Swindon Borough Council

2024 Air Quality Annual Status Report (ASR)

In fulfilment of Part IV of the Environment Act 1995 Local Air Quality Management, as amended by the Environment Act 2021

Date: June 2024

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Executive Summary: Air Quality in Our Area

Air Quality in Swindon

Breathing in polluted air affects our health and costs the NHS and our society billions of pounds each year. Air pollution is recognised as a contributing factor in the onset of heart disease and cancer and can cause a range of health impacts, including effects on lung function, exacerbation of asthma, increases in hospital admissions and mortality. In the UK, it is estimated that the reduction in healthy life expectancy caused by air pollution is equivalent to 29,000 to 43,000 deaths a year[1].

Air pollution particularly affects the most vulnerable in society, children, the elderly, and those with existing heart and lung conditions. Additionally, people living in less affluent areas are most exposed to dangerous levels of air pollution[2].

Table ES 1 provides a brief explanation of the key pollutants relevant to Local Air Quality Management and the kind of activities they might arise from.

Table ES 1 - Description of Key Pollutants

Pollutant	Description
Nitrogen Dioxide (NO_2)	Nitrogen dioxide is a gas which is generally emitted from high-temperature combustion processes such as road transport or energy generation.
Sulphur Dioxide (SO_2)	Sulphur dioxide (SO_2) is a corrosive gas which is predominantly produced from the combustion of coal or crude oil.
Particulate Matter (PM_{10} and $PM_{2.5}$)	Particulate matter is everything in the air that is not a gas. Particles can come from natural sources such as pollen, as well as human made sources such as smoke from fires, emissions from industry and dust from tyres and brakes. PM_{10} refers to particles under 10 micrometres. Fine particulate matter or $PM_{2.5}$ are particles under 2.5 micrometres.

[1] UK Health Security Agency. Chemical Hazards and Poisons Report, Issue 28, 2022.

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

Traffic derived Nitrogen Dioxide (NO_2) remains the main pollutant of concern in Swindon, and the Council runs a monitoring network of 42 diffusion tubes at 38 sites to monitor levels and to inform the need to declare any new Air Quality Management Areas. All diffusion tubes are situated close to roads and monitor levels monthly over time.

In 2023 the air quality in Swindon improved further, continuing and hastening the improving trend seen in Swindon over the preceding 5 years.

With regard to Nitrogen Dioxide (NO_2); results across our network of monitoring sites returned an average improvement of 9.6% in 2023. This continues and hastens the improving trend seen in the last 5 years. The average improvement across our monitoring network in the 5 years spanning 2019 and 2023 is now 22.8%.

All but 3 monitoring sites across Swindon showed improvement in 2023, of between 0.8% and 24.7%. Not all sites improved however. The 3 sites that returned higher NO_2 levels in 2023 were S40 (Marlborough Road, Wroughton, +3.9%), S14 (Iffley Road, +6.6%), and S9 (Manchester Road, +6.8%).

Of these; Marlborough Road in Wroughton (S40) likely returned higher NO_2 levels due to a long period of roadworks and an associated new housing development increasing traffic loads, but levels here remain significantly below concerning levels.

Manchester Road (S9) and Iffley Road (S14) sites have previously suffered concerning levels of NO_2. In 2023, both monitoring sites worsened but remained lower than before the disruption of the Covid-19 pandemic through 2020, due to the improvements gained in the interim, Iffley Road significantly so. We maintain a watching brief.

Within and adjacent to the Kingshill Air Quality Management Area (Kingshill AQMA) specifically, we have measured an average 9.1% improvement in 2023, contributing to the average 25% improvement over the 5-year period between 2019 and 2023. For the first time since the AQMA's inception in 2018, all of our monitoring sites within the Kingshill AQMA achieved the objective levels when adjusted for distance to the nearest receptor. We published a refreshed Air Quality Action Plan for Kingshill in 2023, and we must now push on with the remaining actions in that plan to ensure that NO_2 levels continue falling, to sustainably below the objective levels across the next 5 years.

The principle action within our Kingshill AQAP remains the imposition of a Traffic Regulation Order removing most heavy vehicles from the road, as this will likely remove at least 5% of the NO_2 emissions there. Other actions are focused on promoting and enabling better and more active travel choices, and improving partnership working with

bus and freight companies. Our Kingshill Air Quality Action Plan may be found by clicking this link: https://www.swindon.gov.uk/downloads/download/396/air_quality_action_plan .

As in most locations in England, especially in the South; Fine Particulate Matter ($PM_{2.5}$) is also a concern. The Environment Act 2021 led to a new national $PM_{2.5}$ target value of 10µg/m^3 by 2040, and Swindon is in a relatively good position with regard to this target. Alongside it, a Population Exposure Reduction Target of 35% by 2040 was also introduced, and this may be more difficult to achieve without real change. Due to $PM_{2.5}$'s transboundary nature, these are principally central government's targets to meet but local action will be critical, and we wait to see how local authorities will be expected to help meet it. Whilst most $PM_{2.5}$ originates outside of our boundary and so is not under our direct influence, $PM_{2.5}$ has arguably a greater health impact than NO_2, and we will fully engage in any centrally led effort to reduce $PM_{2.5}$ locally.

Swindon's Joint Strategic Needs Assessment (JSNA) with regard to air quality describes the problem and identifies those areas, both by Ward and Lower Super Output Area, which are most vulnerable, to both NO_2 and $PM_{2.5}$ pollution, according to the UK Health Security Agency produced vulnerability indicators. Fortunately, in Swindon, those areas where we see the highest pollutant levels are not the most vulnerable.

In 2023 we were fortunate to win funding from the DEFRA Air Quality Grant scheme, to tackle both NO_2 within the AQMA, and $PM_{2.5}$ more widely. A joint project between Highways, Public Health and Environmental Health teams is in progress as a result. A pair of digital screens were installed, one at either end of the Kingshill AQMA, and display nudge messages, 24 hours a day, seeking to change driver behaviour and travel choices.

Alongside this, A funded Public Health Practitioner is running outreach programmes in schools, community and other groups to educate about air pollution with regard to travel choices and solid fuel burning in and around the home. We ran a media campaign aligned with 'Clean Air Night' using DEFRA's 'Burn Better, Breathe Better' materials, for instance, to try to dissuade elective burning in the borough.

Swindon is very well connected to the gas grid, and so levels of solid fuel burning as the primary home heat source are low according to the 2021 Census, but elective burning via bonfires, and the rise in the elective use of log or multi-fuel burners as a secondary heat source is likely a significant contributor to Swindon's $PM_{2.5}$ emissions.

No new major emission sources were identified in this period in Swindon. The previously vacated Honda site is currently being developed into a large commercial and distribution hub alongside the A419.

We will continue to monitor NO_2 through our extensive diffusion tube network in 2024, and continue working to identify any further local actions which may have a meaningful impact on ambient $PM_{2.5}$ levels, in line with the national Air Quality Strategy.

We do not undertake any $PM_{2.5}$ monitoring in Swindon on our own account, but are fortunate to host a DEFRA reference standard monitoring suite in Walcot (UKA00650). $PM_{2.5}$ levels reported from this site for 2023 show a 15% improvement over (annualised) 2022 results.

The same suite, which also measures Ozone, Nitric Oxide, Nitrogen Dioxide, Nitrogen oxides as Nitrogen Dioxide, and PM_{10}, lends confidence to our findings from our network of diffusion tube sites; showing a 15% improvement between 2022 and 2023 with respect to Nitrogen Dioxide.

We have extended our diffusion tube monitoring network in 2023 to add a triplicate diffusion tube site directly adjacent to this DEFRA Walcot site to provide for the possibility of a locally derived bias adjustment factor and to potentially contribute to the national co-location study. Results from this triplicate site will be available for that purpose in 2024.

Actions to Improve Air Quality

Whilst air quality has improved significantly in recent decades, there are some areas where local action is needed to protect people and the environment from the effects of air pollution.

The Environmental Improvement Plan sets out actions that will drive continued improvements to air quality and to meet the new national interim and long-term targets for fine particulate matter ($PM_{2.5}$), the pollutant of most harm to human health. The Air Quality Strategy provides more information on local authorities' responsibilities to work towards these new targets and reduce fine particulate matter in their areas.

The Road to Zero details the Government’s approach to reduce exhaust emissions from road transport through a number of mechanisms, in balance with the needs of the local community. This is extremely important given that cars are the most popular mode of personal travel and the majority of Air Quality Management Areas (AQMAs) are designated due to elevated concentrations heavily influenced by transport emissions.

Swindon continues to work through its Air Quality Action Plan for the Kingshill Air Quality Management Area. The Traffic Regulation Order (TRO), measure 1 of the plan, to remove most heavy vehicles from Kingshill is now at the formal consultation stage following generally favourable informal response from the haulage trade. Routes and signage are fully designed and ready to move to procurement following the final Order imposition, which we expect in 2024.

The DEFRA Air Quality Grant project is in full swing. A programme of outreach into schools and community groups is underway, and 2 Variable Message Signs (VMS) are in action 24 hours a day delivering nudge messaging to road users in the AQMA, to support local action on both NO_2 and $PM_{2.5}$. A communications campaign timed to coincide with the Global Action Plan 'Clean Air Night' Campaign and using DEFRA 'Burn Better, Breathe Better' materials was run just after the period end.

A large portion of locally emitted primary $PM_{2.5}$ is assumed to stem from domestic solid fuel use. We are enforcing the ban on the sale of the most polluting fuels, including wet wood, whilst undertaking petroleum and industrial emissions inspections. The 2021 Census confirmed that the level of solid fuel use for home heating where there is no alternative is extremely low, and so our focus is on targeting elective burning.

We use the results from our monitoring network and national models to work closely with Planning and Highways colleagues when considering new development, and also closely monitor our emitting industries through the Local Air Pollution and Control (LAPPC) regime.

We maintain our advice to residents to avoid bonfires where there is an alternative, and we respond quickly to reports of large smoky burns.

Swindon Borough Council's 'Be the Change' campaign principally targets climate change, but in seeking to reduce fossil fuel use, this will also have important benefits for air quality too. The Solar Together Wiltshire group buy scheme, in partnership with Wiltshire Council, is to run for a further year.

