16 Air Quality

16.1 Introduction

16.1.1 This chapter presents the Design Manual for Roads and Bridges (DMRB) Stage 3 Environmental Impact Assessment (EIA) of the potential air quality impacts associated with the proposed A9 Dualling scheme from Dalwhinnie to Crubenmore (Central Section, Project 8). The Proposed Scheme alignment that has been assessed is described in **Chapter 5**.

16.1.2 The assessment has been undertaken in accordance with DMRB Volume 11, Section 3, Part 1 (HA207/07) (Highways Agency, 2007). The agreed Stage 3 assessment approach of the Proposed Scheme is described in **Chapter 6**.

16.1.3 This chapter includes a review of existing baseline air quality conditions, a summary of relevant air quality guidance and legislation, the methodology used and the results of the impact assessment. Mitigation options are considered for any potentially significant adverse effects.

16.2 Approach and Methods

16.2.1 At the early design and assessment stage, the assessment of potential operational air quality impacts of the Proposed Scheme determined that a detailed assessment at DMRB Stage 3 was not justified. Therefore, a 'Simple Assessment' was carried out using the DMRB screening methodology in order to consider design changes and traffic changes from DMRB Stage 2.

16.2.2 This sub-section details the approach and methodology used to complete the assessment of air quality for the construction and operational phases of the Proposed Scheme. Included in the discussion is a review of the relevant legislation and guidance used and the criteria to define significant impacts in order to recommend adequate mitigation measures if required.

Air Quality Objectives

16.2.3 The assessment considered international and national legislation relevant to assess the impacts of transport schemes on air quality.

16.2.4 The European Union (EU) set pollutant concentration limit values in a series of Directives with statutory dates for member states to reach these targets. It also requires member states to regularly review and assess air quality in order to meet limit values by the required dates.

16.2.5 The UK government is responsible to the European Commission (EC) for ensuring that it complies with the provisions of the EU Directives. This prompted the Environment Act 1995 of which Part IV established the National Air Quality Strategy (AQS) and the basis of Local Air Quality Management (LAQM).

16.2.6 The UK AQS objective for PM smaller than 10µm aerodynamic diameter (PM_{10}) annual mean is 40µg m^{-3}. However, Scotland has adopted a more stringent annual mean objective of 18µg m^{-3}. The UK AQS objective for the 24-hour mean PM_{10} concentration is 50µg m^{-3}, not to be exceeded on more than 35 days per calendar year. The more stringent Scottish objective requires that daily mean PM_{10} concentrations do not exceed 50µg m^{-3} on more than seven days per year.

16.2.7 PM smaller than 2.5µm aerodynamic diameter ($PM_{2.5}$), is not currently included in the DMRB HA207/07 air quality guidance; however, the Scottish Government has recently adopted the World Health Organisation (WHO) guideline value of 10µg m^{-3} as an annual mean.

16.2.8 The air quality objectives of relevance to the Proposed Scheme are shown in **Table 16-1.**

Table 16-1: Air Quality Objectives for NO_X, NO_2, PM_{10} and $PM_{2.5}$

Pollutant	Averaging Period	Limits (µg/m^3)
Nitrogen Dioxide (NO_X) (for the protection of vegetation and ecosystems)	Annual mean	30
Nitrogen Dioxide (NO_2) (for human health)	Annual mean	40
	1-hour mean (not to be exceeded more than 18 times per year)	200
Particulate Matter (PM_{10}) (for human health)	Annual mean	18
	24-hour mean (not to be exceeded more than 7 times per year)	50
Particulate Matter ($PM_{2.5}$) (for human health)	Annual mean	10

16.2.9 When the annual mean NO_2 concentration is below 60µg/m^3, it is not considered to represent an increased risk of exceedance of the 1-hour mean NO_2 objective (for human health).

Scope and Guidance

16.2.10 For this EIA, potential impacts on local air quality resulting from both the construction and operation of the Proposed Scheme were assessed in accordance with relevant guidance outlined in DMRB HA207/07, associated Interim Advice Notes (IANs), Defra's Local Air Quality Management Technical Guidance (LAQM.TG(16)) and the Institute of Air Quality Management (IAQM) construction dust guidance.

16.2.11 Highways England's IANs used in this assessment are listed below:

- IAN 170/12: Updated air quality advice on the assessment of future NO_x and NO_2 projections for users of DMRB Volume 11, Section 3, Part 1 Air Quality (Highways Agency, 2012)
- IAN 174/13: Updated advice for evaluating significant local air quality effects for DMRB Volume 11, Section 3, Part 1 Air Quality (Highways Agency, 2013a)
- IAN 175/13: Updated air quality advice on risk assessment related to compliance with the EU Directive on ambient air quality and on the production of Scheme Air Quality Action Plans (Highways Agency, 2013b)

16.2.12 In accordance with IAN 175/13, Pollution Concentration Mapping (PCM) links have been considered as part of the assessment to verify the potential risk related to EU compliance. No PCM links were found in the area of the Proposed Scheme and this was therefore not considered further in the assessment.

16.2.13 IAN 185/15 has not been adopted by Transport Scotland, with an exception where a scheme passes through an Air Quality Management Area (AQMA), which was not applicable for this Proposed Scheme or assessment.

Study Area

16.2.14 This sub-section discusses the study areas assumed for the assessment of the construction and operational impacts. The study area for the local air quality assessment is shown in **Drawing 16.1,**

as contained in **Volume 3** and the study area for the construction dust impact is shown in **Drawing 16.2 (Volume 3)**.

16.2.15 The extent of the study area for the construction phase has been defined according to IAQM (2014) guidance, which includes sensitive receptors such as houses and schools within 350 – 200 m of construction activities that are expected to generate dust.

16.2.16 The study area for the operational assessment has been defined according to DMRB HA207/07 guidance. It covers receptors within 200 m of roads that are expected to be affected by the Proposed Scheme based on the change in traffic and road alignment. These receptors were identified using address data from Ordnance Survey (OS, 2015) and maps available in ArcMap 10.4.1 (ESRI Inc., 2017).

Construction Assessment Methodology

16.2.17 The assessment of potential construction impacts was undertaken in accordance with the IAQM 'Guidance on the Assessment of Dust from Demolition and Construction' (2014). The assessment methodology is presented in detail in **Appendix 16.1 (Volume 2).**

16.2.18 The aim of the assessment was to determine the risk of dust impacts from four construction activities: demolition, earthworks, construction and track-out (track-out is the transport of dust and dirt from the construction site onto the local roads) to identify the level of required mitigation. The assessment includes the identification of sensitive receptors within 20 m, 50 m, 100 m, 200 m and 350 m from the construction boundary. Beyond 350 m, any construction effects in terms of air quality (primarily dust deposition) would be minimal. Human and ecological receptors are chosen based on their sensitivity to dust soiling and PM_{10} exposure.

