City of Wolverhampton Council

2023 Annual Status Report

Bureau Veritas

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CITY OF WOLVERHAMPTON COUNCIL

2023 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: July, 2023

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Executive Summary: Air Quality in Our Area

Air Quality in City of Wolverhampton Council

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, the elderly, and those with existing heart and lung conditions. There is also often a strong correlation with equalities issues because areas with poor air quality are also often less affluent areas[1,2].

The mortality burden of air pollution within the UK is equivalent to 29,000 to 43,000 deaths at typical ages[3], with a total estimated healthcare cost to the NHS and social care of £157 million in 2017[4].

Wolverhampton is a city situated in the West Midlands to the north-west of the metropolitan borough Birmingham, approximately 12 miles from Birmingham city centre. The city is one of Britain's established visitor destinations and includes various historic locations, such as National Trust Wightwick Manor and Gardens and the 19th Century Wolverhampton Art Gallery, as well as one of the oldest professional football teams Wolverhampton Wanderers. The location also seeks to encourage tourism by hosting several music events and festivals and promotes active travel through various integrated cycling routes that connect to the broader West Midlands.

The area occupies a key strategic position in the West Midlands, lying within close proximity to the geographic centre of England, at the crossing points of the national railway and motorway systems, such as the M42, M54, M5, and M6. Thus, the city acts as a gateway for many to alternate major cities within England as well as being recognised as the entryway from the North of England to the South, and vice versa. Wolverhampton is also approximately 18.5 miles from Birmingham Airport and approximately 37 miles from

[1] Public Health England. Air Quality: A Briefing for Directors of Public Health, 2017

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

[3] Defra. Air quality appraisal: damage cost guidance, January 2023

[4] Public Health England. Estimation of costs to the NHS and social care due to the health impacts of air pollution: summary report, May 2018

East Midlands Airport, offering flights for passengers to continental Europe with over 100 journeys per day between mainland England and destinations such as Italy, Poland, France, Germany and Spain. Additionally, the region provides travel to locations in the Middle East such as Dubai that provide onward travel to further locations, for example to Australia.

Wolverhampton City is approximately 27 square miles and boasts a rich variety of charming landscape, whilst providing access to local Areas of Outstanding Natural Beauty (AONB) such as Cannock Chase AONB and Shropshire Hills AONB, approximately 13 miles north-north-east and approximately 17 miles west from Wolverhampton city centre respectively. There are also over 20 Sites of Special Scientific Interest (SSSI), in the West Midlands, with Gospel End Road Cutting SSSI within 5 miles south-south-west from Wolverhampton city centre. Wolverhampton has green belt within its boundary, as a part of the wider West Midlands Green Belt to prevent the sprawl of urbanisation and protect green spaces.

The city has approximately 264,000 people residing there, with the largest urban area the ward of Bushbury South and Low Hill where approximately 16,000 people live followed by Ettingshall ward with approximately 14,700 people residing there. Other populated wards across the city are Bilston East and Heath Town.

The main source of pollution with the city is from road traffic emissions originating from the extensive road network with major roads including the M42, M54, M5, and M6 that pass through and around the city. Due to the strategic nature of the road links, the majority of the vehicles are throughflow traffic, they do not start nor end their journeys within Wolverhampton with approximately 0.66 billion vehicle miles travelled on roads in Wolverhampton in 2021 as per Department for Transport (DfT) statistics. Car ownership in households in the City of Wolverhampton has been recorded at 66.4% (RAC Foundation 2011 Statistics), which is lower than the national average of 73.2%, reiterating the contribution to air pollution in the city from the through-flow nature of traffic volume as well as major congestion that occurs on the narrow city roads. The 2018 Feasibility Study requested by Defra to investigate intervention measures on four city road links where NO_2 concentrations exceeded standards have been implemented and compliance achieved. Highlighting the influence of vehicle emissions on inner city pollutant concentrations reported in Wolverhampton. Other pollution sources including commercial, industrial, and domestic sources also contribute to pollutant concentrations in the city.

Due to City of Wolverhampton Council's consistent years of high reported NO_2 and PM_{10} concentrations, with some exceedances of the NO_2 Annual Mean and PM_{10} 24-Hour Air Quality Standard (AQS) of 40µg/m^3 and 50µg/m^3 (not to be exceeded more than 35 times per year) respectively, the city is considered to have some areas where the air quality is poor. As a result of this, there is one declared Air Quality Management Area (AQMA) for NO_2 Annual Mean and PM_{10} 24-Hour Average within the Council area which covers the entire city, as declared on 22/03/2005. The Council continues to review its monitoring network, having identified a hotpot on the Ring Road and Broad Street, NO_2 diffusion tube sites RR2 and BRO respectively, in the 2022 monitoring year as well as the requirement to relocate the triplicate tubes, Site IDs STA5, STA6 and STA7, in the upcoming monitoring year 2023 to St Peter's Square automatic monitoring location due to the retraction of Stafford Road automatic monitoring station in October 2022. Thus, maintaining a co-located and triplicate data set.

The logger on the Stafford Road site failed in October and it was decided not to replace it due to the lack of technical support for the instrument model overall, thus closing the automatic monitoring station and inducing the movement of triplicate passive monitoring tubes STA5, STA6 and STA7 to St Peter's Square alongside the automatic monitor for 2023.

During 2022, there were two reported exceedances of the annual mean NO_2 AQS at Site IDs RR2 and BRO, 41.3µg/m^3 and 41.4µg/m^3 respectively. This continues the trend of exceedances since 2018 at RR2 with the exception of 2020 with reported concentration below the AQS attributable predominantly to the COVID-19 lockdown restrictions, therefore there is a requirement to maintain the current city wide declared AQMA. The maximum reported NO_2 concentration was 41.4µg/m^3 at passive monitoring location BRO. It is noted that Site ID's BIL4 and RR3 are within 10% of the AQO, 36.2µg/m^3 and 36.4µg/m^3 respectively.

An overall increase in concentrations from 2021 to 2022 is reported within this report; 36 passive monitoring sites reported an increase compared to 29 passive monitoring sites reporting a decrease. In comparison to 2021, it is noted that 20 fewer passive monitoring sites reported an increase in concentrations. The reduction in the number of increases reported in the 2022 monitoring year (36 increases between 2021 and 2022) compared to 2021 monitoring year (56 increases between 2020 and 2021) is likely due to the establishment of a 'new normal' in traffic volumes, with organisations remaining to facilitate

‘Working From Home’ (WFH) post COVID-19 pandemic restrictions easing, thus reducing the number of vehicles on the road network comparative to pre-pandemic periods.

Despite the reduction in the number of sites reporting a concentration increase, overall 2022 reported an increase in monitored NO_2 concentrations which are attributable to the monitoring year experiencing periods reflective of pre-pandemic traffic volumes, with UK COVID-19 restrictions lifting and a return to business as usual somewhat following the COVID-19 pandemic where UK Government advice was given to stay at home where possible resulting in decreased levels of traffic observed across the UK, and as such, reduced NO_2 concentrations recorded during 2020 and 2021. Therefore, 2022 was subject to increases in NO_2 concentrations from 2020 and 2021.

There are no diffusion tube monitoring sites where the NO_2 annual mean is greater than 60µg/m^3, therefore in accordance with Defra LAQM.TG(22) there are no sites likely to be at risk of exceeding the 1-hour mean AQS objective.

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[5] sets out actions that will drive continued improvements to air quality and to meet the new national interim and long-term $PM_{2.5}$ targets. The National Air Quality Strategy, due to be published in 2023, will provide more information on local authorities' responsibilities to work towards these new targets and reduce $PM_{2.5}$ in their areas. The Road to Zero[6] details the approach to reduce exhaust emissions from road transport through a number of mechanisms; this is extremely important given that the majority of Air Quality Management Areas (AQMAs) are designated due to elevated concentrations heavily influenced by transport emissions.