Swindon is also in the process of finalising its 'Swindon Plan' for its new administration under 3 missions, one of which is 'Achieve Nett Zero' and currently contains targets for both the Council, and then the borough to become nett zero regarding Carbon emissions. Achieving nett zero will involve reducing fossil fuel use, and so will inevitably lead to improved air quality with regards to both NO_2 and $PM_{2.5}$. The Swindon Plan has

undergone very wide consultation with Swindon residents and the Council is currently finalising the Plan based on that consultation.

Conclusions and Priorities

In 2023, all monitoring sites showed levels in compliance with the objective for annual average NO_2 at the receptors, including all of those within the AQMA.

4 monitoring sites, including 3 within the AQMA, returned levels above objective levels at the roadside in 2023, but none showed levels which might indicate non-compliance with the 1-hour objective level, and modelled levels at relevant receptors were compliant.

2023 showed a large improvement in air quality with regard to NO_2 across our network, with the exception of 3 locations.

The 2023 monitoring year is the first year, outside of the extraordinary period associated with the Covid-19 pandemic and the resultant lockdowns and restrictions, showing compliant levels within the AQMA, marginally so; with the highest level at 38.3µg/m^3 at relevant receptors. There remains the possibility that 2023 is later seen as an outlier year, and the margin of compliance seen this year is sufficiently slim that a return to non-compliance could yet be seen in future years.

There is therefore insufficient evidence to revoke the Kingshill AQMA at this time. The existing AQMA boundaries remain relevant for our Action Plan, with all historic exceedances, and sites within 10% of the objectives, contained within it. In late 2023 we published our revised AQAP for Kingshill, maintaining the existing boundaries as those within which exceedances are likely to be seen on any worsening of air quality.

Local Engagement and How to get Involved

The Head of Environmental Health contributes to the JSNA on air quality in Swindon, and works closely with the Consultant in Public Health, Health Protection on the topic. The Environmental Health team is a consultee for all large developments in the Borough, and works with Highways colleagues to provide an air quality input to transport decisions.

Members of the public who would like to help improve Swindon's air quality are encouraged to:

- Avoid burning garden or other waste where possible.

- Avoid the use of solid fuel heating such as wood or coal burners where alternatives such as central heating are available and healthy indoor temperatures can be maintained without.
- Choose active modes of travel; walking and cycling, or public transport for local journeys.
- Choose greener vehicles when replacing existing vehicles; alternative fuel over petrol, petrol over diesel, smaller over larger.
- Consider renewable technologies to supplement or replace home energy use. Use a renewable supplier for grid energy.

Watch Swindon Borough Council's Be the Change campaign for ways to get involved in reducing fossil fuel use in Swindon.

Local Responsibilities and Commitment

This ASR was prepared by the Environmental Health Department of Swindon Borough Council.

This ASR has been approved by the Director of Public Health as the chair of the Air Quality Steering Group.

This ASR has been signed off by the Director of Public Health; Professor Steve Maddern

If you have any comments on this ASR please send them to the Head of Environmental Health, Damon Green, at: dgreen@swindon.gov.uk .

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Tables

1 Local Air Quality Management

This report provides an overview of air quality in Swindon during 2023. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995), as amended by the Environment Act (2021), 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 order to achieve and maintain the objectives and the dates by which each measure will be carried out. This Annual Status Report (ASR) is an annual requirement showing the strategies employed by Swindon to improve air quality and any progress that has been made.

The statutory air quality objectives applicable to LAQM in England are presented in Table E.1.

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 should prepare an Air Quality Action Plan (AQAP) within 18 months. The AQAP should specify how air quality targets will be achieved and maintained, and provide dates by which measures will be carried out.

A summary of AQMAs declared by Swindon can be found in Table 2.1. The table presents a description of the Kingshill AQMA that is currently designated within Swindon. Appendix D: Map(s) of Monitoring Locations and AQMAs provides links to maps of the AQMA and also the air quality monitoring locations in relation to the AQMA and across Swindon. The air quality objectives pertinent to the current AQMA designation are as follows:

- NO_2 annual mean;

Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Date of Declaration	Pollutants and Air Quality Objectives	One Line Description	Is air quality in the AQMA influenced by roads controlled by Highways England?	Level of Exceedance: Declaration	Level of Exceedance : Current Year	Number of Years Compliant with the Air Quality Objective	Name and Date of AQAP Publication	Web Link to AQAP
Kingshill	02/05/2018	NO_2 Annual Mean	An area encompassing 14 properties on Kingshill Road west of the junction of Clifton Road	NO	56µg/m3	38.3 µg/m3	1	Kignshill Air Quality action Plan v1.1, March 2024	https://www.swindon.gov.uk/downloads/file/10506/kingshill_air_quality_action_plan

☒ **Swindon confirm the information on UK-Air regarding their AQMA(s) is up to date.**

☒ **Swindon confirm that all current AQAPs have been submitted to Defra.**

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

Defra's appraisal of last year's ASR concluded that overall that the report was '…detailed, concise and satisfies the criteria of relevant standards. The Council should keep up its good work.'. A number of comments were provided to assist enhancing future reports:

1. Maps could include a North Cardinal marker and a scale bar. Further maps could be included to show all monitoring locations in detail, but it was accepted that there are no air quality concerns outside of the AQMA, which is mapped in detail.
    a. Further physical maps have not been provided.
    b. Links are now provided to online mapping, which allows for detailed maps of individual monitoring sites at different zoom levels, and includes North orientation and scale bars on printed output from that.
    c. The AQMA is mapped on the same layer.

2. A triplicate site should be set up at the same location as the UKA00650 AURN node at Walcot to allow for local bias adjustment factors.
    a. A triplicate site was set up during 2023, but there is insufficient data thus far to report that data here or to provide for a local bias adjustment factor.

3. Table 2.2, on AQMA actions, included some struck through text on completed actions, which was difficult to read.
    a. There is no struck out text in this report.

4. Site names should be included in Table C1.
    a. Site names for annualisation are included in Table C1 in this year's report.

Swindon has taken forward a number of direct measures during the current reporting year of 2023 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2. 15 measures are included within Table 2.2, with the type of measure and the progress Swindon has made during the reporting year of 2023 presented. Where there have been, or continue to be, barriers restricting the implementation of the measure, these are also presented within Table 2.2.

More detail on these measures can be found in their respective Action Plans. An updated Air Quality Action Plan was published in late 2023, with both carried over and new actions.

Swindon expects the following measures to be completed over the course of the next reporting year:

- Traffic Regulation Order in place.
    - Formal consultation will have completed
    - The diversions and signage will have been procured and installed.
    - Focus will have switched to enforcing the restriction in partnership with the Police.
    - It is accepted that the TRO to further reduce NO_2 levels within the AQMA by around 5%, and secure sustainable compliance with objective limits.
    - Traffic counting hardware will monitor success
- The VMS digital signs will be operational for the entirety of the year as part of the DEFRA AQ project.
    - Traffic counting hardware will monitor success.
- The outreach and communications project on NO_2 and $PM_{2.5}$ will be well advanced.
    - Measures of success will be apparent and reported.
- High level plans and partnerships such as the Local Logistics and Bus Partnerships will be embedded and mature.

Swindon's priorities for the coming year are to finally put the Traffic Regulation Order in place, and to continue and intensify its work fostering and enabling behaviour change and a switch to more sustainable and active travel.

The principal challenges and barriers to implementation that Swindon anticipates facing are both the availability of funds to finance some actions, and the availability of expert staff to do so. These have proven to be a brake throughout the life of the AQMA to date, and are likely to remain so given Local Authority finance.

Progress on the TRO has been slower than anticipated due to a regular turnover of staff within the Highways team responsible for implementing it.

Swindon anticipates, in the light of 2023 monitoring results that the measures stated above and in Table 2.2 will achieve sustainable compliance in the Kingshill AQMA, and that it may, as a result, be revoked within its planned 5-year life span.

The 'Swindon Plan' being put in place by the new administration contains 3 'missions' including one on achieving nett zero by both the Council and then the borough as a whole.

Whilst not explicitly connecting to air quality, the reduced use of fossil fuels which will be necessitated by the mission will inevitably help to improve both local and national air quality.

Table 2.2 – Progress on Measures to Improve Air Quality

Measure No.	Measure Title	Category	Classification	Year Measure Introduced in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
1	Kingshill Weight Limit	Freight and Delivery Management	Strategic Routing for HGVs	2024	2024	LA Strategic Transport	Public Health	No	Fully Funded	£100k - £500k	Implementation	5%	Traffic Regulation Order in Place	Fully funded. Alternative Routes and Signage being designed. Formal consultation beginning .	On track
2	Active Travel Outreach	Promoting Travel Alternatives	Promotion of Cycling. Promotion of Walking. Workplace Travel. Planning. Promotion of use of rail and inland waterways. Modeshift Stars travel planning activity. Swindon Transport Conversation. Engagement. Town Centre Access and Active. Travel Map. Other local walking/cycle maps	2023	2025	LA Public Health. LA Strategic Transport	Internal Funding, BAU. Public Health Funding. DEFRA Grant Funding	Yes	Fully Funded	£50k - £100k	Implementation	5%	Reduction in measured NO2	Teams recruited. Programme of work ongoing.	On track
3	Variable Message Signage	Public Information	Via other mechanisms	2023	2025	LA Highways	DEFRA Grant Funding	Yes	Fully Funded	£59k - £100k	Implementation	<2%	Sign units installed and in use.	Purchase Order issued. Civils order issued.	None expected

