

A417 Missing Link

Preliminary Environmental Information Report

Chapter 5 Air Quality - Appendices

28 September 2020

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Appendix 5.1
Legislation Policy and Guidance

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1 Legislation policy and guidance

1.1 European legislation

- 1.1.1 The EU Directive on ambient air quality (2008/50/EC) sets out a range of mandatory Limit Values (LV) for different pollutants including nitrogen dioxide (NO₂) and particulate matter less than 10 microns (PM₁₀) in diameter, the key traffic related pollutants. The directive consolidated previous air quality directives (apart from the Fourth Daughter Directive), setting Limit Values or Target Values for the concentrations of specific air pollutants and providing a new regulatory framework for particulate matter less than 2.5µm in diameter (PM_{2.5}). It also allows Member States to apply to postpone attainment deadlines.
- 1.1.2 Defra assess and report annually on compliance with the LVs (Table 1-1) to the European Commission. For the purposes of their assessment and reporting, the UK is divided into 43 zones. The status of each zone in relation to a LV is determined within the compliance assessment by the maximum measured or maximum modelled concentrations in the zone. The main pollutants of concern with respect to compliance are NO₂ and PM₁₀. The Air Quality Standards (Amendment) Regulations 2016 transpose into English law the requirements of the Directive 2008/50/EC on ambient air quality.
- 1.1.3 EU LVs apply throughout the zones and agglomerations, the zone/agglomerations achieve compliance when every site listed in the zone/agglomeration is below the EU LV. The exceptions to where the EU Limit Values apply are given in Annex III of the Air Quality Directive, they are, locations that members of the public cannot access or where there is no fixed habitation, for instance, industrial premises etc.

1.2 National legislation

- 1.2.1 Part IV of the Environment Act (1995) requires the UK Government to produce a national air quality strategy (AQS) which contains standards, objectives and measures for improving ambient air quality. The AQS sets out objectives that are maximum ambient concentrations that are not to be exceeded either without exception or with a permitted number of exceedances over a specified timescale.
- 1.2.2 The ambient air quality standards and objectives are given statutory backing in England through the Air Quality (England) Regulations 2010. The AQS objectives for the protection of human health and applicable to this assessment are presented in Table 1-1.

Table 1-1 Air quality objectives and EU limit values for NO₂ and PM₁₀

| Air quality objectives and European directives for the protection of human health | | | | | |
|--|-----------------------|---|------------------------|--|------------------------|
| Air quality objectives | | | | EU limit values | |
| Pollutant | Concentration | Averaging period | Compliance date | Concentration | Compliance date |
| NO ₂ | 200 µg/m ³ | 1-hour mean (not to be exceeded more than 18 times per year) | 31 December 2005 | 200 µg/m ³ (18 exceedances) | 1 January 2010 |
| | 40 µg/m ³ | annual mean | 31 December 2005 | 40 µg/m ³ | 1 January 2010 |
| PM ₁₀ | 50 µg/m ³ | 24-hour mean (not to be exceeded more than 35 times per year) | 31 December 2010 | 50 µg/m ³ (35 exceedances) | 1 January 2005 |
| | 40 µg/m ³ | annual mean | 31 December 2004 | 40 µg/m ³ | 1 January 2005 |

1.2.3 The Air Quality Objectives only apply where members of the public are likely to be regularly present for the averaging time of the objective (i.e. where people will be exposed to pollutants). The annual mean objectives apply to all locations where members of the public might be regularly exposed; these include building façades of residential properties, schools, hospitals, care homes, etc. The 24-hour mean objective applies to all locations where the annual mean objective would apply, together with hotels and gardens of residential properties. The 1-hour mean objective also applies at these locations and at any outdoor location where a member of the public might reasonably be expected to stay for one hour or more, such as shopping streets, parks and sports grounds, as well as bus stations and railway stations that are not fully enclosed.

1.2.4 The AQS objectives and EU LVs for the protection of vegetation and ecosystems applicable to this assessment are presented in Table 1-2.

Table 1-2 Air quality objectives and EU limit values for the protection of vegetation

| Air quality objectives and European directives for the protection of vegetation and ecosystems | | | | | |
|---|-----------------------|-------------------------|------------------------|------------------------|------------------------|
| Air quality objectives | | | | EU limit values | |
| Pollutant | Concentration | Averaging period | Compliance date | Concentration | Compliance date |
| NO _x | 30 µg.m ⁻³ | Annual mean | 31 December 2000 | 30 µg.m ⁻³ | 19 July 2001 |

1.2.5 Local authorities have no legal requirement to comply with AQS objectives. They are however required to demonstrate best efforts to work towards achieving AQS objectives.

1.2.6 Under the Local Air Quality Management (LAQM) regime local authorities have a duty to make periodic reviews of local air quality against the AQS objectives. Where a local authority's review and assessment of local air quality indicates that

AQS objectives are not expected to be achieved, local authorities are required to designate an Air Quality Management Area (AQMA). An Air Quality Action Plan (AQAP) must then be formulated, outlining a plan of action to meet AQS objectives in the AQMA.

1.3 AQS objectives/EU limit values

- 1.3.1 Whilst AQS objectives and EU LVs are identical in terms of concentrations that are applied, they are different, and it is important to understand how they are interpreted and therefore assessed. Local authorities are required to demonstrate best efforts to achieve the AQS objectives whereas the UK government has a mandatory requirement to achieve EU Limit Values.
- 1.3.2 Reporting against compliance with EU Limit Values is undertaken by Defra and reported at a zone/agglomeration level. Zones/agglomerations only comply when everywhere in the zone is below the EU Limit Value and this is the basis of Defra's reporting, which is designed to determine what the maximum concentration is in the zone and hence determine the date by which the zone will comply with the Limit Value. AQS objectives are assessed at a much more local level where an AQMA can be designated as a result of exceedance at individual properties.
- 1.3.3 The air quality assessment will consider the impacts on both AQS objectives (does the proposed scheme lead to a significant impact on air quality at individual properties) and EU LVs (will the proposed scheme impact Defra's plans to achieve compliance with the LVs).

1.4 Environmental Protection Act 1990

- 1.4.1 Generally, dust is only a cause of annoyance but when of sufficient scale and frequency it may become a statutory nuisance. The relevant legislation dealing with statutory nuisance is given in Part III of the Environmental Protection Act 1990 (EPA 1990). A statutory nuisance in relation to dust and deposits is defined under Section 79 of the act as follows:
- (d) Any dust, steam, smell or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisance.
 - (e) any accumulation or deposit which is prejudicial to health or a nuisance.
- 1.4.2 Under the provisions of the Act where a local authority is satisfied that a Statutory Nuisance exists, it is under a mandatory duty to serve an Abatement Notice requiring abatement or cessation of one or more activities deemed to be causing the nuisance. In the absence of any kind of standard, identification of a nuisance is dependent on the professional judgement of the local authority as to whether Best Practical Means (BPM) are being employed to control emissions. If BPM is evident or can be clearly demonstrated then a particular activity cannot be deemed to be causing a Statutory Nuisance.

1.5 National Planning Policy Framework (NPPF)

- 1.5.1 The NPPF published in 2012 and revised in February 2019 sets out the Government's planning policies for England and how these are expected to be applied. The NPPF revokes 44 planning documents including: Planning Policy Statement 23: Planning and Pollution Control.
- 1.5.2 Paragraph 181 considers impacts of developments on air quality:

‘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. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan.’

1.5.3 The NPPF therefore requires:

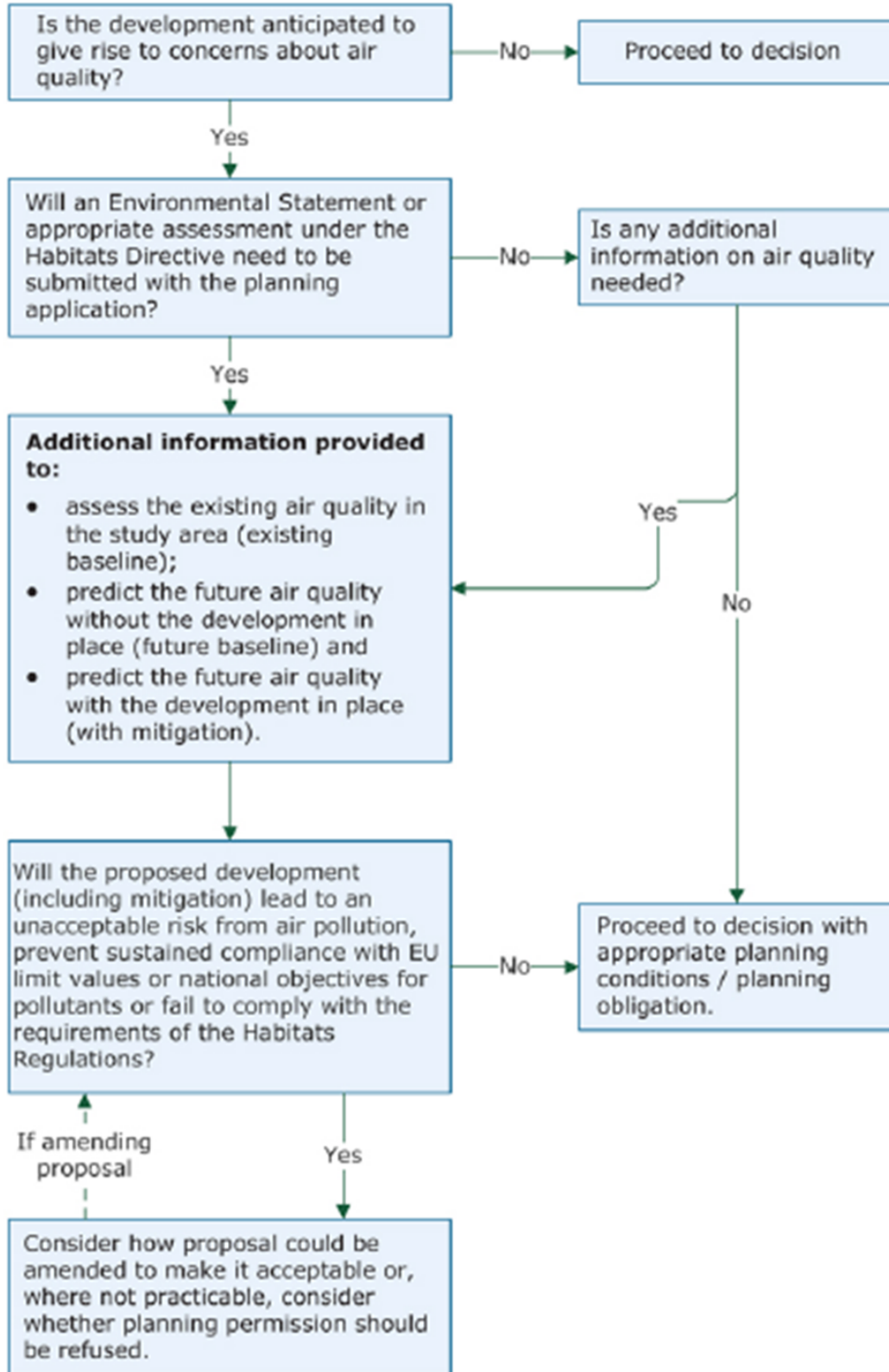
- consideration of the scheme air quality impacts should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones; and
- consideration of opportunities to improve air quality or mitigate impacts, such as through traffic and travel management, and green infrastructure provision and enhancement.

1.5.4 However, the NPPF does not provide guidance on how to come to a judgement on sustaining compliance with the Air Quality Directive.

1.6 National planning practice guidance

1.6.1 Figure 1-1 of this appendix presents the National Planning Practice Guidance (NPPG) flowchart which provides guidance on the process for reviewing planning applications.

Figure 1-1 National Planning Practice Guidance (NPPG) flowchart



1.7 National Policy Statement for National Networks (NPSNN)

- 1.7.1 NPSNN sets out the Government's policies to deliver the development of nationally significant infrastructure projects (NSIPs) on the national road and rail networks in England. The Secretary of State (SoS) uses the NPSNN as the primary basis for making decisions on development consent applications for national network NSIPs in England.
- 1.7.2 Sections 1.7.3 to 1.7.5 provide the context of when the decision maker should give substantive consideration to air quality impacts and whether they should recommend refusal.
- 1.7.3 Air quality considerations are likely to be particularly relevant where schemes are proposed:
- Within or adjacent to AQMAs; and
 - Where changes are sufficient to bring about the need for a new AQMA or change the size of an existing AQMA; or bring about changes to exceedances of the Limit Values, or where they may have the potential to impact on nature conservation sites.
- 1.7.4 Further information on areas exceeding UK AQS objective or EU limit value thresholds is available from Defra's Pollution Climate Mapping (PCM) model. This model provides predicted annual mean NO₂ concentrations. The SoS must give air quality considerations substantial weight where, after taking into account mitigation, a project would lead to a significant air quality impact in relation to EIA and/or where they lead to a deterioration in air quality in a zone/agglomeration.
- 1.7.5 The SoS should refuse consent where, after taking into account mitigation, the air quality impacts of the proposed 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.

1.8 Dust

- 1.8.1 Dust is the generic term used in *British Standard BS 6069 Characterization of air quality, Glossary (Part Two)*¹ to describe particulate matter in the size range 1–75µm in diameter. Under provisions in the Environmental Protection Act 1990 dust nuisance is defined as a statutory nuisance.
- 1.8.2 There are currently no formal standards or guidelines for dust nuisance in the UK. In addition, formal dust deposition standards are not specified. This reflects the uncertainties in dust monitoring technology and the highly subjective relationship between deposition events, surface soiling and the perception of such events as a nuisance. Complaints about excessive dust deposition would have to be investigated by the local authority and any complaint upheld for a statutory nuisance to occur. However, dust deposition is generally managed by suitable on-site practices and mitigation rather than by the determination of statutory nuisance and/or prosecution or enforcement notice(s).

1.9 Regional management and planning policy

Cotswolds AONB Management Plan 2018-2023

- 1.9.1 The management plan acknowledges that air quality may be improved through major development. Policy CE11: Major Development states:

‘Any upgrade of the Air Balloon junction should also help to deliver the objectives of the Air Quality Action Plan for this Air Quality Management Area, by reducing nitrogen dioxide levels at the junction.’

Gloucestershire’s Local Transport Plan 2015-2031

- 1.9.2 Gloucestershire County Council (GCC) is responsible for the maintenance and development of the highway network for a number of district councils within the Gloucestershire area.

- 1.9.3 Policy LTP PD 4.9 Environment of the Local Transport Plan states:

‘GCC will work with District Councils to improve air quality, levels of noise pollution and biodiversity loss resulting from traffic on the highway network.’

Joint Core Strategy for Gloucester, Cheltenham and Tewkesbury (JCS) 2011-2031 (December 2017)

- 1.9.4 The Joint Core Strategy (JCS) is a coordinated development strategy between Tewkesbury Borough Council, Gloucester City Council and Cheltenham Borough Council.

- 1.9.5 Policy SD3: Sustainable Design and Construction, states:

‘Development proposals will demonstrate how they contribute to the aims of sustainability by increasing energy efficiency, minimising waste and avoiding the unnecessary pollution of air, harm to the water environment, and contamination of land or interference in other natural systems.’

1.10 Local planning policy

- 1.10.1 The study area for the air quality assessment covers a number of local authority areas. The Scheme is located within the administrative areas of Cotswold District Council and Tewksbury District Council. However, changes in traffic across the network as a result of the Proposed Scheme are predicted in adjacent planning authorities. Planning policy relating to air quality for each of the local planning authorities within the study area are outlined below. These local policies have been taken into account in the air quality assessment for the project.

