

A1 Birtley to Coal House

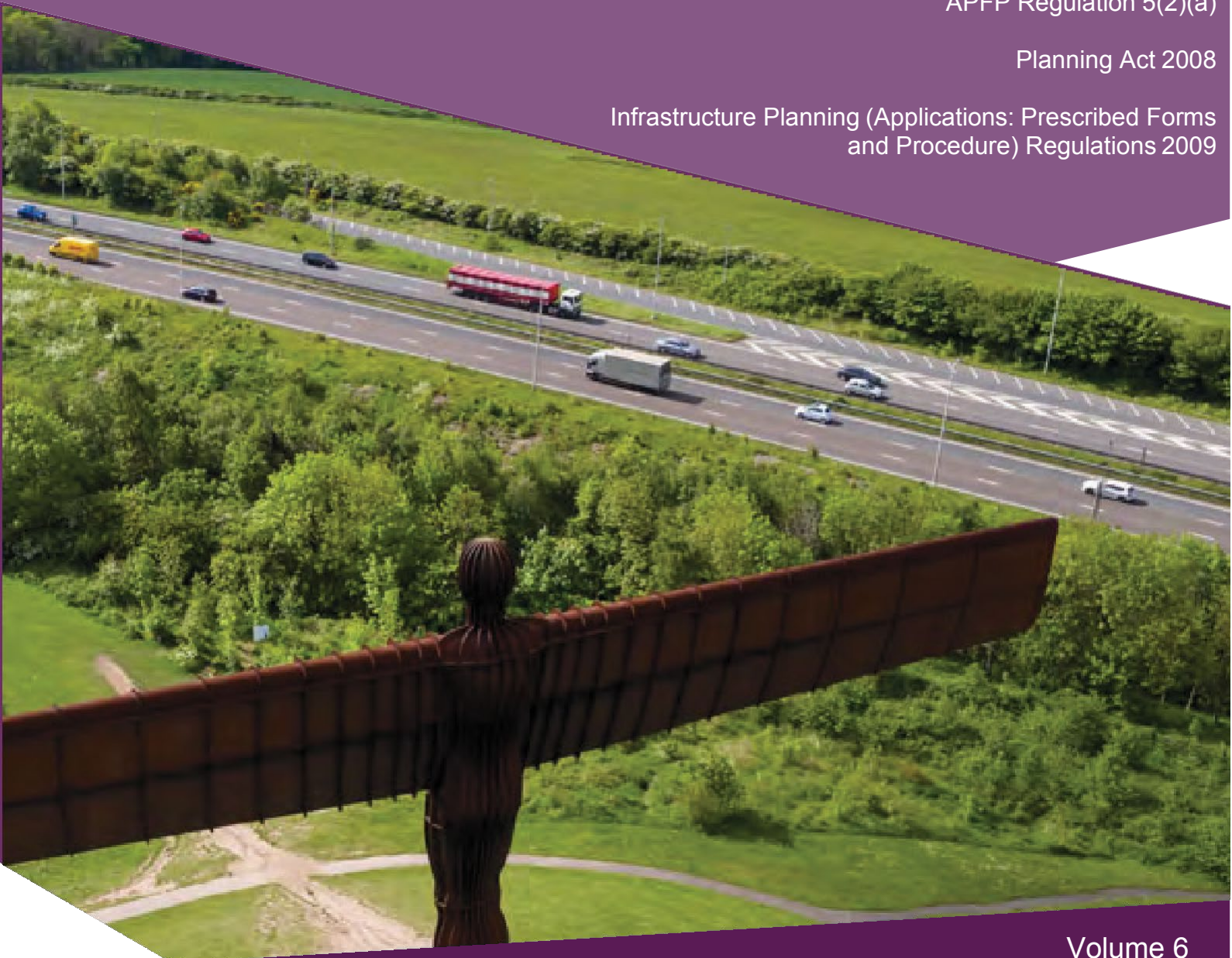
Scheme Number: TR010031

6.1 Environmental Statement Chapter 5 Air Quality

APFP Regulation 5(2)(a)

Planning Act 2008

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



Infrastructure Planning

Planning Act 2008

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

**A1 Birtley to Coal House
Development Consent Order 20[xx]**

Environmental Statement

Regulation Reference:	APFP Regulation 5(2)(a)
Planning Inspectorate Scheme Reference	TR010031
Application Document Reference	TR010031/APP/6.1
Author:	A1 Birtley to Coal House Project Team, Highways England

Version	Date	Status of Version
Rev 0	14 August 2019	Application Issue

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5. AIR QUALITY

5.1. INTRODUCTION

5.1.1. This chapter reports the outcome of the air quality assessment of the Scheme. This assessment has been carried out following the methodology set out in in the Design Manual for Roads Bridges (DMRB) HA 207/07 (**Ref 5.1**) and all relevant Interim Advice Notes (IANs) ((170/12 (**Ref 5.2**), 174/13 (**Ref 5.3**), 175/13 (**Ref 5.4**) and 185/15 (**Ref 5.5**)). This chapter summarises the legislative and policy framework and describes the methodology followed for the assessment along with the assessment assumptions and limitations. The chapter identifies the potential impacts as a result of the Scheme, details the design, mitigation and enhancement measures that have been identified and reports the assessment of the significant effects of the Scheme. Details of monitoring that should be carried out for the Scheme are also provided. This chapter is intended to be read as part of the wider Environmental Statement (ES) and in conjunction with its associated figures and appendices.

5.1.2. The Scheme has the potential to affect air quality as a result of emissions to air including:

a. During construction:

- i.** Particulate matter/dust from enabling works.
- ii.** Particulate matter/dust from materials handling and transportation.
- iii.** Exhaust emissions and dust from on and offsite construction vehicles movements and non-road mobile machinery.

b. During operation:

- i.** Exhaust emissions from traffic on the local road network, taking into account the effects of the reassignment of traffic between routes and changes in traffic speed.

5.1.3. The impacts of the Scheme have been assessed in relation to national and EU air quality standards.

5.1.4. A full description of the Scheme is given in Chapter 2 The Scheme of this ES (Application Document Reference: TR010031/APP/6.1).

Allerdene Bridge Options

5.1.5. For this topic, the differences between Allerdene embankment option and Allerdene viaduct option, as detailed in **paragraphs 2.7.11 to 2.7.18** of this ES, affect the traffic construction phase but not the operational phase of the air quality assessment. The only difference between the options is the materials/plant used within the construction phase. The differences between the options have no bearing on the operational phase assessments presented in this chapter as the alignment and source are in the same location, but both bridge

options have been considered within the construction traffic assessment, this is detailed further in **Appendix 5.2** of this ES (**Application Document Reference: TR010031/APP/6.3**).

5.2. COMPETENT EXPERT EVIDENCE

5.2.1. As detailed in **Table 5-1**, the professionals contributing to the production of this ES chapter have sufficient expertise to ensure the completeness and quality of this assessment.

Table 5-1 - Air quality professional competence

Name	Role	Qualifications and Professional Membership	Experience
Sioni Hole	Author	<ul style="list-style-type: none"> – MPhys, Physics – Associate Member Institute of Air Quality Management 	<ul style="list-style-type: none"> – Over 3 years' experience – M27 SMP Environmental Assessment (2017-2018) – Modeller/Author – A1(M2F) – Air Quality modeller
Andy Talbot	Reviewer	<ul style="list-style-type: none"> – Chartered Scientist – Member of the Institution of Environmental Sciences – Member of the Institute of Air Quality Management – Practitioner of the Institute of Environmental Management and Assessment 	<ul style="list-style-type: none"> – Over 10 years' experience – M3 Junction 9 Improvement at Stage 2 (2017-2018) – AQ Lead – A27 Worthing-Lancing Improvement at Stage 2 (2017-2018) – Air Quality Lead – SMP T5 M62 J20-25 (2018) – Air Quality Lead

5.3. LEGISLATIVE AND POLICY FRAMEWORK

INTERNATIONAL LEGISLATION

European Union Ambient Air Quality Directive

- 5.3.1. The European Union Ambient Air Quality Directive (Air Quality Directive) (**Ref 5.6**) sets limit values for the concentration of pollutants in air for the protection of health and ecosystems. The Air Quality Directive is transposed into legislation in the Air Quality Standards (England) Regulations 2010 (as amended) (**Ref 5.7** and **Ref 5.8**). Compliance with the European Union (EU) limit values for pollutants is mandatory and this is ultimately the responsibility of the Secretary of State. Failure to comply will result in infraction proceedings by the EU with potentially a substantial financial penalty.

