



**2020 Air Quality Annual Status Report (ASR)
In fulfilment of Part IV of the Environment Act 1995
Local Air Quality Management**

June 2020

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Executive Summary: Air Quality in Our Area

Air Quality in Eden

Air pollution is associated with a number of adverse health impacts. It is recognised as a contributing factor in the onset of heart disease and cancer. Additionally, air pollution particularly affects the most vulnerable in society: children and older people, and those with heart and lung conditions. There is also often a strong correlation with equalities issues, because areas with poor air quality are also often the less affluent areas^{1,2}.

The annual health cost to society of the impacts of particulate matter alone in the UK is estimated to be around £16 billion³.

Actions to Improve Air Quality

Development Control within the district of Eden is managed by Eden District Council, the Lake District National Park Authority, the Yorkshire Dales National Park Authority and Cumbria County Council. Cumbria County Council is responsible for the management of the roads across Eden and Highways England are responsible for the M6 and A66 through the district. All the local planning authorities are strongly committed to development where sustainable transport is a key consideration in the process. Eden District Council is the most sparsely populated of any district in England and as a consequence many people depend on car travel since public transport can be infrequent or non-existent in rural areas.

Eden District Council's Local Plan sets out that new development will be required to demonstrate that it protects air quality and does not result in environmentally unacceptable levels of traffic. It identifies that the Council will work with partner organisations to ensure that the environmental impact of travel is reduced, to conserve energy and reduce air pollution by limiting the growth in traffic.

Eden District Council Local Plan 2014 – 2032, Policy ENV7 – Air Pollution states that:

¹ Environmental equity, air quality, socioeconomic status and respiratory health, 2010

² Air quality and social deprivation in the UK: an environmental inequalities analysis, 2006

³ Defra. Abatement cost guidance for valuing changes in air quality, May 2013

All major development proposals will be required to assess the likely impacts of the development on air quality and mitigate any negative impacts by:

1. Ensuring the development is located within easy reach of established public transport routes
2. Maximising provision for cycling and pedestrian facilities
3. Encouraging the use of cleaner transport fuels on site, through the inclusion of electric car charging points, and
4. Contributing towards the improvement of the highway network where the development is predicted to result in increased congestion on the highway network.

The Cumbria Local Transport Plan 2011 - 2026, produced by Cumbria County Council, identifies many measures aimed at improving ease of access to jobs, services and healthcare. The progress of this plan to date has seen:

- Introduction of Rural Wheels scheme - Transport for people in rural areas. Passengers sharing transport benefit from a reduced rate.
- Introduction of a Village Wheels Scheme - Timetabled service for communities to nearest town. Only available in Eden for Greystoke and Newbiggin.
- Introduction of a Community Wheels scheme - Demand responsive transport service for residents of Alston Moor Parish. One bus and service is for Alston, the other for Garrigill
- A66 Temple Sowerby by-pass
- Innovative rural traffic calming scheme in Clifton
- Environmental improvements in Appleby and Kirkby Stephen
- Surfaced walk and cycle route from Penrith to University campus at Newton Rigg

Penrith Town Council, published their Council Plan for 2017-2022 in January 2017. This outlines the strategic plan for the town and identifies Improving Air Quality as a key theme. Measures that are identified will promote improvements in air quality include:

- Provide inclusive walking and cycling opportunities in and around Penrith;

- Improve transport services through working with partners to secure improvements in public transport services, look for real alternatives to public transport, promote Car Club, community transport schemes and workable schemes for lift and car share;
- Lobbying for electric car charge points

As regards the wider Eden area, the Council has recently declared a Climate Emergency and agreed a number of actions, several of which are likely to impact upon air quality:

- Declaring a Climate Emergency and an Ecological Emergency.
- To aim to make Eden District carbon neutral by 2030, taking into account both production and consumption emissions.
- Critically to evaluate the ecological impacts of all Eden District Council's decisions and actions; to refuse initiatives that will result in the degradation of the natural environment and biodiversity; and actively to promote the safeguarding and improvement of the natural environment.
- To prepare, by the end of 2019, a strategic plan to achieve zero carbon emissions by 2030, across all activities for which the Council is responsible, working with independent expert advisory groups to ensure the council adopts best practice.
- To call on the UK Government to provide the powers, resources and funding to meet a 2030 zero carbon target across Eden District.
- To work together with other councils, public and private sector organisations (within Eden, Cumbria, the UK and internationally) to determine and implement best practice methods to achieve zero emissions in Eden District by 2030.
- To facilitate the involvement of Eden's residents, from schoolchildren to elders, in formulating plans to address the climate and ecological crisis, delivering those plans and monitoring their progress.

A new strategic and corporate plan <https://www.eden.gov.uk/your-council/council-business/council-documents/corporate-plan-2019-to-2023/> was developed and published in 2019 that identified a number of key priorities for the next four years. Air Quality comes under two of the headings, 'sustainable' and 'healthy, safe and

secure'. A number of key actions are identified in both headings that have the potential to improve air quality for Eden visitors and residents:

- Identify opportunities to lobby for improvements to the network of public transport provision.
- Support communities to build resilient integrated transport through the Cumbria Mobility Network.
- Work in partnership to deliver the Cumbria Cycle Strategy to make Eden an even better place to cycle for those who visit and live here.
- Delivering electric vehicle charging points in the district.
- Develop a superfast broadband action plan by March 2020, working with partners to upgrade broadband provision to communities and businesses through the Borderlands Deal.
- Deliver a strategy which supports innovative, environmentally sustainable and affordable housing.
- Deliver a programme to reduce fuel poverty linked to the Zero Carbon Eden Strategy.
- Conduct a feasibility study for a support service (Homes Improvement Agency) to enable access to grants to improve the condition, energy efficiency and carbon footprint of private rented and owner occupied properties.

Unfortunately the recent pandemic has meant that as part of its recovery plan, the Council intends to revisit the Corporate Plan and amend some of the priorities and key actions. It is envisaged that this will happen over the next few months, but at the time of writing this report, no information is available.

Conclusions and Priorities

There have now been no exceedances of the AQO for NO₂ measured along the A6 within Eamont Bridge since 2012. The traffic data has been estimated to show an ongoing trend upwards in total traffic numbers (2% increase estimated in 2016). However this is still considerably lower than has been counted on this section of road in previous years. At the end of 2017, the number of monitoring tubes within Eamont

Bridge was reduced to three locations in light of the monitoring results, and as a result of the 2019 data, this will reduce to two tubes.