Cheltenham Local Plan (Pre-submission) 2011-2031

- 1.10.2 The new Cheltenham Plan was submitted to the Secretary of State for independent inspection in October 2018. Whilst there is not a specific policy in the Local Plan to address air quality, it acknowledges that transport choice can have an impact on emissions of pollutants.

Cotswold District Council Local Plan 2011-2031

- 1.10.3 The local plan recognises that air quality is a problem in certain parts of the local authority area and that particular caution will be applied in or close to designated AQMAs.

- 1.10.4 Policy EN15 Pollution and Contaminated Land, states:

‘Development will be permitted that will not result in unacceptable risk to public health or safety, the natural environment or the amenity of existing land uses through:

a. Pollution of the air, land, surface water, or ground water sources’

Gloucester City Council Draft Local Plan 2016-2031

1.10.5 The draft local plan for 2016-2031 was consulted on between 16th January 2017 and 27th February 2017. The draft contains reference to Policy D10: Air quality which specifies that *‘development proposals will ensure that development is not contributing to poor air quality’*.

1.10.6 Policy H1: Sustainable Transport, also recognises poor air quality as a key issue in AQMAs to be addressed by developing sustainable transport.

South Gloucestershire Council Local Plan (Core Strategy) 2006 – 2027

1.10.7 The core strategy was adopted in December 2013. Policy CS9 – Managing the Environment and Heritage, focuses on protection and management of the environment. The policy states:

‘New development will be expected to: protect land, air and aqueous environments, buildings and people from pollution.’

1.10.8 Consultation is currently being held to implement the updated South Gloucestershire Local Plan (2018-2036).

Stroud District Council Local Plan 2015-2031

1.10.9 The local plan has one policy that addresses air quality.

1.10.10 ES5 Air quality, states:

‘Development proposals which by virtue of their scale, nature or location are likely to exacerbate existing areas of poor air quality, will need to demonstrate that measures can be taken to effectively mitigate emission levels in order to protect public health and wellbeing, environmental quality and amenity. Mitigation measures should demonstrate how they will make a positive contribution to the aims of any Air Quality Strategy for Stroud District.’

Swindon Borough Local Plan 2026

1.10.11 The local plan was adopted in March 2015. It has a number of objectives to address issues of pollution and congestion in Swindon.

1.10.12 Policy TR1: Sustainable Transport Networks, states:

‘The Council will use its planning and transport powers to help reduce the need to travel, and support and encourage the sustainable, safe and efficient movement of people and good within and through the Borough. This will be achieved by:

- *Minimising emissions from transport by:*
 - *Reducing the need to travel*
 - *Promoting sustainable travel choices*
 - *Personal workplace and school travel planning*

- *Designing the built environment to encourage healthy lifestyles and travel choices.*

1.10.13 Policy EN7: Pollution, focuses on development that leads to emissions of pollutants. The policy states:

‘Development that is likely to lead to emissions of pollutants such as noise, light, vibration, smell, fumes, smoke, soot, ash, dust, grit or toxic substances that may adversely affect existing development and vulnerable wildlife habitats, shall only be permitted where such emissions are controlled to a point where there is no significant loss of amenity for existing land use or habitats.’

Tewkesbury Borough Council Draft Local Plan 2011-2031

1.10.14 The draft local plan for 2011-2031 was consulted on between 10th October and 30th November 2018 and it is yet to be published. The draft contains reference to policies in the Local Transport Plan which are aimed at reducing air pollution and carrying out air quality assessments when it is considered that air quality may be impacted by development. The draft also defers to the Joint Core Strategy for additional air quality related development policy. This is discussed in sections 1.9.4 and 1.9.5.

West Berkshire Core Strategy (2006 – 2026)

1.10.15 The Core Strategy forms part of the West Berkshire local plan as a development plan document (DPD). Although air quality is not explicitly mentioned in a policy, policies such as Transport (CS 13) mention that ‘Development that generates a transport impact will be required to:

... ‘Minimise the impact of all forms of travel on the environmental and help tackle climate change’

... ‘Reduce the need to travel’.

West Oxfordshire Local Plan 2031

1.10.16 The local plan was adopted in September 2018 and provides a framework for planning between 2011 and 2031. Air quality is mentioned as part of Policy OS3: Prudent use of natural resources:

‘All development proposals (including new buildings, conversions and the refurbishment of existing building stock) will be required to show consideration of the efficient and prudent use and management of natural resources, including:

... minimising waste and making adequate provision for the re-use and recycling of waste; and causing no deterioration and, where possible, achieving improvements in water or air quality.’

1.10.17 One of the transport related objectives (CO16) ensures the District will ‘*Enable improvement in water and air quality*’.

1.10.18 Policy EH8: Environmental protection states ‘*Where appropriate, development will need to be supported by an air quality assessment*’.

Wiltshire Council Local Plan (Core Strategy) 2026

1.10.19 The core strategy was adopted in January 2015. Core Policy 55: Air quality, recognises that a key contributor to air quality issues is emissions from transport. It states that:

'Development proposals, which by virtue of their scale, nature or location are likely to exacerbate existing areas of poor air quality, will need to demonstrate that measures can be taken to effectively mitigate emission levels in order to protect public health, environmental quality and amenity. Mitigation measures should demonstrate how they will make a positive contribution to the aims of the Air Quality Strategy for Wiltshire and where relevant, the Wiltshire Air Quality Action Plan.'

End notes and References

¹ British Standard BS 6069 Characterization of air quality, Glossary (Part two)

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Appendix 5.2
Air Quality Operational Assessment Methodology

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1 Operational assessment methodology

1.1 Introduction

1.1.1 This section includes details used in the operational assessment for air quality.

Dispersion model and set up

1.1.2 The ADMS-Roads model (version 5.0.0) developed by Cambridge Environmental Research Consultants Ltd (CERC) has been used for this assessment. ADMS-Roads is a detailed atmospheric dispersion model, which focuses on road traffic as a source of pollutant emissions.

1.1.3 The model takes into account emissions from light and heavy duty vehicles, travelling at specified speeds along a road 'link' over a period of one hour, and predicts the dispersion of these emissions using appropriate historical meteorological data.

Traffic emissions

1.1.4 Traffic data has been provided for the air quality assessment by the Arup transport team. Road traffic emissions were calculated using the emission factors provided in the latest version (version 2.3) of Highways England speed band emissions factors spreadsheet¹.

NO_x to NO₂ conversion

1.1.5 The main air quality chapter sets out the approach to NO_x to NO₂ conversion. Defra background maps and associated tools were updated from a 2015 base year to a 2017 base year in May 2019. The base year in the assessment is 2016. Traffic data and monitoring data for 2016 has been provided and collected for the assessment.

1.1.6 The update to the Defra backgrounds showed that the 2015 base year maps were predicting concentrations which were lower than the updated 2017 predictions. Therefore, whilst the updated 2017 maps do not include 2016 data, the data for 2017 in the updated maps is considered to be more representative of 2016 than those provided from the 2015 base year.

1.1.7 In addition, it is not considered appropriate to use 2015 base year maps and associated tools for the model verification and to switch to 2017 data for the future year assessment. Therefore, the 2017 background maps and tools have been used throughout this assessment.

Minimum Monin-Obukhov length and surface roughness

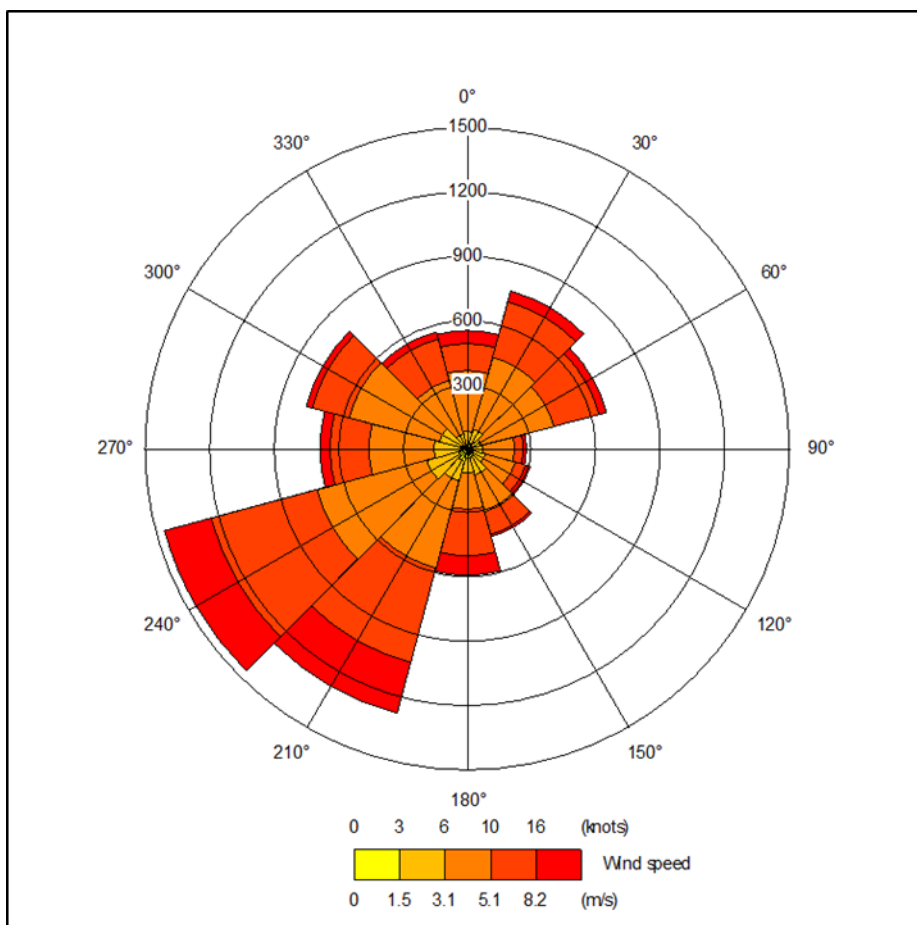
1.1.8 The minimum Monin-Obukhov length describes the minimum stability of the atmosphere. For this model, a length of 10m was used representing the rural nature of the region.

1.1.9 The amount of mechanical turbulence (and hence, mixing) in the atmosphere is affected by the surface/ground over which the air is passing. Typical surface roughness values range from 1.5m (for cities, forests and industrial areas) to 0.0001m (for water or sandy deserts). In this assessment, a surface roughness of 0.3m was used, which represents the agricultural nature of the area.

Meteorological data

- 1.1.10 Meteorological data for one year (2016) from the Little Rissington meteorological monitoring station was used in the dispersion modelling. The Little Rissington meteorological monitoring station is located 27km east of the proposed scheme.
- 1.1.11 Most dispersion models of roads do not use meteorological data if they relate to calm winds conditions, as dispersion of air pollutants is more difficult to calculate in these circumstances. ADMS-Roads treats calm wind conditions by setting the minimum wind speed to 0.75m/s. LAQM TG.162 guidance states that the meteorological data file is tested in a dispersion model and the relevant output log file checked to confirm the number of missing hours and calm hours that cannot be used by the dispersion model. This is important when considering predictions of high percentiles and the number of exceedances. The guidance recommends that meteorological data should only be used if the percentage of usable hours is greater than 75% and preferably greater than 90%.
- 1.1.12 The meteorological data selected from Little Rissington includes greater than 95% of usable data. This is above the 90% threshold and this data therefore meets the requirement of the Defra guidance.
- 1.1.13 The wind rose at Little Rissington (2016) is provided in Figure 1-1 of this appendix. The wind rose indicates that the study area is affected by predominantly south-westerly winds.

Figure 1-1 Wind rose for Little Rissington for 2016



End notes & References

¹ Highways England speed band emission factors for use with DMRB (version 2.3)

² Department for Environment Food & Rural Affairs, "Local Air Quality Management Technical Guidance (TG16)," 2018.

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Appendix 5.3
Air Quality Receptors

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1 Air quality receptors

1.1 Human receptors

1.1.1 A total of 91 receptors were included in the assessment. They were selected using professional judgement and the following criteria:

- within 200m of the Affected Road Network (ARN);
- representativeness of the receptor of the maximum effects of the proposed scheme in that region; and
- at risk of exceeding the annual mean NO₂ Air Quality Objective (AQO).

1.1.2 All locations, referred to as 'receptors' are treated as being equally sensitive. The locations are shown in the human receptors drawing PEI report Figure 5.3. The human receptors have been modelled at a height of 1.5m, to be representative of pollution exposure.

1.2 Ecological receptors

1.2.1 There are 26 designated habitat sites¹ within 200m of the ARN have been identified, which are sensitive to nitrogen. These sites and their habitat type are shown in Table 1-1. Critical loads² for designated habitat sites are presented in Table 1-2.

1.2.2 The designated habitats have been included in the air quality modelling assessment, and have been modelled at a height of 0m, to be representative of ground level vegetation. Transects have been modelled at ecological sites away from the road. The locations modelled are shown in Table 5-3.

1.2.3 Ecological receptor locations are presented in PEI report Figure 5.4.

Table 1-1 Designated habitats used in the assessment

| Site name | Designation | Habitat |
|---|--|--|
| Crickley Hill and Barrow Wake | SSSI | Broad-leaved, mixed and yew woodland Calcareous grassland |
| Cotswold Commons and Beechwoods/Bucklewoods | Ancient Woodland (AW), SSSI, Special Areas of Conservation (SAC) | Broad-leaved, mixed and yew woodland Calcareous grassland |
| Cotswold Beechwood | SAC | Asperuulo-Fagetum beech forests Semi-natural dry grasslands and scrubland facies on calcareous substrates |
| Hucclecote Meadows | SSSI, Local Wildlife Site (LWS), Local Nature Reserve (LNR) | Neutral grassland |
| North Meadows and Clattinger Farm | SAC | Lowland hay meadows |
| Lineover Wood | SSSI, Ancient Woodland (AW) | Broad-leaved, mixed and yew woodland |
| Westwell Gorse | SSSI | Woodland |

¹ Designated habitats, as defined in DMRB LA 105, include Ramsar sites, special protection areas, special areas of conservation, sites of special scientific interest, local nature reserves, local wildlife sites, nature improvement areas, ancient woodland and veteran trees.