NATIONAL LEGISLATION

Environment Act & UK Air Quality Strategy

- 5.3.2. Under the requirements of the Environment Act 1995, the UK government published an Air Quality Strategy (1997, revised in 2000 and 2007), hereafter referred to as 'The Strategy'. The Strategy sets out the UK's national standards and objectives for ambient air quality, and measures to help achieve the objectives. The overall aim of the Strategy is to achieve steady improvement in air quality into the long term. The objectives are transcribed into the Air Quality (England) Regulations 2000 (as amended) (**Ref 5.9** and **Ref 5.10**).
- 5.3.3. The Environment Act 1995 also sets out the principles for Local Air Quality Management (LAQM) (**Ref 5.11**) under which Local Authorities are required to review current and future air quality within their area against the air quality objectives. Where it is anticipated that an air quality objective will not be met, the Local Authority is required to declare an Air Quality Management Area (AQMA) and to produce an Action Plan in pursuit of the achievement of the air quality objectives.

Environmental Protection Act

- 5.3.4. Air pollution can constitute a 'statutory nuisance', as set out in the Environmental Protection Act 1990 (EPA) (**Ref 5.12**), and places a duty on Local Authorities to detect any such nuisances within their area. Dust arising from construction works could lead to statutory nuisance if it "interferes materially with the wellbeing of the residents, i.e. affects their wellbeing, even though it may not be prejudicial to health". Dust generated by construction and demolition work, i.e. resulting from activities such as earthworks, the cutting of materials and in particular, vehicles using haul roads which results in re-suspension of deposited dust can constitute a statutory nuisance. Local Authorities have the power to serve an abatement notice, requiring the abatement of a nuisance or requiring works to be executed to prevent their occurrence.

AIR QUALITY THRESHOLDS

- 5.3.5. The relevant air quality thresholds set out in both the Strategy (as objectives) and the Air Quality Directive (as limit values) for oxides of Nitrogen (NO_x), Nitrogen Dioxide (NO₂) and particulate matter (in the form of PM₁₀) are presented below in **Table 5-2**.

Table 5-2 - Ambient air quality thresholds relevant to the assessment of air quality impacts for the Scheme

Pollutant	Concentration (µg/m³)	Measured As	Number of Exceedances Allowed in a Calendar Year
Set for the protection of human health			
NO ₂	40	Annual mean	None
	200	1-hour mean	No more than 18
PM ₁₀	40	Annual mean	None
	50	24-hour mean	No more than 35
Set for the protection of ecosystems (critical level)			
NO _x	30	Annual mean	None

POLICY

National

- 5.3.6. **Table 5-3** sets out the assessment of Scheme against national policies relevant to Air Quality.

Table 5-3 - Assessment of Scheme against national policies and plans relevant to air quality

Policy	Relevant Policy Objectives	Significance of impact of the Scheme on policy objective
<p>National Policy Statement for National Networks (NPS NN)</p> <p>Requirements of the Highways England's assessment - Sections 5.7 and 5.9</p>	<p>Paragraph 5.7 outlines that the environmental statement should include a description of:</p> <p>“Existing air quality levels;</p> <p>Forecasts of air quality at the time of opening, assuming that the scheme is not built (the future baseline) and taking account of the impact of the scheme.</p> <p>Any significant air quality effects, their mitigation and any residual effects, distinguishing between the construction and operation stages and taking account of the impact of road traffic generated by the project”.</p>	<p>The assessment includes all aspects set out in NPS NN paragraph 5.7:</p> <ul style="list-style-type: none"> - Existing air quality levels are described in Section 5.7 - Baseline conditions. - The assessment considers both “Do Minimum” and “Do Something” scenarios, as set out in the Section 5.4 - Assessment methodology. - Significant effects, mitigation (where required), and residual effects are set out in Section 5.9 - Design, mitigation and enhancement measures and Section 5.10 - Assessment of likely significant effects.
<p>National Policy Statement for National Networks (NPS NN)</p> <p>Requirements of the Highways England's assessment - Sections 5.7 and 5.9</p>	<p>Paragraph 5.9 states:</p> <p><i>“In addition to information on the likely significant effects of a project in relation to EIA, the Secretary of State must be provided with a judgement on the risk as to whether the project would affect the UK's ability to comply with the Air Quality Directive.”</i></p>	<p>An assessment of the likely significant effects, including the UK's compliance with the Air Quality Directive is provided in 5.10 - Assessment of likely significant effects and summarised in Table 5-14.</p>
<p>National Policy Statement for National Networks (NPS NN)</p> <p>Secretary of State's responsibilities in decision making</p>	<p>Paragraph 5.12 of the NPS NN states:</p> <p>“The Secretary of State must give air quality considerations substantial weight where a project would lead to a significant air quality impact in relation to EIA and/or where they lead to a</p>	<p>The results of the assessment confirm that the Scheme will not have a significant impact in relation to EIA, and will not affect the UK's compliance with the limit values set out in the Air Quality Directive.</p>

Policy	Relevant Policy Objectives	Significance of impact of the Scheme on policy objective
<p>- Paragraphs 5.12 and 5.13</p>	<p>deterioration in air quality in a zone/agglomeration.”</p> <p>Paragraph 5.13 of the NPS NN states:</p> <p>“The Secretary of State should refuse consent where, after taking into account mitigation, the air quality impacts of the scheme will: result in a zone/agglomeration which is currently reported as being compliant with the Air Quality Directive becoming non-compliant; or affect the ability of a non-compliant area to achieve compliance within the most recent timescales reported to the European Commission at the time of the decision”.</p>	
<p>National Planning Policy Framework (NPPF) (Ref 5.13)</p>	<p>The NPPF has an overarching environmental objective to protect and enhance our environment and to minimise pollution.</p> <p>In relation to air quality, paragraph 181 of the NPPF states: “Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas... Planning decisions should ensure that any new development in Air Quality Management Areas is</p>	<p>The Scheme will sustain future compliance with air quality objectives and EU limit values.</p> <p>In reaching this conclusion, consideration has been given in the assessment to the impacts of cumulative traffic growth.</p> <p>The Scheme does not affect air quality within any AQMAs.</p>

Policy	Relevant Policy Objectives	Significance of impact of the Scheme on policy objective
<p>UK Plan for Tackling Roadside Nitrogen Dioxide Concentrations (UK Plan) (Ref 5.14)</p>	<p>consistent with the local air quality action plan”.</p> <p>The UK Plan sets out measures for bringing nitrogen dioxide (NO₂) levels within the EU limit values in the shortest possible time.</p> <p>Under the UK Plan, Highways England have a responsibility to improve air quality on the strategic road network. This includes exploration and testing of innovative technologies and ideas for improving air quality.</p> <p>Newcastle City Council and Gateshead Council have been directed to undertake feasibility studies in relation to measures to deliver compliance with EU limit values. This work is ongoing.</p>	<p>The Scheme will not affect the UK’s compliance with the limit values set out in the Air Quality Directive.</p> <p>There are no national measures in the UK plan that would be affected by the Scheme.</p>
<p>Highways England Air Quality Strategy (Ref 5.15)</p>	<p>In August 2017, Highways England published ‘<i>Our strategy to improve air quality</i>’ (Ref 5.15). This follows on from the Department for Transport Road Investment Strategy and the Highways England Delivery Plan 2015-2020. The strategy recognises the critical importance of air quality to the UK and sets out the approach to “<i>achieving cleaner air for our customers and our neighbours who live alongside our network</i>”.</p>	<p>The Scheme will sustain future compliance with air quality objectives and EU limit values, whilst increasing capacity on the strategic network.</p>

Regional

- 5.3.9. **Table 5-4** sets out the assessment of Scheme against regional policies relevant to Air Quality.

Table 5-4 - Assessment of the Scheme against regional policies and plans relevant to air quality

Policy	Relevant Policy Objectives	Significance of impact of the Scheme on policy objective
The Tyne and Wear Air Quality Delivery Plan	The Tyne and Wear Air Quality Delivery Plan aims to present a set of clearly structured indicators and targets for measuring and delivering better air quality in the whole of Tyne and Wear.	The Scheme will not impact on any of the actions within the delivery plan.

Local

- 5.3.10. There are no air quality-specific local policies relevant to the Scheme.

5.4. ASSESSMENT METHODOLOGY

SCOPE OF ASSESSMENT

- 5.4.1. A detailed assessment has been undertaken following the principles and procedures set out in the DMRB HA 207/07 and all relevant IANs (170/12, 174/13, 175/13 and 185/15).
- 5.4.2. The following potential impacts have been scoped into the assessment, with more detail being provided in the paragraphs following:
- a. Construction dust on existing air quality receptors
 - b. Changes in roadside pollutant concentrations from operational traffic (local air quality assessment)
 - c. Emissions from operational traffic (regional air quality assessment)
- 5.4.3. The assessment of roadside air quality considers NO_x and NO₂ impacts on human health, ecological receptors, and EU limit value compliance only. The assessment of vehicle emissions considers NO_x, PM₁₀ and CO₂.

