANCEMENT MEASURES

6.9.26. No enhancement measures are proposed for the construction stage of Part A. The mitigation measures described above from **paragraph 6.9.19** onwards are sufficient in reducing potential noise and vibration impacts as far as reasonably possible.

Enhancement in Accordance with the NPSE

6.9.27. As discussed in **Section 6.3,** in order for Part A to be compliant with the NPSE (**Ref. 6.10**), provided that mitigation / enhancement measures are considered sustainable (refer to **paragraph 6.9.29**), noise levels between the LOAEL and SOAEL, should be mitigated and reduced to a minimum, and above SOAEL should be avoided.

6.9.28. In accordance with the three policy aims of the NPSE, noise levels above the SOAEL should be mitigated where possible to avoid significant adverse effects; noise levels between the LOAEL and SOAEL should be mitigated where possible to minimise adverse noise effects, and for all receptors, mitigation and enhancement measures should be considered to improve the noise environment.

6.9.29. However, it is also stated that the above aims should be achieved within the context of Government policy on sustainable development, although this concept is not clearly defined. For this assessment, enhancement measures have been considered sustainable based on the following three tests (based upon professional judgement and the NPSE):

a. Noise enhancement in the form of acoustic screening has only been considered within the Order Limits where noise levels are dominated by the A1 and where the enhancement measure would not restrict access to the property. In addition, for noise enhancement to be included, it should ideally provide a meaningful benefit. In this case a meaningful benefit has been taken as a reduction in noise levels of at least 3 dB as this is generally considered a level which could be perceived by residents.

b. Noise bunds have been considered first, as these are generally the most sustainable form of enhancement. The exact monetary cost of a bund is dependent on a number of variables such as the area of land uptake required and whether excess material is

available. Noise bunds have only been specified where (as stated above) they are predicted to give a meaningful benefit to residential receptors.

c. Where it is not possible to construct a noise bund in the desired location, noise barriers have been considered. However, in order for these to be sustainable in line with the aims of the NPSE they must have a 'value for money' score of 1 or greater. This is based on the comparison of the monetised acoustic benefits of a barrier[15] and the cost of installing the barrier. So, where the value for money is 1 or more, the monetary acoustic benefits outweigh the cost of installing the barrier.

6.9.30. Part A would be deemed policy compliant provided noise enhancement measures are considered for receptors with noise levels above LOAEL and where the above three tests are met.

6.9.31. When considering the year of opening (2023) Part A Do-Something scenario, noise levels from Part A are predicted to exceed the LOAEL at over 300 properties and enhancement measures must therefore be considered. However, these properties are generally isolated or are not sufficiently close to Part A for a noise barrier or bund to provide a meaningful benefit. For a barrier to be considered value for money (and therefore considered sustainable) it must provide sufficient benefits which are determined by the number of receptors affected, the magnitude of the noise level change and the magnitude of the absolute noise level. Where properties are isolated and at a large distance from Part A, a barrier is unlikely to be value for money. As such, for the majority of properties, enhancement is unlikely to be sustainable in the context of the aims of the NPSE and has not been considered further.

6.9.32. However, in two locations, noise sensitive receptors are located close enough to Part A to experience meaningful benefits from a proposed barrier which would also be value for money.

6.9.33. The first of these is a 70 m long, 3 m high, reflective noise barrier (Proposed Noise Barrier 1, [PNB1]), which has been specified for four properties in the Northgate Farm area (three of which are located within NIA 10003) at the southern end of Part A, immediately east of the A1. This noise barrier would reduce noise levels at these properties. Properties in this area are orientated such that this short section of noise barrier is anticipated to provide meaningful benefits to residents (i.e. the change in noise is likely to be perceived by residents). The predicted noise level reduction resulting from the barrier ranges from 1-4 dB for the four properties. The proposed barrier is also predicted to be value for money, and

[15] The value for money analysis of noise barriers has taken the marginal values reported in Defra's report "Environmental noise: valuing impacts on sleep disturbance, annoyance, hypertension, productivity and quiet" from November 2014. These values consider average figures for the UK population and omit specific health statistic figures from the communities being assessed.

therefore sustainable in accordance with the NPSE (**Ref. 6.10**). It is understood that in this location, further investigation is required to determine whether there is space for the required foundations for this barrier. The barrier would be constructed if it can be built meeting the value for money criteria in **paragraph 6.9.29**. If PNB1 can be built, Northgate Farm would not be eligible for compensation under the NIR.