² Critical loads have been taken from the Air Pollution Information Site (<http://www.apis.ac.uk>).

| Site name | Designation | Habitat |
|--|-------------------------------------|--|
| Leckhampton Hill and Charlton Kings Common | SSSI | Broad-leaved, mixed and yew woodland Calcareous grassland |
| North Meadow, Cricklade | SSSI, National Nature Reserve (NNR) | Neutral grassland |
| Chatcombe Wood | AW | Woodland |
| Ancient Woodland near Michaelwood services | AW | Woodland |
| Ancient Woodland near Broad Blunsdon | AW | Woodland |
| Cleevely Wood | AW | Woodland |
| Cowley/Wards Woods | AW | Woodland |
| Daniels Wood | AW | Woodland |
| Furzeground Wood | AW | Woodland |
| Hartley Wood | AW | Woodland |
| Michael Wood North | AW | Woodland |
| Mole Grove | AW | Woodland |
| Park Wood | AW | Woodland |
| Strays Grove | AW | Woodland |
| Ullenwood | AW | Woodland |
| Charlton Kings Railway Line | LWS | Grassland and Woodland |
| Cockleford Marsh and Banks | LWS | Grassland |
| Hartley Hill Field | LWS | Grassland |
| Marlborough Downs | Nature Improvement Area (NIA) | Grassland |

Table 1-2 Ecological receptors for nitrogen deposition critical loads

| Designated site | Designation | Habitat | Total background nitrogen deposition (kg N/ha/yr) | | | Empirical critical load (kg N/ha/yr) |
|---|-------------|---|---|------|---------|--------------------------------------|
| | | | Max | Min | Average | |
| Crickley Hill and Barrow Wake | SSSI | Broad-leaved, mixed and yew woodland Calcareous grassland | 35.4 | 35.4 | 35.4 | 10 – 20 |
| Cotswold Commons and Beechwoods | SSSI | Broad-leaved, mixed and yew woodland Calcareous grassland | 29.8 | 29 | 29.5 | 10 – 20 |
| Cotswold Beechwood | SAC | Asperuulo-Fagetum beech forests Semi-natural dry grasslands and scrubland facies on calcareous substrates | 29.8 | 29 | 29.6 | 10 – 20 |
| Hucclecote Meadows | SSSI | Neutral grassland | 17.9 | 17.9 | 17.9 | 20 – 30 |
| North Meadows and Clattinger Farm | SAC | Lowland hay meadows | 19.6 | 17.6 | 18.5 | 20 – 30 |
| Lineover Wood | SSSI | Broad-leaved, mixed and yew woodland | 29.1 | 29.1 | 29.1 | 15 – 20 |
| Westwell Gorse ^a | SSSI | Downy-Fruited Sedge | n/a | n/a | - | - |
| Leckhampton Hill and Charlton Kings Common | SSSI | Broad-leaved, mixed and yew woodland Calcareous grassland | 35.4 | 29.1 | 30.9 | 10 – 20 |
| North Meadow, Cricklade | SSSI | Neutral grassland | 19.6 | 19.5 | 19.6 | 10 - 20 |
| Chatcombe Wood ^a | AW | Woodland | n/a | n/a | 17.4 | 10 |
| Ancient Woodland near Michaelwood services ^a | AW | Woodland | n/a | n/a | 19.2 | 10 |
| Ancient Woodland near Broad Blunsdon ^a | AW | Woodland | n/a | n/a | 19.5 | 10 |
| Cleevely Wood ^a | AW | Woodland | n/a | n/a | 17.9 | 10 |
| Cowley/Wards Woods ^a | AW | Woodland | n/a | n/a | 17.9 | 10 |
| Daniels Wood ^a | AW | Woodland | n/a | n/a | 18.1 | 10 |
| Furzeground Wood ^a | AW | Woodland | n/a | n/a | 19.2 | 10 |
| Hartley Wood ^a | AW | Woodland | n/a | n/a | 17.4 | 10 |

| Designated site | Designation | Habitat | Total background nitrogen deposition (kg N/ha/yr) | | | Empirical critical load (kg N/ha/yr) |
|--|---------------|------------------------|---|-----|---------|--------------------------------------|
| | | | Max | Min | Average | |
| Michael Wood North ^a | AW | Woodland | n/a | n/a | 19.2 | 10 |
| Mole Grove ^a | AW | Woodland | n/a | n/a | 18.3 | 10 |
| Park Wood ^a | AW | Woodland | n/a | n/a | 17.9 | 10 |
| Strays Grove ^a | AW | Woodland | n/a | n/a | 18.1 | 10 |
| Ullenwood ^a | AW, SAC, SSSI | Woodland | n/a | n/a | 21.1 | 10 |
| Charlton Kings Railway Line ^a | LWS | Grassland and Woodland | n/a | n/a | 17.4 | 10 |
| Cockleford Marsh and Banks ^a | LWS | Grassland | n/a | n/a | 17.2 | 10 |
| Hartley Hill Field ^a | NIA | Grassland | n/a | n/a | 17.4 | 10 |
| Marlborough Downs ^a | AW | Grassland | n/a | n/a | 20.4 | 10 |

n/a: No data available on the APIS website², a: no ecological site-specific information available on the APIS website. Data collected using search by location tool.

Table 1-3 Receptor locations for ecological assessment

| ID | Receptor ID | Site designation | X | Y | Distance from nearest road (m) |
|-----------|---|-------------------------|----------|----------|---------------------------------------|
| EA1 | Cotswold Commons and Beechwoods and Witcombe/Buckle woods | AW, SAC, SSSI | 392416 | 214442 | 2 |
| EA2 | Cotswold Commons and Beechwoods and Witcombe/Buckle woods | AW, SAC, SSSI | 392410 | 214437 | 10 |
| EA3 | Cotswold Commons and Beechwoods and Witcombe/Buckle woods | AW, SAC, SSSI | 392402 | 214430 | 20 |
| EA4 | Cotswold Commons and Beechwoods and Witcombe/Buckle woods | AW, SAC, SSSI | 392396 | 214423 | 30 |
| EA5 | Cotswold Commons and Beechwoods and Witcombe/Buckle woods | AW, SAC, SSSI | 392389 | 214417 | 40 |
| EA6 | Cotswold Commons and Beechwoods and Witcombe/Buckle woods | AW, SAC, SSSI | 392382 | 214409 | 50 |
| EA7 | Cotswold Commons and Beechwoods and Witcombe/Buckle woods | AW, SAC, SSSI | 392375 | 214403 | 60 |
| EA8 | Cotswold Commons and Beechwoods and Witcombe/Buckle woods | AW, SAC, SSSI | 392367 | 214396 | 70 |
| EA9 | Cotswold Commons and Beechwoods and Witcombe/Buckle woods | AW, SAC, SSSI | 392360 | 214389 | 80 |
| EA10 | Cotswold Commons and Beechwoods and Witcombe/Buckle woods | AW, SAC, SSSI | 392354 | 214383 | 90 |
| EA11 | Cotswold Commons and Beechwoods and Witcombe/Buckle woods | AW, SAC, SSSI | 392346 | 214376 | 100 |
| EA12 | Cotswold Commons and Beechwoods and Witcombe/Buckle woods | AW, SAC, SSSI | 392339 | 214369 | 110 |
| EA13 | Cotswold Commons and Beechwoods and Witcombe/Buckle woods | AW, SAC, SSSI | 392332 | 214362 | 120 |
| EA14 | Cotswold Commons and Beechwoods and Witcombe/Buckle woods | AW, SAC, SSSI | 392325 | 214356 | 130 |
| EA15 | Cotswold Commons and Beechwoods and Witcombe/Buckle woods | AW, SAC, SSSI | 392318 | 214349 | 140 |
| EA16 | Cotswold Commons and Beechwoods and Witcombe/Buckle woods | AW, SAC, SSSI | 392310 | 214342 | 150 |
| EA17 | Cotswold Commons and Beechwoods and Witcombe/Buckle woods | AW, SAC, SSSI | 392303 | 214336 | 160 |
| EA18 | Cotswold Commons and Beechwoods and Witcombe/Buckle woods | AW, SAC, SSSI | 392296 | 214329 | 170 |
| EA19 | Cotswold Commons and Beechwoods and Witcombe/Buckle woods | AW, SAC, SSSI | 392289 | 214322 | 180 |
| EA20 | Cotswold Commons and Beechwoods and Witcombe/Buckle woods | AW, SAC, SSSI | 392282 | 214315 | 190 |
| E21 | Cotswold Commons and Beechwoods and Witcome/Buckle woods | AW, SAC, SSSI | 392276 | 214309 | 200 |
| EC1 | Crickley Hill and Barrow Wake | SSSI | 393323 | 215760 | 10 |
| EC2 | Crickley Hill & Barrow Wake | SSSI | 393313 | 215760 | 10 |
| EC3 | Crickley Hill & Barrow Wake | SSSI | 393303 | 215759 | 20 |
| EC4 | Crickley Hill & Barrow Wake | SSSI | 393293 | 215759 | 30 |

| ID | Receptor ID | Site designation | X | Y | Distance from nearest road (m) |
|------|-----------------------------|------------------|--------|--------|--------------------------------|
| EC5 | Crickley Hill & Barrow Wake | SSSI | 393283 | 215759 | 40 |
| EC6 | Crickley Hill & Barrow Wake | SSSI | 393273 | 215759 | 50 |
| EC7 | Crickley Hill & Barrow Wake | SSSI | 393263 | 215759 | 60 |
| EC8 | Crickley Hill & Barrow Wake | SSSI | 393253 | 215759 | 70 |
| EC9 | Crickley Hill & Barrow Wake | SSSI | 393243 | 215759 | 80 |
| EC10 | Crickley Hill & Barrow Wake | SSSI | 393233 | 215759 | 90 |
| EC11 | Crickley Hill & Barrow Wake | SSSI | 393223 | 215759 | 100 |
| EC12 | Crickley Hill & Barrow Wake | SSSI | 393213 | 215759 | 110 |
| EC13 | Crickley Hill & Barrow Wake | SSSI | 393203 | 215759 | 120 |
| EC14 | Crickley Hill & Barrow Wake | SSSI | 393193 | 215759 | 130 |
| ED1 | Crickley Hill & Barrow Wake | SSSI | 393082 | 215277 | 140 |
| ED2 | Crickley Hill & Barrow Wake | SSSI | 393073 | 215281 | 20 |
| ED3 | Crickley Hill & Barrow Wake | SSSI | 393063 | 215284 | 30 |
| ED4 | Crickley Hill & Barrow Wake | SSSI | 393054 | 215288 | 40 |
| ED5 | Crickley Hill & Barrow Wake | SSSI | 393045 | 215291 | 50 |
| ED6 | Crickley Hill & Barrow Wake | SSSI | 393035 | 215295 | 60 |
| ED7 | Crickley Hill & Barrow Wake | SSSI | 393026 | 215298 | 70 |
| ED8 | Crickley Hill & Barrow Wake | SSSI | 393016 | 215302 | 80 |
| ED9 | Crickley Hill & Barrow Wake | SSSI | 393007 | 215305 | 90 |
| ED10 | Crickley Hill & Barrow Wake | SSSI | 392998 | 215308 | 100 |
| ED11 | Crickley Hill & Barrow Wake | SSSI | 392988 | 215312 | 110 |
| ED12 | Crickley Hill & Barrow Wake | SSSI | 392979 | 215315 | 120 |
| ED13 | Crickley Hill & Barrow Wake | SSSI | 392969 | 215319 | 130 |
| EE1 | Crickley Hill & Barrow Wake | SSSI | 393147 | 216008 | 140 |
| EE2 | Crickley Hill & Barrow Wake | SSSI | 393142 | 216017 | 0 |
| EE3 | Crickley Hill & Barrow Wake | SSSI | 393137 | 216025 | 10 |

| ID | Receptor ID | Site designation | X | Y | Distance from nearest road (m) |
|------|--|------------------|--------|--------|--------------------------------|
| EE4 | Crickley Hill & Barrow Wake | SSSI | 393132 | 216034 | 20 |
| EE5 | Crickley Hill & Barrow Wake | SSSI | 393127 | 216043 | 30 |
| EE6 | Crickley Hill & Barrow Wake | SSSI | 393123 | 216051 | 40 |
| EE7 | Crickley Hill & Barrow Wake | SSSI | 393118 | 216060 | 50 |
| EE8 | Crickley Hill & Barrow Wake | SSSI | 393113 | 216069 | 60 |
| EE9 | Crickley Hill & Barrow Wake | SSSI | 393108 | 216078 | 70 |
| EE10 | Crickley Hill & Barrow Wake | SSSI | 393103 | 216086 | 80 |
| EE11 | Crickley Hill & Barrow Wake | SSSI | 393098 | 216095 | 90 |
| EE12 | Crickley Hill & Barrow Wake | SSSI | 393093 | 216104 | 100 |
| EE13 | Crickley Hill & Barrow Wake | SSSI | 393088 | 216112 | 110 |
| EE14 | Crickley Hill & Barrow Wake | SSSI | 393083 | 216121 | 120 |
| EE15 | Crickley Hill & Barrow Wake | SSSI | 393078 | 216130 | 130 |
| EE16 | Crickley Hill & Barrow Wake | SSSI | 393073 | 216138 | 140 |
| EE17 | Crickley Hill & Barrow Wake | SSSI | 393068 | 216147 | 150 |
| EE18 | Crickley Hill & Barrow Wake | SSSI | 393063 | 216156 | 160 |
| EE19 | Crickley Hill & Barrow Wake | SSSI | 393058 | 216164 | 170 |
| EE20 | Crickley Hill & Barrow Wake | SSSI | 393053 | 216173 | 180 |
| EE21 | Crickley Hill & Barrow Wake | SSSI | 393049 | 216182 | 190 |
| EG1 | Hartley Woods | AW | 396541 | 216967 | 92 |
| EH1 | Leckhampton Hill and Charlton Kings Common | SSSI | 394459 | 217829 | 25 |
| EH2 | Leckhampton Hill and Charlton Kings Common | SSSI | 394469 | 217829 | 35 |
| EH3 | Leckhampton Hill and Charlton Kings Common | SSSI | 394479 | 217829 | 45 |
| EH4 | Leckhampton Hill and Charlton Kings Common | SSSI | 394489 | 217829 | 55 |
| EH5 | Leckhampton Hill and Charlton Kings Common | SSSI | 394499 | 217829 | 65 |
| EH6 | Leckhampton Hill and Charlton Kings Common | SSSI | 394509 | 217829 | 75 |
| EH7 | Leckhampton Hill and Charlton Kings Common | SSSI | 394519 | 217829 | 85 |

| ID | Receptor ID | Site designation | X | Y | Distance from nearest road (m) |
|------|--|------------------|--------|--------|--------------------------------|
| EH8 | Leckhampton Hill and Charlton Kings Common | SSSI | 394529 | 217829 | 95 |
| EH9 | Leckhampton Hill and Charlton Kings Common | SSSI | 394539 | 217829 | 105 |
| EH10 | Leckhampton Hill and Charlton Kings Common | SSSI | 394549 | 217829 | 115 |
| EH11 | Leckhampton Hill and Charlton Kings Common | SSSI | 394559 | 217829 | 125 |
| EH12 | Leckhampton Hill and Charlton Kings Common | SSSI | 394569 | 217829 | 135 |
| EH13 | Leckhampton Hill and Charlton Kings Common | SSSI | 394579 | 217829 | 145 |
| EH14 | Leckhampton Hill and Charlton Kings Common | SSSI | 394589 | 217829 | 155 |
| EH15 | Leckhampton Hill and Charlton Kings Common | SSSI | 394599 | 217829 | 165 |
| EI1 | Leckhampton Hill and Charlton Kings Common | SSSI | 396421 | 218345 | 160 |
| EI2 | Leckhampton Hill and Charlton Kings Common | SSSI | 396411 | 218342 | 170 |
| EI3 | Leckhampton Hill and Charlton Kings Common | SSSI | 396402 | 218340 | 180 |
| EI4 | Leckhampton Hill and Charlton Kings Common | SSSI | 396392 | 218337 | 190 |
| EI5 | Leckhampton Hill and Charlton Kings Common | SSSI | 396382 | 218335 | 200 |
| EJ1 | Chatcombe Wood | AW | 397799 | 217955 | 2 |
| EK1 | Lineover Wood | SSSI, AW | 398695 | 218473 | 2 |
| EK2 | Lineover Wood | SSSI, AW | 398692 | 218483 | 10 |
| EK3 | Lineover Wood | SSSI, AW | 398690 | 218493 | 20 |
| EK4 | Lineover Wood | SSSI, AW | 398688 | 218503 | 30 |
| EK5 | Lineover Wood | SSSI, AW | 398686 | 218512 | 40 |
| EK6 | Lineover Wood | SSSI, AW | 398683 | 218522 | 50 |
| EK7 | Lineover Wood | SSSI, AW | 398681 | 218532 | 60 |
| EK8 | Lineover Wood | SSSI, AW | 398679 | 218541 | 70 |
| EK9 | Lineover Wood | SSSI, AW | 398676 | 218551 | 80 |
| EK10 | Lineover Wood | SSSI, AW | 398674 | 218561 | 90 |
| EK11 | Lineover Wood | SSSI, AW | 398672 | 218571 | 100 |
| EK12 | Lineover Wood | SSSI, AW | 398670 | 218580 | 110 |