Assessment Scenarios

- 5.4.4. The assessment has considered the operational effects of the Scheme using traffic data for the following scenarios:
- a. Baseline (2017).
 - b. Opening Year (2023) - Do Minimum (without the Scheme), Do Something (with the Scheme).

c. Design Year (2038) - Do Minimum (without the Scheme), and Do Something (with the Scheme) (considered within the regional assessment only).

- 5.4.5. DMRB HA 207/07 paragraph 3.5 (**Ref 5.1**) sets out the need for “the worst year in the first 15 years from opening” to be assessed. In general, the worst year from opening is the opening year itself, as it is anticipated that improvements in vehicle emission rates will offset the impacts of growth in vehicle numbers over time. As such, for the operational assessment of local air quality, only those results which relate to the Scheme opening year (2023) are presented in this report. Both the opening and design years are presented for the assessment of regional air quality.
- 5.4.6. Two options have been presented for the crossing of the railway line near Lamesley: Allerdene embankment option and Allerdene viaduct option. There are no changes to traffic or route alignment between the two options. Therefore, this air quality assessment considers a single operational assessment that covers both options. For the assessment of effects during construction, Allerdene embankment option and Allerdene viaduct option have been considered separately as the materials/plant used within (and schedule of) the construction phase differs between the two options.
- 5.4.7. The A1 to the north of the Scheme, between Scotswood and North Brunton (SNB) is also being improved, with the opening date scheduled to overlap with the opening year for the Scheme. Due to the proximity and timing of the two schemes, this air quality assessment has been undertaken as a single scenario only, with only the cumulative (Scheme plus SNB) impacts and effects reported. This represents a conservative assessment for the Scheme since the future traffic flow along the A1 is maximised.

ASPECTS SCOPED OUT OF THE ASSESSMENT

- 5.4.8. The impacts of the Scheme on PM₁₀ were considered at Stage 2 (Option Selection), and found to be imperceptible with no modelled exceedances of either the annual mean or daily mean thresholds during operation. Taking into account the magnitude of impacts on NO₂ (typically an order of magnitude larger than PM₁₀ impacts) and the low monitored baseline concentrations, the risk of the Scheme causing an exceedance of the annual mean threshold for PM₁₀ during operation is negligible – further detail is provided in **Appendix 5.1** of this ES (**Application Document Reference: TR010031/APP/6.3**).
- 5.4.9. Following an initial assessment for the construction phase, none of the routes exceeded the relevant DMRB HA207/07 (paragraph 3.12) criteria – i.e. 1,000 vehicles Annual Average Daily Traffic (AADT), or 200 Heavy Duty Vehicle (HDVs). Therefore, a full assessment of construction traffic impacts (NO_x and NO₂) was found not to be necessary upon receipt of traffic data – this is detailed further in **Appendix 5.2** of this ES (**Application Document Reference: TR010031/APP/6.3**).

METHODOLOGY

Construction

- 5.4.10. The assessment of dust impacts generated from construction activity (including demolition, earthworks, construction activity, and trackout) has been undertaken qualitatively, taking into account the number and proximity of potentially sensitive receptors within 200m of the Scheme Footprint.

Operation

- 5.4.11. The operational assessment has been based on traffic data for the scenarios described above in **paragraph 5.4.4**, with vehicle emissions taken from IAN 185/15. For the regional assessment, total emissions of NO_x, PM₁₀ and CO₂ were calculated for all roads within the Study Area for the baseline, opening and future years. For the local air quality assessment, dispersion modelling using ADMS-Roads v4.1.1.0 was used to predict roadside concentrations of NO_x resulting from these emissions in the baseline and opening years.
- 5.4.12. On some major routes markedly different, and even opposing, traffic impacts occur during different periods of the day. As such, the assessment has been undertaken at the detailed level, with dispersion and emissions modelling based on traffic flows specified by period of the day (morning and afternoon peaks plus inter-peak and off-peak periods, as per IAN 185/15). This has ensured that the impacts of the Scheme on traffic flows are appropriately represented in the dispersion modelling.
- 5.4.13. The dispersion modelling used meteorological data taken from Newcastle Airport.
- 5.4.14. The modelling of the baseline scenario was verified against monitoring data taken from Local Authority and Highways England survey. This verification was applied to all future year modelling.
- 5.4.15. Future year concentrations were adjusted to take account of the impact of alternative long-term trends in emissions from vehicles subject to the latest standards. IAN 170/12v3 sets out that this approach is precautionary since the resulting concentrations are likely to be conservative.
- 5.4.16. Modelled concentrations of NO_x were converted to NO₂ using Defra's NO_x to NO₂ Calculator v6.1 (**Ref 5.16**).
- 5.4.17. Details of the model setup and verification are provided in **Appendix 5.6** and **Appendix 5.7** of this ES (**Application Document Reference: TR010031/APP/6.3**).

SIGNIFICANCE OF EFFECTS

Assessment Criteria

- 5.4.18. The relevant air quality thresholds for assessment of compliance with The Strategy (as objectives) and the Air Quality Directive (as limit values) are set out in **Table 5-2**.

- 5.4.19. For ecological receptors, in addition to the air quality standard for NO_x (termed the ‘critical level’), impacts must also be assessed for nitrogen deposition (HA 207/07, Annex F (**Ref 5.1**)). The relevant assessment criteria in this case are the critical loads which are defined as *"a quantitative estimate of exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge"* (**Ref 5.17**).
- 5.4.20. The minimum of the critical load range for each ecological feature (i.e. most conservative) has been used for the assessment.

Local Air Quality

- 5.4.21. The approach set out in IAN 174/13 (**Ref 5.3**) to evaluate the significance of local air quality effects from the operation of the Scheme has been followed. For human health, this approach considers the magnitude of impacts and the number of properties affected, whether an air quality threshold is exceeded, and risk to compliance with the Air Quality Directive. For ecological receptors, impacts less than or equal to 1% of the critical level are considered insignificant. Where impacts exceed this level and the critical level is exceeded, the assessment of significance must be assessed by the Scheme ecologist, taking into account changes to nitrogen deposition.
- 5.4.22. IAN 174/13 (**Ref 5.3**) suggests that receptor locations where concentrations do not exceed the relevant air quality objective (either in the Do Minimum or Do Something scenarios), or where the change in concentration is imperceptible ($\leq 1\%$ of the air quality threshold), will not experience significant effects. The criteria in **Table 5-5** sets out the classification of the magnitude of change of annual mean NO₂ and PM₁₀, as well as the number of affected receptors, required to constitute a significant effect.

Table 5-5 - Classification of the magnitude of change of pollutant concentration and guideline significance criteria (IAN 174/13).

Classification of magnitude	Change in annual mean NO ₂ or PM ₁₀ concentration (µg/m ³)	No. of receptors constituting a significant effect	
		Worsening of air quality objective already above objective or creation of new exceedance	Improvement of air quality objective already above objective or removal of existing exceedance
Large	>4	1 to 10	1 to 10
Medium	>2 – 4	10 to 30	10 to 30
Small	>0.4 – 2	30 to 60	30 to 60
Imperceptible	≤0.4	Not included in the judgement of significant AQ effects	

5.4.23. The overall significance of the effects from the Scheme is assessed using professional judgement taking into consideration the key criteria outlined in **Table 5-6**.

Table 5-6 - Significance criteria questions

Key Criteria Questions	Comments
Is there a risk that environmental standards will be breached?	Considers air quality thresholds for human health – i.e. air quality objectives and EU limit values.
Will there be a large change in environmental conditions?	Considers magnitude of impacts.
Will the effect continue for a long time?	Considers duration of exceedance of air quality thresholds (where exceedances exist), based on the magnitude of impacts.
Will many people be affected?	Considers number of properties.
Is there a risk that designated sites, areas, or features will be affected?	Considers ecological impact, based on the conclusion of the Scheme ecologist.
Will it be difficult to avoid, or reduce or repair or compensate for the effect?	Considers options to mitigate the impacts.
On Balance is the Overall Effect Significant?	Overall conclusion on significance – Yes/No.

EU Limit Value Compliance

5.4.24. IAN 175/13 sets out a Compliance Risk Assessment for assessing future compliance with the EU limit values. The outcome of this assessment is a rating of either a 'low' or a 'high' risk of non-compliance and is set out in **Appendix 5.11** of this ES (**Application Document Reference: TR010031/APP/6.3**).

DATA SOURCES

5.4.25. The following data sources have been used for this assessment:

- a.** Scheme traffic modelling undertaken by WSP, as set out in the Combined Modelling and Appraisal Report (**Ref 5.18**).
- b.** LAQM reporting undertaken by Newcastle City Council (**Ref 5.19**) and Gateshead Council (**Ref 5.20**).