Since the initiation of the passive monitoring network within the City of Wolverhampton, there have been sites that have exceeded the AQS annual mean and 24-hour objective of

[5] Defra. Environmental Improvement Plan 2023, January 2023

[6] DfT. The Road to Zero: Next steps towards cleaner road transport and delivering our Industrial Strategy, July 2018

40µg/m^3 for NO_2 and the PM_{10} respectively. As a result, there is currently one designated AQMA, which has been declared city wide. As such, an Air Quality Action Plan (AQAP) is required, which has established 23 actions that seek to improve air quality in Wolverhampton, although it is recognised the document is currently being updated. There are currently no plans to produce an AQS for the city.

There are certain locations within the City of Wolverhampton where the air quality is considered to be historically poor, with air quality in 2022 displaying non-compliance with the AQS and following the same trend for the previous years of monitoring. The Council will continue to monitor and assess the results for the coming year within the NO_2 diffusion tube network.

As part of the City of Wolverhampton Council's commitment to reduce the impacts of climate change, and specifically air pollution, the Council declared a climate emergency in July 2019 and continues to progress and aim to hit net-zero carbon emissions by 2028 for Council activities and 2041 across the city, as reported in the Climate Commitment Document. The Climate Commitment Document sets out various actions with 6 core objectives across 3 themes (Council, City and Community), to reduce CO_2 emissions, of which also have shared benefits in improving air quality through reducing both NO_2 and PM emissions. Examples include making the council's transport fleet ultra-low emission by 2028, use renewable energy sources to power all council buildings, and further develop electric vehicle infrastructure across the city.

The Council has implemented measures in the following categories as part of the strategy in 2022 that have been effective in reducing air pollution concentrations and enabled more frequent air pollutant compliance in the city with the required standards:

- Road Improvements;
- Public Transport Improvements;
- Specific Bus Route Improvements;
- Traffic Management;
- Promoting Travel Alternatives;
- Promoting Low Emission Vehicles (LEVs); and
- Air Quality Planning and Guidance.

In 2018 a feasibility study was conducted in the City of Wolverhampton Council area, to investigate intervention measures that would assist in the acceleration of NO_2 concentration reduction on four road links identified by Defra which exceeded the EU limit

value for NO_2. The measures were considered in terms of their ability to deliver reductions in minimal time relative to investment required and resource availability for achievement. The following priority interventions have since been implemented and remain effective in the 2022 monitoring year:

- Road link 28464 – A4150 Ring Road St David's (North East Quadrant)
    - Action 1:
        - Signal optimisation
        - Air quality and journey time monitoring equipment
        - Carriage way improvement
    - Action 2: Phased retrofit of buses with SCR technology
    - Action 3: Development of walking and cycling infrastructure

The journey time monitoring system has been expanded since initial implementation to assist with signal optimisation, thus easing traffic flow and minimising congestion as such reducing NO_2 emissions from idling vehicles, thus limiting overall NO_2 concentrations monitored in this area. Sensors for NO_2 have been located at junctions that feed into this system, therefore enabling traffic to be routed away from hotspots identified on the road network. As a result, the following road links are now compliant with the EU limit value for NO_2 of 40µg/m^3, as per the 2022 monitoring data:

- Road link 57739 – A4150 Ring Road St Georges (South East Quadrant); and
- Lichfield Street, Bilston.

Broad Street and Ring Road St Davids (North East Quadrant) still remain to be non-compliant with the NO_2 AQS, as such greater mitigation techniques are required to ensure compliance during the 2023 monitoring year. The Council are considering measures to reduce vehicular traffic along Broad Street to assist in reducing pollutant emissions, although this is yet to be confirmed.

City of Wolverhampton Council have recognised that the A454 Willenhall Road experiences significant congestion and is unable to accommodate multiple modes of transport, particularly walking and cycling, as such worsening air quality by establishing an air quality exceedance area. As a result, the Council have received funding for the redevelopment and improvement of the area to incorporate active transport provisions for pedestrian activity and cycling, therefore creating efficient travel between Wolverhampton City Centre, the east of Wolverhampton and Walsall, whilst improving air quality in the city by removing an air quality exceedance area. Development is planned in three phases as

detailed below, with construction expected to commence Autumn 2023. More details regarding the scheme are available at: https://www.wolverhampton.gov.uk/parking-and-roads/city-east-gateway-a454-improvements

- Phase 1 and 2 – Willenhall Road
- Phase 3 – Neachells Lane
- Noose Lane to Pinson Road Cycle Scheme

The Council has established a collaborative relationship with the bicycle mechanic business 'Dr Bike' and Cycling UK who host free sessions for locals to check that their bikes are safe and make minor adjustments to get them on the road. This relationship promotes the use and benefits of active transport on air quality comparative to vehicle use and encourages locals to support the establishment of a greener, cleaner city.

City of Wolverhampton Council maintains to promote the West Midlands Cycle Hire innovative bike sharing service launched in March 2021 and operating through a bespoke hire and payment app, Beryl cycle hire. The scheme replicates notable cycle sharing schemes found in large metropolitan areas (e.g., Santander Cycles, Mobike, Lime) and compliments the city cycling route. It also attempts to promote alternative and accessible forms of travel between neighbouring towns and cities across West Midlands region to help its residents lead active lifestyles and limit vehicular emissions.

The Council have an established Local Cycling and Walking Infrastructure Plan (LCWIP) as part of the wider West Midlands Local Cycling and Walking Infrastructure Plan produced in August 2018, with identification of four key corridors in Wolverhampton with high propensity for cycling. Identified routes (see Chapter 2.2) experience high commuting levels due to key destinations including the City Centre, New Cross Hospital and Bentley Retail Park, thus it is proposed that greater active travel infrastructure is established to support the adoption comparative to vehicle commuting, therefore reducing emissions released.

City of Wolverhampton Council promotes active travel, and the reduction in vehicle usage and subsequent emissions, through walking with established Core Walking Zones (CWZs) across the city. The CWZs have been assessed and audited to ensure safety and identify any required interventions along the pedestrian corridors within each CWZ. Interventions proposed include improving existing infrastructure as well as introducing new pedestrian facilities such as wayfinding, new pedestrian crossings and benches to improve the public realm. The Council has also maintained the initiative 'Roll and Stroll' post COVID-19

lockdown which encourages active travel across the area and promotes the associated health benefits as well as subsequent reduction in vehicular usage. The campaign encourages the nation to continue their COVID-19 habits and uptake walking and cycling, promoting Wolverhampton as an enabler of active travel.

City of Wolverhampton Council has established a Business Engagement Programme, with funding provided by Transport for West Midlands (TfWM) and Park That Bike providing free cycle parking for up to 100 businesses to promote and encourage sustainable transport.

The city has implemented a cycling initiative 'Bikeability' focussed at 8-15 year olds, with frequent cycling proficiency courses. The initiative has centred on three core stages, Bikeability: Level 1, Level 2 and Level 3, with children required to meet specific criteria to enable being accredited the awards. There is also Bikeability Plus level which bodes a suite of courses to meet needs and specifically to complement and support the core training delivered.

The City of Wolverhampton Council actively encourages developers at the planning stage to install electric charging points or consider suitable infrastructure to allow for future cost-efficient installations. The Council has encouraged Ultra Low Emission Vehicle (ULEV) adoption across the city during the 2022 monitoring year, with infrastructure to support the uptake of ULEVs being implemented with a wider extent planned for implementation. Also, the Council have proposed to improve the use of ULEVs as taxis across the city, to reduce vehicular emissions and reduce the overall pollutant concentrations. The Black Country Ultra-Low Emission Vehicle Strategy approved on 28 July 2021 requires that most taxi and private hire vehicles convert to ULEVs by 2025.