Measure No.	Measure Title	Category	Classification	Year Measure Introduced in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
4	Enhanced Bus Partnership, Bus Service Improvement Plan,	Transport Planning & Infrastructure	Bus route Improvements. Other	2021	Ongoing	LA Transport	Internal, BAU	No	Funded	BAU	Implementation	<2%	44% increase in passenger boardings by 2030, 13% by 2025. 40% increase in propensity to use the bus. Doubling of Bus Mode Share in Highworth and Wroughton, and new developments	Plan in place	
5	Town Centre Regeneration (inc. Bus Boulevard)	Transport Planning & Infrastructure	Public Transport Improvements – interchanges, stations and services	2023	2025	LA Highways	Future High Streets Fund, internal, LEP	No	Funded	£33m	Implementation	<2%	New town centre bus boulevard built out and in use.	Construction underway	
6	Staff Travel	Promoting Travel Alternatives	Workplace Travel Planning (inc. SBC)	2018	2025	LA Highways	Internal, BAU	No	Funded	NA	Implementation	<1%	SBC Staff Travel Plan review.	ongoing	
7	Old Town Railway Cycle Path	Transport Planning & Infrastructure	Cycle Network	2024	2025	LA Highways	TBC	No	Not yet funded	£1m	Awaiting funding	<2%	Improved cycle way in regular use.	Drainage works in 2022.	Funding the major constraint.
8	Local Logistics Partnership	Freight and Delivery Management	Freight Partnerships for Swindon including last mile town centre deliveries	2023	2024	LA Highways	Internal, BAU	No	Funded	BAU	Implementation	<5%	Local Logistics Partnership in place and functioning well.	LLP in place.	
9	Public EV Charging	Promoting Low Emission Transport	Procuring Alternative Fuelling Infrastructure	2025	ongoing	LA Highways	External Grants, TBC	No	Not yet funded	TBC	Planning	NA	Appropriate levels of EV charging for fleet.	NA	Dependent on strategic bids for funding
10	Transport Modelling Application	Traffic Management and Forward Planning	Other	2024	2024 initial outputs	LA Highways	Internal, BAU	No	Not yet funded	TBC	Market Testing	NA	New modelling solution in use	Market testing	Funding
11	Schools Sustainable Transport	Promoting Travel Alternatives	Other	2023	2025	LA Public Health. LA Highways	Internals, DEFRA Grant	Yes, partially	Partially funded, partially BAU	BAU	Implementation	<1%	More pupils arriving at school by active travel modes	Planning	
12	Local Transport Plan, Town Centre Movement Strategy	Policy Guidance and Development Control	Other Policy	2023	ongoing	LA Planning. LA Highways	Internal, BAU	No	Funded, BAU	BAU	Implementation	<2%	Plan priorities in place	Plans in Place	

Measure No.	Measure Title	Category	Classification	Year Measure Introduced in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
13	Local Enterprise Partnership Priorities	Promoting Low Emission Transport	Procuring alternative refuelling infrastructure to promote low emission vehicles…	2023	ongoing	Swindon and Wiltshire LEP	Internal, BAU	No	BAU	TBC	Implementation	<1%	Increased Hydrogen fuelling facilities on main regional corridors	Plan in Place	Swindon and Wiltshire Green Hydrogen Plan as a component of the 'West HyWay' and Western Gateway hydrogen network.
14	Bus Signal Advantage Scheme	Traffic Management	Bus Priority	2024	2025	LA Highways	Internal, BAU	No	Not yet funded	TBC	Planning	<1%	Bus Signal Advantage scheme in place	High Level Planning	Funding possibly a constraint.
15	Growth Modelling	Policy Guidance and Development Control	Other	2024	2025	LA Highways / Planning Policy	Internal	No	TBC	TBC	Planning and Design	TBC	Mitigation measures to be agreed	Moving from concept to detailed approach	In design as part of transport modelling linked outputs

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

As detailed in Policy Guidance LAQM.PG22 (Chapter 8) and the Air Quality Strategy, local authorities are expected to work towards reducing emissions and/or concentrations of fine particulate matter ($PM_{2.5}$). There is clear evidence that $PM_{2.5}$ (particulate matter smaller 2.5 micrometres) has a significant impact on human health, including premature mortality, allergic reactions, and cardiovascular diseases.

The Public Health Outcomes Framework identifies that the fraction of mortality attributable to particulate air pollution (new method, 2020) in Swindon is 6.5% for 2022; the latest available, which is higher than both the regional (SW) average and the England average. With reference to Swindon's CIPFA nearest neighbours; Swindon lies in joint 3rd at the top of that range, of 16.

Swindon notes the World Health Organisation's $PM_{2.5}$ guidelines, which reduce the previous aspirational annual mean target to 5µg/m^3, from 10µg, along with a suite of interim targets for nations unable to immediately achieve the ultimate guideline. This reflects the very low threshold for health impacts from $PM_{2.5}$ and will serve to drive regional and global reduction of this pollutant.

Swindon further notes the Environment Act 2021, and the more recent Environmental Targets (Fine Particulate Matter) (England) Regulations 2023, which sets two $PM_{2.5}$ targets in law, to be met by the end of 2040, and is expected to drive national reductions. The Regulations set both an annual mean target of 10µg/m^3, commensurate with WHO interim target four, and a Population Exposure Reduction Target (PERT) of 35% by the same date. Swindon notes the interim targets, for 2028, of 12µg (which Swindon meets, modelled, for all of its 232 km^2 grid squares in 2023) and 22% PERT reduction from 2018 base.

The new $PM_{2.5}$ legal limits will not be assessed at local scale, but it is useful to compare Swindon's local levels to the new future annual mean limits, to inform and motivate progress. Current models extend only to 2030, but by that time only 2 of Swindon's 232 1km grid squares are forecast to exceed the new legal limit (marginally) at that time.

Swindon relies on the DEFRA background mapping resource to estimate maximum ambient $PM_{2.5}$ in Swindon, by 1km grid square (whilst noting that the models used to produce it are based on the 2018 base year, which predates the Covid-19 period and may

not accurately predict local $PM_{2.5}$ now). DEFRA's AURN node at Walcot in Swindon has measured Urban Background $PM_{2.5}$ to reference standard since June 2022 however. Full year 2023 results for the Walcot node are reported in Appendix A.

Background mapping for 2023 suggests that, of Swindon's 232 grid squares; 8 exceeded a $PM_{2.5}$ level of 10 µg/m^3 (11 in 2022) the highest at 10.47µg/m^3, the lowest 7.60. The highest levels are, expectedly, seen around the urban centre of Swindon, bounded by the M4 motorway to the South, the A419 to the East and North, and the Borough boundary to the West.

The Mean modelled level of $PM_{2.5}$ across Swindon Borough in 2023 was 8.65µg/m^3 (2022: 8.77µg), and the Median was 8.40 (2022: 8.52µg).

Along with local traffic, domestic solid fuel burning is thought to be the likely biggest local contributor to $PM_{2.5}$ levels that is under any potential local influence. Census 2021 identified, however, that there are very low numbers relying on solid fuel as their primary home heat source. Overall, 0.0% of homes in Swindon rely on solid fuel, and the worst Middle Super Output Area returns only 0.1%. This is significantly lower than neighbouring local authority areas, which have larger rural populations that may not benefit from good gas connections. This might indicate that Swindon may not be in a position to influence locally generated $PM_{2.5}$ to any great degree, other than by reducing elective and top up heating burning and fugitive emissions.

Notwithstanding, and with the benefit of a DEFRA Air Quality Grant, Swindon is currently running outreach and campaign work around $PM_{2.5}$ generation, seeking to influence behaviours mostly around elective burning, where this is not needed for home heating, and also fugitive and incidental generation via bonfires etc.

With regard to traffic derived $PM_{2.5}$ pollution; actions 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, & 15 in the Kingshill Air Quality Action Plan could also be expected to exert downward pressure on local $PM_{2.5}$ emissions. It is noted that the greatest primary $PM_{2.5}$ contribution from traffic is now brake, tyre and road surface erosion, and that work is underway nationally and beyond to reduce this through product standards.

In addition; Swindon's 'Be the Change' campaign and Solar Group Buying project is expected to reduce energy produced through fossil fuels demand, so decreasing $PM_{2.5}$ emissions more widely. Swindon's new 'Swindon Plan', which has 3 missions around making Swindon's infrastructure better, reducing inequalities, and achieving nett zero is also expected to limit exposure to $PM_{2.5}$ in time.

Swindon maintains the proactive enforcement stance on smoke nuisance from bonfires and similar burning that it put in place during the Covid-19 pandemic, and fully complies with its statutory responsibilities around permitted processes in Swindon; ensuring that emitting companies do not emit more than they are permitted to.

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

This section sets out the monitoring undertaken within 2023 in Swindon and how it compares with the relevant air quality objectives. In addition, monitoring results are presented for a five-year period between 2019 and 2023 to allow monitoring trends to be identified and discussed.

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

Swindon undertakes no automatic (continuous) monitoring on its own account. DEFRA runs an Automatic Urban and Rural Network node (UKA00650) at Walcot in Swindon however, and results from that node are presented here. Table A.1 in Appendix A shows the details of this automatic monitoring site.

Maps showing the location of the monitoring sites are provided in Appendix D.

3.1.2 Non-Automatic Monitoring Sites

Swindon undertook non-automatic (i.e. passive) monitoring of NO_2 at 38 sites during 2023. Table A.2 in Appendix A presents the details of the non-automatic sites.

Maps showing the location of all monitoring sites are provided via external link, here: https://maps.swindon.gov.uk/sbcatmycouncil.aspx ; selecting the 'Planning' category and adding the 'Air Quality Monitoring Stations' layer.

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 bias, annualisation (where the annual mean data capture is below 75% and greater

than 25%), and distance correction. Further details on adjustments are provided in Appendix C.

3.2.1 Nitrogen Dioxide (NO_2)

In Swindon in 2023, Nitrogen Dioxide levels improved, by an average across the 38 monitoring sites of 9.6%. 35 sites improved, by between 24.7% and 0.8%, and 3 sites worsened (S9, S14, S40), by between 6.8% and 3.9%. These results are somewhat confirmed by the results from the DEFRA AURN node at Walcot (UKA00650) for the period, which showed a 15% reduction in urban background NO_2. The 2023 results continue and hasten the improving trend seen over the last 5 years, in which all sites have improved by 22.8% on average, and by between 2.5% (S9) and 46.0% (S10).

At the roadside; no sites exceeded the 60µg/m^3 annual value at which there would be an indicated risk of breaching the 1-hour objective (of 200µg/m^3). Just 3 sites exceeded the 40µg/m^3 annual average objective at the roadside (S29, S30, S42), two of which lie within the Kingshill AQMA (S29, S30). The other of these 3 sites (S42) is representative of a farm which lies alongside the A419 trunk road, for which National Highways carries responsibility. Once corrected for distance to the relevant receptor however; all of these sites returned values better than the annual objective value (S29: 38.3µg/m^3, S30: 32.2µg/m^3, S42: 32.8µg/m^3).

One further site, S15, also within the Kingshill AQMA, returned a roadside value within 10% of but below the objective value; which returned a value of 38.7µg/m^3.

These encouraging results move Swindon closer to revoking the current Kingshill AQMA, if the progress can be maintained. In the interim, results within the Kingshill AQMA do not yet show sufficient improvement to indicate a sustainable resolution of the air quality issue there. The current boundaries of the Kingshill AQMA remain relevant and so there is no proposal to amend them at this time.