In 2017 there was again no exceedance of the AQO for NO₂ at any monitoring location along Victoria Road. At the end of 2017 in light of these results, a review of monitoring locations was undertaken and the total number has been reduced by two with one tube being relocated to the bottom of Roper Street.

In 2016 there was a breach of the AQO at the top of Castlegate although there were concerns regarding the accuracy of the data at this location. In 2017 there has again been a breach of the AQO at one location although this time it is further down the street but within the canyon-like section. In 2018 two of the tubes on Castlegate showed a breach of the AQO and in establishing the extent of the area affected is a key priority going forward. In 2019 the same two tubes failed on Castlegate which lead to the council purchasing two automatic monitoring devices to install along Castlegate to define and assess the likely air quality monitoring area that the Council recognises that it will need to declare.

In 2018 the Council became aware that the nationally published background maps for nitrogen dioxide did not include a major industrial process that is upwind of Penrith or the two large industrial areas (Penrith Industrial Estate and Gilwilly Industrial Estate) on the eastern edge of the town. Air Quality reports accompanying planning applications and under-reporting the impact of air quality in the officers' opinion. The Council has therefore included for 2018, two new tube sites which it is hoped will give some useful data on these areas and these have been reported for the first time in this report.

The Council and the Environmental Protection Team is now involved with the proposed widening of the A66 through Eden and Penrith. There is the potential for significant increase in traffic numbers within the sensitive areas of Penrith and the impact of them on Air Quality is a key consideration. An initial consultation on preferred routes has been received by the Council and Members and Officers have responded with explicit reference to Air Quality concerns.

Local Engagement and How to get Involved

There has been an increasing media interest in air quality nationally as a wider understanding of the health effects from air quality has been publicised.

For members of the public wanting to take an active role in improving air quality within this district there are the following action groups:

- Cumbria Action for Sustainability (CAfS) promotes low carbon living, energy saving and reduced use of fossil fuels throughout Cumbria.
- Penrith Action for Community Transition (PACT) is a transition town group started in Cumbria during 2008, and is part of the growing transition network here in the UK and around the world, working to develop community-based responses to the challenges of peak oil, climate change and economic sustainability.
- Extinction Rebellion: is a global environmental movement with the stated aim of using non-violent civil disobedience to compel government action to avoid tipping points in the climate system, biodiversity loss, and the risk of social and ecological collapse. There has been a local branch that have demonstrated in Penrith town centre.

In 2019, both Cafs and PACT have worked with a number of villages in the district and have given presentations to Councillors at Full Council. CAfS has been working with Eden District Council on the “Warm Homes Eden” project. The scheme aims to help people who find it difficult to heat their homes and who meet any of the following requirements:

- People with a low income who are struggling to pay your energy bills.
- People who have to choose between either heating your home or feeding your family.
- People with a low income and a chronic health condition, affected by living in a cold home.
- People with energy inefficient homes.

CAfS also is offering an assessment of residents energy efficiency. Warm Homes Eden offers a range of support from energy efficiency advice, making homes warmer, access to draught proofing, through to accessing a benefit entitlement review and assessment of an inefficient heating system. They’re also helping give energy efficiency advice to village halls and community venues across the district.

However there are also many simple measures that can be taken by individual members of the public to help improve air quality such as:

- Walking and cycling short journeys rather than taking the car
- Using public transport wherever possible, the Plan Your Journey website has been established to assist with this;
- Electric bike hire is now available at several locations within Eden;
- Lift sharing to work and for the school run;
- Turning off the car engine when stationary;
- Choose a low emission vehicle such as an electric or hybrid car
- Start a 'walking bus' for the journey to school.

Finally the Council has drafted a webpage, 'Air Quality and what you can do....' which includes these and other measures, sits alongside the Council's other pages on Air Quality and can be found on the Council's website, <http://www.eden.gov.uk>.

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1. Local Air Quality Management

This report provides an overview of air quality in Eden during 2019. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) and the relevant Policy and Technical Guidance documents.

The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where an exceedance is considered likely the local authority must declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives. This Annual Status Report (ASR) is an annual requirement showing the strategies employed by Eden District Council to improve air quality and any progress that has been made.

The statutory air quality objectives applicable to LAQM in England can be found in Table E.1 in Appendix E.

2. Actions to Improve Air Quality

2.1 Air Quality Management Areas

Air Quality Management Areas (AQMAs) are declared when there is an exceedance or likely exceedance of an air quality objective. After declaration, the authority must prepare an Air Quality Action Plan (AQAP) within 12-18 months setting out measures it intends to put in place in pursuit of compliance with the objectives.

Eden currently does not have any AQMAs. For reference, a map of Eden's monitoring locations is available in Appendix D

2.2 Progress and Impact of Measures to address Air Quality in Eden

Defra's appraisal of last year's ASR concluded the report was well structured, detailed, and provides the information specified in the Guidance. The following comments were made:

1. Trends are presented but could be subject to further discussion, a robust comparison with air quality objectives is provided.
2. Actions to improve air quality could be included with start dates to make it clear which initiatives are currently being undertaken.
3. Annual mean NO₂ concentrations have been exceeded at Castlegate for a number of years now at a site of relevant exposure. The Council need to take steps towards introducing an AQMA without delay.
4. Comments from the previous appraisal are provided making it possible to compare the report with the previous year's advice.

Eden District Council has taken forward a number of direct measures during the current reporting year of 2019 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 0.1.

As a result of these comments, the Council has made changes to the sampling programme have been in order to inform a possible AQMA on Castlegate and purchased additional monitoring equipment. Officers are planning to install the continuous monitoring equipment, this year, which can be used to better understand the extent of the exceedances on Castlegate. However the principal challenges and barriers to implementation that Eden District Council anticipates facing are resource constraints within a very small team.

All planning applications continue to be screened for possible impacts on air quality too and where appropriate, air quality assessments are required as supporting information prior to the application being determined. However, the adverse impact of air quality is rarely an over-riding factor, because invariably the consultants and developers base the calculations on background data, rather than measured results. Officers are therefore concerned that the estimates in the air quality assessments underestimate the true impact of the developments.