16.2.19 The methodology takes into account the scale to which impacts are likely to be generated (classed as small, medium or large). The distance of the closest receptors and background PM_{10} concentrations are also taken into account to determine the sensitivity of the surrounding area.

16.2.20 Construction impacts are assessed qualitatively to determine the overall level of risk of impacts for dust soiling, human health and ecology and identify suitable mitigation measures. Professional judgement is applied to define the overall significance of impacts taking into account any additional project specific factors.

Operational Assessment Methodology

16.2.21 The transport model covers the full A9 route from Perth to Inverness. Potential operational impacts have been assessed on the basis of the information obtained from the transport model outputs. The model included the full length of the A9, however the local air quality assessment presented in this chapter only considered data within the Project 8 extent. Other sections of the A9 are considered in separate project assessments.

16.2.22 The following scenarios have been considered in the local air quality assessment:

- 2015: Base Year
- 2026: Opening Year Do-Minimum (DM) without A9 Dualling
- 2026: Opening Year Do-Something (DS) with A9 Dualling

16.2.23 The opening year DS scenario refers to the first full year of operation of the Proposed Scheme. An additional scenario to represent the so called 'Design Year' (i.e. year 2041) has been considered in the regional assessment.

Local Air Quality

16.2.24 The local air quality assessment involves estimating the change in pollutant concentrations resulting from the operation of the Proposed Scheme. Under DMRB HA207/07 guidance, affected roads are defined where:

- road alignment will change by 5m or more, or
- daily traffic flows will change by 1,000 Annual Average Daily Traffic (AADT) flow or more, or
- Heavy Duty Vehicle (HDV) flows will change by 200 AADT or more, or
- daily average speed will change by 10 kph or more, or
- peak hour speed will change by 20 kph or more

16.2.25 Operational air quality impacts may occur on the existing road network where the Proposed Scheme leads to changes in traffic or alignment that trigger the criteria outlined above.

16.2.26 Changes from the DMRB Stage 2 assessment, including changes in modelled traffic volumes in the opening year as well as some alignment changes to the Proposed Scheme, led to air quality impacts requiring a reassessment at DMRB Stage 3. The same method used for DMRB Stage 2 was carried out at DMRB Stage 3. The model calculations were based on the distance from the road, fleet composition and traffic volume.

16.2.27 Following a DMRB HA207/07 screening of Project 8 DMRB Stage 3 traffic data, the affected road network (ARN) identified for the local air quality assessment encompassed the full length of the A9 mainline and included local roads surrounding the proposed Dalwhinnie junction. Other roads screened in primarily due to alignment changes as a result of the new carriageway along the A9, and new slip roads around the Dalwhinnie Junction. Total traffic volume changes also screened in on roads along the A9. New roads around Dalwhinnie Junction were also included in the ARN. The ARN is presented in **Drawing 16.1** contained in **Volume 3** of this report.

16.2.28 The local pollutant component at receptors considered in this assessment will be strongly controlled by emissions associated with road traffic. Emissions of pollutants were calculated for each affected road using Defra's Emission Factor Toolkit (EFT v7.0), released in July 2016.

16.2.29 DMRB screening method calculations from HA 207/07 Annex C3.2 were used to estimate the pollutant atmospheric concentration at receptors based on distance from the road, fleet composition and traffic volume. The concentrations of NO_2 were calculated using Defra's NO_x to NO_2 calculator v5.1 (https://laqm.defra.gov.uk/documents/no2tonox9_ja-forweb_june2016.xls).

16.2.30 Total air pollutant concentrations comprise a background and local component. It is common practise to validate these against any background monitoring data. A comparison of background pollutant concentrations to background monitoring data could not be carried out as the nearest monitoring sites were more than 10 km from the proposed scheme extent. In addition, background values are well below the AQS objectives for relevant pollutants (NO_2 and PM_{10}).

Regional Air Quality

16.2.31 The regional air quality assessment considered the change in emissions resulting from the Proposed Scheme. This is required as emissions not only affect local air quality, but could also have an impact on a regional scale.

16.2.32 Under the DMRB HA207/07 guidance for regional air quality, affected roads are expected to have:

- A change of more than 10% in AADT, or
- A change of more than 10% HDVs, or
- A change in daily average speed of more than 20 kph

16.2.33 Following the DMRB screening criteria, it was determined that the same study area is applicable to the regional assessment as the one used for the local assessment. It includes the A9 mainline and the local roads surrounding the Dalwhinnie junction.

16.2.34 Regional air quality emissions have been calculated using Defra's Emission Factor Toolkit 7.0 (EFT v7.0). For future years, the assessment was undertaken for first full year of operation of the Proposed Scheme (2026) and the design year (2041). It should be noted that EFT v7.0 only provides emission estimates up to the year 2030. Year 2030 emissions have therefore been used to represent emissions in the Design Year. Emissions are expected to decline in future years as a result of more stringent emission controls on vehicles; therefore, this approach provides a worst-case assessment of Design Year emissions.

Ecological Designated Sites

16.2.35 Ecological designated sites refer to habitats and species within nature conservation sites (designated sites) that contain features sensitive to air pollution. These include Special Areas of Conservation (SAC), Special Protection Areas (SPA), Sites of Special Scientific Interest (SSSI) and Ramsar sites. Following DMRB HA207/07 Annex F guidance these sites have been considered where they are within 200 m of ARN. The full ecological assessment is presented in **Chapter 12** of this report.

16.2.36 The pollutants of most concern in relation to vegetation and ecosystems near roads are oxides of nitrogen (NO_X). Total NO_X concentrations and rates of nitrogen deposition have been calculated along transects that extend from the Proposed Scheme into nearby designated sites.

16.2.37 Road-traffic contributions have been combined with annual background mapped concentrations in order to calculate the total NO_X concentration along each transect. NO_X concentrations have been adjusted following DMRB Interim Advice Note (IAN 170/12v3) on long-term trend (LTT) Gap Analysis methodology.

16.2.38 The annual mean objective/limit value for NO_X applies only to locations more than 20 km from towns with more than 250,000 inhabitants or more than 5 km from other built-up areas, industrial installations or motorways. The World Health Organisation (WHO) have set a critical level for NO_x for the protection of vegetation, therefore the Statutory Nature Conservation Agencies' (Scottish Natural Heritage (SNH)) policy is to apply the 30 µg/m^3 criterion, on a precautionary basis, as a benchmark, in internationally designated conservation sites and SSSIs.