6.9.34. The second barrier, which is predicted to provide meaningful benefits in terms of noise levels, as well as being value for money is in the area of Felmoor Park and Bockenfield Holiday Park.

6.9.35. As discussed in **paragraph 6.7.23**, it is unclear how many of the mobile homes in this area are permanent or semi-permanent residential properties. In addition, mobile homes for holiday lettings have also been considered as a noise sensitive receptor, and most of these would likely be above the LOAEL. Therefore, a noise barrier has been considered in this location (PNB4). Given the dense nature of the homes within the site it is likely that the barrier would be value for money. The predicted benefits as a result of a 3 m high noise barrier (although this cannot be tested against the value for money criteria, given the aforementioned ambiguity in receptor numbers in the area) are presented in **Figure 6.7: Noise Level Benefits from Proposed Noise Barrier Four**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**). It is understood that in this location, further investigation is required to determine whether the barrier can be built. The barrier would be constructed if it can be built meeting the value for money criteria in **paragraph 6.9.29**.

Noise Important Areas

6.9.36. Particular reference is made below to the five properties within the two NIAs. Whilst noise levels are predicted to decrease at all these properties as a result of Part A in the short-term, the absolute noise level at four of these properties is above the SOAEL (and marginally below the SOAEL at the other). The two NIAs have been considered as follows:

a. NIA 10002 (2 properties) Causey Park – The properties at this location would no longer be located next to the A1 as it would be ‘de-trunked’ following the construction of the offline section of Part A. The noise level is still above the SOAEL at one property, whilst at the other, the noise level falls marginally below the SOAEL in the short-term. These properties would both experience a beneficial impact in terms of noise levels from Part A.

b. NIA 10003 (3 properties) Northgate Farm – As discussed in **paragraph 6.9.33**, a 70 m long, 3 m high, reflective noise barrier (PNB1]) has been specified for these three properties, although it is still to be confirmed whether PNB1 can be constructed in this location. This noise barrier would reduce noise levels at these properties.

6.10. ASSESSMENT OF LIKELY SIGNIFICANT EFFECTS

CONSTRUCTION

6.10.1. The context of construction noise and vibration in relation to the receptor under consideration and the surrounding environment as well as the duration of the impact needs

to be considered in determining the significance of effect with regard to the EIA Regulations. The key aspects in terms of determining significance are the predicted noise or vibration level, whether this level is above the SOAEL, and the duration of the construction works.

6.10.2. In **Section 6.4** of this chapter, a significant effect in the context of the EIA Regulations (**Ref. 6.3**) has been defined where a sensitive receptor exceeds the noise or vibration SOAEL for longer than a period of 10 or more days of working in any 15 consecutive days, or for a total number of days exceeding 40 in any 6 consecutive months.

6.10.3. The Level 2 mitigation measure in **paragraph 6.9.12**, states the following:

a. Unless for safety or engineering reasons construction works that cause noise or vibration levels at sensitive receptors above the relevant SOAEL would not exceed the following durations:

i. 10 days/nights in any 15 consecutive days/nights.

ii. 40 days/nights in any consecutive six months.

b. If the above durations need to be exceeded, temporary re-housing would be offered to residents for the duration of works.

6.10.4. Therefore, where noise or vibration levels at sensitive receptors would exceed the SOAEL, the working durations would be limited so as to avoid the potential for significant effects, and where exceeding the above durations cannot be avoided, temporary re-housing would be offered to residents.

6.10.5. As addressed in **paragraphs 6.8.6** to **6.8.11**, the potential impacts from construction vehicles and road traffic movements are expected not to cause significant effects. However, management measures have been put in place to minimise the impacts as far as reasonably possible.

6.10.6. Based on the construction information that has informed this assessment and provided that the mitigation measures described in **Section 6.9** are adhered to, **no significant effects** (in terms of the EIA Regulations (**Ref. 6.3**)) are predicted for construction noise or vibration.

OPERATION

Comparison of the Operational Road Traffic Noise Effects to the aims of the NPSE

6.10.7. As a result of the mitigation measures proposed (refer to **Section 6.9**), the only change in terms of the NPSE (**Ref. 6.10**) thresholds is at one property where the Part A Do-something 2023 daytime level drops below the SOAEL (as a result of the noise barrier at Northgate Farm [PNB1]) and two properties where the Part A Do-something 2023 level drops below the LOAEL in the opening year. In the future year 2038, the trend is similar with one property dropping below the SOAEL and another property dropping below the LOAEL in the daytime.