Table 0.1 – Progress on Measures to Improve Air Quality

Measure No.	Measure	EU Category	EU Classification	Date Measure Introduced	Organisations involved and funding source	Key Performance Indicator	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
1	Traffic Management of new or improved roads (A66)	Traffic Management	Other	Ongoing	Highways England, Cumbria County Council, Eden District Council	NO2 levels not to exceed Objective Level	Planning phase for A66; Environmental Protection Team have fed in to preferred routing consultation on air quality and noise.	Ongoing	Lengthy Timescale
2	Input into Planning applications and Local Plan	Policy Guidance and Development Control	Air quality planning and Policy Guidance	Ongoing	Eden District Council Environmental Protection Team, Eden District Council Planning Dept, Cumbria County Council Planning Dept, Yorkshire Dales NPA, Lake District NPA.	Early consultation with applicants. Improved links with all the planning departments	Whilst Env Protection is consulted on some applications, we are aware that planning officers are not consulting the Team on everything. EP Team does feed back to planner when AQ is a potential issue	Ongoing	Dealing with four different planning depts. Issues with developers not doing any monitoring but relying on background emissions map and national guidance, which may/may not be relevant.
3.	Upgrade of passenger transport infrastructure to make it more convenient and widely accessible across the County. Arrangements for sustainable transport systems will be integrated into major new and proposed developments	Transport Planning and Infrastructure	Bus route improvements	Ongoing	Cumbria County Council	Improved bus service. Increased use of transport provided. Reduced NO2 along main routes	Ongoing improvements Plans for large new housing developments include public transport provision and/or sustainable transport options.	Ongoing	A significant of bus journeys in the District are made using vintage coaches dating from the 1940s and 1950s and one from 1991.
4.	Emissions from all Part A2 and B Processes located within the local authority area.	Environmental Permits	Other	1990	Eden District Council, Environmental Protection Team	Risk based inspections showing that emission limits are being met and efforts are being made to improve on national objectives.	Continued inspection as per national guidance, assessment of monitoring, provision of advice, investigation of complaints and enforcement if necessary	Ongoing	Resources but activity is seen as key work of the EP Team

Measure No.	Measure	EU Category	EU Classification	Date Measure Introduced	Organisations involved and funding source	Key Performance Indicator	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
5.	Education and Promotion of Air Quality	Public Information	Via the Internet and through leaflets	Ongoing	Eden District Council Environmental Protection Team	Increased public awareness about issues of air quality and how to make personal choices to improve local air quality; use of enforcement action where necessary to deal with dark/black smoke, etc	Air quality info is available on the website already and real time monitoring data due soon. Monitoring data shows continued improvement in most areas. Eden District Council is actively supporting and promoting Clean Air Day. Provided Social Media posts for Clean Air Day 2019	Ongoing	Resourcing as above
6.	Ensuring that Council Policies include measures to minimise activities that adversely affect air quality	Promoting Low Emission Plant	Other Policy	On gong	Eden District Council	Involvement of Environmental Protection Team in Council's work on its Environmental Policy, Climate Change, Vehicle Leasing and Procurement	Ongoing, but hope to report more in 2021 Report	Ongoing	Resourcing as above, plus potential for conflict of interest with other Council priorities.

2.3 PM_{2.5} – Local Authority Approach to Reducing Emissions and/or Concentrations

As detailed in Policy Guidance LAQM.PG16 (Chapter 7), local authorities are expected to work towards reducing emissions and/or concentrations of PM_{2.5} (particulate matter with an aerodynamic diameter of 2.5µm or less). There is clear evidence that PM_{2.5} has a significant impact on human health, including premature mortality, allergic reactions, and cardiovascular diseases.

Due to its extremely small size, PM_{2.5} can travel for long distances in the air and it is estimated that as much as 40-50% of the levels found in any given area can be from sources outside the authority's direct boundary ([Fine Particulate Matter in the UK](#). Air Quality Expert Group Report. 2012). Nevertheless this means that the contribution of local sources to total PM_{2.5} levels is significant and therefore local actions to reduce PM emissions will have a significant beneficial impact and local authorities are encouraged to monitor or model PM_{2.5} wherever possible.

Eden District Council is taking the following measures to address PM_{2.5}:

Eden District Council is a signatory of the Cumbria Joint Public Health Strategy which is informed by the Public Health Outcomes Framework. Within this Strategy Air Quality is explicitly identified as an impactor on health and an Implementation Plan is currently being developed. As a mainly rural county, Cumbria is generally favoured with very good air quality: the proportion of mortality attributable to particulate matter air pollution for people over 30 years in Cumbria is 3.4%, lower than the national figure of 5.3% (Cumbria Observatory, 2019, <https://www.cumbriaobservatory.org.uk/environment/>). For PM_{2.5} in particular, there is no safe level and it has been estimated that in 2010 the deaths of 195 people in Cumbria may have been attributable to PM_{2.5}.

Air pollution background maps are published by Defra which provide estimates of background concentrations for PM_{2.5} within the district. Within Eden, 98% of the background levels published by Defra are below 8 µgm⁻³ which is less than half the annual mean objective of 20 µgm⁻³ which is to be achieved by 2020. The highest estimated backgrounds are rural locations affected by the major trunk roads, the M6 and the A66. Within Penrith the background levels are predicted to be below 9 µgm⁻³.

No monitoring of PM_{2.5} was carried out within Eden since this is not currently required by Defra. National PM_{2.5} monitoring is carried out in Carlisle, within a neighbouring district in urban roadside location.

In recognition of the need for the Council to understand particulate levels locally and as part of its approach to reducing PM_{2.5} levels once their distribution and level has been more fully understood, the Council has recently purchased continuous monitoring equipment which will be suitable for providing estimates of actual levels of PM_{2.5}. The two pieces of equipment were due to be installed in March of 2020 but due to Covid-19 their installation date has been pushed back.

3. Air Quality Monitoring Data and Comparison with Air Quality Objectives and National Compliance

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

This section sets out what monitoring has taken place and how it compares with objectives.