Table A.3 and Table A.4 in Appendix A compare the ratified and adjusted monitored NO_2 annual mean concentrations for the past five years with the air quality objective of 40µg/m^3. Note that the concentration data presented 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 2023 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.

Table A.5 in Appendix A compares the ratified continuous monitored NO_2 hourly mean concentrations for the past five years with the air quality objective of 200µg/m^3, not to be exceeded more than 18 times per year.

3.2.2 Particulate Matter (PM_{10})

Swindon undertakes no PM_{10} monitoring on its own account, but benefits from the existence of a DEFRA AURN network node at Walcot (UKA00650), and the results from that node are presented in this report.

With regard to PM_{10}, results show an urban background measured level of 11µg/m^3, significantly better than the 40µg/m^3 objective.

Swindon also relies on the background mapping provided by DEFRA for an indication of wider levels and trends over time, whilst acknowledging that the model which informs the mapping is based on the 2018 base. For 2023, this model predicts an ambient PM_{10} value at the location of the Swindon Walcot AURN monitor of 14.8µg/m^3; the predicted 25th highest (of 232) PM_{10} level in Swindon. In 2023, none of the 232 1km^2 grid squares in Swindon were predicted to exceed the 40µg/m^3 limit level.

The average predicted PM_{10} level of all of Swindon's grid squares is 13.7µg/m^3 in 2023, and 13.3µg/m^3 in 2030.

Table A.6 in Appendix A: Monitoring Results compares the ratified and adjusted monitored PM10 annual mean concentrations for the past five years with the air quality objective of 40µg/m^3.

Table A.7 in Appendix A compares the ratified continuous monitored PM_{10} daily mean concentrations for the past five years with the air quality objective of 50µg/m^3 over 24 hours, not to be exceeded more than 35 times per year.

3.2.3 Particulate Matter ($PM_{2.5}$)

Swindon undertakes no $PM_{2.5}$ monitoring on its own account, but DEFRA operate a reference equivalent urban background monitor in Swindon (UKA00650) as part of its AURN network. For 2023, this monitor returned value of 6.7µg/m^3. This represents a 15% improvement on 2022 results.

Swindon also relies on the background mapping provided by DEFRA for an indication of wider levels and trends over time, whilst acknowledging that the model which informs the mapping is based on 2018 assumptions. This model predicts an ambient $PM_{2.5}$ value at the location of the Swindon Walcot AURN monitor of 10.1µg/m^3; the predicted 7th highest $PM_{2.5}$ level in Swindon. In 2023, 8 of the 232 1km^2 grid squares in Swindon were predicted to exceed the 10µg/m^3 limit level for $PM_{2.5}$, with this number predicted to reduce to 2 grid squares by 2030.

The average of all of Swindon's grid squares is modelled to be 8.6µg/m^3 in 2023, and 8.4µg/m^3 in 2030.

Modelled background maps for Swindon up to 2030 may be found here: https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018 .

Table A.8 in Appendix A presents the ratified and adjusted monitored $PM_{2.5}$ annual mean concentrations from the DEFRA AURN node at Swindon Walcot.

Table A.8 in Appendix A presents the ratified and adjusted monitored $PM_{2.5}$ annual mean concentrations from the DEFRA Walcot AURN node (UKA00650).

Appendix A: Monitoring Results

Table A.1 – Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Inlet Height (m)
UKA00650	Swindon Walcot AURN Node	Urban Background	416341	184379	O_3, NO, NO_2, PM_{10}, $PM_{2.5}$	No	Various (DEFRA AURN)	>40m	40.5	1.8m

Notes:

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

(2) N/A if not applicable

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

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
S1	GWR Museum	Roadside	414629	184737	NO_2	No	0.3	2.0	No	2.5
S3	S4, 8 Okus Road	Roadside	414759	183719	NO_2	No	4.8	2.3	No	2.5
S4	186 Kingshill Rd	Roadside	414258	183972	NO_2	No	2.3	2.0	No	2.6
S5	Chalet School, Queens Drive	Roadside	416089	184907	NO_2	No	0.0	7.5	No	2.8
S6	Swindon 8 - 102 Bath Road	Roadside	414925	183741	NO_2	No	6.9	3.0	No	2.7
S7	No. 81 Kingshill Road	Roadside	414626	183848	NO_2	Yes, Kingshill	6.0	1.6	No	2.3
S8	Aylesbury Street	Roadside	415108	185158	NO_2	No	1.6	1.1	No	2.4
S9	Manchester Rd	Roadside	415157	185101	NO_2	No	0.2	2.6	No	2.8
S10	Meadow Way Badbury	Roadside	419347	180975	NO_2	No	6.5	36.7	No	1.8
S11	Kingshill Rd/Clifton St	Roadside	414733	183783	NO_2	Yes, Kingshill	3.2	1.3	No	2.9
S12	Westcott Place	Roadside	414076	184041	NO_2	No	11.6	1.2	No	2.8
S13	Cricklade Rd (Moonraker)	Roadside	415677	187335	NO_2	No	4.4	1.3	No	2.9
S14	Iffley Rd from 10.05.2017	Roadside	413893	185621	NO_2	No	0.7	7.7	No	2.0
S15	102 Kingshill Road	Roadside	414698	183800	NO_2	Yes, Kingshill	0.1	1.3	No	2.5
S16	86 Clifton Road	Roadside	414756	183789	NO_2	No	10.0	8.6	No	2.6
S17	A420 South Marston	Roadside	419438	186765	NO_2	No	8.2	12.5	No	2.7
S18	63 Kingshill Rd	Roadside	414552	183885	NO_2	Yes, Kingshill	6.0	2.0	No	2.8

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
S19	No. 85 Kingshill Road	Roadside	414654	183834	NO_2	Yes, Kingshill	1.8	1.4	No	2.4
S20, S21, S22	37 Devizes Rd	Roadside	415547	183552	NO_2	No	4.5	1.8	No	2.4
S23	30 Devizes Road	Roadside	415555	183495	NO_2	No	3.5	2.0	No	2.4
S24	68 Cheney Manor Rd (Rodbourne Rd)	Roadside	415532	183666	NO_2	No	2.6	2.4	No	2.3
S25	Tadpole Lane	Roadside	411973	189625	NO_2	No	16.0	0.7	No	2.3
S26	66 Ermin St	Roadside	417399	187354	NO_2	No	0.7	1.9	No	2.5
S2, S27, S28	Bath Rd Car Park	Roadside	415290	183790	NO_2	No	3.3	5.3	No	2.6
S29	Opp 101 Kingshill Road	Roadside	414708	183806	NO_2	Yes, Kingshill	7.9	1.8	No	2.5
S30	Corner of Kingshill/ Clifton Street	Roadside	414757	183783	NO_2	Yes, Kingshill	15.7	1.4	No	2.3
S31	Wanborough Road - Merlin Way	Roadside	418427	186275	NO_2	No	2.9	0.6	No	2.4
S32	516A Cricklade Road	Roadside	415667	187458	NO_2	No	10.7	0.8	No	2.2
S33	Gorse Hill	Roadside	415591	187367	NO_2	No	8.4	1.3	No	2.3
S34	Beechcroft Road/ Moonrakers	Roadside	415721	187414	NO_2	No	6.1	0.4	No	2.5
S35	32 Swindon Street Highworth	Roadside	420030	192367	NO_2	No	2.1	2.5	No	2.1
S36	Highworth - Cricklade Road	Roadside	419987	192409	NO_2	No	2.1	1.6	No	2.3

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
S37	St Michaels Avenue Corner/ Highworth	Roadside	420037	192479	NO_2	No	3.2	1.2	No	2.5
S38	Hanleys, High Street - Highworth	Roadside	420078	192450	NO_2	No	2.1	1.8	No	2.3
S39	Goddard Arms - Cricklade Street	Roadside	415712	183817	NO_2	No	1.1	1.7	No	2.6
S40	10 Marlborough Road - Wroughton	Roadside	414880	180586	NO_2	No	3.8	0.9	No	2.9
S41	No.88 High Street - Wroughton	Roadside	414409	180473	NO_2	No	2.8	0.2	No	2.5
S42	Nythe Farm A419	Roadside	419050	185658	NO_2	No	6.0	2.1	No	1.5

Notes:

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

(2) N/A if not applicable.

Table A.3 – Annual Mean NO_2 Monitoring Results: Automatic Monitoring (µg/m^3)

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2023 (%) (2)	2019	2020	2021	2022	2023
UKA00650	416341	184379	Urban Background	98	98	13.5	9.9	10.3	10.2	8.9

☒ **Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG22.**

☒ **Reported concentrations are those at the location of the monitoring site (annualised, as required), i.e. prior to any fall-off with distance correction.**

☒ **Where exceedances of the NO_2 annual mean objective occur at locations not representative of relevant exposure, the fall-off with distance concentration has been calculated and reported concentration provided in brackets for 2023.**

Notes:

The annual mean concentrations are presented as µg/m^3.

Exceedances of the NO_2 annual mean objective of 40µg/m^3 are shown in **bold**.

All means have been "annualised" as per LAQM.TG22 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

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

(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%).