- c. Project-specific NO₂ diffusion tube monitoring undertaken by Highways England between March 2015 and March 2016.
- d. Highways England projection factors – Long Term Trends, including Euro 6/VI vehicles (LTT_{E6}) taken from IAN 107/12v3 (**Ref 5.2**).
- e. National modelling, including background (**Ref 5.21**) and roadside concentrations, undertaken by Defra using the Pollution Climate Mapping (PCM) model.
- f. Nitrogen deposition and nitrogen oxides (NO_x) modelling provided by the online Air Pollution Information System (APIS) (**Ref 5.22**) for ecological sites.
- g. MAGIC Website – Provides locations of Statutory designated sites such as Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs), Ramsar sites, and National/Local Nature Reserves (NNRs/LNRs) (**Ref 5.22**).
- h. Highways England IAN 185/15 – updated vehicle emission rates (**Ref 5.5**).
- i. Defra's NO_x-to-NO₂ calculator, v6.1 (**Ref 5.16**).

POLICY AND GUIDANCE

- 5.4.26. The NPS NN requires an assessment of the impacts of a scheme to be undertaken where significant air quality effects are likely. The assessment should include a description of existing air quality, future air quality with and without the scheme in place, and any significant effects, mitigation, and residual effects. The assessment should distinguish between the construction and operation phases. The assessment methodology set out above is compliant with these requirements.
- 5.4.27. The NPPF requires the assessment to give consideration to the impacts of cumulative traffic growth. The assessment is inherently a cumulative assessment, due to the Do Something traffic scenarios including both the Scheme and SNB. In addition, other committed developments were included in both the Do Minimum and Do Something scenarios, as set out in the Traffic Forecasting Package (**Ref 5.23**).

Construction

- 5.4.28. The assessment of construction impacts has been undertaken in line with the guidance set out in paragraph 3.45 of HA 207/07.

Operation

- 5.4.29. The following IANs have been used:
- a. IAN 170/12v3 Updated Air Quality Advice on the Assessment of Future NO_x and NO₂ Projections for Users of DMRB Volume 11, Section 3, Part 1 'Air Quality'.
 - b. IAN 174/13 Updated Advice for Evaluating Significant Local Air Quality Effects for DMRB Volume 11, Section 3, Part 1 'Air Quality'.
 - c. IAN 175/13 Updated air quality advice on risk assessment related to compliance with EU Directive on ambient air quality and on the production of Scheme Air Quality Action Plans for user of DMRB Volume 11, Section 3, Part 1 'Air Quality'.

d. 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'.

- 5.4.30. IAN 170/12 advises on the projection of NO_x and NO₂, and provides a “Gap Calculator” to account for the gap between current projected vehicle emission reductions and projections on the annual rate of improvements in ambient air quality. The calculator utilises projection factors for annual mean NO₂ and NO_x concentrations between 2008 and 2030. Updated projection factors were provided by Highways England in May 2015 and have been used for this assessment. These updated factors reflect the latest predicted long-term trends from the introduction of Euro 6/VI vehicles (termed ‘LTTE6’).
- 5.4.31. IAN 174/13 advises on the significance of effects and was discussed above.
- 5.4.32. IAN 175/13 has been withdrawn pending issue of updated advice. However, in the absence of published updated advice, IAN 175/13 has been used to assess the impact of the Scheme on compliance with the Air Quality Directive on ambient air quality.
- 5.4.33. IAN 185/15 includes vehicle emission rates for defined traffic conditions for NO_x, PM₁₀ and CO₂, for use in air quality assessments. Updated vehicle emission factors, for use with IAN 185/15, were provided by Highways England in May 2018.
- 5.4.34. Traffic data for the air quality assessment was provided with a baseline year of 2017, taking into account guidance from Highways England.
- 5.4.35. The assessment has also taken into account Local Air Quality Management Technical Guidance (**Ref 5.24**), (LAQM.TG16) in relation to the processing of monitoring data and the verification of dispersion models.

CONSULTATION

- 5.4.36. Consultation has been undertaken with Newcastle City Council and Gateshead Council Environmental Health Officers (EHOs), to discuss modelled receptor locations and particulate matter monitoring during construction. This consultation is summarised in **Appendix 4.4** of this ES (**Application Document Reference: TR010031/APP/6.3**).

5.5. ASSESSMENT ASSUMPTIONS AND LIMITATIONS

MODELLING UNCERTAINTIES

- 5.5.1. In the baseline year, systematic uncertainties in the model inputs are accounted for by verifying the modelled roadside concentrations against measured NO₂ concentrations. This process produces an adjustment factor which can then be applied to all modelled results. This assumes that the underlying reasons for the over/under prediction of concentrations in the baseline year persist into the future. The verification factor varies regionally to account for local conditions. The verification factors for the Scheme are all greater than 1, implying that concentrations in the baseline are under predicted prior to adjustment. Details of the model verification process are provided in **Appendix 5.7** of this ES (**Application Document Reference: TR010031/APP/6.3**).

- 5.5.2. In future years, a further uncertainty relates to the projection of vehicle emissions, in particular the rate at which emissions per vehicle will improve over time. This has been taken into account in this assessment through the application of the guidance set out in IAN 170/12. This IAN provides advice on the adjustment of modelled concentrations of NO₂ (and NO_x) to take account of recent trends in roadside pollutant concentrations and evidence on future vehicle emissions. The latest annual projection factors (LTT_{E6}) have been used for this assessment. Of the available datasets, LTT_{E6} best reflects the most recent evidence on the impacts of Euro 6/VI vehicles entering the fleet, whilst retaining an appropriate level of conservatism.
- 5.5.3. Projections for the UK fleet mix and vehicle emissions are not available beyond 2030. Therefore, emissions in the design year (2038) have been modelled using projections for 2030. This is a conservative assumption, since the emission rates per vehicle are anticipated to decline beyond 2030 as the number of zero emissions (full electric) vehicles increases.
- 5.5.4. All modelled concentrations presented in this chapter are verified results. Results are presented within **Appendix 5.9** and **Appendix 5.10** of this ES (**Application Document Reference: TR010031/APP/6.3**), both with and without the application of the gap analysis adjustment set out in IAN 170/12.
- 5.5.5. To ensure a conservative assessment of the Scheme impacts and that any air quality risks are captured, the overall assessment is based on verified results, adjusted to represent the long-term trend set out in the LTT_{E6} annual projection factors. The assessment is therefore considered to be robust and includes appropriate measures to ensure that the conclusions will not be significantly influenced by model uncertainty.
- 5.5.6. In summary, the dispersion modelling is based on traffic data that has been approved for use by the Scheme's transport planners, local dispersion characteristics have been taken into account through the model verification process, and a conservative approach to the trends in future vehicle emissions has been adopted (see **Section 4.5, Chapter 4 Environmental Assessment Methodology** of this ES (**Application Document Reference: TR010031/APP/6.1**)).
- 5.5.7. The draft Development Consent Order (DCO) contains powers of lateral and vertical deviation. The EIA has taken the Limits of Deviation (LoD) into account and the approach taken is described in **Chapter 4 Environmental Assessment Methodology, paragraph 4.5.4** of this ES (**Application Document Reference: TR010031/APP/6.1**). The outputs of the assessment are not considered likely to change materially as a result of the power of deviation.

5.6. STUDY AREA

- 5.6.1. In accordance with DMRB, separate Study Areas are defined for the construction and operation phases of the Scheme.

CONSTRUCTION

- 5.6.2. Construction effects can be split into two aspects – construction dust and construction traffic. Construction dust covers the generation and resuspension of particulate matter during the construction period, whereas construction traffic includes the traffic management measures and additional generated trips (especially heavy duty vehicles) during the construction period.
- 5.6.3. The Study Area for construction dust, as set out in paragraph 3.45 of DMRB HA 207/07, consists of an area within 200m of the Scheme Footprint.
- 5.6.4. The Study Area for construction traffic follows the criteria for affected links set out in the following section headed ‘Operation’. The need for quantitative assessment was screened out due to the construction traffic data not meeting the criteria for defining affected links. A summary of the traffic generation plan for the construction period is provided in **Appendix 5.2** of this ES (**Application Document Reference: TR010031/APP/6.3**), and the A1 Birtley to Coal House Outline Construction Traffic Management Plan which is provided in Appendix B of the Outline Construction Environmental Management Plan (CEMP) (**Application Document Reference: TR010031/APP/7.4**).