Eden District Council did not undertake any automatic (continuous) monitoring during 2019. NB. Local authorities do not have to report annually on the following pollutants: 1,3 butadiene, benzene, carbon monoxide and lead, unless local circumstances indicate there is a problem. National monitoring results are available at <https://uk-air.defra.gov.uk/>

3.1.2 Non-Automatic Monitoring Sites

Eden District Council undertook non- automatic (passive) monitoring of NO₂ at 19 sites during 2019. **Error! Reference source not found.** in Appendix A shows the details of the sites.

Maps showing the location of the monitoring sites are provided in Appendix D. Further details on Quality Assurance/Quality Control (QA/QC) for the diffusion tubes, including bias adjustments and any other adjustments applied (e.g. “annualisation” and/or distance correction), are included in Appendix C.

3.2 Individual Pollutants

The air quality monitoring results presented in this section are, where relevant, adjusted for bias⁴, “annualisation” (where the data capture falls below 75%), and distance correction⁵. Further details on adjustments are provided in Appendix C.

3.2.1 Nitrogen Dioxide (NO₂)

Table A. in Appendix A compares the ratified and adjusted monitored NO₂ annual mean concentrations for the past 5 years with the air quality objective of 40µg/m³. Note that the concentration data presented in

⁴ <https://laqm.defra.gov.uk/bias-adjustment-factors/bias-adjustment.html>

⁵ Fall-off with distance correction criteria is provided in paragraph 7.77, LAQM.TG(16)

Table A. represents the concentration at the location of the monitoring site, following the application of bias adjustment and annualisation, as required (i.e. the values are exclusive of any consideration to fall-off with distance adjustment).

For diffusion tubes, the full 2019 dataset of monthly mean values is provided in Appendix B. Note that the concentration data presented in Table B.1 includes distance corrected values, only where relevant.

The monitoring tubes within Eden District Council are supplied and analysed by Gradko. The tubes are prepared using a 50% TEA in acetone solution and typically exposed for a 4 week period. The 2019 results have been corrected for a bias using a factor of 0.87 which was determined following 8 studies undertaken by Gradko as part of the National Diffusion Tube Bias Adjustment Factor study. One location this year required annualisation as it only had 67% of data captured for the year. The Defra annualising continuous monitoring data equation was used to correct for this. The other monitoring locations had >75% data capture for the year and consequently no annualisation of the data was required. All monitoring locations bar one have been chosen to be representative of a relevant receptor, i.e at the façade of a residential property and therefore do not require any distance adjustments. The one location not located on a residential property was corrected using the Defra distance adjustment calculator.

There have been two exceedance this year, both along Castlegate. GAF04 failed at a level of $43\mu\text{g}/\text{m}^3$. This location is at a point where the road is narrowed and canyoned and frequently has queuing traffic. C1 also failed with a level of $42\mu\text{g}/\text{m}^3$, C1 is located along the same stretch of road as GAF04. However GAF05 which is also on this stretch and has failed previously, has been lower than the objective level for the last two years.

Appendix A: Monitoring Results

Table A.2 - Details of Non-Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) ⁽¹⁾	Distance to kerb of nearest road (m) ⁽²⁾	Tube collocated with a Continuous Analyser?	Height (m)
EB15	Glendale	Roadside	352329	528475	NO2	NO	0	1	NO	2.5
EB18	Cherry Cottage	Roadside	352246	528667	NO2	NO	0	2.5	NO	2.5
EB20	2 Kemplay Rd	Roadside	352207	528827	NO2	NO	0	4	NO	2.5
GAF16	Landels Court corner	Roadside	351774	529838	NO2	NO	0	2	NO	2.5
GAF19	25 Victoria Road	Roadside	351774	529910	NO2	NO	0	1.5	NO	2.5
V1	Roper Street	Roadside	351794	529870	NO2	NO	0	1	NO	2.5
V3	25b King Street	Roadside	351720	529966	NO2	NO	0	2	NO	2.5
V5	Front Victoria Rd / Langton Cott	Roadside	351713	529941	NO2	NO	0	1	NO	2.5
V7	Café 15	Roadside	351733	528918	NO2	NO	0	2.5	NO	2.5
C1	Lower Castlegate	Roadside	351413	530069	NO2	NO	0	1	NO	2.5
C30	40 Castlegate	Roadside	351333	530016	NO2	NO	0	1.5	NO	2.5
GAF04	NewVic	Roadside	351363	530046	NO2	NO	0	1	NO	2.5
GAF05	Station Hotel	Roadside	351302	520089	NO2	NO	0	2.5	NO	2.5

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Site ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) ⁽¹⁾	Distance to kerb of nearest road (m) ⁽²⁾	Tube collocated with a Continuous Analyser?	Height (m)
P1	No entry sign, Norfolk Road	Roadside	351144	530056	NO2	NO	1	1	NO	2.5
uB1	13 Balmoral Close	Roadside	350860	529912	NO2	NO	0	3	NO	2.5
B14	4 Brunswick Road	Roadside	351394	530344	NO2	NO	0	2	NO	2.5
SG27	8 Scotland Rd	Roadside	351171	530649	NO2	NO	0	1	NO	2.5
C31	3 Benson Row	Roadside	351741	530313	NO2	NO	0	1	NO	2.5
C32	Penrith Nursery	Roadside	351687	530387	NO2	NO	0	2.5	NO	2.5

Notes:

(1) 0m if the monitoring site is at a location of exposure (e.g. installed on/adjacent to the façade of a residential property).

(2) N/A if not applicable.