6.10.8. PNB1 is predicted to be value for money and to achieve meaningful noise decreases at sensitive receptors. Of the four properties experiencing a benefit from this barrier, one is

predicted to drop below the SOAEL, two remain above SOAEL (whilst experiencing a meaningful benefit in terms of noise level reduction from the barrier) and one remains between LOAEL and SOAEL. As noted in **paragraph 6.9.33**, whether the barrier can be built in this location cannot be confirmed until the detailed design stage. If the barrier cannot be built, three properties would remain above the SOAEL and one above the LOAEL in this area.

6.10.9. If the design constraints allow and the barrier can be built, it should be constructed in order for Part A to be deemed Policy Compliant.

6.10.10. If PNB1 cannot be built because the design constraints do not allow, or to construct the barrier would incur significant costs above those assumed for a standard noise barrier construction, the proposed barrier would be unlikely be value for money and therefore, in line with the NPSE, Part A would still be deemed Policy Compliant if the barrier is not constructed.

6.10.11. As noted in **paragraph 6.9.36**, the five properties within the two NIAs are all predicted to experience a decrease in noise levels as a result of Part A.

6.10.12. The two properties within NIA 10002 are expected to experience lower noise levels as a result of Part A. This is because the route of the A1 is moving approximately 250 m to the west, away from these properties.

6.10.13. The three properties within NIA 10003 are also expected to experience lower noise levels as a result of Part A, this is due to the proposed noise barrier (PNB1) and the change in road surface from HRA to LNS on the A1 adjacent to these properties.

Felmoor Park and Bockenfield Holiday Park

6.10.14. As is discussed above, the exact distribution of residential and holiday properties in Felmoor Park and Bockenfield Holiday Park is unclear. As discussed in **paragraph 6.9.35** a noise barrier (PNB4) has been proposed, which given the dense nature of the properties, is expected to be value for money in accordance with the aims of the NPSE (**Ref. 6.10**). **Figure 6.7: Noise Level Benefits from Proposed Noise Barrier Four**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**) shows that the proposed noise barrier (refer to **paragraph 6.9.35**) is likely to provide a meaningful benefit for noise sensitive receptors in this area and should be included. **Figure 6.8: Do-Something Short Term Noise Level Change with Barrier Four**, **Volume 5** of this ES presents the noise level changes predicted to occur as a result of Part A with the inclusion of PNB4.

6.10.15. As noted in **paragraph 6.9.35**, whether the barrier can be built in this location cannot be confirmed until the detailed design stage. If the barrier cannot be built **Figure 6.5: Do-Something Short-Term Noise Level Change for Felmoor Park and Bockenfield Holiday Park**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**) should be referred to in order to understand the predicted noise level changes as a result of Part A.

6.10.16. If the design constraints allow, and the barrier can be built, it should be constructed in order for Part A to be deemed Policy Compliant.

6.10.17. If PNB4 cannot be built because the design constraints do not allow, or to construct the barrier would incur significant costs above those assumed for a standard noise barrier construction, the proposed barrier would be unlikely to be value for money. Therefore, in line with the NPSE, Part A would still be deemed Policy Compliant if the barrier is not constructed.

6.10.18. Based on the consideration of enhancement measures and noise level predictions, Part A is deemed Policy Compliant.

Operational Road Traffic Noise – DMRB HD 213/11 Assessment

Significant Adverse Effects

6.10.19. It is appropriate to re-consider the noise changes as a result of Part A including the measures proposed to mitigate significant noise effects (two noise barriers) and the enhancement measures in order for Part A to be Policy compliant (two further noise barriers).

6.10.20. As discussed in **Section 6.9**, both PNB2 and PNB3 provide a minimum of 3 dB benefit for at least one property.

6.10.21. Prior to the inclusion of such mitigation measures, three properties were predicted to experience significant operational traffic noise effects as a result of Part A (two at Causey Park and one at New Houses Farm). At each of these properties the daytime noise level change as a result of Part A was predicted to have a major magnitude of impact. **Table 6-33** presents the predicted short-term magnitudes of impact as a result of Part A both with and without the proposed mitigation (PNB2 and PNB3) for the three properties expected to experience significant effects.