The Council's collaborative relationship with Black Country Partners to roll out a programme of charging points for Electrical Vehicles (EV) across the city, has resulted in over 10 EV charging points being implemented in the city with formulation of a strategy to support increased roll-out of infrastructure scheduled into 2023 onwards. EV users can view the current charging points in Wolverhampton at zap-map.com.

The >£150 million redevelopment of the Wolverhampton Interchange to incorporate the West Midlands Metro extension close to the current terminus at Wolverhampton St. George's through to Wolverhampton Railway Station, was still undergoing construction during the 2022 monitoring year and remains uncompleted. The structural amendments to Wolverhampton's railway and bus infrastructure seeks to allow easy interchange with other modes of public and active transport, promoting a green, cleaner city. More details

about the scheme can be found here: https://metroalliance.co.uk/projects/wolverhampton-city-centre-extension/

Conclusions and Priorities

During 2022, the passive monitoring results show that there were exceedances of the annual mean objective of 40µg/m^3 for NO_2 within the jurisdiction of City of Wolverhampton Council at two locations, Site IDs RR2 and BRO, with concentrations high at alternate locations too such as BIL4 and RR3, within 10% of the AQS. Thus, there is a requirement to maintain the designation of the city wide AQMA with an AQAP to be implemented. The Council will continue to use the passive monitoring network to monitor air quality within the district and ensure compliance is maintained with the AQS.

The following actions are considered to be key priorities in ensuring the air quality conditions within City of Wolverhampton Council continue to comply with the AQS objectives:

- Greater progression on the ULEV taxi and private vehicle adoption to achieve targets set;
- Completion of the metro expansion in Wolverhampton City Centre to integrate greater public transport sources;
- Begin construction along A454 to accommodate various active transport modes and improve air quality in the city by removing an air quality exceedance area;
- Determine the outcome for the proposed measures to reduce vehicular movement and associated emissions along Broad Street;
- Continue to review the current monitoring programme, exploring the need to deploy new monitoring locations in areas where monitoring has not previously been undertaken and where it is believed that there may be elevated concentrations of NO_2 in areas of relevant public exposure, relocate monitoring tubes, or remove locations where necessary;
- Actively engage with developers at planning application stages to promote the installation of electric vehicle charging or alternatively, provide suitable infrastructure to allow for future cost-efficient installations;
- Implementation of the scheduled EV charging points on streets and in car parks across the city;
- Continue to provide an integrated transport network to facilitate the efficient movement of pedestrian and vehicular traffic, goods, and services across the city;

- Continue to reduce the volume of traffic on the city roads by encouraging effective active transport methods (e.g. public transport, cycling, and walking);
- Continue to improve the existing walking and cycling network by acquiring funding for development; and
- Implement measures within the Climate Commitment strategy to further reduce concentrations of NO_2 and PM.

Local Engagement and How to get Involved

Given the main source of air pollution across the City of Wolverhampton is from transport sources, the public can support the reduction in air pollutant(s) release and improve air quality within the city by participating in active travel.

City of Wolverhampton Council have progressed additional public engagement work in 2022 through the below schemes, although the engagement schemes in 2021 are still active:

- The collaborative relationship with Black Country Partners to roll out a programme of charging points for EV across the city, resulting in over 10 EV charging points being implemented on streets and in car parks with scheduled infrastructure planned for 2023 onwards to support further EV charging points being implemented;
- Development of Council and public relations through a tool launch which allows existing or potential EV owners to request a charging point so local demand can be mapped and infrastructure can be targeted towards locations that require it;
- Improving the use of ULEVs as taxi fleet and private hire vehicles across the city through improving infrastructure to support the uptake with a wider extent planned for implementation;
- Continued investment for the West Midlands Metro extension to further enhance integration between the active and public transport network;
- Collaboration between local businesses and charities to host events promoting active transport and the benefits;
- Offered active transport education to children, the future generation, through cycling proficiency courses via the ‘Bikeability’ initiative, reducing vehicular pollutant emissions;

- Continued to promote the initiative 'Roll and Stroll' post COVID-19 lockdown, encouraging active travel across the city and wider West Midlands area, with a community focus;
- Promotion of active transport uptake and sustainable travel through the establishment of a Business Engagement Programme offering free cycle parking for businesses whilst also enhancing the Council's relationships between Transport for West Midlands (TfWM), Park That Bike and local businesses such as private companies, hospitals, community organisations and education centres;
- Established relationships with local active transport business Dr Bike to host free bike workshops for locals, supported by Cycling UK, to ensure bikes are safe and road worthy, further encouraging active transport and supporting the establishment of a greener, cleaner city;
- Enhancement and further endorsement of the West Midlands Cycle Hire innovative bike sharing service since launch in March 2021; and
- Investment into enhancing the existing active travel network for walking and cycling through the A454 scheduled re-development.

The following measures are possible alternatives to private travel and actions that everyone can complete that would contribute to improving air quality in the city:

- Use public transport where available – This reduces the number of private vehicles in operation reducing pollutant concentration through the volume of vehicles and limits congestion;
- Walk or cycle if your journey allows – From choosing to walk or cycle for your journey the number of vehicles is reduced and also there is the added health benefits through exercise;
- Car/lift sharing – Where a number of individuals are making similar journeys, such as travelling to work or to school car sharing reduces the volume of vehicles on the road and therefore the amount of emissions being released. This can be promoted via travel plans through the workplace and within schools;
- Alternative fuel / more efficient vehicles – Choosing a vehicle that meets the specific needs of the owner, fully electric, hybrid fuel and more fuel efficient cars are available, and all have different levels benefits by reducing the amount of emissions being released; and
- Asking your employer, school or college about the possibility of developing a green travel plan.

The City of Wolverhampton Council are continuously working with local businesses, charities, developers, tourism bodies, schools, local transport operators and more organisations to develop measures to improve air quality across the city.

Local Responsibilities and Commitment

This ASR was prepared by Bureau Veritas on behalf of the Environmental Health Department of City of Wolverhampton Council with the support and agreement of the following officers and departments:

- Dean Gooch, Senior Officer – Environmental Protection
- Shaun Walker, Environmental Services Lead – Environmental Protection

This ASR has been approved by:

- Dean Gooch, Senior Officer – Environmental Protection
- Shaun Walker, Environmental Services Lead – Environmental Protection

This ASR has not been signed off by a Director of Public Health.

If you have any comments on this ASR please send them to Dean Gooch and/or Shaun Walker at: City of Wolverhampton Council, Civic Centre, St Peter's Square, Wolverhampton, WV1 1SH.

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Figures

Tables

1 Local Air Quality Management

This report provides an overview of air quality in City of Wolverhampton Council during 2022. 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 City of Wolverhampton Council 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 City of Wolverhampton Council can be found in Table 2.1. The table presents a description of the one AQMA that is currently designated within City of Wolverhampton. Appendix D: Map(s) of Monitoring Locations and AQMA(s) provides maps of AQMA and also the air quality monitoring locations in relation to the AQMA. The air quality objectives pertinent to the current AQMA designation are as follows:

- NO_2 annual mean; and
- PM_{10} 24-hour 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 Air Quality Objective	Name and Date of AQAP Publication	Web Link to AQAP
Wolverhampton Air Quality Management Area 2005	22/03/2005	NO_2 Annual Mean; PM_{10} 24-Hour	Whole City Declaration	Yes	55 µg/m^3 34 Exceedances	41.3 µg/m^3 (RR2) and 41.4µg/m^3 (BRO)	1 year*	Wolverhampton City Council Air Quality Management Action Plan 2005	https://aqma.defra.gov.uk/action-plans/WolveCC%20AQAP%202005_06.pdf

NOTE: * = 2020 COVID-19 Pandemic Year. This year needs to be excluded if considering revocation.