OPERATION

- 5.6.5. The Study Area for the assessment of operational impacts on local air quality has been set with regard to the criteria set out in the DMRB Volume 11, Section 3, Part 1 HA 207/07, for determining affected links (i.e. roads), namely, a 200m corridor either side of those links on which:
- a. Road alignment will change by five metres or more.
 - b. Daily traffic flows will change by 1,000 AADT flow or more.
 - c. HDV flows will change by 200 AADT or more.
 - d. Daily average speed will change by 10 kilometres per/hour or more.
 - e. Peak hour speed will change by 20 kilometres per/hour or more.
- 5.6.6. These criteria have been applied to road links within the Traffic Reliability Area (TRA), as outlined in IAN/185, and to changes with the Scheme (cumulatively with SNB) in the opening year. The links meeting the above criteria, known as the affected road network (ARN), are shown in **Figure 5.1** of this ES (**Application Document Reference: TR010031/APP/6.2**).
- 5.6.7. As defined by the DMRB Volume 11 Section 3 Part 1 HA 207/07, paragraph 3.13, the Study Area extends up to 200m from the ARN. Since “at 100m or more from the road, the difference between the total concentration and the background concentration should be as close to zero as will make virtually no difference” (Air Quality Consultants 2008, page 10 (**Ref 5.25**)). The 200m boundary used in this assessment therefore represents a conservative estimate of the extent of impacts from the proposed Scheme. Beyond this distance the impact of the Scheme would be imperceptible.

- 5.6.8. For the Scheme, the Study Area is largely determined by total traffic flow changes rather than changes in vehicle speeds or changes in the numbers of HDVs i.e. there are no links triggering the criteria for speed or HDV changes that do not already trigger the overall daily traffic flow criterion.
- 5.6.9. DMRB includes criteria for defining a separate Study Area for the regional air quality assessment. For the Scheme, the regional criteria (whether applied in the opening or design year) define a smaller area than the local criteria. For this assessment, to ensure that the impacts of the Scheme on overall emissions are fully captured, the regional assessment is based on the ARN defined above.
- 5.6.10. Summary information on the change in traffic flow for the affected road links within the Study Area is shown in **Appendix 5.3** of this ES (**Application Document Reference: TR010031/APP/6.3**).

SELECTION OF SENSITIVE RECEPTORS

Construction

- 5.6.11. DMRB HA207/07 states that the locations of any sensitive receptors such as housing, schools, hospitals or designated species or habitats within a designated site should be identified within the construction Study Area.
- 5.6.12. The purpose of the assessment is to identify the number of such locations, to aid the design of appropriate mitigation. This is undertaken without the quantification of impacts at individual receptors.

Human Health

- 5.6.13. The national air quality regulations make clear that likely exceedances of the air quality objectives should be assessed at locations which are situated outside of buildings or other natural or man-made structures above or below the ground, and where members of the public are regularly present. Air quality assessments should, therefore, focus on those locations where members of the public are likely to be regularly present and are likely to be exposed for a period of time relevant to the averaging period of the objective. The assessment should not consider locations where regular public exposure would not be realistic.
- 5.6.14. The relevant sensitive receptors considered as part of the local air quality assessment were identified using Ordnance Survey data. They comprise locations accessible to the public and/or locations where those more vulnerable to the effects of poor air quality, such as the young and the elderly, are likely to be present such as residential properties, schools, hospitals, and care homes within the Study Area.
- 5.6.15. It is not necessary to quantify impacts at all such receptors, rather a sub-set of receptors is selected for the analysis. Based on the ARN for the Scheme, 281 representative air quality receptors have been used in the modelling of operational impacts on human health. These receptors represent likely worst-case exposure – i.e. where total

concentration/magnitude of impacts are maximised, (e.g. nearest road, at junctions, etc.). Full details of the receptors can be found in **Appendix 5.4** of this ES (**Application Document Reference: TR010031/APP/6.3**).

Ecological

- 5.6.16. In relation to sensitive ecological receptors, Annex F of DMRB HA207/07 states that the air quality assessment should consider the following nature conservation sites: SAC (SCI or cSAC), SPA, pSPA, SSSIs and Ramsar sites. Further, the assessment should be limited to those sites for which the designated features are sensitive to air pollution, either directly or indirectly, and which could be adversely affected by the effect of local air pollution on vegetation.
- 5.6.17. The relevant sensitive ecological receptors were identified in consultation with the Scheme ecologists. Full details of the receptors can be found in **Appendix 5.5** of this ES (**Application Document Reference: TR010031/APP/6.3**).
- 5.6.18. There is one designated site within 200m of the ARN for the Scheme with features potentially sensitive to air quality impacts, namely Shibdon Pond SSSI. Designated sites are assessed in the dispersion modelling as a series of discrete receptors aligned as a transect extending from the edge of the designated site nearest the road and up to 200m into the site to determine the spatial extent of potential impacts. The transects are shown in **Figure 5.3** of this ES (**Application Document Reference: TR010031/APP/6.2**).

5.7. BASELINE CONDITIONS

LOCAL AIR QUALITY MANAGEMENT

- 5.7.1. The Scheme is not located within an AQMA, nor do any of the routes within the ARN for the Scheme lie within an AQMA (refer to **Figures 5.1, 5.2** and **5.4** in **Appendix 5** of this ES (**Application Document Reference: TR010031/APP/6.2**)).
- 5.7.2. The nearest AQMAs are situated over three kilometres to the east of the Study Area:
- a.** In Newcastle City Council:
 - i.** AQMA No. 5 (Gosforth)
 - ii.** AQMA No. 1b (City Centre)
 - b.** In Gateshead Council:
 - i.** AQMA No.1 (Town Centre)
- 5.7.3. All designations are due to monitored exceedances of the objective for annual mean NO₂ resulting from emissions of NO_x from road transport.
- 5.7.4. NO₂ concentrations in Gateshead Town Centre AQMA have been below the air quality objective for annual mean NO₂ for six consecutive years, and the AQMA could be revoked. However, Gateshead Council does not plan to apply for revocation until national modelling of roadside air quality indicates compliance with EU limit values in the town centre (**Table 5-7**).

MONITORING

- 5.7.5. Newcastle City Council and Gateshead Council undertake air quality monitoring using a combination of automatic (continuous) analysers and passive diffusion tubes. Monitored concentrations exceed the annual mean NO₂ objective in Newcastle City Council AQMAs No.1b (City Centre) and No. 5 (Gosforth). There are no monitored exceedances outside of the AQMAs.
- 5.7.6. There are 16 Newcastle City Council and Gateshead Council monitoring sites within the Study Area (**Figure 5.2** of this ES (**Application Document Reference: TR010031/APP/6.2**)). Monitored concentrations at these sites do not exceed the air quality objective.
- 5.7.7. Concentrations at the A1 Dunston roadside continuous analyser have declined over the past five years, which is consistent with the improvements projected by national vehicle emission factors. Diffusion tube monitoring does not show any consistent trend between 2013 and 2017. The maximum monitored concentrations in the Study Area are 31.1µg/m³ on Portobello Terrace, to the west of the A1 in Birtley, and 31.9µg/m³ on Birchfield Gardens, to the west of the A1 in Denton Burn.

Table 5-7 - Local Authority nitrogen dioxide monitoring in the Study Area

Monitoring Location ID	Type	X,Y coordinates	Annual mean NO ₂ concentration (µg/m ³)				
			2013	2014	2015	2016	2017
A1 - A1 Dunston	Continuous Roadside	422510, 561928	35.8	30.6	27.0	26.0	25.0
DT61a - 26 West Copperas Lane (ended 2014)	Diffusion tube Roadside	419581, 565481	36.8	31.7	-	-	-
DT62a - 5 Birchfield Gardens	Diffusion tube Roadside	419448, 565124	39.0	36.2	-	38.9	31.9
G4 - North Dene	Diffusion tube Urban Background	427187, 557230	26.8	23.6	22.1	23.8	22.4
G10 - Portobello Terrace	Diffusion tube Roadside	428254, 554988	32.0	31.8	27.9	32.9	31.1

Monitoring Location ID	Type	X,Y coordinates	Annual mean NO ₂ concentration (µg/m ³)				
			2013	2014	2015	2016	2017
G12 - Coach Road	Diffusion tube Urban Background	423765, 560510	27.2	27.4	18.7	22.6	22.2
G31 - Westway	Diffusion tube Urban Background	423086, 561543	27.6	25.7	19.8	23.1	22.9
G35 - A1 Dunston AQU	Diffusion tube Roadside	422513, 561925	31.4	30.8	26.2	26.4	28.8
G40 - A1 Dunston AQU	Diffusion tube Roadside	422513, 561925			25.7	26.8	28.6
G41 - A1 Dunston AQU	Diffusion tube Roadside	422513, 561925			25.6	27.0	28.4
G87 - A1 Houses	Diffusion tube Urban Background	422518, 561933	28.5	29.2	21.7	22.7	25.9
G88 - Charlton Walk	Diffusion tube Roadside	424260, 562267	26.2	26.7	23.1	25.7	26.0
G89 - Skipper Close	Diffusion tube Urban Background	423609, 561228	-	24.0	21.9	22.8	23.9
G90 - Lobley Hill Rd	Diffusion tube Roadside	423635, 560639	-	26.3	23.1	25.7	24.8
G91 - Holmside Ave	Diffusion tube Urban Background	423101, 561634	-	28.5	24.9	26.8	28.0
G95 - Chiltern Gdns	Diffusion tube Urban Background	423575, 560977	-	-	17.1	20.6	19.6

Highways England Air Quality Monitoring

- 5.7.8. A Scheme specific diffusion tube monitoring survey was undertaken at 36 locations, as shown on **Figure 5.2** of this ES (**Application Document Reference:**

TR010031/APP/6.2). The survey was carried out by Highways England between March 2015 and March 2016. The monitoring results have been annualised to 2017 concentrations and are presented in **Appendix 5.8** of this ES (**Application Document Reference: TR010031/APP/6.3**).