Baseline Data Sources

16.2.39 The Proposed Scheme extents fall within The Highland Council (THC) local authority area and Cairngorms National Park Authority; THC has responsibility for air quality. The key baseline data sources used in this assessment were obtained from the 2015 THC Air Quality Progress Report (THC, 2015) and the Air Quality in Scotland website (http://www.scottishairquality.co.uk/).

16.2.40 Background pollutant concentrations of NO_X, NO_2, and PM_{10} were obtained from the Scottish Air Quality website (http://www.scottishairquality.co.uk/data/mapping?view=data). $PM_{2.5}$ concentrations that were obtained from Defra's LAQM background maps.

16.2.41 The Air Pollution Information Systems website (APIS - http://www.apis.ac.uk/) was used to gather nitrogen deposition information relevant to ecosystems within the study area.

16.2.42 Traffic data were provided for a Base Year (2015), Opening Year (2026) and Design Year (2041) without (DM) and with (DS) the Proposed Scheme scenario options. Data were provided for each traffic model link as both one and two way flows.

Limitations to Assessment

16.2.43 The DMRB screening method is based on a distance drop-off calculation that does not take into account local atmospheric conditions such as wind speed and direction, which directly influence the rate at which pollutants disperse. A wind speed of 2m/s is assumed and no weighting for wind direction is applied; therefore, the equations used have a tendency to overestimate the pollutant concentrations.

16.2.44 Verification of the calculated pollutant concentrations against measured data was not carried out as no diffusion tube monitoring was undertaken within the Central Section. The nearest available monitoring data was not considered to be representative of the Proposed Scheme study area. Furthermore, resulting pollutant concentrations are predicted to be < 25% of the AQS objectives for annual mean NO_2 and PM. Even considering the uncertainty associated within the DMRB screening calculation methodology, it is unlikely that the Proposed Scheme will lead to any exceedances of the AQS Objectives for NO_2 and PM.

16.2.45 There is uncertainty attached to critical load (or critical level) values for ecological sites, which has implications for the interpretation of the APIS data. The empirical critical loads of total nitrogen deposition for vegetation were derived primarily from field experiments and field observations, while for NO_x critical loads the primary source is experimental studies. There are also uncertainties in the Land Use cover map that is used to assign broad habitats and default values are often based on measurements at a limited number of sites across the UK (APIS, 2016).

Assigning Sensitivity

Construction

16.2.46 **Appendix 16.1 (Volume 2)** provide details on the criteria used to assign sensitivity for the temporary construction dust assessment. The discussion below summarises the findings from these tables.

16.2.47 According to IAQM (2014) sensitive receptors to dust are *"any location where a person or property may experience the adverse effects of airborne dust or dust soiling"*. They are categorised based on their sensitivity to potential dust impacts (high, medium and low). High sensitivity receptors include residential properties, schools and care homes; medium sensitivity receptors include hotels and offices; low sensitivity receptors encompass short-term car parks and footpaths.

16.2.48 Similar to human receptors, ecological receptors to dust are categorised as high, medium or low. High sensitivity ecological receptors include sites, such as Special Areas of Conservation (SACs) or Sites of Special Scientific Interest (SSSI) that contain habitats that are sensitive to dust deposition. Medium sensitivity ecological receptors include sites with important plant species whose dust sensitivity is uncertain and sites with national designation containing features that may be affected by dust deposition. Low sensitivity ecological receptors include locations with a local designation where the features may be affected by dust deposition.

Operation - Local Air Quality and Ecological Designated Sites

16.2.49 Sensitive receptors are defined for human health and ecology, respectively, as:

- Relevant locations with public exposure (including residential, medical and educational premises if present) that are potentially sensitive to NO_2, PM_{10} and $PM_{2.5}$
- Internationally and nationally designated ecological sites in the vicinity of the Proposed Scheme (SPA, SAC and SSSI)

Assigning Magnitude and Significance of Impact

16.2.50 IAN 174/13 (Highways Agency, 2013a) provides advice on determining the significance of a Proposed Scheme's impact on local air quality and ecological designated sites. There is alternative guidance from the Institute of Air Quality Management (Moorcroft and Barrowcliffe. et al. (2017) Land-use Planning & Development Control: Planning for Air Quality. v1.2. Institute of Air Quality Management, London) that could be adapted for use in Scottish planning systems. It has however been agreed to follow DMRB HA 207/07, which has a formal status reflecting the connections these organisations have with government departments.

Construction

16.2.51 IAQM (2014) provides guidance on assessing the risk of impacts on human health and ecology in order to define appropriate construction dust mitigation measures. The assessment methodology applied in this work is presented in detail in **Appendix 16.1 (Volume 2)**.

Operation Local Air Quality

16.2.52 The significance of an impact is based on the magnitude of the change in pollutant concentration in relation to air quality objectives, as well as absolute concentrations in relation to air quality objectives. Only receptors which exceed the air quality objective in either the DM or DS scenarios are used to inform significance.

16.2.53 The magnitude of change for NO_2 and PM_{10} concentrations used to assess operational impacts are shown in **Table 16-2.** Concentration changes less than 0.4µg/m³ for NO_2 and 0.2µg/m³ for PM_{10} are 'imperceptible' and are scoped out of the assessment.

16.2.54 Requirements for assessing $PM_{2.5}$ are not included in DMRB HA207/07 air quality guidance, and no significance criteria are provided. However, for Scotland a $PM_{2.5}$ air quality objective (EU's Air Quality Directive 2008/50/EC) is enforced; therefore, to enable consideration of $PM_{2.5}$, this assessment adopted the criteria from IAN 174/13.

Table 16-2: Magnitude of change criteria

Magnitude of Change in Annual Mean Concentrations (µg/m³)	Value of Change in Annual Average NO_2, PM_{10} and $PM_{2.5}$
Large (>4) NO_2 Large (>1.8) PM_{10} Large (>1) $PM_{2.5}$	Greater than full Measure of Uncertainty (MoU) value of 10% of the air quality objective
Medium (>2 to 4) NO_2 Medium (>0.9 to 1.8) PM_{10} Medium (>0.6 to 1) $PM_{2.5}$	Greater than half of the MoU, but less than the full MoU of 10% of the air quality objective.
Small (>0.4 to 2) NO_2 Small (>0.18 to 0.9) PM_{10} Small (>0.1 to 0.5) $PM_{2.5}$	More than 1% of objective and less than half of the MoU i.e. 5%. The full MoU is 10% of the air quality objective.