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

☒ **City of Wolverhampton Council confirm that all current AQAPs have been submitted to Defra.**

2.2 Progress and Impact of Measures to address Air Quality in City of Wolverhampton

Defra's appraisal of last year's ASR concluded that:

"The report is well structured, detailed, and provides the information specified in the Guidance."

The following comments are designed to help inform future reports:

- *There is an inconsistency regarding the objectives resulting in the declaration of the AQMA in this ASR. In the main body of text, the Council state that it is only for the exceedance of the annual mean objective for NO_2. However, in the corresponding table (Table 2.1), PM_{10} is also included. This is confirmed by DEFRA website, which states that this AQMA was declared for both the annual mean objective for NO_2, and the 24-hour mean objective for particulate matter (PM_{10}). The Council should ensure that the 24-hour PM_{10} objective is explicitly stated in the main body of the report, as well as in Table 2.1, to sure consistency and clarity;*
    - The main text body and Table 2.1 have been updated in the 2023 ASR to reflect the city's AQMA declaration for exceedances of the AQS NO_2 Annual Mean and PM_{10} 24-Hour;
- *Check all tables thoroughly and ensure that the correct data/text is shown. In Table A.1, no information is provided as to whether site A2 is within the AQMA. This should be rectified;*
    - This has been updated for the 2023 ASR submission;
- *Trends and comparison of the Air Quality Objectives, and the justification of the bias factor were all clear and detailed which is commended. However, although the data shows that no annualisation has been required, it is advised that the Council include an explicit comment on this in future ASRs;*
    - This has been included for the 2023 ASR submission;
- *As stated in the 2020 ASR appraisal, the map of non-automatic sites, although included, could be improved. There needs to be clear labels of the location IDs. The map shows and labels "New sites 2017". It is advised that this is updated to show sites which were instead new in 2019, as this is a more recent change to the network. The Council have responded to a comment from the 2020 ASR regarding*

the AQMA boundary on the map, with a clear blue line representing this. However, it would be useful to display this in the legend, alongside the sites themselves;

- This has been included for the 2023 ASR submission;

- *The Council have a number of measures in place to address and reduce $PM_{2.5}$ emissions in their district, including their Air Quality Working Group and EarthSense partnership. This is commended and shows the Council's dedicated and pro-active approach to addressing air quality in their district;*
- *There are a number of formatting, referencing and typographical errors in the ASR, including missing subscripts (e.g. "NO2" instead of "NO_2") and a header entitled "Sensitivity: NOT PROTECTIVELY MARKED". The Council should ensure that future reports are thoroughly checked for such errors, and that these are rectified, before submission;*
  - Text typos and errors have been rectified for the 2023 ASR submission;
- *The AQAP table (Table 2.2) needs to be clearer. Although the Council provide a great amount of detail (which is encouraged), there are some columns which are not very clear, namely the "Estimated/Actual Completion Date" column. There are some boxes in this column which contain several dates, and it is not clear what these correspond to (e.g. Measure 1, Measure 2 and Measure 14). The Council should ensure that future tables are clearer;*
  - Issues with Table 2.2 have been rectified for the 2023 ASR submission; and
- *The AQMA is accompanied by an AQAP, which has not been updated since 2005. An AQAP should be updated every 5 years, and a revised AQAP should be published by the Council as soon as possible;*
  - It is recognised that the City of Wolverhampton Council are currently reviewing their AQAP for the city, with the Council's public facing website stating: 'The action plan is currently being updated and when available will be published here.'

City of Wolverhampton Council continues to use its monitoring network to review air quality is at a safe level, and to ensure that all residents have access to safe levels of air quality. The review of monitoring locations in areas of relevant public exposure as consequence of the Council identifying continuous high NO_2 concentration recordings highlights a proactive nature which ensures that the Council are frequently reviewing monitoring locations and are able to identify areas that may be of potential concern at the nearest possible opportunity so that, if required, effective mitigation measures can be implemented. This ensures that compliant levels of air quality are available to all of its residents.

The Council are employing many additional measures to help improve and progress air quality within their respected area. The 2022 ASR outlines the schemes and partnerships that City of Wolverhampton Council are involved in, these measures are still active for the 2022 reporting year.

There have also been additional measures and initiatives implemented in the 2022 reporting year such as the collaborative relationship with the bicycle mechanic business 'Dr Bike' and Cycling UK who host free sessions for locals to check that their bikes are safe and make minor adjustments to get them on the road. This relationship promotes the use and benefits of active transport on air quality comparative to vehicle use and encourages locals to support the establishment of a greener, cleaner city.

City of Wolverhampton Council has welcomed the West Midlands Cycle Hire innovative bike sharing service to the area. The service was launched in March 2021 in Wolverhampton and continues to be endorsed. The scheme aims to replicate notable cycle sharing schemes often found in large metropolitan areas (e.g., Santander Cycles, Mobike, Lime). The scheme compliments the city cycling route, as well as neighbouring towns and cities across West Midlands region in an attempt to promote alternative forms of travel which is accessible to help its residents lead active lifestyles and limit vehicular emissions. The scheme operates via a bespoke app, Beryl cycle hire, to allow easy hiring of pedal bikes and e-bikes with users choosing to pay as they ride or in upfront hire time packages. There are docking stations for the bikes across Wolverhampton city centre including West Park, Pipers Row, Market Street and Victoria Street.

The Council have an established Local Cycling and Walking Infrastructure Plan (LCWIP) as part of the wider West Midlands Local Cycling and Walking Infrastructure Plan produced in August 2018, with identification of four key corridors in Wolverhampton with high propensity for cycling as detailed below:

- Wednesfield to City Centre via A426;
- A449 Fordhouses to Wolverhampton City Centre;
- A454 City Centre to Portobello; and
- Blackenhall to Tettenhall.

These routes experience high commuting levels due to key destinations including the City Centre, New Cross Hospital and Bentley Retail Park, thus it is proposed that greater active travel infrastructure is established to support the adoption comparative to vehicle

commuting, therefore reducing emissions released. The LCWIP provides a strategic approach to identifying cycling and walking improvements required at the local level, with various cycling and walking routes outlined. They enable a long-term approach to developing local cycling and walking networks, ideally over a 10-year period, and form a vital part of the Government's strategy to increase the number of trips made on foot or by cycle. City of Wolverhampton Council acknowledge that they are responsible for implementing actions in the LCWIP and proactively seek funding to improve the existing network.

City of Wolverhampton Council also promotes active travel, and the reduction in vehicle usage and subsequent emissions, through walking with established Core Walking Zones (CWZs) across the city. The CWZs have been assessed and audited to ensure safety and identify any required interventions along the pedestrian corridors within each CWZ. Interventions proposed include improving existing infrastructure as well as introducing new pedestrian facilities such as wayfinding, new pedestrian crossings and benches to improve the public realm. A key CWZ is between Wolverhampton and Bilston. The CWZs and overall adoption of active travel and encouragement of walking are further supported by the Council's establishment of key historical attractions, such as blue plaques, war memorials and wolf sculptures, throughout the city and specifically along walking routes. More information about the locations can be found here: https://www.wolverhampton.gov.uk/parking-and-roads/wolverhampton-emergency-active-travel/cycling-and-walking-city

The Council has also maintained to promote the initiative 'Roll and Stroll' post COVID-19 lockdown which encourages active travel across the area and promotes the associated health benefits as well as subsequent reduction in vehicular usage. The campaign, supported by the organisation One Black Bear, is part of a £17 million UK government investment to encourage the nation to continue their COVID-19 habits and uptake walking and cycling for example to work or school, to see friends or to go shopping. Therefore, seeking to reduce vehicle emissions and contribution to air quality by promoting the Wolverhampton as an enabler of active travel.