| ID | Receptor ID | Site designation | X | Y | Distance from nearest road (m) |
|------|----------------|------------------|--------|--------|--------------------------------|
| EK13 | Lineover Wood | SSSI, AW | 398667 | 218590 | 120 |
| EK14 | Lineover Wood | SSSI, AW | 398665 | 218600 | 130 |
| EK15 | Lineover Wood | SSSI, AW | 398663 | 218610 | 140 |
| EK16 | Lineover Wood | SSSI, AW | 398661 | 218619 | 150 |
| EK17 | Lineover Wood | SSSI, AW | 398658 | 218629 | 160 |
| EK18 | Lineover Wood | SSSI, AW | 398656 | 218639 | 170 |
| EK19 | Lineover Wood | SSSI, AW | 398654 | 218649 | 180 |
| EK20 | Lineover Wood | SSSI, AW | 398652 | 218658 | 190 |
| EK21 | Lineover Wood | SSSI, AW | 398649 | 218668 | 200 |
| EL1 | Cleevely Wood | AW | 403270 | 217748 | 167 |
| EM1 | Westwell Gorse | SSSI | 422002 | 211318 | 1 |
| EM2 | Westwell Gorse | SSSI | 421997 | 211327 | 10 |
| EM3 | Westwell Gorse | SSSI | 421991 | 211335 | 20 |
| EM4 | Westwell Gorse | SSSI | 421986 | 211344 | 30 |
| EM5 | Westwell Gorse | SSSI | 421981 | 211352 | 40 |
| EM6 | Westwell Gorse | SSSI | 421976 | 211361 | 50 |
| EM7 | Westwell Gorse | SSSI | 421970 | 211369 | 60 |
| EM8 | Westwell Gorse | SSSI | 421965 | 211377 | 70 |
| EM9 | Westwell Gorse | SSSI | 421960 | 211386 | 80 |
| EM10 | Westwell Gorse | SSSI | 421954 | 211394 | 90 |
| EM11 | Westwell Gorse | SSSI | 421949 | 211403 | 100 |
| EM12 | Westwell Gorse | SSSI | 421944 | 211411 | 110 |
| EM13 | Westwell Gorse | SSSI | 421938 | 211420 | 120 |
| EM14 | Westwell Gorse | SSSI | 421933 | 211428 | 130 |
| EM15 | Westwell Gorse | SSSI | 421928 | 211437 | 140 |
| EM16 | Westwell Gorse | SSSI | 421923 | 211445 | 150 |

| ID | Receptor ID | Site designation | X | Y | Distance from nearest road (m) |
|------|-------------------------|------------------|--------|--------|--------------------------------|
| EM17 | Westwell Gorse | SSSI | 421917 | 211454 | 160 |
| EN1 | North Meadow, Crickdale | SSSI | 409605 | 194836 | 100 |
| EN2 | North Meadow, Crickdale | SSSI | 409598 | 194828 | 110 |
| EN3 | North Meadow, Crickdale | SSSI | 409591 | 194821 | 120 |
| EN4 | North Meadow, Crickdale | SSSI | 409585 | 194814 | 130 |
| EN5 | North Meadow, Crickdale | SSSI | 409578 | 194806 | 140 |
| EN6 | North Meadow, Crickdale | SSSI | 409571 | 194799 | 150 |
| EN7 | North Meadow, Crickdale | SSSI | 409564 | 194792 | 160 |
| EN8 | North Meadow, Crickdale | SSSI | 409557 | 194784 | 170 |
| EN9 | North Meadow, Crickdale | SSSI | 409550 | 194777 | 180 |
| EN10 | North Meadow, Crickdale | SSSI | 409544 | 194770 | 190 |
| EN11 | North Meadow, Crickdale | SSSI | 409537 | 194762 | 200 |
| EP1 | Mole Grove | AW | 378484 | 207491 | 124 |
| EQ1 | Hucclecote Meadows | SSSI, LWS, LNR | 387250 | 216295 | 25 |
| EQ2 | Hucclecote Meadows | SSSI, LWS, LNR | 387259 | 216290 | 35 |
| EQ3 | Hucclecote Meadows | SSSI, LWS, LNR | 387268 | 216286 | 45 |
| EQ4 | Hucclecote Meadows | SSSI, LWS, LNR | 387277 | 216281 | 55 |
| EQ5 | Hucclecote Meadows | SSSI, LWS, LNR | 387286 | 216276 | 65 |
| EQ6 | Hucclecote Meadows | SSSI, LWS, LNR | 387294 | 216271 | 75 |
| EQ7 | Hucclecote Meadows | SSSI, LWS, LNR | 387303 | 216267 | 85 |
| EQ8 | Hucclecote Meadows | SSSI, LWS, LNR | 387312 | 216262 | 95 |
| EQ9 | Hucclecote Meadows | SSSI, LWS, LNR | 387321 | 216257 | 105 |
| EQ10 | Hucclecote Meadows | SSSI, LWS, LNR | 387329 | 216252 | 115 |
| EQ11 | Hucclecote Meadows | SSSI, LWS, LNR | 387338 | 216247 | 125 |
| EQ12 | Hucclecote Meadows | SSSI, LWS, LNR | 387347 | 216243 | 135 |
| EQ13 | Hucclecote Meadows | SSSI, LWS, LNR | 387356 | 216238 | 145 |

| ID | Receptor ID | Site designation | X | Y | Distance from nearest road (m) |
|------|--|------------------|--------|--------|--------------------------------|
| EQ14 | Hucclecote Meadows | SSSI, LWS, LNR | 387365 | 216233 | 155 |
| EQ15 | Hucclecote Meadows | SSSI, LWS, LNR | 387373 | 216228 | 165 |
| ER1 | Hucclecote Meadows | SSSI, LWS, LNR | 387204 | 216350 | 15 |
| ER2 | Hucclecote Meadows | SSSI, LWS, LNR | 387195 | 216355 | 25 |
| ER3 | Hucclecote Meadows | SSSI, LWS, LNR | 387186 | 216360 | 35 |
| ER4 | Hucclecote Meadows | SSSI, LWS, LNR | 387177 | 216365 | 45 |
| EF1 | Ullenwood | AW | 393643 | 216232 | 1 |
| EO1 | Ancient Woodland near Broad Blunsdon | AW | 413680 | 190638 | 158 |
| ES1 | Ancient Woodland near Michaelwood services | AW | 370171 | 195491 | 187 |
| ET1 | Cowley/wards woods | AW | 395518 | 213803 | 1 |
| EU1 | Daniels wood | AW | 369547 | 194097 | 99 |
| EV1 | Furzeground wood | AW | 370045 | 195067 | 43 |
| EW1 | Michael wood north | AW | 370860 | 195796 | 27 |
| EX1 | Park wood | AW | 395580 | 212199 | 173 |
| EY1 | Strays grove | AW | 369052 | 193826 | 166 |
| EZ1 | Charlton Kings Railway Line LWS | LWS | 396475 | 219677 | 1 |
| EAA1 | Cockleford Marsh and Banks LWS | LWS | 396944 | 214241 | 1 |
| EAB1 | Hartley Hill Field LWS | LWS | 396521 | 218042 | 145 |
| EAC1 | Marlborough Downs | NIA | 419195 | 180699 | 1 |

A417 Missing Link

Preliminary Environmental Information Report

Appendix 5.4
Air Quality Baseline Data

28 September 2020

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1 Baseline data

1.1 Local air quality monitoring

- 1.1.1 Measurements of nitrogen dioxide (NO₂) concentrations in the study area (i.e. within 200m of the Affected Road Network (ARN)) were undertaken using passive monitoring diffusion tubes at 22 locations in the base year 2016. Results of local monitoring are available from the air quality Annual Status Reports (ASRs) from South Gloucestershire Council¹, Swindon Borough Council², West Berkshire Council³, Wiltshire Council⁴, Cheltenham Borough Council⁵, Cotswold District Council⁶, Gloucester District Council⁷, Stroud District Council⁸, Tewkesbury Borough Council⁹ and West Oxfordshire District Council¹⁰. Monitoring of PM₁₀ is not currently undertaken in the study area. Details of the local authority monitoring sites are presented in Table 1-1.
- 1.1.2 A summary of diffusion tube monitoring results for local air quality monitoring sites in the study area is presented in Table 1-2, for annual mean NO₂ concentrations from 2014 to 2018. Any NO₂ annual mean concentrations, shown in the table, exceeding the 40µg/m³ air quality objective are highlighted in bold. Concentrations of annual mean NO₂ exceeding the objective have been recorded in 2014- 2017 in the study area. The exceedances were at roadside locations in Cheltenham and the Birdlip roundabout (location of the Air Balloon air quality management area) in the Cotswolds.
- 1.1.3 Cotswold District Council had maintained an automatic monitor for NO₂ at the Air Balloon Pub, Birdlip until early 2014. However, due to technical issues there was no monitoring data available from this automatic analyser to report after 2013.
- 1.1.4 Concentrations at the proposed scheme location by the Air Balloon roundabout were recorded as exceeding the air quality objective for annual mean NO₂ between 2014-2017. The highest concentration recorded of 61µg/m³ is well above the objective of 40µg/m³, however it is at a roadside location which is not representative of relevant exposure.

Table 1-1 Details of local authority monitoring sites

| Local authority and ID | Site name | Site classification | National grid reference | | In AQMA (Y/N) |
|------------------------|--|---------------------|-------------------------|---------------------|---------------|
| | | | X | Y | |
| Cheltenham 6.1 | 56 Church Road | Roadside | 394577 | 219728 | Y |
| Cheltenham 18 | 81 London Road | Roadside | 395660 | 221670 | Y |
| Cotswold T8/N@1S1 | Cirencester – London Road (Wagon/Horses) | Kerbside | 402735 ^a | 201962 ^a | N |
| Cotswold T11/N@1S1 | Birdlip – Air Balloon | Kerbside | 393446 ^a | 216118 ^a | Y |
| Cotswold T12 | Birdlip – Air Balloon 1 | Kerbside | 393459 ^a | 216124 ^a | Y |
| Cotswold T13 | Birdlip – Air Balloon 2 | Kerbside | 393459 ^a | 216124 ^a | Y |
| Cotswold T16 | Stow Lodge | Kerbside | 403943 | 202961 | N |
| Cotswold N@1S12 | Opp 8 Burford Road | Roadside | 403124 | 202245 | N |
| Cotswold N@1S4 | Tetbury Road, Cirencester | Roadside | 401064 | 201044 | Y |
| Cotswold N@1S8 | 62 Grove Lane, Cirencester | Roadside | 402305 | 202519 | Y |
| Cotswold N@1S9 | Hammond Way, Cirencester | Kerbside | 402309 | 201765 | Y |
| Cotswold N@1S10 | Lewis Lane, Cirencester | Roadside | 402480 | 201772 | Y |
| Gloucester 3 | 35 Buscombe Gardens | Roadside | 387670 | 217250 | N |
| Gloucester 4 | 12 Caravan Site | Urban background | 387250 | 216530 | N |
| Stroud 3 | Brookthorpe – North View | Roadside | 383410 | 212570 | N |
| Stroud 31 | Upton St Leonards – 50 Woodland Green | Kerbside | 386301 | 215294 | N |
| Tewkesbury 14N | 69 Sussex Gardens | Urban background | 387915 | 217389 | Y |
| Tewkesbury 15N | Comus Bamforlong | Urban background | 389714 | 221845 | N |
| Tewkesbury 16N | 15 Withybridge Gardens | Urban background | 390461 | 225544 | N |
| Tewkesbury 52N | 43 Stocken Close | Roadside | 387570 | 216935 | N |
| Tewkesbury 54N | Woodside House - Crickley Hill | Urban centre | 393106 | 215913 | N |
| Swindon S10 | Meadow Way | Roadside | 419347 | 180975 | N |

Note: a. Please note coordinates are based on 2017 ASR. The location of this diffusion tube has been moved according to the 2018 ASR.

Table 1-2 Local authority monitoring results

| Local authority and ID | Site name | Annual mean NO ₂ (µg/m ³) | | | | |
|------------------------|--|--|-------------|-------------|-------------|-------------|
| | | 2014 | 2015 | 2016 | 2017 | 2018 |
| Cheltenham 18 | London Road | 41.8 | 41.4 | 39.6 | 38.4 | 37.3 |
| Cotswold T8/N@1S1 | Cirencester – London Road (Wagon/Horses) | 29.8 | 23.8 | 30.4 | 25.7 | 22.6 |
| Cotswold T11/N@1S1 | Birdlip – Air Balloon | 61.5 | 59.1 | 61.2 | 61.4 | 54.1 |
| Cotswold T12 | Birdlip – Air Balloon 1 | 40.3 | 40.5 | 39.8 | n/a | n/a |
| Cotswold T13 | Birdlip – Air Balloon 2 | 41.4 | 39.4 | 39.2 | n/a | n/a |
| Cotswold T16 | Stow Lodge | 32.2 | 31.7 | 33.3 | n/a | n/a |
| Cotswold N@1S12 | Opp 8 Burford Road | n/a | n/a | n/a | 23.2 | 15.6 |
| Cotswold N@1S4 | Tetbury Road, Cirencester | n/a | n/a | n/a | 24.6 | 21.8 |
| Cotswold N@1S8 | 62 Grove Lane, Cirencester | n/a | n/a | n/a | 34.8 | 29.8 |
| Cotswold N@1S9 | Hammond Way, Cirencester | n/a | n/a | n/a | 21.0 | 18.1 |
| Cotswold N@1S10 | Lewis Lane, Cirencester | n/a | n/a | n/a | 22.6 | 20.9 |
| Gloucester 3 | 35 Buscombe Gardens | 27.9 | 25.5 | 27.9 | 24.0 | 23.7 |
| Gloucester 4 | 12 Caravan Site | 22.6 | 20.4 | 22.7 | 19.6 | 19.4 |
| Stroud 3 | Brookthorpe – North View | 25.1 | 25.9 | 27.6 | 21.7 | n/a |
| Stroud 31 | Upton St Leonards – 50 Woodland Green | 22.9 | 24.6 | 27.1 | 21.4 | 22.5 |
| Tewkesbury 14N | 69 Sussex Gardens | 26.3 | 25.4 | 26.8 | n/a | n/a |
| Tewkesbury 15N | Comus Bamforlong | 27.9 | 28.5 | 25.6 | n/a | n/a |
| Tewkesbury 16N | 15 Withybridge | 27.8 | 26.5 | 29.0 | n/a | n/a |
| Tewkesbury 52N | 43 Stocken Close | 25.5 | 25.1 | 26.2 | n/a | n/a |
| Tewkesbury 54N | Woodside House - Crickley Hill | n/a | n/a | 30.6 | n/a | n/a |
| Swindon S10 | Meadow Way | 31.1 | 30.4 | 30.1 | 28.4 | n/a |
| Cheltenham 6.1 | 56 Church Road | n/a | 20.5 | n/a | n/a | n/a |

n/a: monitoring data not available

1.2 Scheme-specific monitoring

- 1.2.1 Highways England carried out monitoring of NO₂ using diffusion tubes at 22 monitoring sites from January 2016 to June 2016. 21 of the sites were located where humans maybe exposed to a change in concentrations.
- 1.2.2 Since data capture is less than 75% at any location (i.e. 9 months), monitored results have been annualised, to determine a representative annual mean concentration for comparison with the annual mean NO₂ objective.
- 1.2.3 The results have been bias adjusted following Defra guidance. The bias adjustment and annualisation was carried out by consultants on behalf of Highways England for the EIA Scoping Report¹¹ and has been used for this assessment. The details of the monitoring locations are shown in Table 1-3. The annualised and bias-adjusted results are presented in Table 5.4.
- 1.2.4 Most of the monitoring sites measured NO₂ concentrations that were below the annual mean objective. The only monitoring site that recorded an exceedance for the annual mean NO₂ objective was at the house opposite the Air Balloon pub within the Birdlip Air Quality Management Area (AQMA). The annual mean NO₂ concentration recorded was 41.7µg/m³.