Table A.3 – Annual Mean NO₂ Monitoring Results

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2019 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ^{(3) (4)}				
							2015	2016	2017	2018	2019
EB15	352329	528475	Roadside	Diffusion Tube	-	100	32	32	32	32	27
EB18	352246	528667	Roadside	Diffusion Tube	-	100	35	33	35	33	31
EB20	352207	528827	Roadside	Diffusion Tube	-	100	30	32	31	32	28
GAF16	351774	529838	Roadside	Diffusion Tube	-	100	30	34	24	27	23
GAF19	351774	529910	Roadside	Diffusion Tube	-	100	29	32	27	29	27
V1	351794	529870	Roadside	Diffusion Tube	-	92	-	-	-	29	26
V3	351720	529966	Roadside	Diffusion Tube	-	100	23	23	27	30	27
V5	351713	529941	Roadside	Diffusion Tube	-	100	38	35	31	31	28
V7	351733	528918	Roadside	Diffusion Tube	-	100	36	36	35	33	31
C1	351413	530069	Roadside	Diffusion Tube	-	92	-	-	-	48	42
C30	351333	530016	Roadside	Diffusion Tube	-	92	38	37	31	30	29

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2019 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ^{(3) (4)}				
							2015	2016	2017	2018	2019
GAF04	351363	530046	Roadside	Diffusion Tube	-	92	50	39	47	49	43
GAF05	351302	520089	Roadside	Diffusion Tube	-	67	45	53	33	30	28
P1	351144	530056	Roadside	Diffusion Tube	-	100	-	-	-	23	21
uB1	350860	529912	Roadside	Diffusion Tube	-	100	-	-	-	17	15
B14	351394	530344	Roadside	Diffusion Tube	-	100	31	35	33	33	30
SG27	351171	530649	Roadside	Diffusion Tube	-	100	31	33	30	30	27
C31	351741	530313	Roadside	Diffusion Tube	-	100	34	32	29	29	26
C32	351687	530387	Roadside	Diffusion Tube	-	100	33	36	33	33	30

Diffusion tube data has been bias corrected (confirm by selecting in box)

Annualisation has been conducted where data capture is <75% (confirm by selecting in box)

Reported concentrations are those at the location of the monitoring site (bias adjusted and annualised, as required), i.e. prior to any fall-off with distance adjustment (confirm by selecting in box)

Notes:

Exceedances of the NO₂ annual mean objective of 40µg/m³ are shown in **bold**.

NO₂ annual means exceeding 60µg/m³, indicating a potential exceedance of the NO₂ 1-hour mean objective are shown in **bold and underlined**.

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

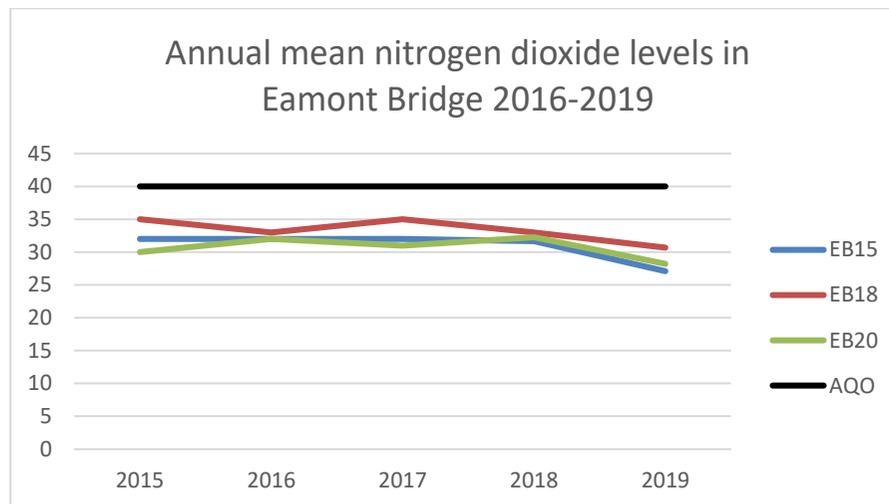
(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

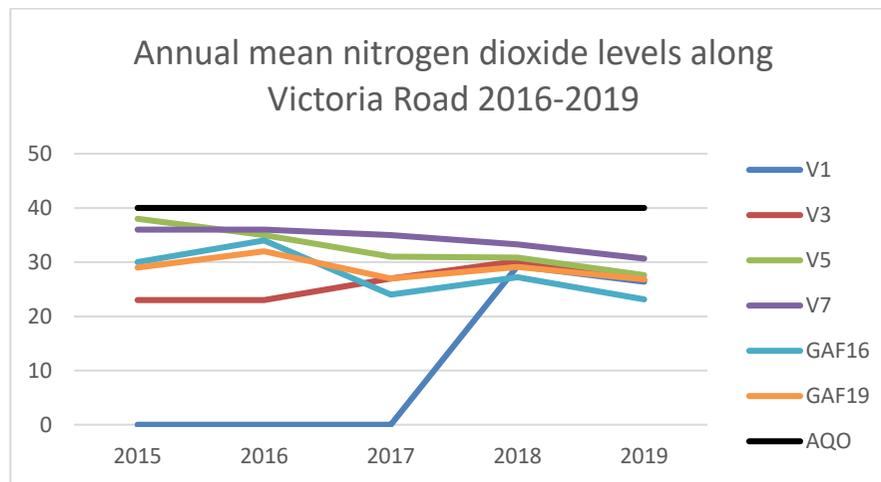
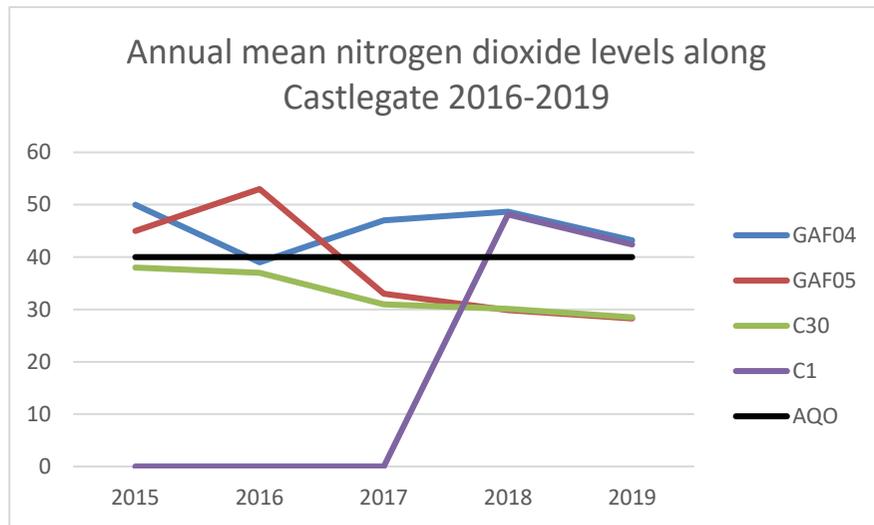
(3) Means for diffusion tubes have been corrected for bias. All means have been “annualised” as per Boxes 7.9 and 7.10 in LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