Magnitude of Change in Annual Mean Concentrations (µg/m³)	Value of Change in Annual Average NO_2, PM_{10} and $PM_{2.5}$
Imperceptible (≤ 0.4) NO_2 Imperceptible (≤ 0.18) PM_{10} Imperceptible (≤ 0.1) $PM_{2.5}$	Less than or equal to 1% of objective.
The MoU is due to uncertainty in the air quality monitoring, modelling and traffic data used in the assessment. The approach for defining the MoU is based around the advice in Defra (2009) on the desirability in achieving 10% verification (modelled versus monitored results) where concentrations are close to or above air quality objectives.	

16.2.55 The number of receptors in each magnitude band are aggregated and compared to the guideline number of receptors provided in IAN 174/13 to determine whether there is a significant effect (shown in **Table 16-3)**.

Table 16-3: Guidelines to numbers of properties constituting a significant impact

Magnitude of Change in Annual Mean NO_2	Total Number of Receptors with	
	Worsening of air quality objective already above objective or creation of a new exceedance	Improvement of an air quality objective already above objective or the removal of an existing exceedance
Large	1 to 10	1 to 10
Medium	10 to 30	10 to 30
Small	30 to 60	30 to 60

16.2.56 The guideline bands have been developed for each magnitude category, and set the upper level of likely non-significance and the lower level of likely significance. It should be noted that these are guideline values only and are designed to provide consistency in the assessment of significance across all highway schemes.

16.2.57 Where the results reside between the lower and upper guideline bands for any of the magnitude criteria (**Table 16-3**) then scheme effects could be significant and a judgement is required taking into account the results for all six categories (different magnitudes of change for both worsening and improvement). According to DMRB IAN174/13 this decision will also be based on technical knowledge and consideration given to (but not limited to) whether scheme effects are likely to be significant.

16.2.58 Scheme effects are more likely to be significant where:

- There are no/ few receptors with any improvements
- PM_{10} and $PM_{2.5}$ annual averages are also affected by small, medium or large deteriorations
- Short term exceedances may be caused or worsened by the Proposed Scheme for either NO_2 or PM_{10}

16.2.59 Proposed Scheme effects are more likely to be not significant where:

- There are receptors with small, medium or large improvements
- PM_{10} and $PM_{2.5}$ annual averages are not affected by small, medium or large deteriorations
- Short term exceedances are not caused or worsened by the Proposed Scheme for either NO_2 or PM_{10}

Ecological Designated Sites

16.2.60 The approach to the air quality assessment of designated sites is outlined in HA207/07, Annex F. Once a Designated Site has been scoped in to an assessment, the steps associated with the evaluation of significance follows a similar process as described for public exposure.

16.2.61 **Table 16-2** defines the magnitude categories to apply to changes in annual average NO_2, which should also be used to describe the magnitude of change in annual average NO_X concentrations; which is 30µg/m³ for designated sites. Concentrations of NO_X were used as the main basis for evaluating the significant effects.

16.2.62 According to DMRB HA207/07 guidance, where NO_X concentrations were assessed to be below the AQS objective then significant effects are not anticipated. If the AQS objective is exceeded, then significant effects may occur, and further consideration should be given to the magnitude of change. The exception to this is where changes are less than 0.4µg/m³, then effects are considered to be imperceptible and unlikely to be significant.

16.2.63 In addition, critical loads for nitrogen deposition have been set that represent (based on current knowledge) exposure below which there should be no significant harmful effects on sensitive elements of the ecosystem. The critical loads vary by type of ecosystem and can be obtained from the APIS website.

16.3 Baseline Conditions

16.3.1 The baseline assessment considered air quality monitoring within the THC local authority area and Scottish air quality background mapped annual concentrations (http://www.scottishairquality.co.uk/data/mapping?view=data) for both local air quality and ecosystems.

16.3.2 The Proposed Scheme does not fall within, nor is it in the vicinity of, any AQMAs. The nearest AQMA is located more than 70 km away, encompassing the main built-up area of Perth and is declared for both NO_2 and PM_{10}.

Air Quality Monitoring

16.3.3 There are two principal methods used for measuring air quality, either using passive sampling techniques such as diffusion tubes, or through the use of sophisticated continuous monitoring equipment. THC monitor NO_2 and PM_{10} from a network of continuous monitoring locations and diffusion tube sites. None of these monitoring sites are located within the vicinity of the Proposed Scheme. The nearest continuous monitoring station is located on Telford Street in Inverness, more than 60 km north of the Proposed Scheme extents. Both NO_2 and PM_{10} monitoring data from the Telford Street site are presented in **Appendix 16.2 (Volume 2)**. The monitoring site is located within an urban area and is therefore not considered to be representative of the Proposed Scheme, which is located within a rural area.

16.3.4 As it is likely that current baseline NO_2 and PM_{10} concentrations meet AQS objectives at sensitive receptors within the Proposed Scheme study area, no air quality monitoring was deemed necessary in the A9 Central Section for the purposes of this assessment.

16.3.5 Two air quality monitoring surveys were carried out for the A9 Dualling in the Northern and Southern Sections by the Atkins-Mouchel Joint Venture (AMJV) and Jacobs UK (JUK), respectively. The monitoring locations and measured annual mean concentrations of NO_2 are reported in **Appendix 16.2 (Volume 2)**. These are the nearest monitoring data available to Project 8 were consulted to

establish baseline conditions along the A9 to the north and south of the Proposed Scheme. The measured NO_2 concentrations show there is little or no risk of exceeding NO_2 AQS objectives.

Background concentrations

16.3.6 The background concentration of a pollutant is determined by regional, national and international emissions and often represents a significant proportion of the total pollutant concentration. The local component is determined by local pollutant sources such as road traffic and chimney stacks.

16.3.7 Background pollutant concentrations are spatially and temporally variable. Annual mean background concentrations of NO_X, NO_2, and PM_{10} are provided annually and are mapped on a grid resolution of 1 km^2 across the whole of Scotland; obtained from a Scotland-specific model using Scottish monitoring and meteorological data (http://www.scottishairquality.co.uk/data/mapping?view=data). $PM_{2.5}$ background was obtained from Defra background mapping.

16.3.8 To prevent double counting of source contributions, background contributions from the traffic sector were subtracted from total background NO_X concentrations using the Defra tool (NO_2 Adjustment for NO_X Sector Removal Tool v5.0). **Table 16-4** provides the total emissions and the percentage emissions contributions to NO_X and PM_{10} in Scotland in 2015 from the latest '*National Atmospheric Emissions Inventory report*' (September 2017). For NO_X, transport, energy, industry, and residential and commercial sources contribute the most to total emissions. Residential and commercial sectors are also the largest contributions for PM_{10}, followed by transport, agriculture and industry. The area surrounding the Proposed Scheme, however, does not include any large industrial sources or energy facilities. There are also no large population centres with domestic heating. Therefore, the main source of emissions in the Proposed Scheme study area is from transport.