Table 1-3 Scheme specific monitoring

| Site name | Location | Site classification | National grid reference | |
|-------------------|---|---------------------|-------------------------|--------|
| | | | X | Y |
| A417AB_001_1215 | Birdlip | Roadside | 393205 | 214125 |
| A417AB_002_1215 | Road off A417 towards | Roadside | 393802 | 215431 |
| A417AB_003_1215 | The Willows, near Crickley Hill | Roadside | 393030 | 215876 |
| A417AB_004_1215 | House opposite The Air Balloon Pub | Roadside | 393458 | 216121 |
| A417AB_005_1215 | A436 | Roadside | 394269 | 216375 |
| A417AB_006_1215 | Ullenwood Cottages, Greenway Lane | Roadside | 394413 | 216847 |
| A417AB_007_1215 | B4070 Ridgeway Close | Roadside | 392618 | 214415 |
| A417AB_008_1215 | Shurdington Road near roundabout | Roadside | 390439 | 216678 |
| A417AB_009_1215 | Shurdington Road (Henley Bank Lane) | Roadside | 390397 | 216488 |
| A417AB_010_1215 | 62 Court Road | Roadside | 389182 | 216837 |
| A417AB_011_1215 | End of Cedar Road | Roadside | 388598 | 217247 |
| A417AB_012_1215 | 73 Sussex Gardens | Roadside | 387925 | 217384 |
| A417AB_013_1215 | 13 Hucclecote Road | Roadside | 388356 | 216802 |
| A417AB_014_1215 | Churchdown Lane | Roadside | 387623 | 217636 |
| A417AB_015_1215 | 14 Millfields | Roadside | 387454 | 217908 |
| A417AB_016_1215 | Hucclecote Road side of 177 Sussex Gardens | Roadside | 388124 | 216931 |
| A417AB_017_1215 | Shurdington Road | Roadside | 390599 | 216877 |
| A417AB_018_1215 | Near Shab Hill | Urban Background | 394270 | 215829 |
| A417AB_019_1215 | Dog Lane Sign | Roadside | 391469 | 216107 |
| A417AB_020_1215 | 76 Mill Lane | Roadside | 390190 | 216546 |
| A417AB_021a_1215* | Triplicate co-location, The Air Balloon Pub (Automatic Monitor) | Roadside | 393431 | 216092 |
| A417AB_022_1215 | 1 Oak Drive | Roadside | 388908 | 217014 |

* Automatic monitor refers to a local authority automatic monitor. However, it was not in operation at the time of the scheme specific monitoring survey

Table 1-4 Scheme specific monitoring results

| Site name | Location | 2016 Annualised NO ₂ (µg/m ³) |
|------------------|---|---|
| A417AB_001_1215 | Birdlip | 7.7 |
| A417AB_002_1215 | Road off A417 towards | 8.3 |
| A417AB_003_1215 | The Willows, near Crickley Hill | 29.1 |
| A417AB_004_1215 | House opposite The Air Balloon Pub | 41.7 |
| A417AB_005_1215 | A436 | 19.0 |
| A417AB_006_1215 | Ullenwood Cottages, Greenway Lane | 9.3 |
| A417AB_007_1215 | B4070 Ridgeway Close | 16.9 |
| A417AB_008_1215 | Shurdington Road near roundabout | 18.7 |
| A417AB_009_1215 | Shurdington Road (Henley Bank Lane) | 11.4 |
| A417AB_010_1215 | 62 Court Road | 13.4 |
| A417AB_011_1215 | End of Cedar Road | 14.9 |
| A417AB_012_1215 | 73 Sussex Gardens | 20.4 |
| A417AB_013_1215 | 13 Hucclecote Road | 19.4 |
| A417AB_014_1215 | Churchdown Lane | 22.6 |
| A417AB_015_1215 | 14 Millfields | 20.4 |
| A417AB_016_1215 | Hucclecote Road side of 177 Sussex Gardens | 18.0 |
| A417AB_017_1215 | Shurdington Road | 26.5 |
| A417AB_018_1215 | Near Shab Hill | 7.3 |
| A417AB_019_1215 | Dog Lane Sign | 12.9 |
| A417AB_020_1215 | 76 Mill Lane | 13.5 |
| A417AB_021a_1215 | Automatic Monitor, The Air Balloon Pub (triplicate co-location) | 34.2 |
| A417AB_021b_1215 | Automatic Monitor, The Air Balloon Pub (triplicate co-location) | 33.9 |
| A417AB_021c_1215 | Automatic Monitor, The Air Balloon Pub (triplicate co-location) | 35.8 |
| A417AB_022_1215 | 1 Oak Drive | 12.1 |

1.3 Background pollution concentrations

1.3.1 Background concentrations refer to the existing levels of pollution in the atmosphere, produced by a variety of sources, such as roads and industrial processes. Defra has produced estimated background air pollution data for each 1kmx1km OS grid square for each local authority area in the UK¹². Background maps are available for 2017 and projected through to 2030.

1.3.2 Estimated background air pollution data for 2017 for NO₂ and PM₁₀ for the local authorities within the ARN are presented in Table 1-5. The table shows the maximum, minimum and average concentrations for the grid squares in the following local authorities:

- Cheltenham Borough Council
- Cotswold District Council
- Gloucester City Council
- South Gloucestershire District Council
- Stroud District Council
- Swindon Borough Council
- Tewkesbury Borough Council
- West Berkshire Council
- West Oxfordshire District Council
- Wiltshire Council

1.3.3 As the table shows, none of the background concentrations are above the relevant annual AQS objective concentration for NO₂ or PM₁₀ (40µg/m³).

Table 1-5 Predicted background pollutant concentrations for 2017

| Local Authority | Annual mean NO ₂ concentration (µg/m ³) | | | Annual mean PM ₁₀ concentration (µg/m ³) | | |
|--|--|-----|---------|---|------|---------|
| | Max | Min | Average | Max | Min | Average |
| Cheltenham Borough Council | 17.5 | 7.7 | 12.2 | 14.6 | 12.0 | 13.1 |
| Cotswold District Council | 11.7 | 5.8 | 6.9 | 16.3 | 11.5 | 13.2 |
| Gloucester City Council | 18.1 | 8.1 | 13.3 | 15.3 | 12.1 | 13.6 |
| South Gloucestershire District Council | 26.1 | 5.9 | 11.4 | 17.2 | 10.7 | 13.2 |
| Stroud District Council | 18.9 | 5.8 | 8.5 | 15.8 | 10.8 | 12.4 |
| Swindon Borough Council | 20.2 | 7.9 | 12.1 | 17.7 | 12.8 | 14.5 |
| Tewkesbury Borough Council | 22.7 | 5.9 | 8.9 | 16.8 | 11.5 | 13.0 |
| West Berkshire Council | 22.7 | 8.3 | 11.1 | 17.1 | 12.4 | 14.2 |
| West Oxfordshire District Council | 12.3 | 6.4 | 7.9 | 16.7 | 12.3 | 14.2 |
| Wiltshire Council | 19.0 | 4.9 | 7.9 | 16.6 | 11.3 | 13.1 |

1.3.4 A comparison has been undertaken between the Defra background concentrations and monitored background concentrations from local authority and scheme specific sites. There is limited background monitoring in the study area. Most of the background monitoring available in the 10 neighbouring local authorities are at urban background locations and are not representative of the study area.

- 1.3.5 A comparison of the monitored background data at rural background monitoring sites and the Defra mapped concentrations has been carried out as shown in Table 1-6.
- 1.3.6 All of the monitored background concentrations are well below the annual mean air quality objective for NO₂ and the absolute difference in µg/m³ between monitored and modelled is small. The Defra predicted background concentrations have been used for the air quality assessment.

Table 1-6 Comparison between Defra modelled background concentration and local background monitoring

| Site ID | Grid square | | Local authority | Local authority monitored NO ₂ 2016 (µg/m ³) | Defra background NO ₂ 2016 (µg/m ³) | Difference (µg/m ³) | % change |
|------------------------------|-------------|--------|-------------------------|---|--|---------------------------------|----------|
| | X | Y | | | | | |
| Elmbridge Road Junior School | 385500 | 218500 | Gloucester City Council | 15.2 | 18.1 | -2.9 | -19% |
| Gloucester Guildhall | 383500 | 218500 | Gloucester City Council | 18.6 | 17.2 | 1.4 | 7% |
| Frethern Cl, Burford | 425500 | 211500 | West Oxfordshire | 10.7 | 6.6 | 4.1 | 38% |
| Orchard Rise | 425500 | 211500 | West Oxfordshire | 9.6 | 6.6 | 3.0 | 31% |
| Near Shab Hill | 394500 | 215500 | Scheme specific monitor | 7.3 | 7.3 | 0 | 0% |

End notes and References

- ¹ South Gloucestershire Council, 2019 Air Quality Annual Status Report (ASR)
- ² Swindon Borough Council, 2018 Air Quality Annual Status Report (ASR) (for 2017 monitoring year)
- ³ West Berkshire Council, 2019 Air Quality Annual Status Report (ASR)
- ⁴ Wiltshire Council, 2017 Air Quality Annual Status Report (ASR)
- ⁵ Cheltenham Borough Council, 2019 Air Quality Annual Status Report (ASR)
- ⁶ 2018 Air Quality Annual Status Report (ASR) for Cotswold District Council
- ⁷ Gloucester City Council, 2019 Air Quality Annual Status Report (ASR)
- ⁸ Stroud District Council, 2018 Air Quality Annual Status Report (ASR)
- ⁹ Tewkesbury Borough Council, 2017 Air Quality Annual Status Report (ASR)
- ¹⁰ 2019 Air Quality Annual Status Report (ASR) for West Oxfordshire District Council
- ¹¹ A417 Missing Link Scoping Report <https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/TR010056/TR010056-000009-A417%20-%20Scoping%20Report.pdf>
- ¹² Defra background maps <https://uk-air.defra.gov.uk/data/laqm-background-home>

A417 Missing Link

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Appendix 5.5
Air quality sites used for verification

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| 1.1 Sites used for verification | i |

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1 Air quality sites used for verification

1.1 Sites used for verification

- 1.1.1 Verification has been completed using 31 monitoring sites across the study area. Where appropriate, the locations of the monitoring sites were updated following the site visit and location reviews.
- 1.1.2 Verification followed the methodology outlined in the Local Air Quality Management Technical Guidance (LAQM TG.16)¹. The following method has been used:
- comparison of the modelled road NO_x versus the monitored Road NO_x. road NO_x measured at the diffusion tube monitoring sites was calculated using the latest Defra NO_x to NO₂ calculator², available on the LAQM website;
 - a verification factor was calculated based on the regression equation and this was applied to the modelled road NO_x concentrations; and
 - the adjusted modelled road NO_x contribution was then used to calculate the total NO₂ using the Defra NO_x to NO₂ calculator².
- 1.1.3 The air quality monitoring data collected as part of this assessment was reviewed to determine the suitability of each of the monitoring locations for inclusion in the model verification process. The criteria used to determine the suitability of the monitoring data for inclusion into the verification process is outlined below:
- monitoring location was required to be within 200m of a road within the study area;
 - monitoring data in 2016 was required to have a data capture of ≥75%;
 - monitoring data influenced by major road emissions sources which were missing from the traffic model, and hence could not be included in the dispersion model was excluded; and
 - monitoring data from sites where the exact location could not be accurately identified or validated was excluded.
- 1.1.4 Twelve monitoring sites were not used in the verification process, and the reasons are detailed in Table 1-1.
- 1.1.5 Table 1-2 provides the verification details, and graphs showing the model performance are shown in Figure 1-1 and Figure 1-2 of this appendix.

¹ Department for Environment Food & Rural Affairs, "Local Air Quality Management Technical Guidance (TG16)," 2018.

² Defra, "Defra LAQM website NO_x to NO₂," 2017. [Online]. Available: <http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOxNO2calc>. [Accessed July 2020]

Table 1-1 Monitoring sites removed from the verification process

| Site ID | Location | Reason |
|-----------------|---------------------------------|--|
| 18 | 81 London Road, Cheltenham | No modelled roads adjacent to monitor. |
| T13 | Air Balloon Roundabout, A417 | Located on the same lamppost as T12. Average concentration used. |
| T16 | Stow Lodge, Cirencester | Road opposite monitor not modelled. |
| 14N | Sussex gardens, Hucclecote | Location could not be determined. |
| 15N | M5, Bamfurlong | Location could not be determined. |
| 16N | Withybridge Gardens | No modelled roads adjacent to monitor. |
| 54N | Stocken Close, Hucclecote | Location could not be determined. |
| A417AB_001_1215 | A417, Birdlip | No modelled roads adjacent to monitor. |
| A417AB_002_1215 | Unnamed road near A417, Birdlip | No modelled roads adjacent to monitor. |
| A417AB_009_1215 | Shurdington Road, Brockworth | No modelled roads adjacent to monitor. |
| A417AB_014_1215 | Churchdown Lane, Hucclecote | No modelled roads adjacent to monitor. |
| A417AB_020_1215 | Mill Lane, Brockworth | No modelled roads adjacent to monitor. |

Table 1-2 Model performance

| A417 | | M5 | |
|---------------------------------|-------|---------------------------------|---|
| Adjustment factor – | 2.126 | Adjustment factor – | 1 |
| Within +10% | 5 | Within +10% | 0 |
| Within -10% | 4 | Within -10% | 1 |
| Within +-10% | 9 | Within +-10% | 1 |
| Within +10 to 25% | 2 | Within +10 to 25% | 0 |
| Within -10 to 25% | 2 | Within -10 to 25% | 4 |
| Within +-10 to 25% | 4 | Within +-10 to 25% | 4 |
| Over +25% | 0 | Over +25% | 0 |
| Under -25% | 0 | Under -25% | 1 |
| Greater +-25% | 0 | Greater +-25% | 1 |
| Within +-25% | 13 | Within +-25% | 5 |
| Total | 13 | Total | 6 |
| Uncertainties assessment | | Uncertainties assessment | |

| A417 | | M5 | |
|-----------------------------------|-------|-----------------------------------|------|
| Adjustment factor – | 2.126 | Adjustment factor – | 1 |
| Correlation | 0.95 | Correlation | 0.52 |
| RMSE ($\mu\text{g}/\text{m}^3$) | 3.96 | RMSE ($\mu\text{g}/\text{m}^3$) | 3.27 |
| Fractional bias | 0.03 | Fractional bias | 0.09 |