- 5.7.9. Concentrations exceed the air quality objective for annual mean NO₂ at one location (A1SNB_025) at the roadside of the A69 (A1 junction 75), although this is 8m closer to the road than the closest relevant human exposure (R105). This is 6 kilometres to the north-east of the Scheme, but within the operational Study Area. The concentration measured was 46.6µg/m³. Other diffusion tubes within the vicinity measured concentrations well below the air quality objective with concentrations ranging from 26.1µg/m³ to 33.4µg/m³.

DEFRA POLLUTION CLIMATE MAPPING (PCM)

- 5.7.10. The PCM model is used by Defra, in combination with monitoring data, for the assessment of compliance with EU limit values. Compliance information is reported within 43 zones and urban agglomerations across the UK. The Study Area is located in the Tyneside and north-east zones, both of which are compliant in the Scheme opening year.
- 5.7.11. The PCM annual mean NO₂ concentrations are taken from the latest data, issued in 2017 with a 2015 reference year. Maximum roadside annual mean NO₂ concentrations in the Study Area are 54.2µg/m³ in the baseline, in exceedance of the EU limit value of 40 µg/m³, falling to 37.8µg/m³ by the opening year (2023). **Table 5-8** shows the PCM data for links within the air quality Study Area that exceed the EU limit value in the PCM reference year (2015). All the modelled PCM links are predicted to be compliant with the EU limit value in the opening year without the Scheme.

Table 5-8 - PCM roadside annual mean NO₂ concentrations (µg/m³) for the baseline and opening year (without the Scheme)

PCM Link	Road	2017	2023	Link Compliance Year	Compliance Zones
18626	A1	48.2	34.2	2021	Tyneside
28772	A1	54.2	37.8	2023	Tyneside and North-East
28776	A1	50.7	36.0	2022	Tyneside and North-East
36656	A1	51.2	36.0	2022	North-East
48707	A1	46.3	33.0	2020	Tyneside
73526	A1	48.9	34.7	2021	Tyneside and North-East
75020	A184	39.7	29.0	2017	Tyneside

PCM Link	Road	2017	2023	Link Compliance Year	Compliance Zones
77743	A69	39.4	27.9	2017	Tyneside
80427	A1	52.2	35.8	2022	Tyneside
80428	A1	49.7	34.1	2021	Tyneside

DEFRA BACKGROUND MAPPING

- 5.7.12. The PCM-modelled pollutant concentration at any location has two components, namely a contribution from the local (modelled) sources and a contribution from more distant sources (background). Background pollutant concentrations for this assessment, i.e. those resulting from distant sources and pollutant transport, have been taken from the mapped PCM data provided by Defra on a 1 kilometre x 1 kilometre grid covering the UK.
- 5.7.13. **Table 5-9** shows a summary of the background data for the assessment years 2017 (baseline) and 2023 (opening year) for both total pollutant concentrations, and the concentration with the contribution from major roads removed. The latter were used within the assessment as background concentrations onto which the contribution of the modelled roads was added. This avoids the double-counting of contributions from roads included within the detailed dispersion model.
- 5.7.14. In 2023, background concentrations are below the air quality objectives for the protection of human health and ecological receptors for all pollutants. Projected concentrations improve over time due to a reduction in emissions from all sources and sectors.

Table 5-9 - Ranges of annual mean background pollutant concentrations (mg/m³)

Year	NO ₂	NO _x	PM ₁₀	PM _{2.5}
Objective	40	30	40	25
Total pollutant concentrations				
2017	13.3 – 20.2	18.1 – 29.4	9.6 – 13.5	6.3 – 8.3
2023	10.1 – 16.5	13.4 – 23.4	9.3 – 13.2	6.0 – 7.9
Concentrations with road concentration removed				
2017	-	9.4 – 20.3	9.5 – 13.2	6.2 – 8.1
2023	-	8.0 – 16.4	9.3 – 13.1	6.0 – 7.9

ECOLOGICAL RECEPTORS

5.7.15. **Table 5-7** shows the baseline nitrogen deposition over Shibdon Pond SSSI. The data are taken from APIS. Baseline NO_x concentrations are taken from the PCM model for 2017.

5.7.16. Baseline concentrations of NO_x are within the critical level (and air quality objective) of 30µg/m³ (**Table 5-10**); Nitrogen deposition exceeds the critical load.

Table 5-10 - Background NO_x and nitrogen deposition levels for designated ecological sites in the Study Area

Site	Sensitive Habitat	Critical Load (kg N/ha/yr)	Background Deposition (kg N/ha/yr)	Critical Level (µg/m ³)	Baseline NO _x (µg/m ³)
Shibdon Pond SSSI	Fen, Marsh & Swamp	15	17.8 ^a	30	28.9 ^b

a. 5km x 5km average, grid reference 417500, 562500 – for years 2013-15
b. 1km x 1km average, grid reference 419500. 563500 – for 2017

MODELLED BASELINE

5.7.17. In 2017, air quality within the ARN was largely good, with 275 of the 283 selected receptors not at risk of exceeding air quality thresholds (<36µg/m³, or <90% of the standard i.e. would require a minimum of a “large” impact in order to result in an exceedance) – the remaining receptors are shown in **Table 5-11** below and in **Figure 5.6** of this ES (**Application Document Reference: TR010031/APP/6.2**).

5.7.18. Concentrations were elevated towards the east of the A1 (downwind on the prevailing wind), and/or where the receptors were in the proximity of junctions.

Table 5-11 – Modelled baseline NO₂ concentrations at selected receptors above 90% of the annual mean air quality standard (40µg/m³).

Site	Description/Location	Baseline NO ₂ (µg/m ³)
R10	Residential property to the South of the A1 at junction 65	37.4
R11	Residential property to the South of the A1 at junction 65	37.4
R55	Residential property to the North of the A1 at junction 69	40.0
R56	Residential property to the North of the A1 at junction 69	38.2

Site	Description/Location	Baseline NO ₂ (µg/m ³)
R59	Residential property to the North of the A1 at junction 69	40.9
R62	Residential property to the North of the A1 at junction 69	42.8
R78	Residential property to the East of the A1 between junctions 4-75	36.2
R142	Residential property to the West of the A1 at junction 76	36.2
Exceedances of the annual mean NO ₂ standard (40µg/m ³) are emboldened.		

- 5.7.19. Two receptors to the north of the southbound offslip of junction 69 (Gateshead Quays), R59 and R62, exceeded the air quality threshold for annual mean NO₂ (40.9µg/m³ and 42.8µg/m³ respectively). R55 and R56, also to the north of the southbound offslip of junction 69 (Gateshead Quays), were at risk of exceeding the threshold (40.0µg/m³ and 38.2µg/m³ respectively).
- 5.7.20. Receptors R10 and R11 (along the southbound offslip of junction 65 (Birtley), R78 (to the east of the A1 between junctions 74-75), and R142 (west of junction 76 - Denton Interchange), were also > 36µg/m³ and at risk of exceeding the air quality threshold.
- 5.7.21. The complete set of modelled results for the baseline scenario is provided in Appendix 5.9 and Appendix 5.10 of this ES (Application Document Reference: TR010031/APP/6.3) and set out in Figure 5.3 of this ES (Application Document Reference: TR010031/APP/6.2).

5.8. POTENTIAL IMPACTS

CONSTRUCTION

Construction Dust

- 5.8.1. Air quality impacts due to construction would be temporary, occur within 200m of the construction site/haulage routes, and typically include an increase in emissions of dust and particulate matter from earthworks and general construction activity and the presence of heavy construction-related traffic. There is the potential for dust nuisance, which is separate from adverse effects on health, through, for example, the soiling of windows, cars, washing and other property. With the application of mitigation measures and standard practice during construction, no impacts are anticipated.
- 5.8.2. There are 1,192 sensitive receptors (primarily residential properties, but also Birtley East Community Primary School) that are at risk from impacts during the construction period including dust soiling and increases in PM₁₀ and PM_{2.5} concentrations. These are shown in **Figure 5.5** of this ES (**Application Document Reference: TR010031/APP/6.2**). There

are no designated sites within the construction dust Study Area. This impacts from construction dust to human health are reflected in **Chapter 12 Population and Human Health** of this ES (**Application Document Reference: TR010031/APP/6.1**).