Table 6-33 – Predicted Magnitudes of Impact with and without Mitigation at Properties likely to Experience a Significant Effect

Property	Magnitude of Impact without Mitigation	Magnitude of Impact with Mitigation
The Cottage, Causey Park	Major Adverse	Major Adverse
Joiners Cottage, Causey Park	Major Adverse	Moderate Adverse
New Houses Farm	Major Adverse	Moderate Adverse

6.10.22. The major magnitude of impact does not change for The Cottage at Causey Park as the predicted short-term noise level change was +10.5 dB prior to the proposed mitigation. Whilst the proposed barrier does not provide the 5.6 dB required for the magnitude of impact at the property to reduce to moderate, the barrier is predicted to provide a notable benefit and therefore is included in Part A. The predicted noise level reduction from the two barriers is sufficient to reduce the magnitude of impact from major to moderate adverse at both Joiners Cottage and New Houses Farm.

Significant Beneficial Effects

6.10.23. As noted in **Table 6-31** in **Section 6.8**, 13 properties and three other sensitive receptors are predicted to experience moderate or major short-term beneficial impacts as a result of Part A and these are therefore deemed significant beneficial effects. The location of these properties is shown on **Figure 6.6: Receptor Groups**, **Volume 5** (**Application Document Reference: TR010041/APP/6.5**) of this ES**.**

Potential Significant Beneficial Effects from Enhancement Barriers

6.10.24. Whilst the two enhancement barriers, PNB1 and PNB4 (discussed in **paragraph 6.9.33** and **paragraph 6.9.35**), are not intended to mitigate significant adverse effects, it is appropriate to consider whether these barriers cause sufficient noise level reductions that significant beneficial effects arise.

6.10.25. It should be noted that it cannot currently be confirmed whether the proposed enhancement barriers (PNB1 and PNB4) can be constructed due to design constraints. Whilst it is appropriate to consider the potential for significant beneficial effects as a result of these barriers, the potential significant beneficial effects described below cannot be confirmed until the barrier construction has been confirmed and therefore are not reported further (this would likely be during the detailed design stage for Part A).

6.10.26. As a result of barrier PNB1 at Northgate Farm, one property is predicted to experience a **minor beneficial** (**not significant**) impact, and three properties are predicted to experience a **moderate beneficial** impact. The three properties (Warreners Cottages and Northgate Farm) predicted to experience a **moderate beneficial** impact are deemed to experience significant beneficial effects.

Felmoor Park and Bockenfield Holiday Park

6.10.27. **Figure 6-8: Do-Something Short Term Noise Level Change with Barrier Four**, Volume 5 of this ES (**Application Document Reference: TR010041/APP/6.5**) presents the noise level changes predicted to occur as a result of Part A with PNB4 at Felmoor Park and Bockenfield Holiday Park. The likely impacts range from major to minor beneficial. Properties predicted to experience moderate or major beneficial impacts in this area are deemed to experience significant beneficial effects.

Future Developments

6.10.28. It is appropriate to consider the significance of effects on future developments within the Operational Noise and Vibration Calculation Area. From the list of committed developments within **Appendix 16.1: Cumulative Short List**, **Volume 4** of this ES (**Application Document Reference: TR010041/APP/6.4**), five developments have been granted planning permission, which are at least partly within the Calculation Area. The potential impacts from Part A upon these developments are described in **Table 6-34**.

Table 6-34 - Impacts from Part A on Future Developments

Development ID[1]	Brief Description	Potential Impact from Part A	Potential Significant Effect?
22	Change of use of land within part of airfield for outdoor recreational activities including corporate team building and experience days, and off-road motor vehicle driving experiences together with construction of associated activity centre off-road motor vehicle course, screen mounding, car parking area, internal site access track and landscape planting.	Given the stated use of the proposed site for development, this site does not qualify as a noise-sensitive receptor and is therefore considered no further in this assessment.	N/A
7	Reserved Matters Application seeking consent for; appearance, landscape planting, layout and scale for 218 dwellings following outline approval of application ref 13/02105/OUT- (Outline Planning Application for the proposed development of approximately 255 residential dwellings with associated access.)	Only the northern part of this site lies within the operational noise Calculation Area. Within the Calculation Area, **Figure 6.2: Do-Something Short Term Noise Level Change**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**), shows that in the short-term, Part A is predicted to cause an increase in noise levels of a negligible magnitude.	**Not significant**
14	Proposed siting of 24 timber holiday lodges, 10 static caravans including associated site access roads and construction of miniature golf course.	The proposed development would be located within the existing Felmoor Park. This site would experience a reduction in noise levels from Part A (refer to **Figure 6.2: Do-Something Short Term Noise Level Change**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**), in part due to the new alignment, the LNS which would be laid and the proposed noise barrier PNB4.	**Not significant**
20	Hybrid Application incorporating: Detailed application for demolition of hospital buildings (excl medical directorate, Tweed, Tyne, Hebron, Hepscott, Mitford unit, Gees Club, Chapel (PMVA), Bothal, Cambo and Belsay Villas), Development of medium secure in-patient unit and ancillary facilities; Refurbishment of Gees club (Villa 34), Hebron, Medical directorate and Belsay, Bothal and Cambo villas and Hepscott 1-4; Associated parking and landscape works across masterplan area; and, Outline application for residential development.	**Figure 6.2: Do-Something Short Term Noise Level Change**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**), shows that in the short-term, Part A is predicted to cause an increase in noise levels of a negligible magnitude in the area covered by this application.	**Not significant**
21	Construction of 61 no. dwellings with associated landscaping, access and infrastructure works.	**Figure 6.2: Do-Something Short Term Noise Level Change**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**), shows that in the short-term, Part A is predicted to cause an increase in noise levels of a negligible magnitude in the area covered by this application	**Not significant**