City of Wolverhampton Council has established a Business Engagement Programme, enhancing the relationships between Transport for West Midlands (TfWM) and Park That Bike, of free cycle parking for businesses to promote and encourage sustainable transport. Funding is provided by TfWM for the project and up to 100 organisations have been supported through the scheme which includes private companies, hospitals, community

organisations and education centres. The scheme is available to review: https://www.sustainabilitywestmidlands.org.uk/news/launch-of-cycle-parking-for-organisations-scheme/

The city has implemented a cycling initiative 'Bikeability' focussed at 8-15 year olds, with frequent cycling proficiency courses hosted at Aldersley Leisure Village during the school holidays. The initiative has centred on three core stages, Bikeability: Level 1, Level 2 and Level 3, with children required to meet specific criteria to enable being accredited the awards. There is also Bikeability Plus level which bodes a suite of courses to meet needs and specifically to complement and support the core training delivered through a range of options. The City of Wolverhampton Council's Sport and Recreation Service has achieved the collaborative relationship with the Traffic and Road Safety Team to roll out this educational and safety programme designed to encourage the uptake of cycling and provide young people confidence in cycling on the roads. Therefore, seeking to reduce pollutant concentrations imminently and through actions of longevity by targeting future generations.

As part of the City of Wolverhampton Council's commitment to reduce the impacts of climate change, and specifically air pollution, the Council declared a climate emergency in July 2019 and continues to progress and aim to hit net-zero carbon emissions by 2028 for Council activities and 2041 across the city, as reported in the Climate Commitment Document. The Climate Commitment Document sets out various actions with 6 core objectives across 3 themes (Council, City and Community), to reduce CO_2 emissions, of which also have shared benefits in improving air quality through reducing both NO_2 and PM emissions. Examples include making the council's transport fleet ultra-low emission by 2028, use renewable energy sources to power all council buildings, and further develop electric vehicle infrastructure across the city.

The Council has implemented measures in the following categories as part of the strategy in 2022 that have been effective in reducing air pollution concentrations and enabled more frequent air pollutant compliance in the city with the required standards:

- Road Improvements;
- Public Transport Improvements;
- Specific Bus Route Improvements;
- Traffic Management;
- Promoting Travel Alternatives;
- Promoting Low Emission Vehicles (LEVs); and

- Air Quality Planning and Guidance.

The Council actively encourages developers at the planning stage to install electric charging points or consider suitable infrastructure to allow for future cost-efficient installations.

The City of Wolverhampton Council have proposed to improve the use of Ultra Low Emission Vehicles (ULEVs) as taxis across the city, to reduce vehicular emissions and reduce the overall pollutant concentrations. The Council's Cabinet approved the Black Country Ultra-Low Emission Vehicle Strategy on 28 July 2021, which requires that most taxi and private hire vehicles convert to ULEVs by 2025. To achieve this target, the Council has released a draft proposal of achieving a zero-tailpipe emission or ultra-low emission hackney carriage and private hire vehicle fleet by 2028. City of Wolverhampton Council has continued to encourage the adoption of ULEVs across the city during the 2022 monitoring year, with infrastructure to support the uptake of ULEVs being implemented with a wider extent planned for implementation. Documentation regarding the policy can be found here: https://consultation.wolverhampton.gov.uk/licensing/ultra-low-emission-vehicle-policy/user_uploads/764-001-03-ultra-low-emission-vehicle-taxi-licensing-policy.pdf

City of Wolverhampton Council confirms the collaborative relationship with Black Country Partners to roll out a programme of charging points for Electrical Vehicles (EV) across the city, resulting in over 10 EV charging points being implemented already in the city with formulation of a strategy to support increased roll-out of infrastructure scheduled to be implemented into 2023 onwards. EV users can view the current charging points in Wolverhampton at zap-map.com. The council has also developed the relationship between itself and local residents to establish a reduction in vehicle emissions by launching a tool which allows existing or potential EV owners to request a charging point so local demand can be mapped and infrastructure can be targeted towards locations that require it. Location suggestions will be mapped against the existing charge point network and usage to identify priority areas. More information can be found here: https://www.wolverhampton.gov.uk/environment-and-climate/climate-change-and-sustainability/electric-vehicles

The >£150 million redevelopment of the Wolverhampton Interchange to incorporate the West Midlands Metro extension close to the current terminus at Wolverhampton St. George's through to Wolverhampton Railway Station, was still undergoing construction during the 2022 monitoring year and remains uncompleted. The structural amendments to

Wolverhampton's railway and bus infrastructure seeks to allow easy interchange with other modes of public and active transport, promoting a green, cleaner city. More details about the scheme can be found here: https://metroalliance.co.uk/projects/wolverhampton-city-centre-extension/

City of Wolverhampton Council has also taken forward a greater number of direct measures during the current reporting year of 2022 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2. A total of 29 measures are included within Table 2.2, with the type of measure and the progress City of Wolverhampton Council have made during the reporting year of 2022 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, Climate Commitment Document, West Midlands Local Cycling and Walking Infrastructure Plan, and Black Country Ultra-Low Emission Vehicle Strategy. Key completed measures are:

- Bikeability – Offered active transport education to children, the future generation, through cycling proficiency courses via the 'Bikeability' initiative, reducing vehicular pollutant emissions; and
- West Midlands Cycle Hire – Enhancement and further endorsement of the West Midlands Cycle Hire innovative bike sharing service since launch in March 2021, promoting active transport and reducing emissions from vehicle transport.

The City of Wolverhampton Council worked to implement measures in the 2022 monitoring year in partnership with the following stakeholders:

- Neighbouring local authorities;
- Local businesses;
- Charities;
- Educational centres; and
- Transport for West Midlands.

City of Wolverhampton Council expects the following measures to be completed over the course of the next reporting year:

- EV Charging Infrastructure – The collaborative relationship between the Council and various Black Country Partners to roll out a programme of EV charging points across the city has been successful in the 2022 monitoring year with over 10 EV charging points being implemented already, although more are required with

formulation of a strategy to support increased roll-out of infrastructure that is scheduled to be implemented in 2023;

- Ultra Low Emission Vehicle (ULEV) Taxi Fleet and Private Hire Vehicles – Improvement in the adoption of ULEVs as taxis across the city, to reduce vehicular emissions and overall pollutant concentrations. The Council's Cabinet approved the Black Country Ultra-Low Emission Vehicle Strategy on 28 July 2021, which requires that most taxi and private hire vehicles convert to ULEVs no later than 2025; and
- West Midlands Metro Expansion - The structural amendments to Wolverhampton's railway and bus infrastructure seeks to allow easy interchange with other modes of public and active transport, promoting a green, cleaner city whilst reducing vehicular traffic volume and pollutant emissions.

City of Wolverhampton Council's priorities for the coming year are:

- A454 Willenhall Road Redevelopment – The road experiences significant congestion and poses inability to accommodate multiple modes of transport, especially walking and cycling, as such worsening air quality by establishing an air quality exceedance area. Thus, the Council has received funding for the redevelopment and improvement of the area to incorporate active transport provisions for pedestrian activity and cycling, therefore creating efficient travel between Wolverhampton City Centre, the east of Wolverhampton and Walsall whilst improving air quality in the city by removing an air quality exceedance area. Development is planned in three phases as detailed below, with construction expected to commence Autumn 2023.

The principal challenges and barriers to implementation that City of Wolverhampton Council anticipates facing are funding and resource availability.