Construction Traffic

- 5.8.3. Traffic management measures may result in changes to emissions from vehicle exhausts and roadside pollution concentrations. However, based on current data, the additional traffic generated during construction will not trigger the qualifying criteria set out in **paragraph 5.6.5** for defining affected roads set out in HA 207/07. As such, no further assessment of these effects is considered to be warranted, as set out in **Appendix 5.2** of this ES (**Application Document Reference: TR010031/APP/6.3**).

OPERATION

- 5.8.4. The Scheme has the potential to cause a change in concentrations of NO₂, PM₁₀ and PM_{2.5}, through changes to vehicle emission rates as a result of traffic re-routing and changes to fleet mix and speeds.
- 5.8.5. The complete set of modelled results is provided in Appendix 5.9 and Appendix 5.10 of this ES (Application Document Reference: TR010031/APP/6.3). The results are also set out in Figures 5.3-5.9 of this ES (Application Document Reference: TR010031/APP/6.2).
- 5.8.6. As set out in **paragraph 5.8.4**, the impacts of the Scheme on Particulate Matter (PM₁₀ and PM_{2.5}) were considered at Option Selection stage, and found to be imperceptible during operation – further detail is provided in **Appendix 5.1** of this ES (**Application Document Reference: TR010031/APP/6.3**), although no further consideration is given within this chapter.
- 5.8.7. The details below relate to modelled annual mean NO₂ following model verification and gap analysis. This is a conservative approach.

Human Health

- 5.8.8. In 2023, with or without the Scheme, modelled concentrations at all selected receptors are below the annual mean objective. The highest modelled concentration is 36.7µg/m³ at R62 (situated alongside the A1 between junctions 69 and 70) in the Do Minimum scenario. With the Scheme, there is an imperceptible decrease in concentrations.
- 5.8.9. In the Scheme opening year (2023), 234 of the 281 modelled receptors are predicted to experience an imperceptible change in air quality with the Scheme. The opening year Do Minimum and Do Something concentrations at those receptors discussed in the Modelled Baseline section are shown in **Table 5-12** below and **Figures 5.7-9** of this ES (**Application Document Reference: TR010031/APP/6.2**).

Table 5-12 – Modelled opening year NO₂ concentrations at selected receptors

Site	Do Minimum NO ₂ /µg/m ³	Do Something NO ₂ /µg/m ³	Change in NO ₂ /µg/m ³	Impact Magnitude (IAN 174/13)
R10	31.8	33.1	1.3	Small worsening
R11	31.9	32.6	0.7	Small worsening
R55	34.3	34.1	-0.2	Imperceptible
R56	32.6	32.6	0	Imperceptible
R59	35.1	35	-0.1	Imperceptible
R62	36.7	36.6	-0.1	Imperceptible
R78	32	31.6	-0.4	Imperceptible
R92*	26.3	24.8	-1.5	Small beneficial
R142	31.3	30.9	-0.4	Imperceptible

*Included to indicate the largest modelled beneficial change.

5.8.10. Twenty-seven receptors (R72-75, 77, 84-87, 92-94, 99, 100, 142, 148-150, 152-155, 174, 258-260, 262) are predicted to experience an improvement in air quality as a result of the Scheme. Areas that are predicted to benefit are:

- a. East of the A1 north of junction 79 (Gateshead Quays)
- b. Along B3624 Stamfordham Road (east of junction 76)
- c. Along the A1 within the vicinity of junction 75 (Denton Interchange)
- d. Hertford Road, Gateshead
- e. South of A1 junction 66 (Eighton Lodge)

5.8.11. Receptor R92 is predicted to experience the largest improvement in air quality with a reduction in annual mean NO₂ concentrations of 1.5µg/m³, from 26.3µg/m³ to 24.8µg/m³. There is predicted to be a decrease of approximately 620 vehicles per day along the nearest modelled road (southbound slip road at A1 junction 75 (Denton Interchange)). The predicted improvement in air quality is due to this decrease in flow, coupled with a reduction in emissions per vehicle due to a change in speeds along the slip road with the introduction of a speed limit and offslip layout (with the SNB Scheme). The change in speeds caused a speed banding change along this link (from high speed to free flow in the inter-peak and off-peak periods).

5.8.12. Six properties are predicted to experience an increase in pollutant concentrations:

- a. R10 and R11 north west of junction 65 (Birtley).
- b. R21 south of junction 67 (Coal House).
- c. R187, R189, and R198 between junctions 76 and 77 (Stamfordham Road and Ponteland).

- 5.8.13. None of these properties are predicted to be at risk of exceeding the threshold for annual mean NO₂ concentrations.
- 5.8.14. Receptor R10 is predicted to experience an increase in NO₂ concentrations of 1.3µg/m³. The Do Something modelled concentration is predicted to be below the annual mean objective for NO₂ (33.1µg/m³). The predicted increase is a result of the combination of route realignment and increase in traffic flow before and through junction 65 (Birtley). There is predicted to be an increase of approximately 1,800 vehicles per day along the westbound slip road of junction 65 (Birtley) (of which 160 are HDVs) and a predicted increase of approximately 1,800 vehicles per day (including 330 HDVs) along the A1 through the junction. The slip road in the Do Something scenario is approximately three metres closer to R10 than in the Do Minimum scenario.
- 5.8.15. **Figure 5.6** of this ES (**Application Document Reference: TR010031/APP/6.2**) shows that modelled baseline concentrations at receptors to the north of the A1 (R55, R56, R59 and R62), between junctions 69 (Gateshead Quays) and 70 (Dunston), are predicted to be higher than local monitoring (S5_005 and A1BC_026) presented in **Appendix 5.8** of this ES (**Application Document Reference: TR010031/APP/6.3**) and G91 (**Table 5-7** above). Whilst these receptors are situated closer to the road than the available monitoring, it is recognised that the model gives a conservative estimation of total pollutant concentrations within this region. Despite this conservatism, total modelled NO₂ concentrations at these monitoring points are predicted to be within 10% of monitored values. Given the lack of modelled exceedances of the air quality objective, and the tendency for the model to over-estimate within this region, no further adjustment has been applied.
- 5.8.16. Modelled baseline concentrations at receptors R105-R114 are consistently lower than the monitored concentration at A1SNB_025 (46.6µg/m³), although this monitored concentration is inconsistent with other monitoring in the area (A1SNB_26, 37 & 40, 26.1µg/m³ to 33.4µg/m³). The potential under prediction is attributed, in part, to the proximity of the monitoring at A1SNB_025 to queuing traffic from the A69/A1 junction, the detail of which is not represented within the traffic model. Model verification shows that the model underestimates concentrations at this point. However, the modelled concentrations are consistent with the monitoring at A1SNB_26, 37 & 40.

Ecological Receptors

- 5.8.17. The complete set of results for ecological receptors is provided in **Appendix 5.5** of this ES (**Application Document Reference: TR010031/APP/6.3**). In the opening year, annual mean NO_x concentrations are predicted to be below the critical level (30µg/m³) at

all points along the modelled transects. Furthermore, at the closest point on the transect to the roadside, concentrations are predicted to fall by 0.4µg/m³ with the Scheme.

- 5.8.18. In accordance with IAN 174, where NO_x concentrations are assessed to be below the objective, significant effects are not anticipated. Furthermore, where the assessment indicates a potentially significant effect due to changes in NO_x concentrations, then changes in nutrient nitrogen deposition should be calculated. In the absence of modelled exceedances of the NO_x objective, no assessment of deposition has been undertaken.

PCM Compliance

- 5.8.19. The compliance risk assessment, following IAN 175/13, is provided in **Appendix 5.11** of this ES (**Application Document Reference: TR010031/APP/6.3**). The Scheme does not cause or worsen exceedances of the EU limit values on any road within the ARN and is, therefore, at low risk of impacting on Defra's projected compliance dates for the Tyneside and north-east zones (2022 in both cases).

Regional Impacts

- 5.8.20. At a regional level, the Scheme results in an increase in emissions of all pollutants (**Table 5-13**). This is due to an overall increase in vehicle-kilometres travelled, offset in part by congestion relief.

Table 5-13 - Regional emissions for the baseline (2017), do minimum (DM) and do something (DS) scenarios in the opening year (2023) and design year (2038)

Scenario	CO ₂		NO ₂		PM ₁₀	
	Total	Change	Total	Change	Total	Change
Baseline	1,455,203	-	3,690	-	935	-
DM 2023	1,465,645	2901	2,256	5.1	796	2.0
DS 2023	1,468,545		2,261		798	
DM 2038	1,624,092	4370	1,493	4.2	812	3.3
DS 2038	1,628,462		1,498		815	

5.9. DESIGN, MITIGATION AND ENHANCEMENT MEASURES

DESIGN MEASURES

- 5.9.1. No design measures have been considered with respect to air quality for this Scheme.