NOTE [1] – For further details of the developments refer to **Appendix 16.1: Cumulative Short List**, **Volume 4** of this ES (**Application Document Reference: TR010041/APP/6.4**).

Wider Network Noise Level Changes

6.10.29. DMRB HD 213/11 (**Ref. 6.20**) also requires that noise level changes are considered outside of the 1 km main boundary from Part A.

6.10.30. CRTN (**Ref. 6.21**) includes a procedure for calculating the basic noise level (BNL) for a road link. This calculation takes into account the link's traffic flow, speed, percentage of heavy vehicles and distance to receptor. As directed by CRTN, a notional distance of 10 m has been used for these calculations.

6.10.31. As for the operational noise assessment within the Calculation Area the approach has been taken that negligible and minor impacts are unlikely to be significant and moderate and major impacts are likely to be significant.

6.10.32. For all but two road links (discussed below in **paragraph 6.10.33**), minor adverse changes in noise level are predicted at worst, which are considered **not significant**.

6.10.33. **Moderate adverse** impacts are predicted for two road links in the short-term and one in the long-term (which corresponds to the same link as one of the moderate adverse short-term impacts). These two links are located to the north-west of Part A, approximately 12 km from the north end of the Calculation Area.

6.10.34. Both links are also at the lower end of the moderate noise level change band, 3.5 and 3.0 dB in the short-term and 5.3 dB for the one road link predicted to experience a long-term moderate noise level change (corresponding to the 3.5 dB short-term change).

6.10.35. Both of these are rural roads, predicted to carry very low numbers of vehicles (less than 1,500 in the Do-minimum opening year). Using the CRTN BNL methodology a low flow correction is added to links with a predicted 18-hour flow of less than 4,000 vehicles. Where this low flow correction is applied, a small change in vehicle numbers can lead to a large change in noise level which is not necessarily representative of the perception of people living close to the road.

6.10.36. More detail regarding the noise level changes and locations of the predicted moderate adverse impacts is presented in **Appendix 6.9: Wider Network Noise Level Changes**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**) and **Figure 6.9: Moderate Adverse Wider Network Noise Level Changes**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**) which shows the locations of the links predicted to experience a **moderate adverse** increase in noise level.

6.10.37. Given the low traffic flow on these links, and the large distance from Part A, the predicted noise level changes are deemed to be **not significant**.

SIGNIFICANT NOISE EFFECTS

6.10.38. **Table 6-35** presents the results of the assessment in terms of significance, including the proposed mitigation measures. Only the receptors previously identified as having significant effects in **Section 6.8** have been included. The potential significant beneficial effects due to PNB1 at Northgate Farm and PNB4 at Felmoor Park and Bockenfield Holiday Park have not

been reported in **Table 6-35** as, due to potential design constraints, these barriers have not yet been confirmed for Part A. This is described in greater detail in **paragraph 6.10.24** onwards.