Progress on the following measures has been slower than expected due to:

- A454 Willenhall Road Redevelopment – Extensive funding, resource availability and phased planning required have slowed progress alongside consultation periods and confirmation with regards to the definitive final design for development;
- West Midlands Metro Expansion – Unforeseen supply chain constraints, worker strikes, and damaged tram/train vehicles have impeded the completion of the development; and
- ULEV Taxi Fleet and Private Hire Vehicles – Requirement for an infrastructure strategy and increased funding to implement a greater volume of EV charging

points across the city as well as a target date for zero-tailpipe emissions to support the adoption of ULEVs as taxi fleet and private hire vehicles.

Whilst the measures stated above and in Table 2.2 will help to contribute towards compliance, City of Wolverhampton Council anticipates that further additional measures not yet prescribed will be required in subsequent years to achieve compliance and enable the revocation of Wolverhampton Air Quality Management Area 2005.

Table 2.2 – Progress on Measures to Improve Air Quality

Measure No.	Measure	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	Traffic signal optimisation and junction improvements to improve traffic flow Road link 28464 A4150 Ring Road St David's (North East Quadrant) Road link 57739 A4150 Ring Road St Georges (South East Quadrant)	Traffic Management	UTC, Congestion management, traffic reduction	2018	2019	City of Wolverhampton Council (CWC)	Defra grant				Completed	Predicted reduction in NO2 emissions of 2.9%	None set	Feasibility study completed and accepted by Defra. Bluetooth Journey time monitoring and pollution monitoring installed on Ring Road St David's and Ring Road St Georges; now fully operational recording baseline journey times and air quality data Highway improvements to road links 28464 and 57739 have been completed	Part of a range of measures identified in the Black Country Local Authorities feasibility study to deliver nitrogen dioxide concentration compliance in the shortest possible time.
2	Retrofitting of buses with SCR technology Road link 28464 A4150 Ring Road St David's (North East Quadrant) Road link 57739 A4150 Ring Road St Georges (South East Quadrant)	Vehicle Fleet Efficiency	Vehicle Retrofitting programmes	2018	2021	CWC and Transport For West Midlands	Defra grant	Yes		£1.2m	Completed	Predicted reduction in NO2 emissions of 2.1% (100% take up)	Retrofit 127 buses with SCR Decommission and retrofit 19 buses CBTF programme 7 buses	2018 Feasibility study completed and accepted by Defra. 2018 Bus retrofit procurement (National Express) 2019 Bus retrofit delivery (National Express) 2019 Bus retrofit procurement (other operators) 2019 Bus retrofit mobilisation (other operators) 2019 Bus operator's vehicle decommissioning/ new vehicle procurement 2019 Tendered bus services operational	The cost of retrofitting this technology to existing buses is expensive. In order to achieve a reduction in emissions of 2.1% it would require 100% compliance meaning over 160 buses would need to be retrofitted at a cost of £3million. This is intended to be a phased retrofit upgrading the oldest buses first. Supply chain delays due to volume of orders.
3	Development of walking and cycling infrastructure. Road link 28464 A4150 Ring Road St David's (North East Quadrant) Road link 57739 A4150 Ring Road St	Promoting Travel Alternatives	Promotion of cycling	2018	to be confirmed	CWC	Defra grant		Partially	£250k	Planning	Predicted reduction in NO2 emissions of 1.4% based on a 2.5% take up and a reduction of 5.5% with a	None set	Feasibility study completed and accepted by Defra.	Walking and cycling infrastructure intervention scored lowest in the evaluation assessment of the various interventions. This intervention will be reviewed pending the outcome of other implementations.

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	Georges (South East Quadrant)											10% take up.			
4	Wolverhampton Interchange project phase 1	Transport Planning and Infrastructure	Public transport improvements-interchanges stations and services	2010	2012	CWC	CWC Defra grant				Completed	23%	None set		The provision of a new access road into the bus station from the ring road, has led to a net reduction in the numbers of buses within the city centre. NO2 levels dropped by 23% following completion of the scheme. The number of monitoring sites exceeding the air quality objective reduced from 19 in 2009 to 4 in 2013.
5	Wolverhampton City Centre Scheme	Transport Planning and Infrastructure	Public transport improvements-interchanges stations and services	2012	2012	CWC	CWC, Defra grant				Completed	14%	None set		The pedestrianisation of Market Street and the re-routing of traffic along Queen St and Princess St have reduced NO2 levels in this area of the city centre by 14%.
6	Connected Places Programme	Transport Planning and Infrastructure	Public transport improvements-interchanges stations and services	2017	2025	CWC in conjunction with private business.	Local Growth Fund grant, CWC regeneration reserve, other external funding bodies to be secured.		Partially		Implemented		None set	Connected Places Strategy and delivery plan has been produced along with technical supporting documents including Car Parking Strategy, Baseline Report, Materials Guide and summary document. The Planning and consultation phase has been completed. Westside link Phase 1 - Victoria St, Skinner St, Salop St and School St: Removing existing obstructions such as unnecessary street furniture and signage Removing existing roadway in Victoria Street and creation of a new public square. Public consultation,	The Connected Places Programme outlines the council's vision and priorities for a people centred approach to improving Wolverhampton's city centre streets and public spaces. The baseline assessment has identified a number of key drivers for change including the need to accommodate additional demands for movement due to a shift towards non car based modes of transport. To do this the environment for walking and cycling needs to be improved. This will be achieved through improved links between key assessts and increased pedestrianisation within the city centre.

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														ground investigations and site surveys completed autumn 2019.	
7	Midland Metro City Centre extension.	Transport Planning and Infrastructure	Public transport improvements-interchanges stations and services	2017	2021	CWC	CWC Defra grant				Completed	Reduced vehicle emissions	None set	Submission of Noise and Air Quality assessments. Necessary approvals have been obtained. Work commenced 2018 due to be completed early 2021	The development of a fully integrated transport structure will provide new linkages and encourage a modal shift in transport, enhancing and improving City Centre access. By improving public transport links, it is anticipated car ingress into the city centre will be reduced lowering vehicle emissions and improving air quality.
8	New access road to railway station	Transport Planning and Infrastructure	Public transport improvements-interchanges stations and services	2017	2019	CWC	CWC Defra grant				Completed	Reduced vehicle emissions	None set	2016 Construction of new access road 2019 Reoptimised signal timings on corn hill junction and hurry call facility installed to allow rapid egress of traffic	The provision of a new station access road will reduce traffic within the ring road particularly along Broad Street, Fryer Street and Lichfield Street, thereby reducing NO2 emissions within the city centre. The effectiveness of this will be determined following a review of the monitoring data.
9	City North Gateway A449 Stafford Road improvement	Transport Planning and Infrastructure	Public transport improvements-interchanges stations and services	2017	Phase 1 completed 2019 Phase 2 & 3 to be completed 2025.	CWC	CWC,		Fully	£1m-10m	Implemented	Reduced vehicle emissions	None set	Phase 1 Vine Island to M54 island Phase 2 Elephant and Castle junction; improvement to provide sustainable connectivity between the university main campus and Springfield campus Phase 3 in design stage.	The City North Gateway project is a major transport corridor review which forms part of the key route network to support growth and minimising the impact of increasing vehicle numbers through: • Improving traffic flow • Individual junction improvements• Improving sustainable transport – walking/cycling/public transport•

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															Encouraging modal shift • Reducing single occupancy
10	City East Gateway A454 Willenhall Road improvements.	Transport Planning and Infrastructure	Public transport improvements-interchanges stations and services	2017	Phase 1 to be completed 2025. Future Phases to be completed by 2028.	CWC	CWC		Fully	£20m	Implemented	Reduced vehicle emissions	None set	Phase 1 design and consultation completed. Phases 2 and 3 consultation stage.	The A454 Willenhall Rd project is a major transport corridor review which forms part of the key route network to support growth and minimising the impact of increasing vehicle numbers through:• Improving traffic flow • Individual junction improvements• Improving sustainable transport – walking/cycling/public transport• Encouraging modal shift • Reducing single occupancy
11	Advanced Quality Bus Partnership	Vehicle Fleet Efficiency	Promoting Low Emission Public Transport	2018	2018	CWC & Centro					Completed	Reduced vehicle emissions	None set	Draft AQPS consultation completed. Scheme come into force 14th August 2018. All services operating within the Ring Road to comply with Euro VI.	The AQP will enable better control of the quality of vehicles, emissions standards and the management of bus stops to ensure reliability and journey times within the city centre. Sets an agreed standard for all buses to achieve EURO 6 within the city centre by 2021/22
12	Showcase route extension and improvements	Transport Planning and Infrastructure	Bus route improvements	2011	2012	CWC & Centro					Completed	Reduced vehicle emissions	None set	WCW has implemented a programme of enhanced bus routes featuring real time information at bus stops, improved bus shelters and lighting at stops improved bus shelters and lighting at stops and bus priority at junctions. Electric hybrid buses were introduced on show case route 1 in 2011.	This is part of a range of measures aimed at reducing emissions from buses and encouraging the use of public transport.