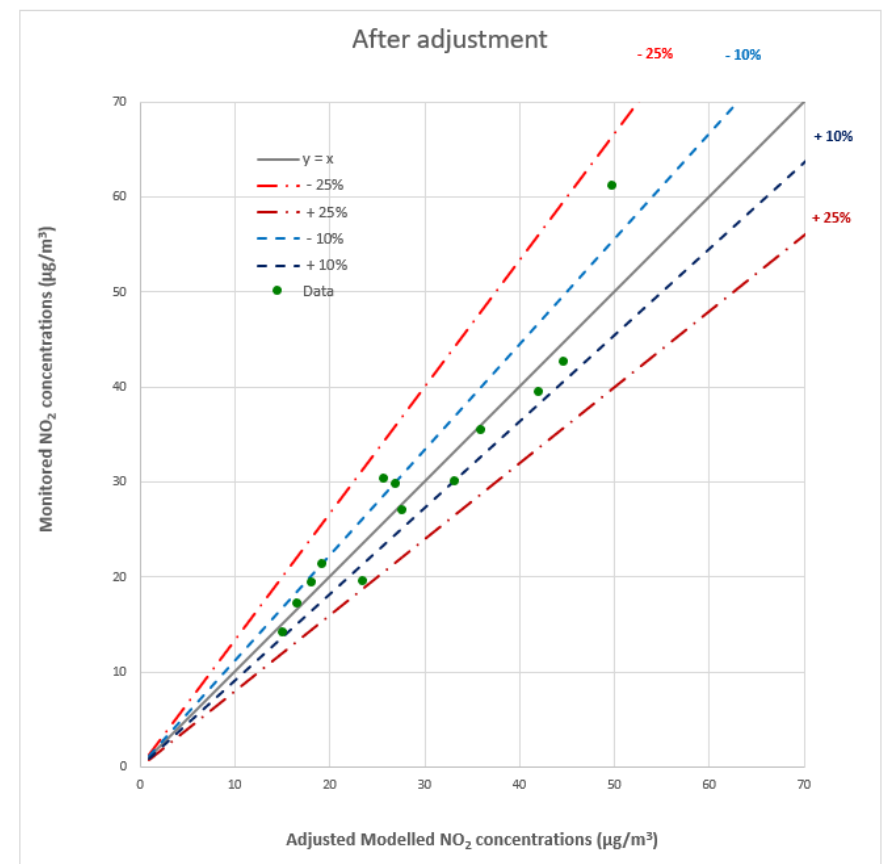
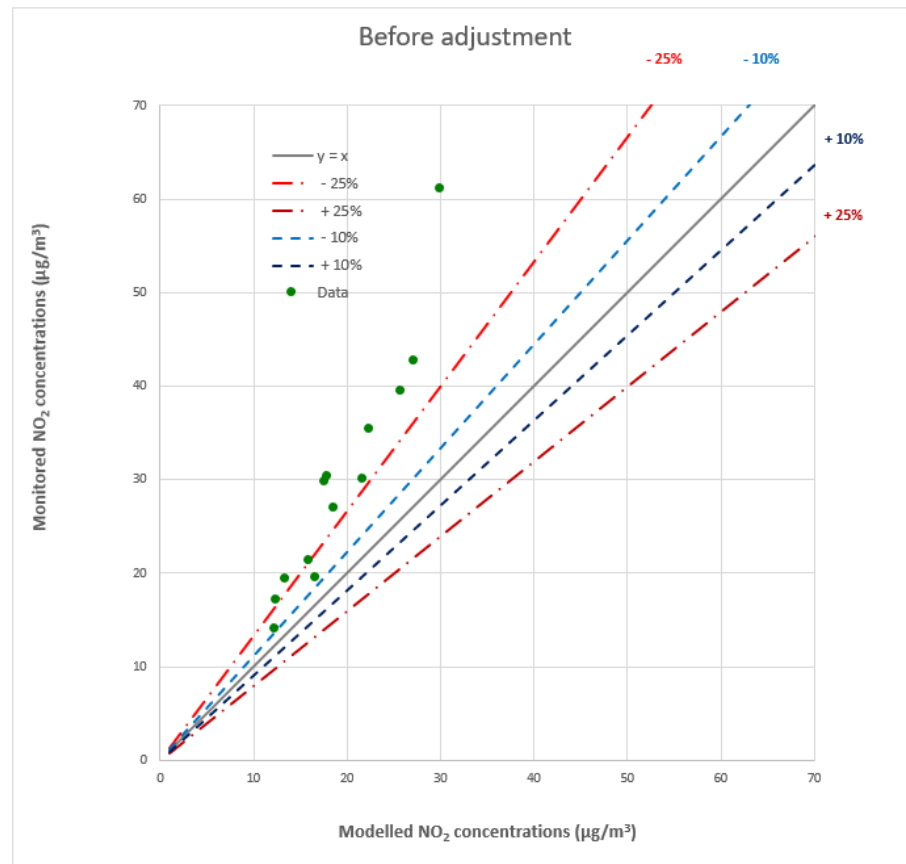


Figure 1-1 A417 model performance

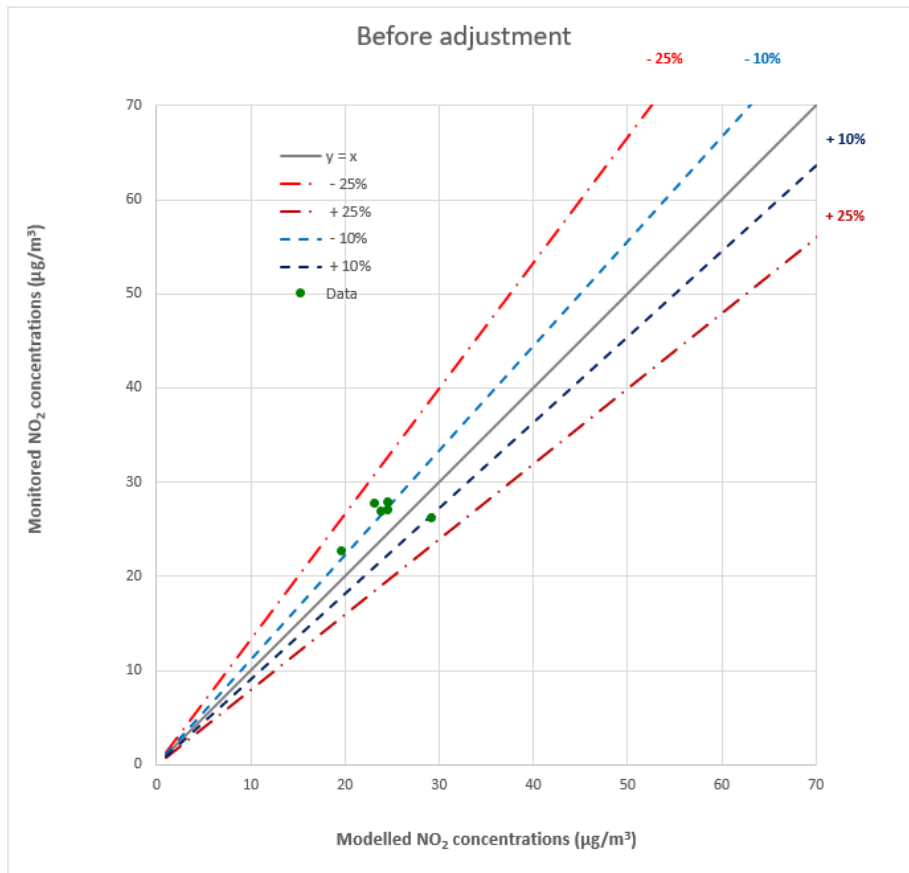


Figure 1-2 M5 model performance (no adjustment required)

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Appendix 5.6
Air quality operational phase impacts

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1 Operational phase impacts

1.1 Ecological receptor results

Nutrient nitrogen deposition

- 1.1.1 The modelled results showing the total and change in nitrogen deposition at all sites as a result of the scheme are provided in Table 1-1 for the baseline year (2016), and the opening year (2024).

Table 1-1 Annual mean nutrient nitrogen deposition in 2024

| Receptor ID | Site name | Critical load | Nitrogen deposition (kg N ha ⁻¹ yr ⁻¹) | | | |
|-------------|---|---------------|---|---------|---------|--------|
| | | | Baseline | 2024 DM | 2024 DS | Change |
| EA1 | Cotswold Commons and Beechwoods and Witcombe/Buckle woods | 10-20 | 30.8 | 30.8 | 30.4 | -0.4 |
| EA2 | Cotswold Commons and Beechwoods and Witcombe/Buckle woods | 10-20 | 30.4 | 30.5 | 30.2 | -0.2 |
| EA3 | Cotswold Commons and Beechwoods and Witcombe/Buckle woods | 10-20 | 30.3 | 30.3 | 30.1 | -0.2 |
| EA4 | Cotswold Commons and Beechwoods and Witcombe/Buckle woods | 10-20 | 30.2 | 30.2 | 30.1 | -0.1 |
| EA5 | Cotswold Commons and Beechwoods and Witcombe/Buckle woods | 10-20 | 30.1 | 30.2 | 30.1 | -0.1 |
| EA6 | Cotswold Commons and Beechwoods and Witcombe/Buckle woods | 10-20 | 30.1 | 30.1 | 30.1 | -0.1 |
| EA7 | Cotswold Commons and Beechwoods and Witcombe/Buckle woods | 10-20 | 30.1 | 30.1 | 30.0 | -0.1 |
| EA8 | Cotswold Commons and Beechwoods and Witcombe/Buckle woods | 10-20 | 30.0 | 30.1 | 30.0 | -0.1 |
| EA9 | Cotswold Commons and Beechwoods and Witcombe/Buckle woods | 10-20 | 30.0 | 30.1 | 30.0 | -0.1 |
| EA10 | Cotswold Commons and Beechwoods and Witcombe/Buckle woods | 10-20 | 30.0 | 30.1 | 30.0 | -0.1 |
| EA11 | Cotswold Commons and Beechwoods and Witcombe/Buckle woods | 10-20 | 30.0 | 30.0 | 30.0 | -0.1 |
| EA12 | Cotswold Commons and Beechwoods and Witcombe/Buckle woods | 10-20 | 30.0 | 30.0 | 30.0 | 0.0 |
| EA13 | Cotswold Commons and Beechwoods and Witcombe/Buckle woods | 10-20 | 30.0 | 30.0 | 30.0 | 0.0 |
| EA14 | Cotswold Commons and Beechwoods and Witcombe/Buckle woods | 10-20 | 30.0 | 30.0 | 30.0 | 0.0 |
| EA15 | Cotswold Commons and Beechwoods and Witcombe/Buckle woods | 10-20 | 29.9 | 30.0 | 30.0 | 0.0 |
| EA16 | Cotswold Commons and Beechwoods and Witcombe/Buckle woods | 10-20 | 29.9 | 30.0 | 30.0 | 0.0 |
| EA17 | Cotswold Commons and Beechwoods and Witcombe/Buckle woods | 10-20 | 29.9 | 30.0 | 30.0 | 0.0 |
| EA18 | Cotswold Commons and Beechwoods and Witcombe/Buckle woods | 10-20 | 29.9 | 30.0 | 30.0 | 0.0 |
| EA19 | Cotswold Commons and Beechwoods and Witcombe/Buckle woods | 10-20 | 29.9 | 30.0 | 30.0 | 0.0 |
| EA20 | Cotswold Commons and Beechwoods and Witcombe/Buckle woods | 10-20 | 29.9 | 30.0 | 30.0 | 0.0 |
| EA21 | Cotswold Commons and Beechwoods and Witcombe/Buckle woods | 10-20 | 29.9 | 30.0 | 29.9 | 0.0 |
| EC1 | Crickley Hill and Barrow Wake | 10-20 | 40.7 | 40.1 | 37.1 | -3.0 |
| EC2 | Crickley Hill and Barrow Wake | 10-20 | 39.2 | 38.8 | 37.0 | -1.8 |
| EC3 | Crickley Hill and Barrow Wake | 10-20 | 38.4 | 38.2 | 36.9 | -1.3 |

| | | | Nitrogen deposition (kg N ha ⁻¹ yr ⁻¹) | | | |
|------|-------------------------------|-------|---|------|------|------|
| | | | | | | |
| EC4 | Crickley Hill and Barrow Wake | 10-20 | 38.0 | 37.8 | 36.8 | -0.9 |
| EC5 | Crickley Hill and Barrow Wake | 10-20 | 37.7 | 37.5 | 36.8 | -0.7 |
| EC6 | Crickley Hill and Barrow Wake | 10-20 | 37.5 | 37.3 | 36.8 | -0.6 |
| EC7 | Crickley Hill and Barrow Wake | 10-20 | 37.3 | 37.2 | 36.7 | -0.5 |
| EC8 | Crickley Hill and Barrow Wake | 10-20 | 37.2 | 37.1 | 36.7 | -0.4 |
| EC9 | Crickley Hill and Barrow Wake | 10-20 | 37.1 | 37.0 | 36.7 | -0.3 |
| EC10 | Crickley Hill and Barrow Wake | 10-20 | 37.0 | 37.0 | 36.7 | -0.2 |
| EC11 | Crickley Hill and Barrow Wake | 10-20 | 37.0 | 36.9 | 36.7 | -0.2 |
| EC12 | Crickley Hill and Barrow Wake | 10-20 | 36.9 | 36.9 | 36.7 | -0.2 |
| EC13 | Crickley Hill and Barrow Wake | 10-20 | 36.9 | 36.8 | 36.7 | -0.1 |
| EC14 | Crickley Hill and Barrow Wake | 10-20 | 36.9 | 36.8 | 36.7 | -0.1 |
| ED1 | Crickley Hill and Barrow Wake | 10-20 | 37.4 | 37.3 | 36.7 | -0.7 |
| ED2 | Crickley Hill and Barrow Wake | 10-20 | 37.2 | 37.1 | 36.5 | -0.6 |
| ED3 | Crickley Hill and Barrow Wake | 10-20 | 37.0 | 36.9 | 36.5 | -0.5 |
| ED4 | Crickley Hill and Barrow Wake | 10-20 | 36.9 | 36.8 | 36.4 | -0.4 |
| ED5 | Crickley Hill and Barrow Wake | 10-20 | 36.8 | 36.7 | 36.4 | -0.4 |
| ED6 | Crickley Hill and Barrow Wake | 10-20 | 36.7 | 36.6 | 36.3 | -0.3 |
| ED7 | Crickley Hill and Barrow Wake | 10-20 | 36.6 | 36.6 | 36.3 | -0.3 |
| ED8 | Crickley Hill and Barrow Wake | 10-20 | 36.6 | 36.5 | 36.3 | -0.3 |
| ED9 | Crickley Hill and Barrow Wake | 10-20 | 36.5 | 36.5 | 36.3 | -0.2 |
| ED10 | Crickley Hill and Barrow Wake | 10-20 | 36.5 | 36.4 | 36.2 | -0.2 |
| ED11 | Crickley Hill and Barrow Wake | 10-20 | 36.4 | 36.4 | 36.2 | -0.2 |
| ED12 | Crickley Hill and Barrow Wake | 10-20 | 36.4 | 36.4 | 36.2 | -0.2 |
| ED13 | Crickley Hill and Barrow Wake | 10-20 | 36.4 | 36.4 | 36.2 | -0.1 |
| EE1 | Crickley Hill and Barrow Wake | 10-20 | 45.9 | 44.7 | 39.9 | -4.8 |
| EE2 | Crickley Hill and Barrow Wake | 10-20 | 41.7 | 41.0 | 39.1 | -1.9 |
| EE3 | Crickley Hill and Barrow Wake | 10-20 | 39.9 | 39.5 | 38.5 | -1.0 |