Table 16-4: NAEI (2017) Total emissions (kt) and source emission contributions (%) by sector for Scotland in 2015

Sector	NO_X	PM_{10}
Total emissions	84	12
Agriculture	0.0	15.8
Energy Industries	28.2	3.6
Fugitive	0.0	0.0
Industrial Combustion	14.4	10.0
Industrial Processes	0.0	13.2
Residential, Commercial & Public Sector Combustion	12.0	30.0
Solvent Processes	0.0	2.8
Transport Sources	43.4	18.5
Waste	0.0	0.0
Other sources*	2.0	6.5
*Other sources include all "other" categories in the NAEI inventory and several categories that are insignificant for a specific pollutant		

16.3.9 Background NO_2, PM_{10} and $PM_{2.5}$ concentrations are shown in **Table 16-5** for all receptors within the vicinity of the Proposed Scheme; locations of receptors are shown in **Drawings 16.4 - 16.6** in **Volume 3** of this report.

Table 16-5: Annual mean background pollutant concentrations (µg m^{-3}) at human health receptors used in Stage 3 assessment

Receptor ID	Grid Square (m)	Base Year (2015)			Opening Year (2026)		
		NO_2	PM_{10}	$PM_{2.5}$	NO_2	PM_{10}	$PM_{2.5}$
R1-R22	263,500; 784,500	2.6	7.5	4.8	2.0	7.2	4.6
R23-R29	265,500; 787,500	2.5	7.2	4.6	1.9	7.0	4.3
R30	267,500; 791,500	2.2	7.3	4.6	1.7	7.1	4.4

Key Receptors

Residential Properties

16.3.10 Thirty sensitive receptors (R1- R30) were identified within 200 m of affected roads associated with the Proposed Scheme and were considered for the local air quality assessment. These were identified at worst-case locations alongside the affected road network (ARN). Locations of the receptors included in this assessment are presented in **Table 16-6** below.

Table 16-6: Sensitive human health receptors identified for the local air quality assessment

Receptor ID	Description	Chainage (ch.)	X	Y
R1	Loch Ericht Cottages 1	22,500	263,561.62	784,124.41
R2	Loch Ericht Cottages 2	22,500	263,552.21	784,124.69
R3	Ben Alder Cottages 3	22,500	263,598.58	784,136.44
R4	Ben Alder Cottages 2	22,500	263,615.58	784,141.96
R5	Ben Alder Cottages 1	22,500	263,630.15	784,146.25
R6	Woodside	22,500	263,664.41	784,157.46
R7	Birch View	22,500	263,537.66	784,163.04
R8	Fern Cottage	23,050	263,659.38	784,748.53
R9	Bracken Cottage	23,050	263,667.12	784,756.27
R10	Aldersyde	23,100	263,666.52	784,787.10
R11	Truimbank	23,150	263,721.98	784,812.44
R12	Glenlochsie	23,200	263,733.20	784,857.26
R13	Old Toll House	23,200	263,707.27	784,857.79
R14	The Bungalow	23,200	263,693.64	784,863.08
R15	Glenisla Cottage	23,200	263,762.96	784,867.32
R16	Glenisla	23,200	263,731.87	784,876.98
R17	Repeater Station	23,200	263,781.09	784,891.79
R18	By-the-way	23,150	263,561.51	784,894.32
R19	Tigh Fhothannan	23,200	263,694.17	784,911.77
R20	Truim View 3	23,250	263,785.72	784,921.43
R21	Truim View 2	23,300	263,794.05	784,952.78
R22	Truim View 1	23,300	263,766.40	784,968.52
R23	3 Cuaich Cottage	25,900	265,535.16	787,058.62
R24	5 Cuaich Cottage	25,950	265,547.82	787,077.52
R25	4 Cuaich Cottage	25,950	265,555.38	787,089.34
R26	Cuaich Cottage	25,950	265,562.20	787,094.33

Receptor ID	Description	Chainage (ch.)	X	Y
R27	Cuaich Farm	26,000	265,608.21	787,109.09
R28	2 Cuaich Cottage	26,000	265,570.80	787,112.65
R29	1 Cuaich Cottage	26,050	265,572.15	787,174.67
R30	Truim Cottage	30,900	267,621.45	791,303.23

16.3.11 Given that regional background pollutant concentrations (less than 3.0 µg m^{-3} for NO_2) are below AQS objectives (less than 10% of the objective for NO_2), it is highly likely that current baseline NO_2 and PM_{10} concentrations meet annual mean AQS objectives at all noted receptors within the vicinity of the Proposed Scheme. It would also be expected that the short term AQS objectives (1 and 24 hour limits for NO_2 and PM_{10} respectively) are also met.

Ecological Designated Sites

16.3.12 The River Spey SAC and Drumochter Hills SSSI designated sites have been identified within 200 m of the Proposed Scheme (see **Drawing 16.1** contained in **Volume 3** of this report). Two other internationally designated sites (Drumochter Hills SAC and SPA) are located more than 200 m from the A9; they are unlikely to be affected and have therefore not been considered further.

16.3.13 Drumochter Hills SSSI contains ecological features that could be sensitive to changes in nitrogen levels, which can have direct and indirect effects on vegetation affecting species composition and ecosystem health. The River Spey SAC; however, is designated only for faunal species (Atlantic salmon, freshwater pearl mussel, otter and sea lamprey) which are not known to be impacted by nitrogen. As the site is not designated for vegetation, the River Spey SAC was excluded from the nitrogen assessment of ecological effects of the Proposed Scheme.

16.3.14 APIS reports baseline nitrogen deposition data for 2013 (as the average of the period from 2012 to 2014) on a grid with a resolution of 5 km^2. This was projected forward to the base year (2015) and the opening year (2026), assuming a 2% decrease per year (HA 207/07). **Table 16-7** summarises this information below.

Table 16-7: Designated site critical loads for nitrogen deposition and baseline nitrogen deposition (kg N ha^{-1} yr^{-1})

Designated Site	Habitat Type	Critical Load	Nitrogen Deposition (Average 2012 – 2014)	Base Year (2015) Nitrogen Deposition	Opening Year (2026) Nitrogen Deposition
Drumochter Hills SSSI	Alpine and subalpine grasslands	5-10	8.5	8.2	6.5
	Montane - Moss and lichen dominated mountain summits	5-10	8.5		

16.3.15 Baseline nitrogen deposition rates are not within acceptable limits in the base year, being above the lower limit of the critical load range for both habitats located within Drumochter Hills SSSI.