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13	Urban traffic Control Major Scheme	Traffic Management	UTC, Congestion management, traffic reduction	2013	2014	CWC					Completed	Reduced vehicle emissions	None set	Approximately 20 traffic signals were upgraded to SCOOT with bus priority during 2013/14. Approximately 80 traffic PELICAN crossings have been upgraded to PUFFIN crossings over the last 5 years. A journey time monitoring system comprising of 28 ANPR cameras has been installed within the city. The traffic light signalling system has been upgraded to wireless digital communications. This has improved the control of traffic light signals and traffic flow within the city.	The UTC Major Scheme seeks to make more efficient use of the existing infrastructure and reduce congestion on the network of strategic routes throughout the West Midlands. It will make traffic signals more efficient, provide a common platform for bus priority measures, deliver more variable message signs, and, create a technical platform which enables intelligent transport services to be deployed. The project has been developed in partnership with the police, Highways Agency and public transport operators.
14	Ultra-low Emission Taxi scheme	Promoting Low Emission Transport	Taxi emission incentives	2017	2019	CWC OLEV	OLEV		Yes	£500k	completed	Reduced vehicle emissions	None set	The Council has been awarded £478,00 from OLEV to install 24 electric vehicle charging points for taxis by 2020.	The OLEV award has enable the council to install the necessary infrastructure to facilitate the uptake of electric taxis as they become available. The council is aiming to convert 16% of both the Hackney and private hire fleets in the city to electric vehicles by 2020. Whilst the taxi fleet will have priority use by way of a booking system, the general public will also be able to use them as well. The scheme compliments the wider work of the West Midlands Combined Authority to promote low emission vehicles.
15	West Midlands Low Emissions Towns & Cities	Policy Guidance and	Regional Groups Co-ordinating programmes	2012	2016	West Midlands Authorities	Defra grant		Yes	£100k	Completed	Reduced vehicle emissions	None set	Publication of the Good Practice Air Quality Planning Guidance and the	The LETCP program comprises of a range of measures and guidance to drive

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	Program (LETCP)	Development Control	to develop Area wide Strategies to reduce emissions and improve air quality											Good Practice Procurement Guidance. Low Emission Strategy published These documents have been adopted by CWC and are being implemented.	policy and reduce emissions from road traffic across the West Midlands.
16	Black Country Air Quality SPD	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	2016	2016	Black Country Authorities led by Dudley MBC					Completed	Reduced vehicle emissions	None set	The 4 Black Country authorities, Dudley, Sandwell, Walsall and Wolverhampton have produced a Black Country supplementary planning document (SPD) to incorporate the LETCP Air Quality good Practice Guide into planning policy.	The SPD requires new development to incorporate a range of measures to reduce emissions from road traffic. These include the provision of electric charging points, traffic management plans, and a damage cost calculator. The level of mitigation required is proportional to the size of the development.
17	Black Country Ultra Low Emission Vehicle Strategy and Implementation Plan	Policy Guidance and Development Control	Regional Groups Co-ordinating programmes to develop Area wide Strategies to reduce emissions and improve air quality	2017	2017	Black Country Authorities led by Dudley MBC					Implemented	Reduced vehicle emissions	None set	Low Emission Strategy published 2017 Black Country ULEV Strategy 2020 Black Country ULEV Strategy Supplement 2021 Black Country ULEV Vision Roadmap+O8+O27	The Black Country Ultra Low Emission Vehicle Strategy and implementation plan will form part of a Black Country Transport Strategy and will help deliver a step change in the number of ULEV's in the sub-region by meeting existing demand and stimulating further demand by providing vehicle owners and operators with the confidence to invest in ULEVs. The Implementation Plan will drive each council's own capital and revenue programmes and inform funding bids to the Local Growth Fund, Combined Authority, Office for Low Emission Vehicles (OLEV), European Structural Investment Fund (ESIF), Horizon 2020

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															and other appropriate funds. It will also support the wider promotion of ULEVs to the public, other public sector organisations and to businesses.
18	Movement for Growth: West Midlands strategic Transport Plan	Policy Guidance and Development Control	Regional Groups Co-ordinating programmes to develop Area wide Strategies to reduce emissions and improve air quality	2016	2018	Combined Authority					Implemented	Reduced vehicle emissions	Key Performance Indicators related to air quality: Number of poor days of air quality per year (rated 4 or higher on the daily air quality index). Nitrogen dioxide levels in the metropolitan area.	Transport plan published 2017-18	The document sets out the West Midlands Combined authority's vision and strategy to deliver a transport system that will boost the region's economy and improve the quality of life for the people of the West Midlands. Over the next 10 years the Combined authority will invest £5bn in the regions transport network. This investment will focus on improving the transport infrastructure including public transport, cycling and walking and behaviour change by giving the information to make the best travel choice possible.
19	West Midlands Transport Emissions Framework	Policy Guidance and Development Control	Regional Groups Co-ordinating programmes to develop Area wide Strategies to reduce emissions and improve air quality	2016	2016	Combined Authority					Implemented	Reduced vehicle emissions	None set		The West Midlands Transport emissions Framework is in direct response to the Defra Air Quality Action Plan which requires the implementation of Clean Air Zones. It is aligned to the Strategic Transport Plan and will provide a coordinated approach at Combined Authority level, to tackle air quality issues and improve our overall transport emissions.
20	West Midlands Combined Authority Regional Air	Policy Guidance and	Regional Groups Co-ordinating programmes	2018	2019	Combined Authority					Implemented	Reduced vehicle emissions		Action Plan published July 2019	Identifies effective and feasible regional level actions to improve air quality in

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	Quality Review and Action Plan	Development Control	to develop Area wide Strategies to reduce emissions and improve air quality												the west Midlands region.
21	West Midlands Low Emissions Bus Delivery Plan	Policy Guidance and Development Control	Regional Groups Co-ordinating programmes to develop Area wide Strategies to reduce emissions and improve air quality	2016	2035	Centro	centro				Implemented	Reduced vehicle emissions	A reduction in NOx emissions of 90% by 2035	Scoping study July 2016	The objective of this study, commissioned by Centro, is to develop a Delivery Plan to 2035 for low emission bus adoption and the installation of the required refuelling infrastructure. The Delivery Plan aims to guide and support the transition of the West Midlands bus fleet towards a zero/low emission fleet and, by providing a quantification of impacts and prioritisation of efforts, will be a valuable source of evidence for funding applications.
22	Local sustainable transport initiatives	Promoting Low Emission Transport	Other	2015	2020	CWC, Local Sustainable Transport Fund	Growth fund				Implemented	Reduced vehicle emissions	None set	£3m obtained from Local sustainable transport bid for the period 2015 to 2019, £4.6m received from the growth fund covering the period 2015 to 20. The following initiatives are on-going: promotion of sustainable transport, managing short trips, Smarter Networks, Smarter Choices, cycle to work scheme, salary sacrifice scheme to purchase bikes, cycle parking, promotion of walking, monthly payments for transport season	Part of a range of initiatives aimed at improving fleet emissions by encouraging the take up of low emission vehicles, driver training and vehicle management.