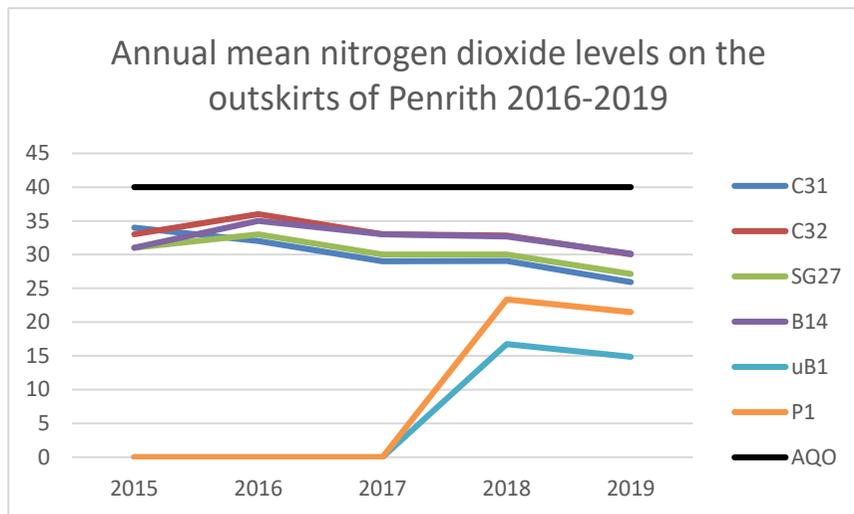
(4) Concentrations are those at the location of monitoring and not those following any fall-off with distance adjustment.

Figure A.1 – Trends in Annual Mean NO₂ Concentrations

Trend plots for the last four years of data for the areas monitored. On each chart the black line represents the AQO for nitrogen dioxide of 40µg/m³.







Appendix B: Full Monthly Diffusion Tube Results for 2019

Table B.1 - NO₂ Monthly Diffusion Tube Results - 2019

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	NO ₂ Mean Concentrations (µg/m ³)														
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
															Raw Data	Bias Adjusted (factor) and Annualised ⁽¹⁾	Distance Corrected to Nearest Exposure ⁽²⁾
EB15	352329	528475	38.0	29.2	33.1	28.8	27.0	27.3	31.3	29.2	30.6	34.0	34.8	30.5	31.1	27.1	-
EB18	352246	528667	41.3	36.2	42.8	34.3	30.7	28.9	36.6	31.8	36.7	32.1	37.7	33.9	35.3	30.7	-
EB20	352207	528827	40.0	37.0	25.8	38.7	32.5	27.4	27.7	23.1	30.5	36.7	41.5	28.2	32.4	28.2	-
GAF16	351774	529838	38.2	30.8	26.1	28.9	21.7	17.5	23.4	24.4	25.3	24.7	30.8	27.4	26.6	23.1	-
GAF19	351774	529910	38.1	33.6	27.7	39.3	26.2	23.6	25.3	22.8	29.3	32.8	41.7	29.6	30.8	26.8	-
V1	351794	529870	37.4	28.8	-	31.4	25.9	21.6	23.6	8.7	30.5	55.1	39.2	31.3	30.3	26.4	-
V3	351720	529966	44.6	34.5	27.5	34.5	29.2	25.7	25.4	21.6	27.7	31.0	36.6	30.5	30.7	26.7	-
V5	351713	529941	44.1	36.5	33.6	35.8	27.8	26.8	26.6	26.7	27.8	30.2	35.8	28.9	31.7	27.6	-
V7	351733	528918	44.4	36.6	33.6	35.3	29.0	28.1	27.1	28.3	30.5	44.0	40.9	45.0	35.2	30.6	-
C1	351413	530069	44.2	55.8	49.2	-	42.9	47.2	44.7	55.1	43.5	48.9	52.0	52.3	48.7	42.4	-
C30	351333	530016	44.9	-	29.8	34.9	29.2	30.0	27.4	26.0	32.4	36.1	38.3	31.4	32.8	28.5	-
GAF04	351363	530046	54.8	48.6	51.1	64.7	40.9	46.7	-	43.3	51.7	42.4	56.7	45.7	49.7	43.2	-

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	NO ₂ Mean Concentrations (µg/m ³)														
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
															Raw Data	Bias Adjusted (factor) and Annualised ⁽¹⁾	Distance Corrected to Nearest Exposure ⁽²⁾
GAF05	351302	520089	42.5	35.5	32.1	31.7	-	26.1	-	-	-	34.5	37.8	34.1	34.3	28.3	-
P1	351144	530056	30.1	28.1	16.7	27.7	20.5	18.0	18.5	16.5	22.4	26.4	35.1	23.7	23.6	20.6	19.0
uB1	350860	529912	22.9	24.0	16.9	15.1	12.2	10.1	12.8	12.3	15.4	18.2	25.2	20.1	17.1	14.9	-
B14	351394	530344	46.7	33.0	36.4	29.2	33.4	30.7	29.0	31.3	35.5	36.3	39.6	34.9	34.7	30.2	-
SG27	351171	530649	32.7	29.8	23.9	40.8	30.3	27.0	23.2	21.3	32.0	37.0	47.1	29.3	31.2	27.1	-
C31	351741	530313	38.9	32.2	27.7	30.3	27.4	23.3	25.2	25.1	30.2	29.8	38.1	29.5	29.8	25.9	-
C32	351687	530387	40.5	35.2	31.6	39.0	33.9	30.8	27.8	32.7	34.7	33.7	39.9	34.8	34.5	30.0	-

Local bias adjustment factor used (confirm by selecting in box)

National bias adjustment factor used (confirm by selecting in box)

Annualisation has been conducted where data capture is <75% (confirm by selecting in box)

Where applicable, data has been distance corrected for relevant exposure in the final column (confirm by selecting in box)

Notes:

Exceedances of the NO₂ annual mean objective of 40µg/m³ are shown in **bold**.

NO₂ annual means exceeding 60µg/m³, indicating a potential exceedance of the NO₂ 1-hour mean objective are shown in **bold and underlined**.

(1) See Appendix C for details on bias adjustment and annualisation

(2) Distance corrected to nearest relevant public exposure.