Table 6-35 – Specific Noise Sensitive Receptor Summary and Determination of Residual Significance

Receptor Group	Number of Receptors	Short-term Magnitude of Impact and Contextual Factors	Summary of Residual Impacts	Significance
Group 1	13 (3 Tritlington Church of England School and two Oakwood Holiday Cottages)	Major and Moderate (Decrease)	Part A would improve the noise climate at these properties. As the magnitudes of impact are predicted to be moderate or major, the noise level changes are deemed significant.	Significant (beneficial)
Group 7 (The Cottage and Joiners Cottage, Causey Park Loop Road)	2	The Cottage - Major (Increase) Joiners Cottage – Moderate (Increase)	The noise barrier (PNB2) improves noise levels at these properties in the short-term Part A Do-something scenario by over 3 dB on at least one façade of each property. However, the noise level change still presents a major magnitude of impact for one property and moderate for the other. Consequently, the noise level changes at these properties are deemed a significant effect.	Significant (adverse)
Group 8 (New Houses Farm)	1	Moderate (Increase)	The noise barrier (PNB3) improves noise levels at this property in the short-term Do-something scenario by over 3 dB on one façade but this still presents a moderate magnitude of impact. Consequently, the noise level change at these properties is deemed a significant effect.	Significant (adverse)

Note: Bracketed values represent other sensitive receptors, unbracketed values represent residential dwellings.

UPDATED DMRB GUIDANCE

6.10.39. The outputs of the DMRB sensitivity test as described in **Section 6.4** (**paragraph 6.4.13**), can be found in **Appendix 6.10: Noise and Vibration DMRB Sensitivity Test**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**). The findings of the study are summarised below.

6.10.40. The methodology used to undertake the construction Noise and Vibration assessment for Part A is similar to that recommended in LA 111 (**Ref. 6.28**). The potential for changes to the conclusions of the construction noise and vibration as a result of LA 111 is very low and therefore no further appraisal is necessary.

6.10.41. In relation to operational noise, it has been identified that LA 111 includes a number of key changes in the assessment methodology compared to HD 213/11 (**Ref. 6.20**) which it replaces. A number of the identified changes are considered unlikely to affect the conclusions of the operational road traffic noise and vibration assessment presented in this chapter. However, the following identified changes were considered to warrant further consideration:

a. Traffic speeds – For the derivation of vehicle speeds, LA 111 (**Ref. 6.28**) requires the use of pivoted traffic speeds rather than speed banding and pivoting as required by IAN 185/15 (**Ref. 6.22**).

b. Significance of effects – LA 111 (**Ref. 6.28**) requires that assessment is undertaken at facades of sensitive receptors experiencing the greatest magnitude of change between the Do-minimum and Part A Do-something scenarios in the short-term and long-term rather than the least beneficial change as was the case using the HD 213/11 (**Ref. 6.20**) guidance.

6.10.42. As part of the study, the operational road traffic noise levels and changes described in this chapter, were recalculated using pivoted (rather than pivoted and banded) speeds and reanalysed using the different approach to determine the representative noise change at each receptor (i.e. the façade with the greatest magnitude of change).

6.10.43. LA 111 (**Ref. 6.28**) notes that the short-term noise level changes should be used initially when determining potential EIA significant effects. It is therefore appropriate to compare the results of the short-term noise level changes following both HD 213/11 (**Ref. 6.20**) and LA 111 (**Ref. 6.28**) methodology. This analysis considers the different methods of selecting a representative noise change for each building as discussed above.

6.10.44. **Table 6-36** below shows a comparison between the results of using the original HD 213/11 (**Ref. 6.20**) and IAN 185/15 (**Ref. 6.22**) methodology and the LA 111 (**Ref. 6.28**) methodology. For simplicity only the daytime results are presented in the following table for residential properties, the night time results follow broadly the same pattern.

Table 6-36 - Short-term Magnitudes of Impact at Residential Properties for HD 213/11 and IAN 185/15 Methodology Compared to LA 111 Methodology

Adverse/Beneficial	Magnitude of Impact	HD 213/11 and IAN 185/15 Methodology	LA 111 Methodology
Beneficial	Major	9	22
	Moderate	4	3
	Minor	12	50
	Negligible adverse/beneficial and no change	328	264
Adverse	Minor	26	39
	Moderate	1	1
	Major	3	4

Significance of effects

6.10.45. The following paragraphs focus on the potential for the LA 111 (**Ref. 6.28**) methodology to give rise to additional significant adverse noise effects which would result in a change in the conclusions of the Noise and Vibration assessment.