16.3.16 It is important to note that there is uncertainty attached to these APIS values, which has implications for the interpretation of the data. Critical loads are based on empirical data from field experiments and observations. There is high uncertainty associated with these values as they are based on professional judgement. There are also uncertainties associated with land use cover maps that are used to assign broad habitats, with default values often based on very few measurements from a limited number of sites in the UK. Similarly, baseline nitrogen deposition is provided on a 5 km grid, which does not account for sub-grid variability.

16.3.17 **Table 16-8** presents a summary of the receptors considered in each part of the construction and operational assessments of local air quality. Ecological receptors in the Drumochter Hills SSSI represent medium sensitivity habitats, as despite Drumochter Hills as a site of designated importance, the dust sensitivity impact on plant species is uncertain but it may contain features that may be affected by dust deposition.

Regional Assessment

16.3.18 The regional assessment did not consider the impacts of the Proposed Scheme at individual receptors, rather the wider impacts of total emissions from the road network. The sum of pollutant contributions from individual traffic links is considered instead.

Summary

16.3.19 **Table 16-8** summarises the key receptors considered in each assessment of air quality impacts, as shown in **Drawings 16-3 to 16-6**, contained in **Volume 3**.

Table 16-8: Summary of key receptors considered in each assessment of air quality impacts

Assessment (Phase)	Description
Local Air Quality (Operational)	Residential properties in Dalwhinnie, group of properties approximately 3 km north of Dalwhinnie, and one near Crubenmore: R1-R30
Ecological (Operational)	Five ecological receptors within one transect extending from the A9, including the Drumochter Hills SSSI (E1-E5).
Dust (Construction)	Human receptors: 21 high sensitivity, 2 medium sensitivity, 0 low sensitivity. Ecological receptors: medium sensitivity receptors within 20 m and 50 m of the works boundary.

16.4 Potential Impacts Assessment

Impact Assessment Introduction

16.4.1 This sub-section considers the potential temporary (construction) and permanent (operational) air quality impacts for the Proposed Scheme.

16.4.2 Throughout the DMRB Stage 3 iterative design process, a number of environmentally led workshops considered each aspect of the developing design and made recommendations for certain features to be included in the next design iteration. These aspects have been defined as 'embedded mitigation' and, where they are included in the Proposed Scheme design, they are considered within the context of the impact assessment as providing mitigation to avoid or reduce environmental impacts, and in some cases, provide environmental benefits.

16.4.3 With respect to the topics under consideration in this chapter, the relevant aspects of embedded mitigation include:

- Alignment informed by consideration of proximity to local sensitive receptors (both residential properties and ecological designated sites)

16.4.4 While the impact assessment is undertaken in cognisance of the embedded mitigation features noted above, in order to ensure that all project mitigation requirements (including embedded, specific and generic mitigation) are captured, they have been included within the summary of mitigation section of this chapter, and the Schedule of Environmental Commitments contained in **Chapter 21**.

Construction Impact Assessment: Temporary

16.4.5 The construction assessment addresses potential temporary impacts during demolition, earthworks, construction and track-out (movement of construction plant to/ from the site and associated compounds or waste sites), and the level of mitigation required. Dust emissions can result in dust soiling and lead to elevated PM_{10} concentrations. Elevated dust emissions can also have impacts on vegetation via deposition, which can alter photosynthetic processes and cause damage to sensitive habitats. The construction assessment methodology is presented in detail in **Appendix 16.1 (Volume 2)** to this report. The volume of materials to be used during construction activities is detailed in **Chapter 18** (**Materials**).

16.4.6 Demolition activities along the length of the Proposed Scheme will include, but are not limited to, the existing Allt Coire, Allt Garbh and Allt Cuaich underbridges and the existing SSE Aqueduct near Dalwhinnie. Redundant road signage will be also removed. However, the total building volume to be demolished at each location is expected to be less than 20,000 m^3. Therefore, according to the IAQM guidance, demolition activities have been considered to have a Small magnitude.

16.4.7 A considerable amount of earthworks are needed along the Proposed Scheme, including such activities as vegetation clearance, excavation, and other land manipulation for drainage and the new route. The total area comprising earthworks activities is expected to exceed 10,000 m^2. Therefore Earthworks is assigned a Large magnitude.

16.4.8 Construction activities will involve the placement of the new road and the Dalwhinnie junction, as well as local road realignments to accommodate the junction and alternative access provisions. Based on the estimates in **Chapter 18** and the IAQM (2014) guidance presented in in **Appendix 16.1 (Volume 2)**, the volume of construction is likely to be greater than 100,000 m^3. Construction is therefore assigned a Large magnitude.

16.4.9 There are expected to be more than 50 HGVs one-way movements per day during the construction phase of the Proposed Scheme. Track-out is assigned a Large magnitude.

16.4.10 Following the construction assessment methodology presented in **Appendix 16.1 (Volume 2)**, nineteen (19) high sensitivity receptors, all residential properties, and four (4) medium sensitivity receptors, including a hotel and some shops, have been identified.

16.4.11 Human health impacts also take the local background PM_{10} concentration into consideration as dust emissions will lead to localised increases. Based on the number and sensitivity of human receptors, and the background PM_{10} concentration, the area sensitivity is Low for dust soiling and human health impacts.

16.4.12 Ecological impacts are assessed within 20 and 50 m of the Proposed Scheme permanent works boundary. The River Spey SAC and Drumochter Hills SSSI are both within 20 and 50 m of the permanent works boundary and contain habitats with unknown sensitivities to dust impacts. However, the portion of the ecological designated sites potentially affected by dust emissions is very limited and therefore, the overall area sensitivity to ecological impacts is Medium. Furthermore, the prevailing climatic conditions in the area, with precipitation throughout the year (annual rainfall at Dalwhinnie is around 1217 mm), is likely to mitigate the impact of any dust deposition.

16.4.13 The sensitivity of the area to specific impacts are combined with the estimated magnitudes of construction activities and are used to inform the assessment of the risk of dust impacts from each construction activity. **Table 16-9** presents the risk of dust impacts for dust soiling, human health and ecology for each of the four construction stage activities.

Table 16-9: Overall risk of dust impacts from the four IAQM defined construction activities

Potential Impact	Risk			
	Demolition	Earthworks	Construction	Track-out
Dust Soiling	Low Risk	Medium Risk	Medium Risk	Medium Risk
Human Health	Low Risk	Medium Risk	Medium Risk	Medium Risk
Ecological	Low Risk	Medium Risk	Medium Risk	Medium Risk

16.4.14 There is a medium risk of dust impact for dust soiling, human health and ecological impacts from earthworks, construction and trackout. The risk of impacts is low from demolition. The overall risk of dust impacts for the construction phase of the Proposed Scheme is medium. The level of risk is used to inform relevant mitigation measures, listed in **Section 16.5**, in order to reduce negative impacts from construction.