MITIGATION MEASURES - CONSTRUCTION

- 5.9.2. Mitigation will be required to reduce emissions of dust from construction works. This would be based on good practice measures for reducing emissions of dust as set out in the Annex 1 of the Minerals Policy Statement (**Ref 5.26**) and summarised below.
- 5.9.3. The proposed measures set out below would be set out in the Outline CEMP for the Scheme and secured through a DCO requirement for a detailed CEMP (**Application Document Reference: TR010031/APP/7.4**).

Site management

- 5.9.4. Records of dust and air quality complaints should be kept, including likely causes and mitigation measures to reduce impacts if appropriate.
- a. Site perimeter, fences etc. should be kept clean.
 - b. Visual inspections of off-site dust deposition (daily) should be undertaken. This may need to be supplemented by automatic monitoring of PM₁₀ if the risk of impacts increases e.g. during prolonged dry weather.

Site Planning

- a. Consideration of weather conditions, dust generating potential of material to be excavated prior to commencement of works.
- b. Plan site layout to maximise distance from plant/stockpiles etc. to sensitive receptors.
- c. Dusty materials should be removed from site as soon as possible.

Construction Traffic

- a. Loads entering and leaving the site with dust generating potential should be covered and wheel washing facilities made available if required.
- b. No idling of vehicles.
- c. Vehicles to comply with site speed limits (15mph on hard surfaces, 10mph on unconsolidated surfaces).
- d. Water assisted sweeping of local roads should be undertaken if material tracked out of site.
- e. Install hard surfacing as soon as practicable on site and ensure that they are maintained in good condition.

Site Activities

- a. Exposed soils should be protected from winds until sealed or re-vegetated.
- b. Minimise dust generating activities, particularly near residential receptors/sensitive ecosystems during prolonged dry, dusty weather unless damping/other suppressants are used.
- c. Ensure an adequate water supply to site and use water as dust suppressant where applicable.
- d. Ensure any site machinery is well maintained and in full working order.

- e. Dust generating materials should be stored away from sensitive receptors and screened/shielded.

5.9.5. Traffic management measures will be required during the construction phase. Details of these are included within **Appendix 5.2** of this ES (**Application Document Reference: TR010031/APP/6.3**).

MITIGATION MEASURES - OPERATION

5.9.6. There is no requirement for Scheme specific mitigation during operation as the Scheme does not give rise to significant effects, as described below.

ENHANCEMENT MEASURES

5.9.7. No enhancement measures have been considered with respect to air quality for this Scheme.

5.10. ASSESSMENT OF LIKELY SIGNIFICANT EFFECTS

CONSTRUCTION

Construction Dust

5.10.1. Whilst the potential for impacts from construction works exists, following the application of the good practice measures detailed in **Section 5.9**, there would be no significant effects as a result of construction dust.

Construction Traffic

5.10.2. Construction traffic impacts were screened out of the assessment in **Section 5.4**. With the development and application of the Construction Traffic Management Plan, no significant air quality effects are likely.

OPERATION

5.10.3. IAN 174/13 sets out key criteria for the assessment of the significance of effects of schemes in terms of impacts to human health. The criteria draw together the results of the assessment of local air quality impacts on population exposure (**Section 5.7**), compliance with EU limit values and impacts on ecological receptors.

Human Health

5.10.4. In relation to population exposure to pollution, IAN 174/13 requires the significance of effects to be assessed at properties where exceedances of the air quality objectives are modelled in any future year scenario. As stated above, pollutant concentrations are within the air quality objectives at all selected receptors in the Scheme opening year (NO₂ and PM₁₀/PM_{2.5}). As such, there are no properties that experience a worsening or improvement of air quality already above the objective, or a creation/removal of an exceedance. Therefore, there are no significant effects from the Scheme on human health during operation.

Ecological receptors

- 5.10.5. No modelled receptors have annual mean concentrations above $30\mu\text{g}/\text{m}^3$ and no changes in the NO_x concentration are greater than $0.4\mu\text{g}/\text{m}^3$. Therefore, there is no significant effect from the Scheme on Shibdon Pond SSSI.

EU Limit Value Compliance

- 5.10.6. No PCM links within the local air quality Study Area exceed the EU limit value for annual mean NO_2 . The Scheme is at low risk of affecting compliance with EU limit values.

5.11. SUMMARY

- 5.11.1. The overall assessment of the effect of the Scheme is not significant for air quality, as set out in **Table 5-14**.

Table 5-14 - IAN 174/13 Key significance criteria and commentary for the Scheme

Key Criteria Questions (Table 3.1 of IAN 174/13)	Scheme Outcome
Is there a risk that environmental standards will be breached	No – There are no modelled exceedances of annual mean NO_2 objective with the Scheme within the assessment area. The Scheme is at low risk of affecting compliance with EU limit values.
Will there be a large change in environmental conditions	No – All impacts are small or imperceptible.
Will the effect continue for a long time	No – Impacts are small in magnitude indicating likely return to pre-Scheme concentrations is within guideline of 6 years.
Will many people be affected	No
Is there a risk that designated sites, areas, or features will be affected	No – NO_x concentrations are below the critical level.
Will it be difficult to avoid, or reduce or repair or compensate for the effect	N/A – No mitigation considered necessary since no significant effects likely.
On Balance is the Overall Effect Significant	No

5.12. MONITORING

- 5.12.1. During construction, monitoring would be required by the appointed contractor to determine the effectiveness of the proposed mitigation, or requirement for further mitigation, as follows:
- a. In the first instance, monitoring would be limited to visual inspections of emissions and/or dust soiling of local roads or properties. This should be undertaken daily for the duration of the construction of the Scheme.
 - b. If risk levels rise, for example as a result of prolonged dry weather, or the visual monitoring indicates persistent soiling, it will be necessary to install continuous monitoring of particulate matter (as 15-minute average PM₁₀ and PM_{2.5}). The monitors should be equipped with an alert mechanism, set to agreed thresholds.
- 5.12.2. The construction monitoring regime and reporting requirements would be set out in the CEMP for the Scheme.
- 5.12.3. No significant effects have been identified for the operational phase of the Scheme and no additional monitoring is necessary.

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<http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section3/ha20707.pdf>

Ref 5.2 Highways England (2012). Interim Advice Note 170/12. Updated air quality advice on the assessment of future NO_x and NO₂ projections for users of DMRB Volume 11, Section 3, Part 1 Air Quality. Available at:

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Ref 5.3 Highways England (2013). Interim Advice Note 174/13. Updated advice for evaluating significant local air quality effects for users of DMRB Volume 11, Section 3, Part 1 Air Quality. Available at:

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Ref 5.6 European Union Ambient Air Quality Directive 2008/50/EC.

Ref 5.7 The Air Quality Standards Regulations, Statutory Instrument 2010/1001.

Ref 5.8 The Air Quality Standards (Amendment) Regulations, Statutory Instrument 2016/1184.

Ref 5.9 The Air Quality (England) Regulations, Statutory Instrument 2000/928d.

Ref 5.10 The Air Quality (England) (Amendment) Regulations, 2002, Statutory Instrument No 3043.

Ref 5.11 Environment Act 1995.

Ref 5.12 Environment Protection Act 1990.

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Ref 5.14 Department for Environment Food and Rural Affairs (2017). UK Plan for Tackling Roadside Nitrogen Dioxide Concentrations (UK Plan). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/633269/air-quality-plan-overview.pdf

Ref 5.15 Highways England (2017). Our strategy to improve air quality. Available at: <https://www.gov.uk/government/publications/highways-england-air-quality-strategy>.

Ref 5.16 Department for Environment Food and Rural Affairs (2017). NO_x to NO₂ conversion spreadsheet. Available at: https://laqm.defra.gov.uk/documents/NOx_to_NO2_Calculator_v6.1.xls.

Ref 5.17 United Nations Economic Commission for Europe. ICP modelling and mapping. Critical loads and levels approach. Available at: <http://www.unece.org/fileadmin/DAM/env/lrtap/WorkingGroups/wge/definitions.htm>

Ref 5.18 WSP (2018). Combined Modelling Appraisal Report (HE551462-WSP-TTM-ZZ-RP-TR-00015).

Ref 5.19 Newcastle City Council (2018). 2018 Air Quality Annual Status Report. (ASR). Available at: https://www.newcastle.gov.uk/sites/default/files/wwwfileroot/business/trading-standards/ncc_asr_2018.pdf

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Ref 5.24 Defra (2018). Part IV The Environment Act 1995 and Environment (Northern Ireland) Order 2002 Part III, Local Air Quality Management Technical Guidance LAQM.TG16.25

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Ref 5.26 Office of the Deputy Prime Minister (2005). Minerals Policy Statement 2: Controlling and mitigating the environmental effects of mineral extraction in England. Annex 1: Dust.

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