6.10.46. It is first appropriate to consider the major and moderate adverse impacts as LA 111 notes that these are likely to be significant:

a. The three HD 213/11 (**Ref. 6.20**) major impacts (at Causey Park and New Houses Farm) are still major (and with higher noise level changes) meaning these three receptors remain significant adverse effects.

b. The one HD 213/11 (**Ref. 6.20**) moderate impact is now the fourth major impact. Whilst this receptor is predicted to experience a major impact on one façade, as the noise level changes on other façades range from minor adverse to moderate beneficial and the absolute noise levels are less than 5 dB above the LOAEL, this is still considered non-significant.

c. The moderate impact (which does not correspond to the previous HD 213/11 (**Ref. 6.20**) moderate impact which is discussed above) is adjacent to the wider road network as opposed to the A1. This receptor is in the lower half of the moderate threshold and the

noise levels around the property are only marginally above the daytime LOAEL. Therefore, the effect at this receptor is considered to be non-significant.

6.10.47. LA 111 (**Ref. 6.28**) states that receptors with a minor short-term noise level change and which are also predicted to experience noise levels above the SOAEL have the potential to be significant. One receptor at Northgate Farm, within the Northgate Farm NIA (NIA 10003), is predicted to experience a minor adverse noise level change in the short-term on a number of facades and noise levels above SOAEL. Although this property is deemed likely to experience a significant adverse effect, this would be mitigated such that the effect was non-significant by a noise barrier already included for the Part A. This is discussed further below in **paragraph 6.10.55**.

6.10.48. As highlighted by **Table 6-36** above, whilst there is an increase in adverse impacts of minor to major magnitude, there is also an increase in minor to major beneficial impacts.

6.10.49. Following HD 213/11 (**Ref. 6.20**) 13 dwellings were predicted to experience significant beneficial effects as a result of Part A. Following the LA 111 (**Ref. 6.28**) methodology, and shown in **Table 6-36**, 25 dwellings are predicted to experience moderate or major benefits, however, only 24 of these are predicted to be significant beneficial effects. One of the receptors in the moderate beneficial impact category is deemed not to be significant due to contextual factors such as the noise level changes on other facades and the predicted absolute noise levels.

6.10.50. The results (following LA 111 methodology) for Felmoor Park and Bockenfield Holiday Park were also compared with the results following HD 213/11 methodology. Whilst the predicted noise levels have changed due to the factors discussed above, no receptors in this area are likely to experience significant adverse effects, as was previously the case.

Other Sensitive Receptors

6.10.51. The results (following LA 111 (**Ref. 6.28**) methodology) for the six other sensitive receptors were also compared with the results following HD 213/11 (**Ref. 6.20**) methodology. Whilst the predicted noise levels have changed due to the factors discussed above, none of the six other sensitive receptors are predicted to experience moderate or major adverse impacts, meaning no significant adverse effects are predicted, as was previously the case.

6.10.52. The results (following LA 111 methodology) for the Burial Ground, St Oswald's Way and the River Coquet and Coquet Valley Woodlands were also compared with the results following HD 213/11 methodology. Whilst the predicted noise levels have changed due to the factors discussed above, none of these three areas are predicted to experience significant adverse effects, as was previously the case.

6.10.53. Three of the receptors, the two holiday cottages and C of E Tritlington School are still predicted to experience significant beneficial effects following LA 111 (**Ref. 6.28**) methodology.

Proposed Noise Barriers

6.10.54. It should be noted noise barriers PNB2 and PNB3 have been included to reduce noise levels for the three receptors predicted to experience significant adverse effects at Causey Park and New Houses Farm. PNB4 is included as an enhancement barrier for Felmoor Park and Bockenfield Holiday Park.

6.10.55. The potential significant adverse effect at Northgate Farm is mitigated by PNB1 such that the worst-case façade is only predicted to experience a negligible increase in noise level. This means that with mitigation, this receptor is not expected to experience a significant adverse effect. It is noted in this chapter that it cannot be confirmed whether a barrier can be built in this location until the detailed design stage. If PNB1 can be built, the attenuation afforded by the barrier would mean that Northgate Farm is not predicted to experience a significant adverse effect.

6.10.56. It is noted in the Part A Chapter that Northgate Farm is likely to be eligible for compensation under the NIR if PNB1 cannot be built. Following LA 111 methodology, the same outcome would occur. If PNB1 can be built, Northgate Farm would not be eligible for compensation under the NIR.

6.10.57. In addition, Strafford house is also predicted to be likely to be eligible for compensation under the NIR, following the LA 111 assessment methodology.