| | | | Nitrogen deposition (kg N ha ⁻¹ yr ⁻¹) | | | |
|------|--|-------|---|------|------|------|
| | | | | | | |
| EE4 | Crickley Hill and Barrow Wake | 10-20 | 39.0 | 38.6 | 38.1 | -0.6 |
| EE5 | Crickley Hill and Barrow Wake | 10-20 | 38.4 | 38.1 | 37.8 | -0.3 |
| EE6 | Crickley Hill and Barrow Wake | 10-20 | 38.0 | 37.8 | 37.6 | -0.2 |
| EE7 | Crickley Hill and Barrow Wake | 10-20 | 37.7 | 37.5 | 37.4 | -0.2 |
| EE8 | Crickley Hill and Barrow Wake | 10-20 | 37.5 | 37.3 | 37.2 | -0.1 |
| EE9 | Crickley Hill and Barrow Wake | 10-20 | 37.3 | 37.2 | 37.1 | -0.1 |
| EE10 | Crickley Hill and Barrow Wake | 10-20 | 37.1 | 37.0 | 37.0 | 0.0 |
| EE11 | Crickley Hill and Barrow Wake | 10-20 | 37.0 | 36.9 | 36.9 | 0.0 |
| EE12 | Crickley Hill and Barrow Wake | 10-20 | 36.9 | 36.8 | 36.8 | 0.0 |
| EE13 | Crickley Hill and Barrow Wake | 10-20 | 36.8 | 36.8 | 36.8 | 0.0 |
| EE14 | Crickley Hill and Barrow Wake | 10-20 | 36.8 | 36.7 | 36.7 | 0.0 |
| EE15 | Crickley Hill and Barrow Wake | 10-20 | 36.7 | 36.6 | 36.7 | 0.0 |
| EE16 | Crickley Hill and Barrow Wake | 10-20 | 36.6 | 36.6 | 36.6 | 0.0 |
| EE17 | Crickley Hill and Barrow Wake | 10-20 | 36.6 | 36.6 | 36.6 | 0.0 |
| EE18 | Crickley Hill and Barrow Wake | 10-20 | 36.5 | 36.5 | 36.5 | 0.0 |
| EE19 | Crickley Hill and Barrow Wake | 10-20 | 36.5 | 36.5 | 36.5 | 0.0 |
| EE20 | Crickley Hill and Barrow Wake | 10-20 | 36.5 | 36.4 | 36.5 | 0.0 |
| EE21 | Crickley Hill and Barrow Wake | 10-20 | 36.4 | 36.4 | 36.4 | 0.0 |
| EG1 | Hartley Wood | 10 | 18.1 | 18.1 | 18.0 | -0.1 |
| EH1 | Leckhampton Hill and Charlton Kings Common | 10-20 | 31.9 | 31.9 | 32.1 | 0.2 |
| EH2 | Leckhampton Hill and Charlton Kings Common | 10-20 | 31.8 | 31.8 | 31.9 | 0.1 |
| EH3 | Leckhampton Hill and Charlton Kings Common | 10-20 | 31.7 | 31.7 | 31.8 | 0.1 |
| EH4 | Leckhampton Hill and Charlton Kings Common | 10-20 | 31.6 | 31.6 | 31.7 | 0.1 |
| EH5 | Leckhampton Hill and Charlton Kings Common | 10-20 | 31.6 | 31.6 | 31.7 | 0.1 |
| EH6 | Leckhampton Hill and Charlton Kings Common | 10-20 | 31.5 | 31.5 | 31.6 | 0.1 |
| EH7 | Leckhampton Hill and Charlton Kings Common | 10-20 | 31.5 | 31.5 | 31.6 | 0.1 |
| EH8 | Leckhampton Hill and Charlton Kings Common | 10-20 | 31.5 | 31.5 | 31.6 | 0.1 |

| | | | Nitrogen deposition (kg N ha ⁻¹ yr ⁻¹) | | | |
|------|--|-------|---|------|------|------|
| | | | | | | |
| EH9 | Leckhampton Hill and Charlton Kings Common | 10-20 | 31.5 | 31.5 | 31.6 | 0.1 |
| EH10 | Leckhampton Hill and Charlton Kings Common | 10-20 | 31.4 | 31.5 | 31.5 | 0.1 |
| EH11 | Leckhampton Hill and Charlton Kings Common | 10-20 | 31.4 | 31.5 | 31.5 | 0.1 |
| EH12 | Leckhampton Hill and Charlton Kings Common | 10-20 | 31.4 | 31.5 | 31.5 | 0.1 |
| EH13 | Leckhampton Hill and Charlton Kings Common | 10-20 | 31.4 | 31.4 | 31.5 | 0.1 |
| EH14 | Leckhampton Hill and Charlton Kings Common | 10-20 | 31.4 | 31.4 | 31.5 | 0.1 |
| EH15 | Leckhampton Hill and Charlton Kings Common | 10-20 | 31.4 | 31.4 | 31.5 | 0.1 |
| EI1 | Leckhampton Hill and Charlton Kings Common | 10-20 | 31.3 | 31.3 | 31.3 | 0.0 |
| EI2 | Leckhampton Hill and Charlton Kings Common | 10-20 | 31.2 | 31.3 | 31.3 | 0.0 |
| EI3 | Leckhampton Hill and Charlton Kings Common | 10-20 | 31.2 | 31.3 | 31.3 | 0.0 |
| EI4 | Leckhampton Hill and Charlton Kings Common | 10-20 | 31.2 | 31.3 | 31.3 | 0.0 |
| EI5 | Leckhampton Hill and Charlton Kings Common | 10-20 | 31.2 | 31.3 | 31.3 | 0.0 |
| EJ1 | Chatcombe Wood | 10 | 22.6 | 21.8 | 21.2 | -0.5 |
| EK1 | Lineover Wood | 10 | 22.2 | 21.4 | 20.9 | -0.5 |
| EK2 | Lineover Wood | 10 | 19.8 | 19.5 | 19.3 | -0.2 |
| EK3 | Lineover Wood | 10 | 19.1 | 18.9 | 18.7 | -0.1 |
| EK4 | Lineover Wood | 10 | 18.7 | 18.6 | 18.4 | -0.1 |
| EK5 | Lineover Wood | 10 | 18.5 | 18.4 | 18.3 | -0.1 |
| EK6 | Lineover Wood | 10 | 18.3 | 18.2 | 18.2 | -0.1 |
| EK7 | Lineover Wood | 10 | 18.2 | 18.2 | 18.1 | -0.1 |
| EK8 | Lineover Wood | 10 | 18.1 | 18.1 | 18.0 | 0.0 |
| EK9 | Lineover Wood | 10 | 18.1 | 18.0 | 18.0 | 0.0 |
| EK10 | Lineover Wood | 10 | 18.0 | 18.0 | 18.0 | 0.0 |
| EK11 | Lineover Wood | 10 | 18.0 | 18.0 | 17.9 | 0.0 |
| EK12 | Lineover Wood | 10 | 17.9 | 17.9 | 17.9 | 0.0 |
| EK13 | Lineover Wood | 10 | 17.9 | 17.9 | 17.9 | 0.0 |
| EK14 | Lineover Wood | 10 | 17.9 | 17.9 | 17.9 | 0.0 |

| | | | Nitrogen deposition (kg N ha ⁻¹ yr ⁻¹) | | | |
|------|-------------------------|---------|---|------|------|-----|
| | | | | | | |
| EK15 | Lineover Wood | 10 | 17.9 | 17.9 | 17.9 | 0.0 |
| EK16 | Lineover Wood | 10 | 17.8 | 17.9 | 17.8 | 0.0 |
| EK17 | Lineover Wood | 10 | 17.8 | 17.8 | 17.8 | 0.0 |
| EK18 | Lineover Wood | 10 | 17.8 | 17.8 | 17.8 | 0.0 |
| EK19 | Lineover Wood | 10 | 17.8 | 17.8 | 17.8 | 0.0 |
| EK20 | Lineover Wood | 10 | 17.8 | 17.8 | 17.8 | 0.0 |
| EK21 | Lineover Wood | 10 | 17.8 | 17.8 | 17.8 | 0.0 |
| EL1 | Cleevely Wood | 10 | 18.2 | 18.2 | 18.2 | 0.0 |
| EM1 | Westwell Gorse | 10 | 17.1 | 17.0 | 17.1 | 0.0 |
| EM2 | Westwell Gorse | 10 | 16.7 | 16.7 | 16.7 | 0.0 |
| EM3 | Westwell Gorse | 10 | 16.6 | 16.5 | 16.6 | 0.0 |
| EM4 | Westwell Gorse | 10 | 16.5 | 16.5 | 16.5 | 0.0 |
| EM5 | Westwell Gorse | 10 | 16.5 | 16.5 | 16.5 | 0.0 |
| EM6 | Westwell Gorse | 10 | 16.4 | 16.4 | 16.4 | 0.0 |
| EM7 | Westwell Gorse | 10 | 16.4 | 16.4 | 16.4 | 0.0 |
| EM8 | Westwell Gorse | 10 | 16.4 | 16.4 | 16.4 | 0.0 |
| EM9 | Westwell Gorse | 10 | 16.4 | 16.4 | 16.4 | 0.0 |
| EM10 | Westwell Gorse | 10 | 16.4 | 16.4 | 16.4 | 0.0 |
| EM11 | Westwell Gorse | 10 | 16.4 | 16.4 | 16.4 | 0.0 |
| EM12 | Westwell Gorse | 10 | 16.4 | 16.4 | 16.4 | 0.0 |
| EM13 | Westwell Gorse | 10 | 16.4 | 16.4 | 16.4 | 0.0 |
| EM14 | Westwell Gorse | 10 | 16.3 | 16.4 | 16.4 | 0.0 |
| EM15 | Westwell Gorse | 10 | 16.3 | 16.4 | 16.4 | 0.0 |
| EM16 | Westwell Gorse | 10 | 16.3 | 16.4 | 16.4 | 0.0 |
| EM17 | Westwell Gorse | 10 | 16.3 | 16.4 | 16.4 | 0.0 |
| EN1 | North Meadow, Cricklade | 20 - 30 | 20.2 | 20.1 | 20.2 | 0.0 |
| EN2 | North Meadow, Cricklade | 20 - 30 | 20.1 | 20.1 | 20.1 | 0.0 |

| | | | Nitrogen deposition (kg N ha ⁻¹ yr ⁻¹) | | | |
|------|-------------------------|---------|---|------|------|-----|
| | | | | | | |
| EN3 | North Meadow, Cricklade | 20 - 30 | 20.1 | 20.1 | 20.1 | 0.0 |
| EN4 | North Meadow, Cricklade | 20 - 30 | 20.1 | 20.0 | 20.1 | 0.0 |
| EN5 | North Meadow, Cricklade | 20 - 30 | 20.0 | 20.0 | 20.0 | 0.0 |
| EN6 | North Meadow, Cricklade | 20 - 30 | 20.0 | 20.0 | 20.0 | 0.0 |
| EN7 | North Meadow, Cricklade | 20 - 30 | 20.0 | 20.0 | 20.0 | 0.0 |
| EN8 | North Meadow, Cricklade | 20 - 30 | 20.0 | 20.0 | 20.0 | 0.0 |
| EN9 | North Meadow, Cricklade | 20 - 30 | 20.0 | 20.0 | 20.0 | 0.0 |
| EN10 | North Meadow, Cricklade | 20 - 30 | 19.9 | 19.9 | 20.0 | 0.0 |
| EN11 | North Meadow, Cricklade | 20 - 30 | 19.9 | 19.9 | 19.9 | 0.0 |
| EP1 | Mole Grove | 10 | 19.8 | 19.9 | 19.9 | 0.0 |
| EQ1 | Hucclecote Meadows | 20 - 30 | 20.2 | 20.2 | 20.2 | 0.0 |
| EQ2 | Hucclecote Meadows | 20 - 30 | 19.8 | 19.8 | 19.8 | 0.0 |
| EQ3 | Hucclecote Meadows | 20 - 30 | 19.5 | 19.5 | 19.5 | 0.0 |
| EQ4 | Hucclecote Meadows | 20 - 30 | 19.3 | 19.4 | 19.3 | 0.0 |
| EQ5 | Hucclecote Meadows | 20 - 30 | 19.2 | 19.2 | 19.2 | 0.0 |
| EQ6 | Hucclecote Meadows | 20 - 30 | 19.0 | 19.1 | 19.1 | 0.0 |
| EQ7 | Hucclecote Meadows | 20 - 30 | 18.9 | 19.0 | 19.0 | 0.0 |
| EQ8 | Hucclecote Meadows | 20 - 30 | 18.9 | 18.9 | 18.9 | 0.0 |
| EQ9 | Hucclecote Meadows | 20 - 30 | 18.8 | 18.8 | 18.8 | 0.0 |
| EQ10 | Hucclecote Meadows | 20 - 30 | 18.7 | 18.8 | 18.8 | 0.0 |
| EQ11 | Hucclecote Meadows | 20 - 30 | 18.7 | 18.7 | 18.7 | 0.0 |
| EQ12 | Hucclecote Meadows | 20 - 30 | 18.6 | 18.7 | 18.7 | 0.0 |
| EQ13 | Hucclecote Meadows | 20 - 30 | 18.6 | 18.6 | 18.6 | 0.0 |
| EQ14 | Hucclecote Meadows | 20 - 30 | 18.6 | 18.6 | 18.6 | 0.0 |
| EQ15 | Hucclecote Meadows | 20 - 30 | 18.5 | 18.6 | 18.6 | 0.0 |
| ER1 | Hucclecote Meadows | 20 - 30 | 20.3 | 20.3 | 20.3 | 0.0 |
| ER2 | Hucclecote Meadows | 20 - 30 | 19.8 | 19.8 | 19.8 | 0.0 |

| | | | Nitrogen deposition (kg N ha ⁻¹ yr ⁻¹) | | | |
|------|--|---------|---|------|------|------|
| | | | | | | |
| ER3 | Hucclecote Meadows | 20 - 30 | 19.4 | 19.5 | 19.4 | 0.0 |
| ER4 | Hucclecote Meadows | 20 - 30 | 19.2 | 19.2 | 19.2 | 0.0 |
| EF1 | Ullenwood | 10 | 27.5 | 26.6 | 26.3 | -0.3 |
| EO1 | Ancient Woodland near Broad Blunston | 10 | 20.3 | 20.3 | 20.3 | 0.0 |
| ES1 | Ancient Woodland near Michaelwood services | 10 | 20.0 | 20.1 | 20.1 | 0.0 |
| ET1 | Cowley/Wards Woods | 10 | 18.4 | 18.4 | 18.5 | 0.0 |
| EU1 | Daniels Wood | 10 | 19.6 | 19.7 | 19.7 | 0.0 |
| EV1 | Furzeground Wood | 10 | 22.0 | 22.1 | 22.1 | 0.0 |
| EW1 | Michael Wood North | 10 | 22.5 | 22.5 | 22.5 | 0.0 |
| EX1 | Park Wood | 10 | 18.6 | 18.6 | 18.7 | 0.1 |
| EY1 | Strays Grove | 10 | 18.8 | 19.0 | 19.0 | 0.0 |
| EZ1 | Charlton Kings Railway Line | 10 | 20.4 | 20.2 | 19.3 | -0.9 |
| EAA1 | Cockleford Marsh and Banks | 10 | 20.4 | 20.1 | 19.4 | -0.6 |
| EAB1 | Hartley Hill Field | 10 | 17.7 | 17.8 | 17.7 | 0.0 |
| EAC1 | Marlborough Downs | 10 | 30.5 | 29.4 | 29.6 | 0.1 |

1.2 Human receptor results

- 1.2.1 The modelled NO₂ concentrations and predicted change in concentrations are presented in Table 1-2.