Table A.4 – Annual Mean NO_2 Monitoring Results: Non-Automatic Monitoring (µg/m^3)

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2023 (%) (2)	2019	2020	2021	2022	2023
S1	414629	184737	Roadside	73.0769	73.1	30.0	24.3	27.2	25.6	23.6
S3	414759	183719	Roadside	100	100.0	17.8	14.1	15.3	14.9	13.3
S4	414258	183972	Roadside	100	100.0	30.5	23.8	25.6	27.1	22.2
S5	416089	184907	Roadside	84.6154	84.6	28.5	22.2	19.5	21.5	21.3
S6	414925	183741	Roadside	100	100.0	32.4	28.1	29.4	26.0	23.3
S7	414626	183848	Roadside	75	75.0	**44.8**	38.3	**40.5**	36.5	31.9
S8	415108	185158	Roadside	100	100.0	22.8	17.8	18.0	19.5	18.1
S9	415157	185101	Roadside	92.3077	92.3	35.6	27.6	29.7	32.5	34.7
S10	419347	180975	Roadside	100	100.0	24.7	18.1	15.6	14.7	13.3
S11	414733	183783	Roadside	100	100.0	39.3	32.4	35.1	33.0	30.8
S12	414076	184041	Roadside	100	100.0	28.1	22.9	25.0	24.6	22.7
S13	415677	187335	Roadside	100	100.0	30.6	28.0	19.8	28.9	24.5
S14	413893	185621	Roadside	92.3077	92.3	32.5	27.0	29.1	25.2	26.9
S15	414698	183800	Roadside	100	100.0	**46.7**	**40.6**	**45.0**	**42.2**	38.7
S16	414756	183789	Roadside	100	100.0	25.8	21.1	21.7	21.9	21.7
S17	419438	186765	Roadside	100	100.0	17.6	14.7	15.9	15.8	13.5
S18	414552	183885	Roadside	100	100.0	29.5	24.4	26.7	25.2	22.1
S19	414654	183834	Roadside	92.3077	92.3	38.5	32.7	33.1	35.9	33.0
S20, S21, S22	415547	183552	Roadside	100	100.0	**40.1**	31.8	33.8	33.8	29.5
S23	415555	183495	Roadside	90.3846	90.4	36.4	28.6	29.6	30.3	23.4
S24	415532	183666	Roadside	100	100.0	38.2	31.3	36.2	34.7	32.4
S25	411973	189625	Roadside	100	100.0	16.2	12.8	13.6	13.4	11.9
S26	417399	187354	Roadside	100	100.0	26.4	22.4	23.7	22.0	19.3
S2, S27, S28	415290	183790	Roadside	100	100.0	21.2	16.0	16.5	16.8	15.0
S29	414708	183806	Roadside	75	75.0	**60.1**	**51.8**	**53.1**	**56.0**	**55.4**

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2023 (%) (2)	2019	2020	2021	2022	2023
S30	414757	183783	Roadside	100	100.0	**75.9**	**62.2**	**67.0**	**69.4**	**56.9**
S31	418427	186275	Roadside	100	100.0	16.5	14.1	14.3	13.9	12.1
S32	415667	187458	Roadside	50	50.0	30.1	26.1	24.4	30.6	27.2
S33	415591	187367	Roadside	100	100.0	30.5	25.4	28.6	29.0	25.2
S34	415721	187414	Roadside	67.3077	67.3	30.5	26.3	28.1	30.1	26.2
S35	420030	192367	Roadside	100	100.0	20.9	16.4	17.5	17.7	15.2
S36	419987	192409	Roadside	100	100.0	20.6	16.3	17.5	18.0	13.6
S37	420037	192479	Roadside	100	100.0	33.1	27.7	29.8	28.8	25.8
S38	420078	192450	Roadside	100	100.0	16.7	13.7	13.6	13.7	11.7
S39	415712	183817	Roadside	100	100.0	32.9	24.0	28.6	29.7	25.1
S40	414880	180586	Roadside	100	100.0	20.5	16.5	17.6	14.7	15.3
S41	414409	180473	Roadside	100	100.0	20.7	17.1	18.1	16.5	15.7
S42	419050	185658	Roadside	82.6923	82.7	**52.3**	37.8	**42.3**	**43.3**	**42.8**

☒ **Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG22.**

☒ **Diffusion tube data has been bias adjusted.**

☒ **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 correction.**

Notes:

The annual mean concentrations are presented as µg/m^3.

Exceedances of the NO_2 annual mean objective of 40µg/m^3 are shown in **bold**.

NO_2 annual means exceeding 60µg/m^3, indicating a potential exceedance of the NO_2 1-hour mean objective are shown in **bold and underlined**.

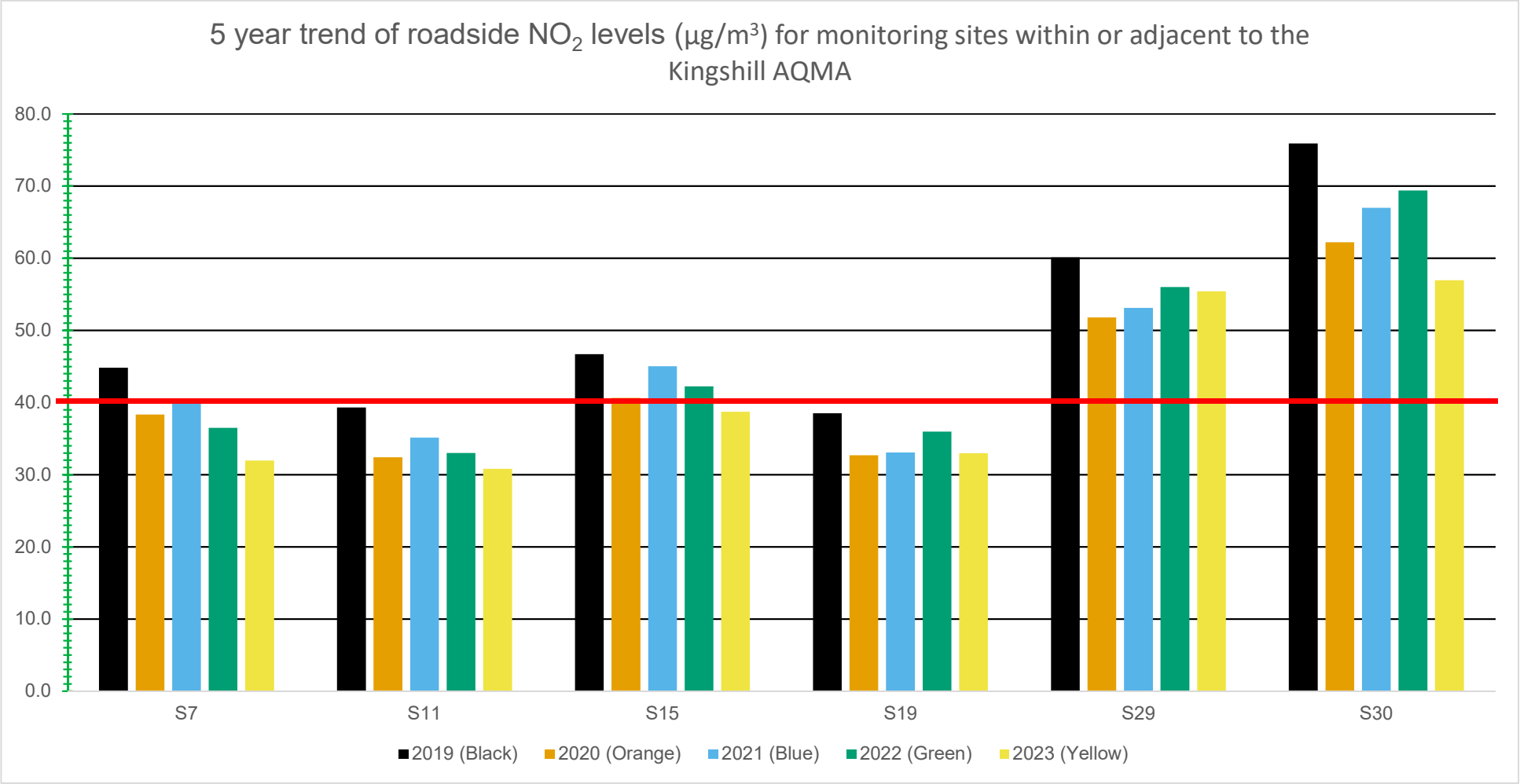
Means for diffusion tubes have been corrected for bias. All means have been "annualised" as per LAQM.TG22 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

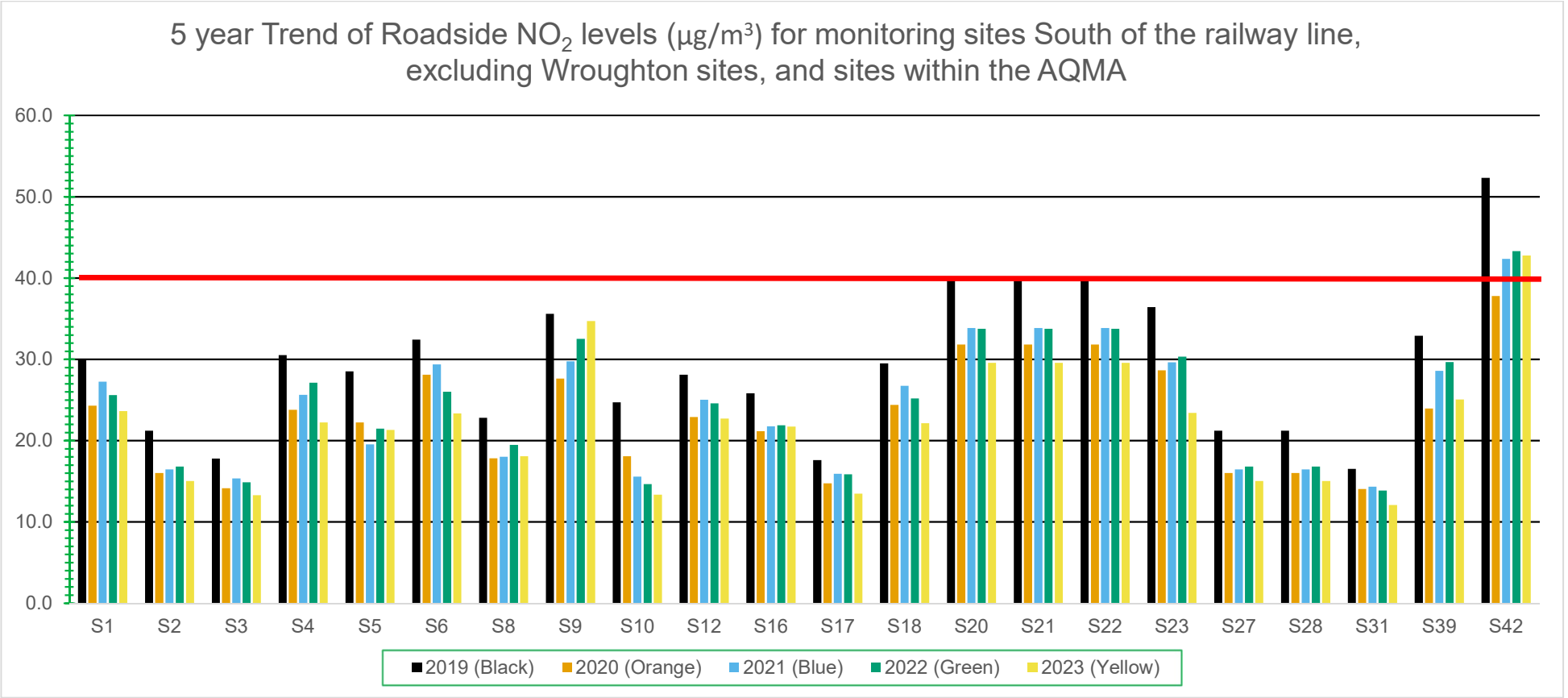
Concentrations are those at the location of monitoring and not those following any fall-off with distance adjustment.