Appendix C: Supporting Technical Information / Air Quality Monitoring Data QA/QC

Choice of NO₂ Bias Adjustment Factor

The monitoring tubes within Eden District Council are supplied and analysed by Gradko. The tubes are prepared using a 50% TEA in acetone solution and typically exposed for a 4 week period. The 2018 results have been corrected for bias using a factor of 0.87 which was determined following 8 studies undertaken by Gradko as part of the National Diffusion Tube Bias Adjustment Factor study.

QA/QC of diffusion tube monitoring

The tube precision for all 8 studies is listed as ‘Good’ for the Gradko laboratory on the [Defra website](#).

The laboratory has also taken part in the [AIR proficiency scheme](#)

Table 1: Laboratory summary performance for AIR NO₂ PT rounds AR024, 25, 27, 28, 30, 31, 33 and 34

The following table lists those UK laboratories undertaking LAQM activities that have participated in recent AIR NO₂ PT rounds and the percentage (%) of results submitted which were subsequently determined to be satisfactory based upon a z-score of ≤ 2 as defined above.

AIR PT Round	AIR PT AR024 January - February 2018	AIR PT AR025 April - May 2018	AIR PT AR027 July - August 2018	AIR PT AR028 September - October 2018	AIR PT AR030 January - February 2019	AIR PT AR031 April - May 2019	AIR PT AR033 July - August 2019	AIR PT AR034 September - November 2019
Aberdeen Scientific Services	100 %	100 %	100 %	100 %	75 %	100 %	100 %	100 %
Cardiff Scientific Services	NR [1]	NR [1]	NR [1]	NR [2]	NR [1]	NR [2]	NR [2]	NR [1]
Edinburgh Scientific Services	100 %	100 %	100 %	100 %	100 %	NR [2]	100 %	100 %
SOCCO/ES	100 % [1]	100 % [1]	100 % [1]	100 % [1]	87.5 % [1]	100 % [1]	100 % [1]	100 % [1]
Exova (formerly Cytec Analytical)	NR [1]	NR [1]	NR [1]	NR [2]	NR [1]	NR [2]	NR [1]	NR [1]
Gloucestershire Scientific Services	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
Gradko International [1]	100 % [1]	100 %	100 %	100 %	75 %	100 %	100 %	100 %
Scott Scientific Services	NR [1]	NR [1]	NR [1]	NR [2]	NR [1]	NR [2]	NR [1]	NR [1]
Wiltshire MRC	NR [1]	NR [1]	NR [1]	NR [2]	NR [1]	NR [2]	NR [1]	NR [1]
Lancashire Scientific Services	NR [1]	NR [1]	NR [1]	25 %	100 %	100 %	100 %	100 %
Midwest Kenton Council	100 %	75 %	100 %	100 %	100 %	100 %	100 %	100 %
Northampton Borough Council	NR [1]	NR [1]	NR [1]	NR [2]	NR [1]	NR [2]	NR [1]	NR [1]
Sussex Scientific Services	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
South Yorkshire Air Quality Samplers	100 %	100 %	100 %	100 %	100 %	100 %	100 %	75 %
Staffordshire County Council	100 %	100 %	100 %	100 %	100 %	75 %	75 %	75 %
Tyneside Scientific Services	100 %	NR [1]	100 %	NR [2]	100 %	NR [2]	100 %	NR [1]
West Yorkshire Analytical Services	100 %	75 %	100 %	100 %	100 %	100 %	100 %	100 %

[1] Participant submitted to two sets of test results (2 x 4 test samples) in each AIR PT round.
 [2] NR No results reported.
 [3] Northampton Borough Council, East Scientific Services, Cardiff Scientific Services, Wiltshire MRC and Exova (formerly Cytec Analytical) no longer carry out NO₂ diffusion tube monitoring and therefore did not submit results.

As can be seen from the table above Gradko have scored 100% for most of 2019 with the exception of January-February 2019 were they scored 75%.

GAF05 required annualisation as only 67% of the data was captured for the year.

The following equation was used to correct the data:

Box 7.9 – Example: Annualising Continuous Monitoring Data

It has only been possible to carry out a monitoring survey at site for six months between July and December 2015. The measured mean concentration M for this period is $30.2\mu\text{g}/\text{m}^3$. How can this be used to estimate the annual mean for this location?

- Identify two to four nearby, long-term, continuous monitoring sites, ideally those forming part of the national network. The data capture for each of these sites should be at least 85%. These sites should be background (Urban Background, Suburban or Rural) sites to avoid any very local effects that may occur at Urban Centre, Roadside or Kerbside sites, and should, wherever possible lie within a radius of about 50 miles. If no background sites are available, and the site to be annualised is itself a Urban Centre, Roadside or Kerbside site, then it is permissible to annualise using roadside or kerbside sites rather than background sites, though this should be clearly stated in the annual report.
- Obtain the annual means, A_m , for the calendar year for these sites.
- Work out the period means, P_m , for the period of interest, in this case July to December 2015.
- Calculate the ratio, R , of the annual mean to the period mean (A_m/P_m) for each of the sites.
- Calculate the average of these ratios, R_a . This is then the annualisation factor.
- Multiply the measured period mean concentration M by this annualisation factor R_a to give the estimate of the annual mean for 2015.

For this example the best estimate of the annual mean for site S in 2015 will be $M \times R_a = 30.2 \times 0.944 = 28.5\mu\text{g}/\text{m}^3$.

Background Site	Annual mean 2015 (A_m)	Period Mean 2015 (P_m)	Ratio (A_m/P_m)
A	28.6	29.7	0.963
B	22.0	22.8	0.965
C	26.9	28.9	0.931
D	23.7	25.9	0.915
Average (R_a)			0.944

If the short-term period covers, for instance, February to June 2016, and the work is being carried out in August 2016, then an annual mean for 2016 will not be available. The calculation can then be carried out using the ratio to the 2015 annual mean, but the result is then an estimate of the 2015 annual mean at the short-term site. The 2016 bias correction factor would also not be available, and so it would be necessary to use the 2015 factor instead.

Where a short-term monitoring survey has been completed in the present year and an estimate of annual mean is required, please contact the LAQM Support Helpdesk for further information.

The four locations selected to calculate R_a were: C30, GAF04, C1,P1.