Summary

6.10.58. The three likely significant adverse effects identified in this chapter would remain significant adverse effects following LA 111 (**Ref. 6.28**) methodology. There is the potential for one additional significant adverse effect at Northgate

6.10.59. It is noted that 27 significant beneficial effects (24 dwellings and three other sensitive receptors) are predicted following LA 111 (**Ref. 6.28**) methodology. The total number has increased as a result of LA 111 (**Ref. 6.28**). The locations of these receptors are shown within **Appendix 6.10: Noise and Vibration DMRB Sensitivity Test**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**).

6.10.60. Whilst there is the potential for one additional significant adverse effect (at Northgate Farm if PNB1 cannot be built), the acoustic mitigation measures proposed in the ES (four noise barriers and a low noise road surface) remain appropriate.

ASSESSMENT PARAMETERS

6.10.61. **Chapter 2: The Scheme**, **Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**) presents the Assessment Parameters. **Table 6-37** below considers these in relation to the potential for each assessment parameter to change the conclusions of this chapter. This focuses on operational noise and vibration because the assessment of potential construction effects in this chapter is based on SOAEL zones rather than the specific locations of construction activities.

Table 6-37 - Consideration of Assessment Parameters

Assessment Parameter	Brief Description	Justification
Parameter 1	Change in permanent boundary around Highlaws Junction	This parameter only relates to the land boundaries around Part A and does not include any alterations to the location of the road. As such, it is highly unlikely this parameter would affect the conclusions identified in this chapter.
Parameter 2	Relocation of Highlaws Junction approximately 47 m north	This parameter has been tested in the 3D noise model. Analysis of the results showed that this parameter is highly unlikely to alter the conclusions of this chapter.
Parameter 3	1 m increase in height of Fenrother Junction	This parameter has been modelled in the 3D noise model. Analysis of the results showed that this parameter is highly unlikely to alter the conclusions of this chapter.
Parameter 4	Slackening of environmental mitigation slopes	The environmental mitigation bunds are not providing a significant benefit in terms of their acoustic performance. Therefore, it is unlikely that a slackening of the slopes would alter the conclusions of this chapter.
Parameter 5	Additional Environmental earth bunds	Additional earth bunds are not expected to significantly alter the noise levels at nearby properties. Therefore, it is highly unlikely to alter the conclusions of this chapter.
Parameter 6	1.5 m off-set to proposed Priest's Bridge Culvert	Locations of the culverts are not expected to significantly affect the operational noise or vibration assessment. Therefore, it is unlikely that this would alter the conclusions of this chapter.
Parameter 7	20 m horizontal parameter for the proposed drainage basin 9	Locations of drainage basins are not expected to affect the operational noise assessment. Therefore, it is unlikely that this would alter the conclusions of this chapter.
Parameter 8	Movement of underground gas pipe near Burgham Park Underbridge	An underground pipe would have no significance in terms of the operational noise or vibration assessment. Therefore, it is unlikely to alter the conclusions of this chapter.
Parameter 9	Additional Earth Bund at West Moor Junction	An additional earth bund in this location is not expected to significantly affect the noise levels at nearby properties. Therefore, it is unlikely to alter the conclusions of this chapter.
Parameter 10	Horizontal parameter of the proposed River Coquet bridge piers	As the line of route is not changing, a change in the location of the bridge piers is highly unlikely to affect the noise or vibration assessment. Therefore, this is highly unlikely to alter the conclusions of this chapter.
Parameter 11	Vertical parameter of up to 1.8 m on the parapet height of overbridges	An increase in the parapet height of overbridges is highly unlikely to increase noise levels as a result of Part A. Instead the parapets should provide additional screening to receptors. Therefore, this is highly unlikely to alter the conclusions of this chapter.
Parameter 12	Horizontal parameter of 10 m to the permanent boundary at Parkwood embankment to allow for a potential berm on the embankment	As the height of the embankment is not changing the acoustic attenuation provided is unlikely to change, it is unlikely this parameter would affect the conclusions identified in this chapter.

6.11. MONITORING

CONSTRUCTION

6.11.1. As summarised within the **Outline CEMP** (**Application Document Reference: TR010041/APP/7.3**), the main contractor would review the need for and scope of noise and vibration monitoring and reporting that is necessary to ensure and demonstrate compliance with all noise and vibration commitments and any CoPA section 61 consent(s).

OPERATION

6.11.2. No monitoring is proposed to support the operational noise and vibration assessment.

REFERENCES

Ref. 6.1 European Parliament (2002). Directive 2002/49/EC of the European Parliament. Environmental Noise Directive 2002/49/EC and Environmental Noise (England) Regulations 2006 (as amended). Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32002L0049&from=EN

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