Table 1-2 Annual mean NO₂ concentrations

| Receptor ID | Grid reference | | Reference map sheet | Base (2016) ($\mu\text{g}/\text{m}^3$) | NO ₂ annual mean ($\mu\text{g}/\text{m}^3$) 2024 | | |
|-------------|----------------|--------|---------------------|--|---|---------------------------------|-------------------------------------|
| | X | Y | | | DM ($\mu\text{g}/\text{m}^3$) | DS ($\mu\text{g}/\text{m}^3$) | Change ($\mu\text{g}/\text{m}^3$) |
| 1 | 374820 | 202409 | 2 | 17.4 | 15.0 | 15.0 | 0.0 |
| 2 | 373639 | 200883 | 2 | 14.8 | 12.8 | 12.8 | > -0.1 |
| 3 | 376855 | 205539 | 3 | 16.1 | 14.1 | 14.1 | > -0.1 |
| 4 | 377621 | 206836 | 3 | 12.7 | 10.7 | 10.6 | > -0.1 |
| 5 | 390481 | 225716 | 7 | 21.6 | 21.8 | 22.3 | 0.5 |
| 6 | 390913 | 226369 | 7 | 16.7 | 14.3 | 14.3 | < 0.1 |
| 7 | 401199 | 203898 | 13 | 12.0 | 9.5 | 10.4 | 0.8 |
| 8 | 402313 | 202523 | 13 | 16.6 | 13.5 | 14.4 | 0.9 |
| 9 | 403812 | 202805 | 13 | 19.4 | 16.5 | 17.1 | 0.6 |
| 10 | 402952 | 202115 | 13 | 24.7 | 21.0 | 22.1 | 1.0 |
| 11 | 401707 | 203106 | 13 | 15.7 | 13.0 | 13.6 | 0.6 |
| 12 | 401292 | 201304 | 13 | 22.5 | 18.8 | 19.5 | 0.7 |
| 13 | 405764 | 203456 | 13 | 10.5 | 8.7 | 8.8 | < 0.1 |
| 14 | 406820 | 217772 | 10 | 11.8 | 9.7 | 9.3 | -0.3 |
| 15 | 414722 | 214046 | 11 | 10.2 | 8.4 | 8.1 | -0.3 |
| 16 | 372623 | 199172 | 1 | 19.7 | 17.6 | 17.7 | < 0.1 |
| 17 | 372163 | 197441 | 1 | 22.6 | 20.4 | 20.6 | 0.2 |
| 18 | 409466 | 195090 | 15 | 19.1 | 16.4 | 17.0 | 0.6 |
| 19 | 406337 | 198747 | 14 | 14.6 | 12.4 | 12.8 | 0.4 |
| 20 | 411208 | 193324 | 15 | 36.5 | 31.8 | 33.7 | 1.9 |

| Receptor ID | Grid reference | | Reference map sheet | Base (2016) ($\mu\text{g}/\text{m}^3$) | NO ₂ annual mean ($\mu\text{g}/\text{m}^3$) 2024 | | |
|-------------|----------------|--------|---------------------|---|---|---------------------------------|-------------------------------------|
| | X | Y | | | DM ($\mu\text{g}/\text{m}^3$) | DS ($\mu\text{g}/\text{m}^3$) | Change ($\mu\text{g}/\text{m}^3$) |
| 21 | 413566 | 191201 | 15 and 16 | 25.6 | 22.0 | 22.9 | 0.9 |
| 22 | 414661 | 190057 | 16 | 23.0 | 19.9 | 20.4 | 0.4 |
| 23 | 412066 | 192574 | 15 | 22.2 | 19.1 | 19.8 | 0.7 |
| 24 | 419419 | 182724 | 17 | 28.8 | 24.9 | 25.5 | 0.6 |
| 25 | 419333 | 180975 | 18 | 34.9 | 31.6 | 32.2 | 0.5 |
| 26 | 419506 | 184885 | 17 | 30.0 | 25.4 | 25.8 | 0.4 |
| 27 | 419929 | 180861 | 18 | 31.8 | 29.0 | 29.1 | 0.2 |
| 28 | 418374 | 186658 | 17 | 25.1 | 21.1 | 21.2 | 0.2 |
| 29 | 417856 | 187561 | 16 | 29.6 | 25.2 | 25.6 | 0.4 |
| 30 | 418541 | 186261 | 17 | 25.7 | 20.4 | 20.6 | 0.2 |
| 31 | 415258 | 189579 | 16 | 25.3 | 21.1 | 21.6 | 0.5 |
| 32 | 383810 | 212888 | 4 | 25.5 | 23.1 | 23.4 | 0.3 |
| 33 | 385818 | 214756 | 5 | 22.6 | 20.2 | 20.4 | 0.2 |
| 34 | 387021 | 216137 | 5 | 20.5 | 17.9 | 18.0 | < 0.1 |
| 35 | 389877 | 216078 | 5 | 19.6 | 16.7 | 16.6 | > -0.1 |
| 36 | 388653 | 218412 | 5 | 17.1 | 14.6 | 14.7 | 0.1 |
| 37 | 389340 | 219107 | 5 and 6 | 24.0 | 21.6 | 22.2 | 0.5 |
| 38 | 387674 | 217142 | 5 | 37.5 | 34.6 | 35.5 | 0.8 |
| 39 | 389637 | 221834 | 6 | 28.4 | 25.1 | 25.6 | 0.5 |
| 40 | 389752 | 221489 | 6 | 26.7 | 23.4 | 23.7 | 0.3 |
| 41 | 394545 | 213635 | 20 | 23.3 | 20.0 | 10.1 | -10.0 |
| 42 | 391752 | 214905 | 9 | 13.4 | 11.4 | 9.6 | -1.8 |

| Receptor ID | Grid reference | | Reference map sheet | Base (2016) ($\mu\text{g}/\text{m}^3$) | NO ₂ annual mean ($\mu\text{g}/\text{m}^3$) 2024 | | |
|-------------|----------------|--------|---------------------|--|---|---------------------------------|-------------------------------------|
| | X | Y | | | DM ($\mu\text{g}/\text{m}^3$) | DS ($\mu\text{g}/\text{m}^3$) | Change ($\mu\text{g}/\text{m}^3$) |
| 43 | 393466 | 213996 | 9 | 13.3 | 11.2 | 8.2 | -3.0 |
| 44 | 392610 | 214354 | 9 | 13.3 | 11.0 | 9.7 | -1.3 |
| 45 | 392879 | 215807 | 9 | 24.0 | 20.3 | 19.9 | -0.4 |
| 46 | 392076 | 215866 | 9 | 19.7 | 16.6 | 16.5 | -0.1 |
| 47 | 394416 | 217791 | 9 | 12.0 | 9.9 | 10.4 | 0.6 |
| 48 | 394442 | 217343 | 9 | 13.7 | 11.3 | 12.3 | 1.0 |
| 49 | 393450 | 216124 | 9 | 39.6 | 33.1 | 19.9 | -13.3 |
| 50 | 392968 | 215759 | 9 | 16.8 | 14.1 | 16.3 | 2.2 |
| 51 | 393457 | 216129 | 9 | 39.1 | 32.3 | 19.3 | -13.0 |
| 52 | 394778 | 216458 | 9 | 21.8 | 18.0 | 16.4 | -1.6 |
| 53 | 394812 | 218886 | 8 | 17.5 | 14.5 | 16.6 | 2.1 |
| 54 | 392116 | 215734 | 9 | 14.6 | 12.2 | 13.3 | 1.1 |
| 55 | 394777 | 219886 | 8 | 17.2 | 14.5 | 16.2 | 1.7 |
| 56 | 390995 | 217304 | 5 and 9 | 28.7 | 25.0 | 26.9 | 1.9 |
| 57 | 392116 | 215734 | 9 | 14.6 | 12.2 | 13.3 | 1.1 |
| 58 | 394924 | 219349 | 8 | 13.2 | 10.9 | 11.9 | 1.0 |
| 59 | 390451 | 216687 | 5 | 24.9 | 21.9 | 22.7 | 0.8 |
| 60 | 393752 | 215136 | 9 | 10.3 | 8.5 | 9.4 | 0.9 |
| 61 | 390286 | 215753 | 5 | 14.6 | 12.5 | 10.9 | -1.6 |
| 62 | 393315 | 215952 | 9 | 17.1 | 14.4 | 13.9 | -0.4 |
| 63 | 393391 | 215756 | 9 | 18.2 | 15.3 | 11.1 | -4.1 |
| 64 | 390184 | 217041 | 5 | 21.9 | 19.0 | 19.7 | 0.7 |

| Receptor ID | Grid reference | | Reference map sheet | Base (2016) ($\mu\text{g}/\text{m}^3$) | NO ₂ annual mean ($\mu\text{g}/\text{m}^3$) 2024 | | |
|-------------|----------------|--------|---------------------|--|---|---------------------------------|-------------------------------------|
| | X | Y | | | DM ($\mu\text{g}/\text{m}^3$) | DS ($\mu\text{g}/\text{m}^3$) | Change ($\mu\text{g}/\text{m}^3$) |
| 65 | 397560 | 209331 | 20 | 16.7 | 14.2 | 15.5 | 1.3 |
| 66 | 396666 | 210897 | 20 | 14.4 | 12.2 | 13.1 | 0.9 |
| 67 | 396884 | 214203 | 9 | 10.8 | 8.8 | 8.2 | -0.6 |
| 68 | 396315 | 214739 | 9 | 8.6 | 7.0 | 7.0 | 0.0 |
| 69 | 396725 | 213176 | 20 | 10.7 | 8.7 | 8.0 | -0.7 |
| 70 | 396810 | 215019 | 9 | 9.0 | 7.3 | 7.1 | -0.2 |
| 71 | 396735 | 211792 | 20 | 10.2 | 8.4 | 7.8 | -0.6 |
| 72 | 396464 | 219318 | 8 | 13.6 | 11.3 | 10.2 | -1.1 |
| 73 | 395165 | 219845 | 8 | 12.2 | 10.1 | 10.7 | 0.6 |
| 74 | 396841 | 216637 | 9 | 12.3 | 10.1 | 9.0 | -1.1 |
| 75 | 398850 | 218461 | 8 | 11.9 | 9.7 | 9.2 | -0.4 |
| 76 | 395257 | 220182 | 8 | 24.2 | 20.3 | 22.3 | 2.0 |
| 77 | 396204 | 220599 | 8 | 16.5 | 13.5 | 12.9 | -0.6 |
| 78 | 401968 | 205119 | 13 | 15.1 | 12.9 | 13.7 | 0.8 |
| 79 | 401725 | 218716 | 10 | 12.4 | 10.1 | 9.7 | -0.4 |
| 80 | 400738 | 218752 | 8 and 10 | 15.5 | 12.6 | 11.8 | -0.8 |
| 81 | 402989 | 218361 | 10 | 13.7 | 11.2 | 10.7 | -0.5 |
| 82 | 411244 | 206752 | 12 | 10.0 | 8.3 | 8.4 | 0.1 |
| 83 | 415568 | 209820 | 12 | 13.3 | 11.2 | 11.5 | 0.4 |
| 84 | 429310 | 177153 | 19 | 30.2 | 27.8 | 27.9 | < 0.1 |
| 85 | 424037 | 180035 | 18 | 21.6 | 19.2 | 19.0 | -0.2 |
| 86 | 393869 | 215412 | 9 | 10.3 | 8.5 | 11.6 | 3.1 |

| Receptor ID | Grid reference | | Reference map sheet | Base (2016) ($\mu\text{g}/\text{m}^3$) | NO ₂ annual mean ($\mu\text{g}/\text{m}^3$) 2024 | | |
|-------------|----------------|--------|---------------------|--|---|---------------------------------|-------------------------------------|
| | X | Y | | | DM ($\mu\text{g}/\text{m}^3$) | DS ($\mu\text{g}/\text{m}^3$) | Change ($\mu\text{g}/\text{m}^3$) |
| 87 | 394208 | 215344 | 9 | 17.7 | 14.5 | 18.6 | 4.2 |
| 88 | 394338 | 216885 | 9 | 18.6 | 15.3 | 15.4 | 0.1 |
| 89 | 395603 | 212647 | 20 | 15.3 | 12.8 | 13.7 | 1.0 |
| 90 | 396666 | 210897 | 20 | 12.0 | 10.1 | 10.9 | 0.8 |
| 91 | 395255 | 213860 | 9 | 11.9 | 9.8 | 10.1 | 0.4 |

1.3 Compliance risk assessment results

1.3.1 The modelled NO₂ concentrations and change in concentrations at qualifying features are presented in Table 1-3.

Table 1-3 Compliance risk annual mean NO₂ concentrations

| Receptor ID | Grid reference | | Base (2016) (µg/m ³) | NO ₂ annual mean (µg/m ³) 2024 | | |
|-------------|----------------|--------|-------------------------------------|---|-------------------------|-----------------------------|
| | X | Y | | DM (µg/m ³) | DS (µg/m ³) | Change (µg/m ³) |
| 8 | 402313 | 202523 | 16.6 | 13.0 | 13.4 | 0.4 |
| 10 | 402952 | 202115 | 24.7 | 20.2 | 20.6 | 0.4 |
| 12 | 401292 | 201304 | 16.5 | 18.0 | 18.3 | 0.3 |
| 77 | 396204 | 220599 | 28.0 | 10.9 | 10.6 | -0.3 |
| C1 | 402948 | 202119 | 32.8 | 15.8 | 16.1 | 0.3 |
| C2 | 395837 | 221478 | 29.3 | 18.8 | 18.6 | -0.2 |
| C3 | 395843 | 221482 | 22.5 | 17.4 | 17.2 | -0.2 |
| C4 | 396125 | 221016 | 17.3 | 14.1 | 13.7 | -0.4 |
| C5 | 396447 | 219744 | 14.9 | 10.9 | 9.8 | -1.1 |
| C6 | 396450 | 219746 | 15.3 | 9.8 | 9.2 | -0.6 |
| C7 | 396361 | 219950 | 14.0 | 10.0 | 9.3 | -0.7 |
| C8 | 396364 | 219952 | 16.6 | 9.4 | 8.9 | -0.5 |
| C9 | 396207 | 220600 | 16.7 | 10.9 | 10.6 | -0.3 |
| C10 | 396330 | 220186 | 15.0 | 11.1 | 10.3 | -0.8 |
| C11 | 396334 | 220187 | 15.9 | 10.3 | 9.8 | -0.5 |
| C12 | 396332 | 220049 | 14.3 | 10.7 | 10.1 | -0.6 |
| C13 | 396328 | 220049 | 13.9 | 10.0 | 9.6 | -0.4 |

| Receptor ID | Grid reference | | Base (2016) ($\mu\text{g}/\text{m}^3$) | NO ₂ annual mean ($\mu\text{g}/\text{m}^3$) 2024 | | |
|-------------|----------------|--------|---|---|---------------------------------|-------------------------------------|
| | X | Y | | DM ($\mu\text{g}/\text{m}^3$) | DS ($\mu\text{g}/\text{m}^3$) | Change ($\mu\text{g}/\text{m}^3$) |
| C14 | 396330 | 219981 | 15.8 | 9.3 | 8.9 | -0.4 |
| C15 | 396334 | 219981 | 16.6 | 10.2 | 9.5 | -0.6 |