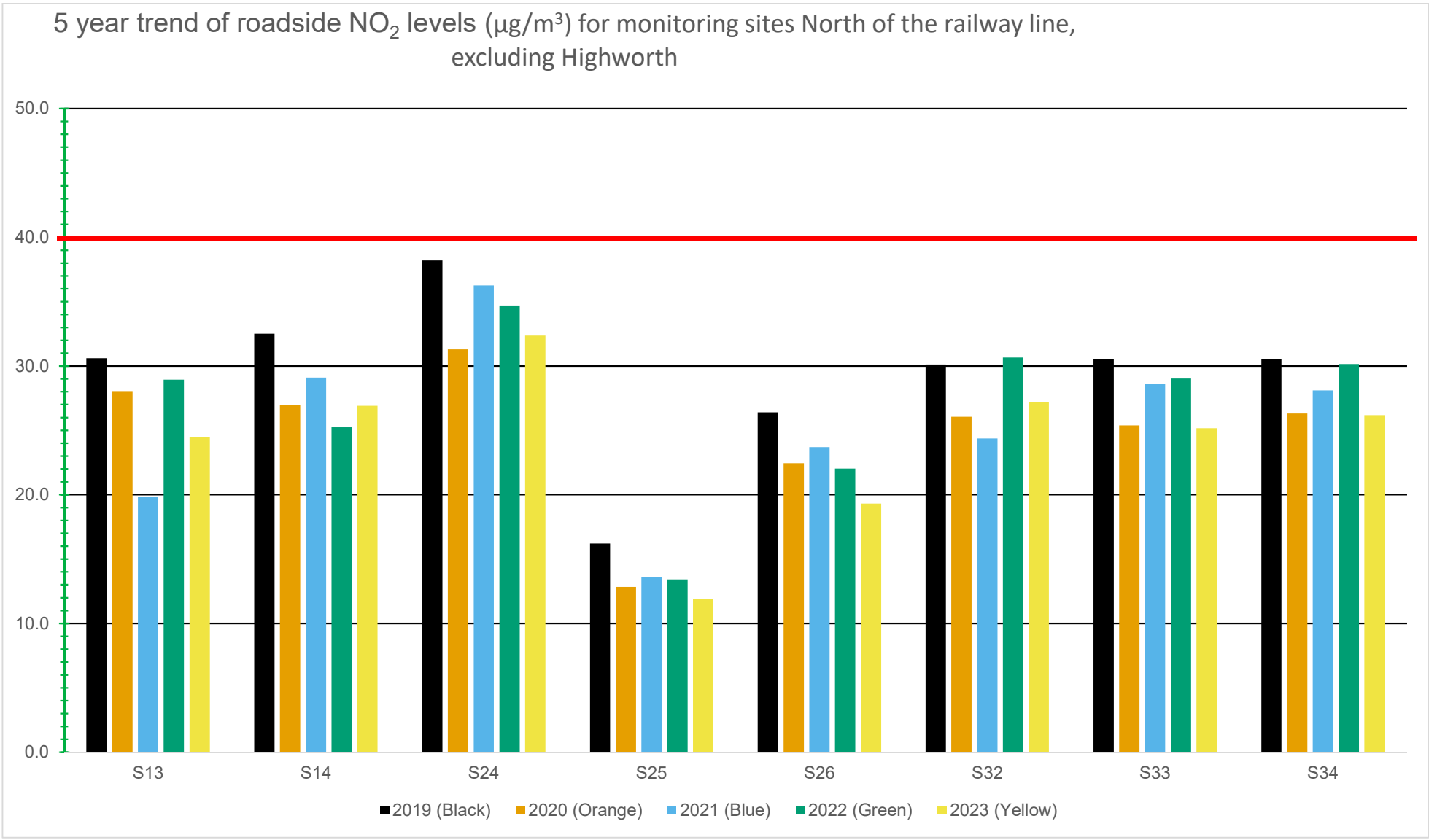
(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

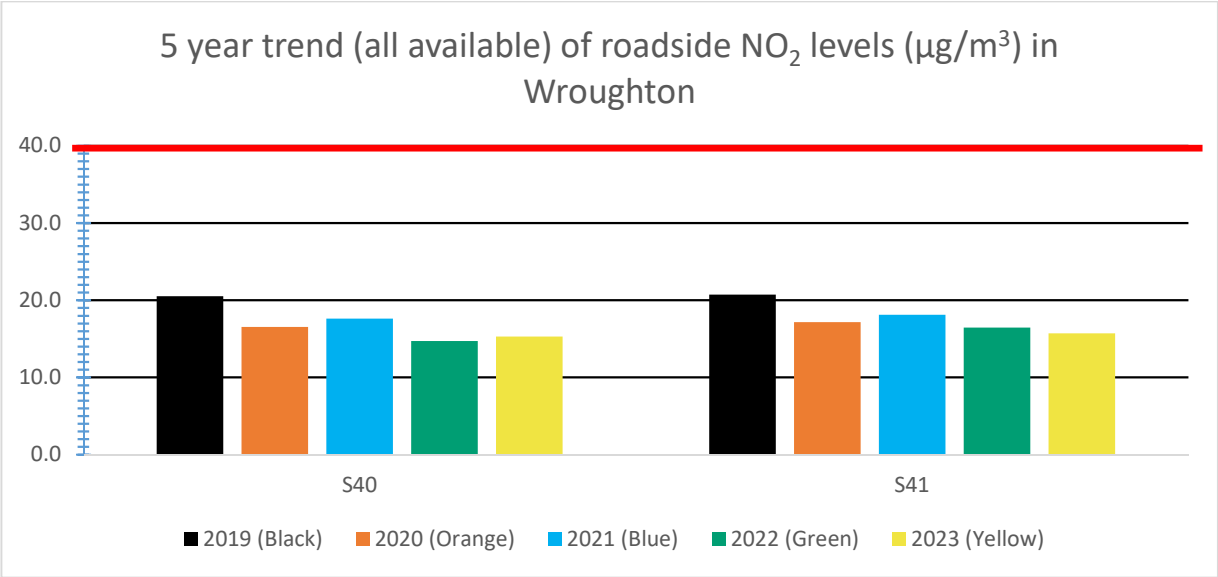
(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

Figure A.1 – Trends in Annual Mean NO_2 Concentrations




5 year Trend of Roadside NO2 levels (µg/m3) for monitoring sites South of the railway line, excluding Wroughton sites, and sites within the AQMA
60.0
50.0
40.0
30.0
20.0
10.0
0.0
S1
S2
S3
S4
S5
S6
S8
S9
S10
S12
S16
S17
S18
S20
S21
S22
S23
S27
S28
S31
S39
S42
2019 (Black)
2020 (Orange)
2021 (Blue)
2022 (Green)
2023 (Yellow)


5 year trend of roadside NO2 levels (µg/m3) for monitoring sites North of the railway line, excluding Highworth
50.0
40.0
30.0
20.0
10.0
0.0
S13
S14
S24
S25
S26
S32
S33
S34
2019 (Black)
2020 (Orange)
2021 (Blue)
2022 (Green)
2023 (Yellow)


5 year trend (all available) of roadside NO2 levels (µg/m3) in Wroughton
40.0
30.0
20.0
10.0
0.0
S40
S41
2019 (Black)
2020 (Orange)
2021 (Blue)
2022 (Green)
2023 (Yellow)

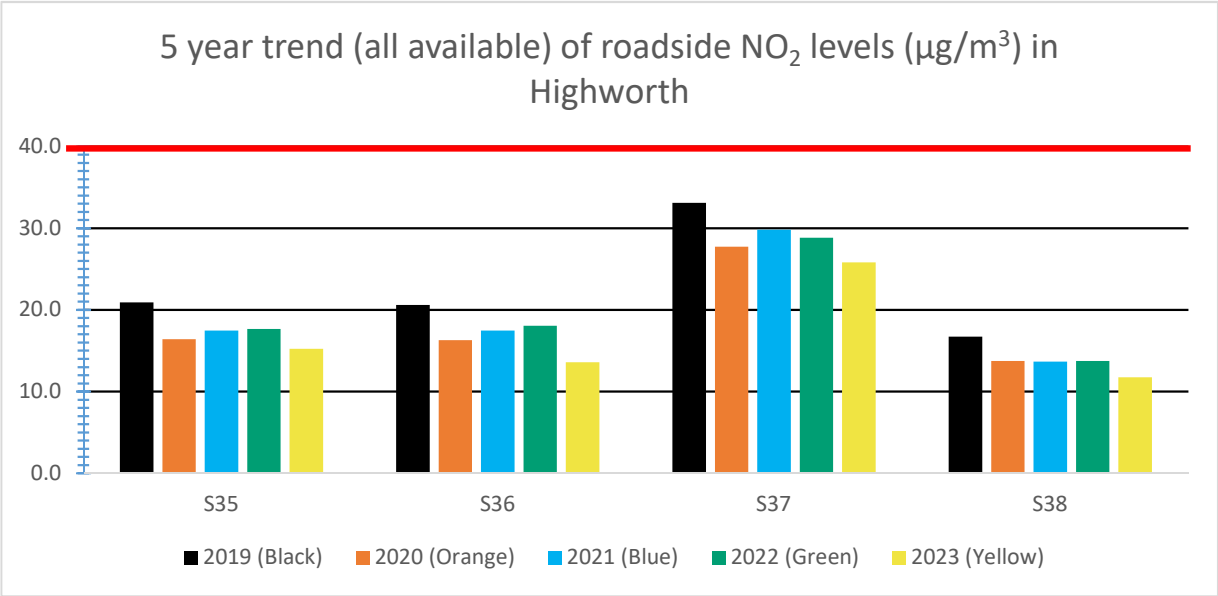

5 year trend (all available) of roadside NO2 levels (µg/m3) in Highworth
40.0
30.0
20.0
10.0
0.0
S35
S36
S37
S38
2019 (Black)
2020 (Orange)
2021 (Blue)
2022 (Green)
2023 (Yellow)

Table A.5 – 1-Hour Mean NO_2 Monitoring Results, Number of 1-Hour Means > 200µg/m^3

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2023 (%) (2)	2019	2020	2021	2022	2023
UKA00650	416341	184379	Urban Background	98	98	0	0	0	0	0

Notes:

Results are presented as the number of 1-hour periods where concentrations greater than 200µg/m^3 have been recorded.