16.4.15 The risk of impacts presented above represent the worst case. Construction works will span a wide area and will move as various parts of the Proposed Scheme are completed. Therefore, construction dust impacts will be spatially and temporally variable. In addition, meteorological conditions will affect the magnitude of dust emissions; under wet conditions dust emissions are significantly reduced.

Operational Impact Assessment: Permanent

Local Air Quality

16.4.16 Results of the local air quality assessment are presented in **Appendix 16.3 (Volume 2)**. NO_2, PM_{10} and $PM_{2.5}$ concentrations were predicted for the Base Year (2015) and Opening Year (2026) Do-Minimum and Do-Something scenarios.

16.4.17 The background pollution maps and vehicle emission factors assume that air quality improves in future years as older vehicles are replaced with modern cleaner vehicles. However, a report produced on behalf of Defra ('Trends in NO_x and NO_2 emissions and ambient measurements in the UK', Defra 18th July 2011 version) considered NO_2 monitoring data from across the UK and showed that reductions in concentrations had slowed in recent years. This trend is thought to be related to the increased use of modern diesel vehicles which emit more NO_x than expected under urban driving conditions and have higher primary NO_2 emissions than petrol vehicles. To reduce this discrepancy, a LTT gap analysis has been carried out for NO_2, in accordance with IAN 170/12v3 (HA, 2012), using the latest Highway's Agency LTT calculator (2016).

16.4.18 On February 2016, Highways England published an interim note about an alternative long term trends projection methodology for NO_2 called LTT_{E6}. The analysis concluded that the previous LTT was too pessimistic. However, in light of recent studies that seem to confirm that a large number of Euro 6 diesel cars are failing to meet the emission standard, the LTT presented in IAN170 has been used as it was deemed the most conservative approach.

16.4.19 In all scenarios considered, estimated annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$ remain below the AQS objectives. No exceedances of the short term objectives: 1-hour NO_2 or 24-hour PM_{10} AQS objectives are predicted. In addition, according to IAN 174/13 **Table 16-2** and 16-3 a significant effect for local air quality is realised when at least 30 receptors have a Small (i.e. > 0.4 µg/m^3) pollutant impact magnitude.

16.4.20 As presented in **Appendix 16.3 (Volume 2)**, the Proposed Scheme impacts are imperceptible at all receptors for all pollutants considered in this assessment, with only one 'small increase' in NO_2

predicted at Cuaich Farm (R27). This is the closest human health receptor identified to the A9 mainline and therefore is consistent with the expected scheme impacts.

16.4.21 Despite the permanency of impacts, the addition of another carriageway and junction design changes on the A9 leads to imperceptible changes of pollutant concentrations at sensitive human receptors.

16.4.22 Given the low concentrations (well below the AQS objectives) and according to methodology presented in **section 16.2**, the impact on local air quality associated with the Proposed Scheme is considered to be **not significant**.

Regional Air Quality

16.4.23 Regional emissions were predicted for the affected road network in the Base Year (2015), and in the Opening Year (2026) and Design Year (2041) with (DS) and without (DM) the Proposed Scheme scenarios.

16.4.24 NO_X, PM_{10}, and CO_2 emissions are shown to increase for all pollutants due to the Proposed Scheme. Year 2030 emissions were used for the Design Year, as this is the latest year available in the Emission Factor Toolkit. **Table 16-10** below summarises the regional assessment results.

Table 16-10: Results of the regional assessment for the pollutants NO_X, PM_{10} and CO_2

Pollutant	Base 2015	Opening Year 2026		Change due to scheme in 2026 (DS-DM)	% Change	Design Year 2041		Change due to scheme in 2041 (DS-DM)	% Change
		DM	*DS*			*DM*	*DS*		
NO_x (kg yr^{-1})	22,606	7,235	10,887	+3,652	50.7	6,808	10,141	+3,333	48.9
PM_{10} (kg yr^{-1})	1,583	1,438	1,734	+296	20.6	1,541	1,844	+303	19.7
CO_2 (T yr^{-1})	8,699	9,348	12,265	+2,917	31.2	10,098	13,078	+2,980	29.5

16.4.25 A decrease in emissions is predicted for NO_X and PM_{10} between 2015 and the 2026 Do-Minimum scenario. This decrease in emissions is the result of the expected improvement in emissions per vehicle due to fleet turnover to later Euro standards, improved emission technologies and fuel economy. CO_2 emissions increase because, for this specific pollutant, the improved emission technologies are not expected to compensate the increase in the number of vehicles.

16.4.26 Increases in regional emissions are predicted for both opening (DS) and design (DS) years, mainly because the Proposed Scheme is expected to lead to an increase in traffic flows due to the increased capacity. Total vehicle kilometres (vkm) also increase in the opening and design years as a result of the Proposed Scheme design, which also contributes to increased regional emissions. This suggests that the extent of the improvement in emissions per vehicle (due to fleet turnover to later Euro standards, improved emission technologies and fuel economy) is less than the increase in emissions associated with traffic growth. It should be noted that the ARN is limited to the A9 mainline and a few secondary local roads. Relative to the total emissions across Scotland for NO_X, PM_{10} and CO_2, the increase of emissions as a result of the Proposed Scheme is small.

16.4.27 According to Scotland's Air Quality Pollutant Inventory (AQPI) (National Atmospheric Emissions Inventory - NAEI, 2016) total NO_X and PM_{10} emissions from all sectors were 90.8 and 18 kilo-tonnes in 2014 respectively. No future estimate are available. The increase in emissions associated with the Proposed Scheme will not significantly affect regional air quality.

Ecological Designated Sites

16.4.28 The Drumochter Hills SSSI has been identified within 200 m of affected roads, containing habitats that are sensitive to changes in nitrogen levels, including alpine and subalpine grasslands and moss and lichen. Its closest point to the Proposed Scheme is south of the proposed Dalwhinnie junction at around 25 m from the A9 (measured from the centre of the carriageway).

16.4.29 The effects of the Proposed Scheme on habitats within the designated site have been considered along a single transect, extending approximately 25-185 m from the Proposed Scheme. The selected receptors are shown in **Drawing 16.3 (Volume 3)** of this report. The transect was located between ch. 21,500 and 21,550.

16.4.30 Road-traffic contributions have been combined with background concentrations to obtain the total NO_X concentration. Background concentrations used in the assessment of the existing baseline (2015) and opening year (2026) DM and DS are presented in **Table 16-11**. To avoid double counting road contributions, the A9 component of the background NO_X concentration was removed.