Enter data into the pink cells

Step 1	How far from the KERB was your measurement made (in metres)?	1	metres
Step 2	How far from the KERB is your receptor (in metres)?	2	metres
Step 3	What is the local annual mean background NO ₂ concentration (in $\mu\text{g}/\text{m}^3$)?	9.022318	$\mu\text{g}/\text{m}^3$
Step 4	What is your measured annual mean NO ₂ concentration (in $\mu\text{g}/\text{m}^3$)?	20.6	$\mu\text{g}/\text{m}^3$
Result	The predicted annual mean NO ₂ concentration (in $\mu\text{g}/\text{m}^3$) at your receptor	19.0	$\mu\text{g}/\text{m}^3$

All bar one monitoring locations have been chosen to be representative of a relevant receptor (residential property) and have been located on the facade of the building

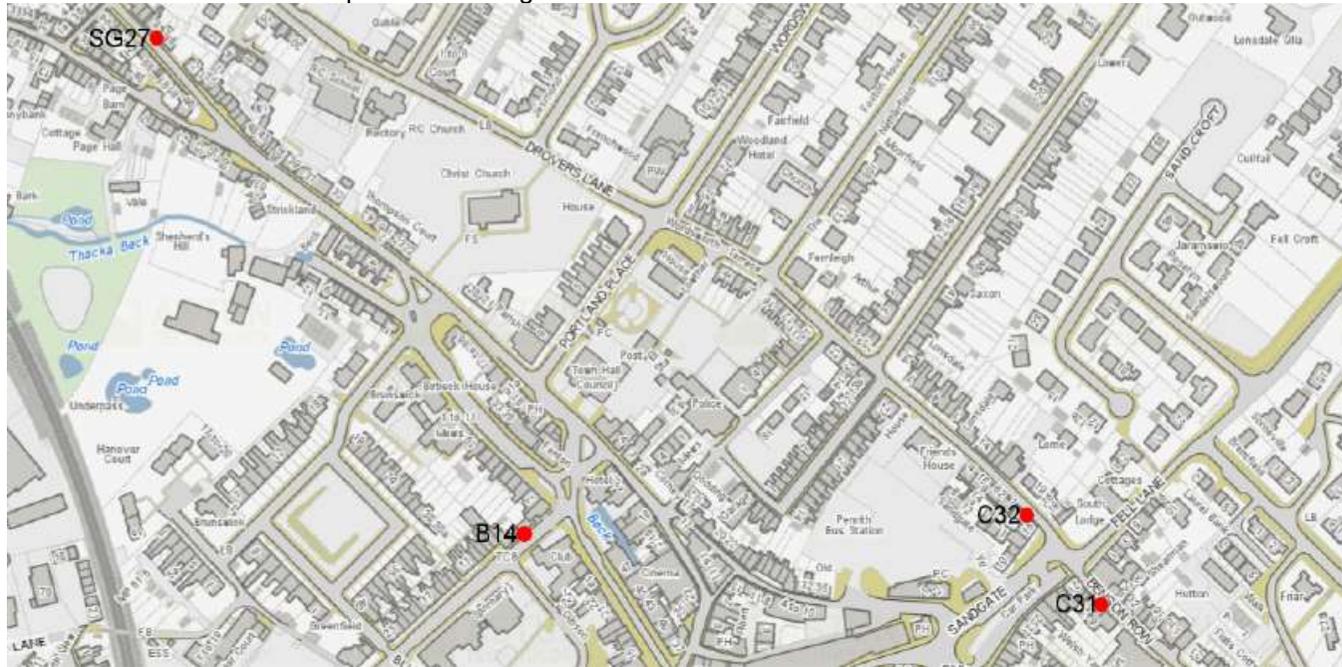
and therefore do not require any distance adjustment. P1 is located 1m away from the relevant receptor. This had to be adjusted for. To do this the Defra NO₂ fall out calculator tool was used. The background levels were found from the Defra Background Mapping data for local authorities.

Appendix D: Map(s) of Monitoring Locations and AQMA

Map D1 Monitoring locations east of Castlegate, along Castlegate and Victoria Road



Map D2 Monitoring locations in the northern outskirts of Penrith



Map D3 Monitoring locations within Eamont Bridge



Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective ⁶	
	Concentration	Measured as
Nitrogen Dioxide (NO ₂)	200 µg/m ³ not to be exceeded more than 18 times a year	1-hour mean
	40 µg/m ³	Annual mean
Particulate Matter (PM ₁₀)	50 µg/m ³ , not to be exceeded more than 35 times a year	24-hour mean
	40 µg/m ³	Annual mean
Sulphur Dioxide (SO ₂)	350 µg/m ³ , not to be exceeded more than 24 times a year	1-hour mean
	125 µg/m ³ , not to be exceeded more than 3 times a year	24-hour mean
	266 µg/m ³ , not to be exceeded more than 35 times a year	15-minute mean

⁶ The units are in microgrammes of pollutant per cubic metre of air (µg/m³).

Glossary of Terms

Abbreviation	Description
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the local authority intends to achieve air quality limit values'
AQMA	Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives
ASR	Air quality Annual Status Report
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England
EU	European Union
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
NO ₂	Nitrogen Dioxide
NO _x	Nitrogen Oxides
PM ₁₀	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less
PM _{2.5}	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO ₂	Sulphur Dioxide

References

Air Quality Expert Group [Fine Particulate Matter in the UK](#) Report. 2012

Cumbria County Council [Moving Cumbria Forward, Cumbria Transport Plan Strategy 2011-2026](#)

Cumbria County Council [Cumbria Joint Public Health Strategy:Tackling the Wider Determinants of Health and Wellbeing](#) Draft Jan 2019

[Diffusion Tubes for Ambient NO2 Monitoring: Practical Guidance, 2008](#)

Defra LAQM Support [Defra](#)

Defra [Defra Air Quality: National Air Pollution Control Programme](#) March 2019

Eden District Council Core Strategy [Development Plan Document](#)

Eden Local Plan <https://www.eden.gov.uk/media/5032/edenlocalplan2014-2032finalwithoutforeword.pdf>

Lake District National Park Authority - [Lake District National Park Authority Core Strategy](#)

Local Air Quality Management Technical Guidance [TG16](#)

[Penrith Town Council Plan 2017 – 2022](#)