Exceedances of the NO_2 1-hour mean objective (200µg/m^3 not to be exceeded more than 18 times/year) are shown in **bold**.

If the period of valid data is less than 85%, the 99.8th percentile of 1-hour means is provided in brackets.

(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%).

Table A.6 – Annual Mean PM_{10} Monitoring Results ($\mu g/m^3$)

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2023 (%) (2)	2019	2020	2021	2022	2023
UKA00650	416341	184379	Urban Background	99	99	**NA**	**NA**	**NA**	**12.9**	**11**

☒ **Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG22.**

Notes:

The annual mean concentrations are presented as $\mu g/m^3$.

Exceedances of the PM_{10} annual mean objective of $40\mu g/m^3$ are shown in **bold**.

All means have been "annualised" as per LAQM.TG22 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

(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%).

Table A.7 – 24-Hour Mean PM_{10} Monitoring Results, Number of PM_{10} 24-Hour Means > 50µg/m^3

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2023 (%) (2)	2019	2020	2021	2022	2023
UKA00650	416341	184379	Urban Background	99	99	**NA**	**NA**	**NA**	**1 (18.8)**	0

Notes:

Results are presented as the number of 24-hour periods where daily mean concentrations greater than 50µg/m^3 have been recorded.

Exceedances of the PM_{10} 24-hour mean objective (50µg/m^3 not to be exceeded more than 35 times/year) are shown in **bold**.

If the period of valid data is less than 85%, the 90.4th percentile of 24-hour means is provided in brackets.

(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%).

Table A.8 – Annual Mean $PM_{2.5}$ Monitoring Results (µg/m^3)

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2023 (%) (2)	2019	2020	2021	2022	2023
UKA00650	416341	184397	Urban Background	99	99	NA	NA	NA	7.8	6.7

☒ **Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG22.**

Notes:

The annual mean concentrations are presented as µg/m^3.

All means have been “annualised” as per LAQM.TG22 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

(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%).

Appendix B: Full Monthly Diffusion Tube Results for 2023

Table B.1 – NO_2 2023 Diffusion Tube Results ($\mu g/m^3$)

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted (0.77)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
S1	414629	184737		34.7		31.2	28.8	30.2	23.6	29.2	36.2	33.2		28.9	30.7	23.6		
S2	415290	183790	26.1	26.3	19.3	19.0	17.0	16.1	11.5	17.1	20.6	22.7	20.8	15.3	-	-		Triplicate Site with S2, S27 and S28 - Annual data provided for S28 only
S3	414759	183719	24.6	21.7	12.0	18.2	22.2	20.5	8.0	15.5	16.0	16.4	19.8	12.1	17.3	13.3		
S4	414258	183972	35.9	18.4	25.1	31.6	23.8	34.1	22.1	26.9	36.7	30.8	33.4	27.4	28.9	22.2		
S5	416089	184907			26.4	27.9	20.1	23.3	25.5	27.5	35.8	30.7	34.4	25.0	27.7	21.3		
S6	414925	183741	40.2	33.6	30.0	27.9	27.3	32.3	16.8	27.4	31.5	32.1	38.7	26.0	30.3	23.3		
S7	414626	183848				46.0	43.7	43.1	30.2	41.8	44.6	45.8	45.5	32.6	41.5	31.9		
S8	415108	185158	34.6	28.9	27.4	24.9	22.9	23.6	12.3	15.5	24.8	25.1	24.1	17.6	23.5	18.1		
S9	415157	185101	45.7	51.6	42.2	45.3	48.2	54.5	30.5	38.0	47.4	44.6	47.8		45.1	34.7		
S10	419347	180975	19.7	18.7	17.6	16.4	12.7	14.9	16.0	16.5	22.3	21.0	14.7	17.5	17.3	13.3		
S11	414733	183783	49.9	46.1	45.8	55.8	35.4	32.9	30.0	40.3	44.5	36.6	32.4	30.4	40.0	30.8		
S12	414076	184041	39.8	29.5	30.1	27.2	26.1	30.8	19.3	27.3	32.5	30.4	37.1	23.8	29.5	22.7		
S13	415677	187335	42.4	35.3	34.5	33.6	35.8	31.7	18.2	27.7	31.8	32.0	34.8	23.4	31.8	24.5		
S14	413893	185621	47.9	36.3	37.1	29.7	28.8	27.2	28.2	29.8	37.9	32.7	48.6		34.9	26.9		
S15	414698	183800	65.6	27.6	50.0	55.4	43.6	54.4	42.3	49.1	65.0	45.5	54.5	50.5	50.3	38.7	38.3	
S16	414756	183789	36.6	33.0	24.7	26.1	20.9	29.5	21.5	27.7	31.6	33.7	32.2	20.8	28.2	21.7		
S17	419438	186765	30.6	17.8	17.2	17.3	19.0	12.6	12.4	16.8	17.6	14.3	18.2	15.9	17.5	13.5		
S18	414552	183885	36.7	26.4	28.8	32.4	31.5	31.7	17.0	27.2	28.7	26.2	37.3	21.0	28.7	22.1		
S19	414654	183834	47.2	52.5	39.2	47.7	48.7	48.2	25.9	39.7	42.8	36.4	42.5		42.8	33.0		
S20	415547	183552	49.9	37.2	38.5	38.0	29.8	36.9	31.4	35.9	42.6	37.7	41.2	21.8	-	-		Triplicate Site with S20, S21 and S22 - Annual data provided for S22 only
S21	415547	183552	52.8	45.6	43.4	37.9	30.1	39.0	35.4	35.4	40.6	39.1	46.5	40.9	-	-		Triplicate Site with S20, S21 and S22 - Annual data provided for S22 only
S22	415547	183552	45.0	44.3	35.3	38.5	27.9	38.2	37.4	35.4	42.5	44.1	34.0	31.3	38.4	29.5		Triplicate Site with S20, S21 and S22 - Annual data provided for S22 only
S23	415555	183495	43.4	8.5	34.9	32.5	30.5		22.7	29.4	34.3	32.7	34.9	30.4	30.4	23.4		
S24	415532	183666	47.7	46.0	42.6	50.6	41.6	45.5	25.5	33.9	46.2	47.4	42.1	35.2	42.0	32.4		
S25	411973	189625	25.1	12.3	15.0	13.7	12.5	13.3	9.5	13.3	17.5	16.2	23.2	13.8	15.5	11.9		
S26	417399	187354	32.2	18.5	24.1	26.1	22.2	22.4	15.6	23.0	28.2	32.0	32.2	24.3	25.1	19.3		
S27	415290	183790		23.8	19.3	19.1	17.4	19.3	11.4	17.5	20.4	22.4	25.4	15.1	-	-		Triplicate Site with S2, S27 and S28 - Annual data provided for S28 only

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted (0.77)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
S28	415290	183790	27.1	21.8	19.5	20.0	17.0	17.3	12.4	12.3	21.1	22.4	24.5	16.8	19.5	15.0		Triplicate Site with S2, S27 and S28 - Annual data provided for S28 only
S29	414708	183806	71.0	57.6	68.0	80.5	70.0	85.4	59.2	70.4	85.5				72.0	**55.4**	38.3	
S30	414757	183783	78.2	93.7	74.3	68.7	64.6	77.6	69.3	84.8	94.3	76.4	52.8	52.7	74.0	**56.9**	32.2	
S31	418427	186275	26.1	23.4	14.0	17.5	16.5	14.3	6.0	12.8	15.4	15.8	14.1	12.1	15.7	12.1		
S32	415667	187458	43.2	43.6	38.7	35.0	30.2	36.7							37.9	27.2		
S33	415591	187367	43.9	30.9	31.7	31.9	27.4	29.3	24.7	31.1	35.8	36.2	40.5	28.8	32.7	25.2		
S34	415721	187414	40.4	31.5	31.8	34.8	26.3	36.1	26.4	31.4					32.3	26.2		
S35	420030	192367	25.5	29.1	20.7	17.3	18.9	17.1	12.8	15.3	17.9	20.2	26.2	16.4	19.8	15.2		
S36	419987	192409	20.6	23.1	18.0	19.4	15.4	16.1	12.2	15.2	20.9	17.0	21.3	12.3	17.6	13.6		
S37	420037	192479	37.1	42.6	38.6	37.9	36.8	41.2	19.1	23.3	30.5	29.2	37.5	28.3	33.5	25.8		
S38	420078	192450	22.8	19.4	15.2	12.9	11.0	13.8	11.1	12.1	15.7	15.7	19.5	13.6	15.2	11.7		
S39	415712	183817	38.8	23.5	37.6	41.8	43.9	37.6	18.8	30.5	33.3	26.2	37.9	20.5	32.5	25.1		
S40	414880	180586	28.3	27.4	20.7	13.0	16.7	17.2	13.9	16.2	20.3	18.0	26.5	20.1	19.9	15.3		
S41	414409	180473	28.2	17.7	19.0	20.8	21.7	22.4	13.4	19.9	19.7	20.2	25.7	15.8	20.4	15.7		
S42	419050	185658	64.0	67.1	53.2	58.9	52.8	60.6	43.4	50.8	57.5	47.1			55.5	**42.8**	32.8	

☒ **All erroneous data has been removed from the NO_2 diffusion tube dataset presented in Table B.1**.

☒ **Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG22.**

☐ **Local bias adjustment factor used.**

☒ **National bias adjustment factor used.**

☒ **Where applicable, data has been distance corrected for relevant exposure in the final column.**

☒ **Swindon confirm that all 2023 diffusion tube data has been uploaded to the Diffusion Tube Data Entry System.**

Notes:

Exceedances of the NO_2 annual mean objective of 40µg/m^3 are shown in **bold**.

NO_2 annual means exceeding 60µg/m^3, indicating a potential exceedance of the NO_2 1-hour mean objective are shown in **bold and underlined**.

See Appendix C for details on bias adjustment and annualisation.

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

New or Changed Sources Identified Within Swindon During 2023

Swindon has identified no new significant sources this year.

Additional Air Quality Works Undertaken by Swindon During 2023

Swindon has not completed any additional works within the 2023 reporting year.