Table 16-11: Annual mean background pollutant concentrations (µg m^{-3}) used in the assessment

Receptor	Easting (m)	Northing (m)	Background NO_X	
			Base Year (2015)	Opening Year (2026)
Drumochter Hills SSSI (Receptor Points E1-E5)	264,500	783,500	3.1	2.3

16.4.31 Total NO_X concentrations have been adjusted using the LTT Gap Analysis method discussed in **section 16.2**. **Table 16-12** presents the results of the assessment of NO_X concentrations for Drumochter Hills SSSI.

Table 16-12: Results of the assessment of NO_X (µg m^{-3}) for Drumochter Hills SSSI

Receptor	Distance to A9 Centreline (m)		Base	DM	DS	Impact	Magnitude of Change
	Base and DM	DS					
E1	25.0	20.3	15.7	10.2	16.4	6.2	Large
E2	65.3	60.5	7.9	5.0	6.3	1.3	Small
E3	105.3	100.5	5.3	3.3	3.8	0.5	Small
E4	145.3	140.5	4.3	2.7	2.9	0.2	Imperceptible
E5	185.3	180.5	3.4	2.1	2.1	0.0	Imperceptible

16.4.32 NO_X concentrations are below the objective of 30 µg m^{-3} in all scenarios. Increases in NO_x concentrations are a result of changes to the alignment of the A9 mainline by approximately 5 m closer to Drumochter Hills SSSI. Traffic flow increase along the A9 for the Proposed Scheme also contributes to this increase of NO_X.

16.4.33 IAN 174/13 guidance recommends that the NO_2 impact magnitude criteria in **Table 16-2** are also used to assess the Proposed Scheme impacts on NO_X, as set out in **Table 16-12**. Where a potentially significant effect is evident due to NO_X concentrations, the nitrogen deposition rates would further assist in the evaluation of significance.

16.4.34 Results for the assessment of NO_X in Drumochter Hills SSSI do not constitute a significant effect as Project 8 does not lead to any exceedances of the NO_X objective (30 µg m^{-3}). Nitrogen deposition rates would therefore not be expected to influence the nitrogen deposition on these habitats and were not assessed further.

16.5 Mitigation and Monitoring Requirements

16.5.1 The findings of the assessment presented in **section 16.4** are used to inform relevant mitigation measures for the operational and construction phases of the Proposed Scheme, where required, to mitigate significant adverse impacts. **Table 16-13** presents standard mitigation measures that are common to the A9 Dualling projects and specific to Project 8.

16.5.2 The operational impacts area anticipated to be not significant and therefore no air quality specific mitigation measures have been identified for the operation of the Proposed Scheme.

Table 16-13: Proposed mitigation measures – air quality and construction dust

Mitigation Item	Approximate Chainage/ Location	Timing of Measure	Description	Mitigation Purpose/ Objective	Specific Consultation or Approval Required
Standard A9 Mitigation					
SMC-AQ1	Throughout proposed scheme	Construction	In relation to minimising fugitive dust emissions from earthworks, material storage and concrete batching the following mitigation items will be implemented: • stockpiles and mounds will be at a suitable angle of repose to prevent material slippage, will be enclosed or securely sheeted, and/or kept damped as necessary during dry weather; • the surfaces of any long-term stockpiles which give rise to a risk of dust or air pollution will be covered with appropriate sheeting or will be treated to stabilise the surfaces; • mixing of large quantities of concrete will be carried out only in enclosed or shielded areas; • all handling areas will be maintained in a dust free state as far as is practicable with sprinklers and hoses used to prevent dust escaping from the site boundaries; and • procedures will be established so that the site is regularly inspected for spillage of dusty or potentially dusty materials and any such spillage will be dealt with promptly where necessary to prevent dust nuisance.	To reduce fugitive dust emissions from earthworks, material storage and concrete batching.	None required
SMC-AQ2	Throughout proposed scheme	Construction	In relation to minimising dust from vehicle movements within the site the following mitigation items will be implemented: • the Contractor will employ appropriate measures, such as covering materials deliveries or loads entering and leaving the construction site by a fixed cover or sheeting appropriately fixed and suitable for the purposes of preventing materials and dust spillage; • where unsurfaced routes are identified as creating dust emissions during periods of dry weather, surfaces will be regularly dampened down using water bowsers; and • appropriate speed limits will be established and enforced over all unmade surfaces.	To reduce dust from vehicle movements.	None required
SMC-AQ3	Throughout proposed scheme	Construction	In relation to appropriate cleaning of public roads the following mitigation items will be implemented: • wheel washing facilities will be installed as required and heavy vehicles will be required to use the facilities prior to leaving the site; • subject to approval from the Roads Authority, public roads immediately outside the site entrance will be cleaned using vacuum sweeper brushes and other specialised road cleaning equipment as necessary to maintain an appropriate state of cleanliness; and • roads and footpaths adjacent to the proposed scheme will be cleaned, with damping if necessary.	To reduce potential of dust from public roads	Approval required from the Roads Authority

16.6 Residual Impacts

16.6.1 During the construction of the Proposed Scheme, construction activities have the potential to give rise to fugitive dust. However, with appropriate mitigation, short-term impacts can be minimised during construction works.

16.6.2 No mitigation is proposed for operational air quality but impacts are predicted to be not significant.

Table 16-14: Summary of air quality residual impacts - mainline options

Environmental topic	Residual Impacts – Air quality and construction dust
Air Quality – During Construction	No significant impact with mitigation in place
Air Quality – During operation	Not significant

16.7 Overall Evaluation of Significant Effects

16.7.1 The overall impact of the scheme follows the guidance presented in IAN 174/13, whereby the professional judgement of the significance determination is presented in terms of specific scheme-related questions. **Table 16-15** presents the evaluation of significant air quality effects of the Proposed Scheme.

Table 16-15: Summary of air quality residual impacts - mainline options

Key Criteria Questions	Yes / No
Is there a risk that environmental standards will be breached?	No
Will there be a large change in environmental conditions?	No
Will the effect continue for a long time?	Yes
Will many people be affected?	No
Is there a risk that designated sites, areas, or features will be affected?	No
Will it be difficult to avoid, or reduce or repair or compensate for the effect?	No
On Balance is the Overall Effect Significant?	No

16.7.2 The area surrounding the Proposed Scheme is sparsely populated with few sources of air pollution, therefore background concentrations are low. Despite the permanency of dualling, the addition of another carriageway and junction design changes on the A9 leads to imperceptible changes of pollutant concentrations at both sensitive human and ecological receptors. Impacts are therefore considered to be not significant.

16.8 References

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