QA/QC of Diffusion Tube Monitoring

Swindon uses Socotec UK Ltd's Environmental Chemistry laboratory at Didcot to supply and analyse the 50%TEA in Acetone diffusion tubes used in its air quality monitoring work. Socotec UK Ltd are accredited by UKAS for such work, and a copy of their current accreditation may be found here: https://www.ukas.com/wp-content/uploads/schedule_uploads/00002/1252Testing-Multiple.pdf

In the AIR PT inter-comparison scheme for comparing spiked Nitrogen Dioxide diffusion tubes; Socotec holds the highest rank of Satisfactory, and the national bias calculation scheme notes the laboratory as having Good precision.

Exposure of the diffusion tubes was completed according to the 2023 Diffusion Tube Monitoring Calendar.

Diffusion Tube Annualisation

Table C.1 – Annualisation Summary (concentrations presented in µg/m^3)

Site ID	Annualisation Factor Bristol St Pauls, UKA00494.	Annualisation Factor Swindon Walcot, UKA00650.	Annualisation Factor	Annualisation Factor	Average Annualisation Factor	Raw Data Annual Mean	Annualised Annual Mean
S1	1.1149	1.1765	NA	NA	1.1457	30.7	-
S32	0.9873	0.8778	NA	NA	0.9326	37.9	35.3
S34	1.0802	1.0218	NA	NA	1.0510	32.3	34.0

Diffusion Tube Bias Adjustment Factors

The diffusion tube data presented within the 2023 ASR has been corrected for bias using an adjustment factor. Bias represents the overall tendency of the diffusion tubes to under or over-read relative to the reference chemiluminescence analyser. LAQM.TG22 provides guidance with regard to the application of a bias adjustment factor to correct diffusion tube monitoring. Triplicate co-location studies can be used to determine a local bias factor based on the comparison of diffusion tube results with data taken from NO_x/NO_2 continuous analysers. Alternatively, the national database of diffusion tube co-location surveys provides bias factors for the relevant laboratory and preparation method.

Swindon have applied a national bias adjustment factor of 0.77 to the 2023 monitoring data, using the Diffusion Tube Data Processing Tool to apply the correction automatically. A summary of bias adjustment factors used by Swindon over the past five years is presented in Table C.2.

Table C.2 – Bias Adjustment Factor

Monitoring Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2023	National	03/24	0.77
2022	National	03/23	0.76
2021	National	06/22	0.78
2020	National	03/21	0.77
2019	National	03/20	0.75

NO_2 Fall-off with Distance from the Road

Wherever possible, monitoring locations are representative of exposure. However, where this is not possible, the NO_2 concentration at the nearest location relevant for exposure has been estimated using the Diffusion Tube Data Processing Tool. Where appropriate, non-automatic annual mean NO_2 concentrations corrected for distance are presented in Table B.1. In 2023, 4 sites were adjusted for fall off with distance from the road.

Table C.3 – Non-Automatic NO_2 Fall off With Distance Calculations (concentrations presented in $\mu g/m^3$)

Site ID	Distance (m): Monitoring Site to Kerb	Distance (m): Receptor to Kerb	Monitored Concentration (Annualised and Bias Adjusted	Background Concentration	Concentration Predicted at Receptor	Comments
S15	1.3	1.4	38.7	11.3	38.3	*Predicted concentration at Receptor within 10% the AQS objective.*
S29	1.8	9.6	55.4	11.3	38.3	*Predicted concentration at Receptor within 10% the AQS objective.*
S30	1.4	17.1	56.9	11.3	32.2	
S42	2.1	8.1	42.8	11.7	32.8	

QA/QC of Automatic Monitoring

Swindon undertakes no automatic monitoring on its own account. References to the automatic monitoring suite at Swindon Walcot (UKA00650) refer to DEFRA's Urban Background site managed in accordance with reference standards for them by Bureau Veritas. All data presented in this report is ratified.

PM_{10} and $PM_{2.5}$ Monitoring Adjustment

Where results from Automatic PM_{10} and $PM_{2.5}$ monitoring are presented in this report, they are obtained courtesy of DEFRA's Automatic Urban and Rural Network node at Swindon Walcot (UKA00650). These monitors are owned and operated by DEFRA or its agents, and are designed and operated to reference quality standards.

Automatic Monitoring Annualisation

Annualisation has not been required in 2023.

NO_2 Fall-off with Distance from the Road

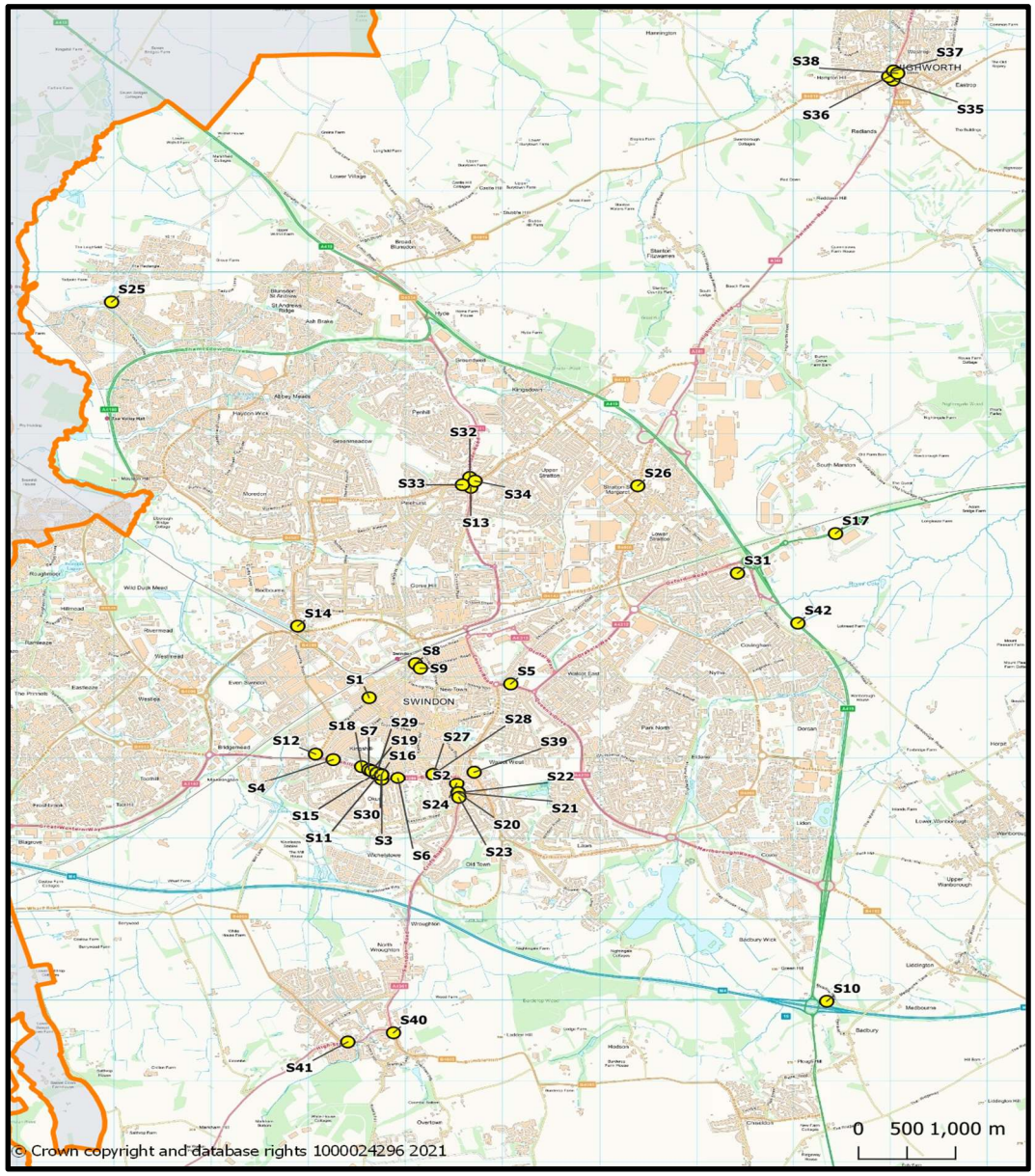
Automatic NO_2 monitoring results undertaken by DEFRA or its agents via the AURN node at Walcot (UKA00650), are presented in this report for interest and/or for comparison of trends with Swindon's non-automatic network only. UKA00650 is an urban background monitor and is not associated with any relevant receptors, and so no fall off with distance corrections are undertaken.

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

Swindon provides interactive online mapping of all of its monitoring locations and the Air Quality Management Area boundary, with the authority boundary, DEFRA AURN Walcot (UKA00650) node and AQMA outline and location, here: Maps showing the location of all monitoring sites are provided via external link, here: https://maps.swindon.gov.uk/sbcatmycouncil.aspx ; selecting the *'Planning'* category and adding the '*Air Quality Monitoring Stations'* and '*Air Quality Management Area Boundary'* layers.

A single map showing all monitoring locations within the borough boundary is provided below as Figure D.1 for completeness, oriented with North at the top of the page.

Figure D.1 – Map of Non-Automatic Monitoring Sites



Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England[3]

Pollutant	Air Quality Objective: Concentration	Air Quality Objective: Measured as
Nitrogen Dioxide (NO_2)	200µg/m^3 not to be exceeded more than 18 times a year	1-hour mean
Nitrogen Dioxide (NO_2)	40µg/m^3	Annual mean
Particulate Matter (PM_{10})	50µg/m^3, not to be exceeded more than 35 times a year	24-hour mean
Particulate Matter (PM_{10})	40µg/m^3	Annual mean
Sulphur Dioxide (SO_2)	350µg/m^3, not to be exceeded more than 24 times a year	1-hour mean
Sulphur Dioxide (SO_2)	125µg/m^3, not to be exceeded more than 3 times a year	24-hour mean
Sulphur Dioxide (SO_2)	266µg/m^3, not to be exceeded more than 35 times a year	15-minute mean

[3] The units are in microgrammes of pollutant per cubic metre of air (µg/m^3).

Glossary of Terms

Abbreviation	Description
AURN	Automatic Urban and Rural Network – A network of real time analysers maintained by DEFRA and its agents across England.
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	Annual Status Report
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by National Highways
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 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

- Local Air Quality Management Technical Guidance LAQM.TG22. August 2022. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.
- Local Air Quality Management Policy Guidance LAQM.PG22. August 2022. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.
- Chemical hazards and poisons report: Issue 28. June 2022. Published by UK Health Security Agency
- Air Quality Strategy – Framework for Local Authority Delivery. August 2023. Published by Defra.