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														tickets, public transport scratch cards for work related trips.	
23	WCC Fleet modernisation	Vehicle Fleet Efficiency	Fleet efficiency and recognition schemes	ongoing	Ongoing, the council intends to adopt low emission vehicle technologies where appropriate as they become available.	CWC			Partially		Implemented	Reduced vehicle emissions	None set	Ongoing process of fleet modernisation. HGV's using Ad blue systems. Low emission vehicles have been adopted in limited numbers where appropriate. Electric vehicle trials are on-going. The Council's fleet of mowers has been upgraded with rotary mowers which are more economical and use less fuel. Heavy commercial vehicles meet EURO VI.	The adoption of low emission vehicle technology will reduce the overall emissions from the council fleet.
24	Increased bus lane enforcement	Transport Planning and Infrastructure	Bus route improvements	2015	2015	CWC					Completed	Reduced vehicle emissions	None set	Completed	6 bus lane enforcement cameras have been installed on bus lanes. These became live on the 1st June 2015
25	Active travel strategy	Promoting Travel Alternatives	Promotion of walking	2014	2014	CWC					Completed	Reduced vehicle emissions	None set	Active Travel Strategy to promote walking and cycling launched December 2014 in conjunction with the council's Transportation and Public Health divisions.	The promotion of alternative forms of transport is intended to reduce the number of vehicles on the road improving congestion and reducing vehicle emissions
26	Green fleet review	Vehicle Fleet Efficiency	Fleet efficiency and recognition schemes	2014	2014	CWC					Completed	Reduced vehicle emissions	None set	completed	Green fleet review of council's liveried and grey fleets. Plugged in fleet initiative review of potential for ULEV vehicles including the introduction of staff pool vehicles.
27	Passenger transport fleet services review	Vehicle Fleet Efficiency	Fleet efficiency and recognition schemes	2017	2017	CWC					Completed	Reduced vehicle emissions	None set		Review of euro classifications of passenger transport vehicles
28	Encouragement of city centre living	Policy Guidance and	Air Quality Planning and	2014	2014	CWC					Completed	Reduced vehicle emissions	None set	As part of its Local Development Scheme the city	City centre living reduces the need for car ownership and

Measure No.	Measure	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
		Development Control	Policy Guidance											council has 3 Area Action Plans including the City Centre AAP adopted in 2016 which promotes city centre living.	promotes the use of public transport.
29	Wolverhampton Car Share (WCS).	Alternatives to private vehicle use	Car & lift sharing schemes	2015	2015	CWC					Completed	Reduced vehicle emissions	None set	The car share scheme was re launched in 2015 as part of the councils revised travel plan which was produced in January 2015.	This forms part of the Green Travel Plan encouraging alternative means of travel. These measures are aimed at reducing the number of vehicles entering the city centre, reducing vehicle emissions.

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

As detailed in Policy Guidance LAQM.PG22 (Chapter 8), 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.

There is currently monitoring of PM_{10} at one location in the city, St Peter's Square, an Urban Background site. As such, concentration values can be estimated using the method described in Box 7.7 of LAQM.TG(22), which provides a methodology for estimating $PM_{2.5}$ concentrations from PM_{10} measurements. As PM_{10} monitoring is undertaken in Wolverhampton at one location, the $PM_{2.5}$ concentration has been estimated below using the 2022 Background National Derived Correction Factor of 5.5:

- Step 1: Subtracting the 2022 annual mean PM_{10} concentration at St Peter's Square by the Background 2022 National Derived Correction Factor -
    - 17.0 - 5.5 = 11.5
- Step 2: Estimated annual mean $PM_{2.5}$ = 11.5µg/m^3

The estimated annual mean $PM_{2.5}$ concentration of 11.5µg/m^3 for 2022 monitoring year is significantly below the AQS of 20µg/m^3.

The Public Health Outcomes Framework data tool compiled by Public Heath England quantifies the mortality burden of $PM_{2.5}$ within England on a county and local authority scale. The 2021 fraction of mortality attributable to $PM_{2.5}$ pollution (indicator D01) within City of Wolverhampton is 5.70%. This is higher than the regional average for the West Midlands (5.50%) and for England as a whole (5.50%). The 2021 fraction of mortality has been used as opposed to the 2022 fraction as the data has not been made available at the time of writing.

City of Wolverhampton Council is taking the following measures to address $PM_{2.5}$:

The Environmental Protection Team of City of Wolverhampton Council remains to work collaboratively with Public Health colleges to assess the current levels of $PM_{2.5}$ within the city and the associated impact on public health. The Council previously undertook a $PM_{2.5}$ monitoring study at four locations over a three-year period, between 2016 and 2018. The

results indicated compliance with the then proposed $PM_{2.5}$ objective and highlighted that there is minimal spatial variation across the city between background and roadside locations. The monitoring programme was discontinued as the Black Country Group Lead, Walsall Metropolitan Borough Council, is developing a computer model for $PM_{2.5}$ that can be utilised across the West Midlands region. Air quality data is being fed into the Council's Public Health Outcomes Framework, with the Wolverhampton Health Inequalities Strategy 2021-2023 correlating data to identify areas of poor air quality and deprivation, enabling services and individuals to assess the impacts and provide and/or acquire support necessary.

The Council has also established an Air Quality Working Group which combines Heads of Service and officers covering the following services areas:

Table 2.3 – Air Quality Working Group Members

Service Area Personnel	Support Provided
Head of City Transport	Chair and Strategic Lead on Air Quality and Transport
Service Lead/ Professional Lead Transport Strategy	Strategic Lead on Transport Strategy
Head of Environmental Services	Strategic Lead on Environmental Services and Fleet
Service Lead/ Professional Lead Parking Services	Link on Parking Management
Fleet Manager	Link on Fleet
Public Health Consultants	• Strategic Lead on Public Health and Air Quality • Strategic Lead on Public Health and Active Travel
Principal Public Health Specialist	Link on Public Health and Air Quality
Senior Officer Environmental Protection	Link on Air Quality
Strategic Health Lead (City Planning)	Link on Strategic Planning, Transport and Health Projects
Licensing Manager	Link on Taxi Regulation
Service Manager – Housing Development	Link on New Housing Built by CWC; WV Living/ WH

Head of City Development	Link on Regeneration Schemes

The purposes of the Air Quality Working Group are to:

- Coordinate and provide maximum value from initiatives to improve air quality and public health within the City of Wolverhampton by establishing partnerships with other agencies to support changes;
- Coordinate measures to meet UK Government statutory requirements as well as national, sub-regional and local strategies and policies on air quality; and
- Improve awareness of available funding opportunities and coordinate the submission of bids to maximise exploitation of such opportunities.

The City of Wolverhampton Council established a partnership with with EarthSense in 2019 and launched the Live Visualisation of Emissions – Towards Informed Avoidance of Pollution Hotspots (LiveTAP) project, a network of 15 additional NO_2, PM_{10} and $PM_{2.5}$ monitors deployed across the city to provide real time data to support identification of pollutant hotspots. The initial project has completed however, funding has unfortunately not been available to continue operating the monitors. The Black Country $PM_{2.5}$ model has instead used a network of $PM_{2.5}$ reference analysers across the region for verification purposes.

The City of Wolverhampton has also established various Smoke Control Areas (SCAs) across the city. A map of the SCAs in Wolverhampton can be found at: https://www.wolverhampton.gov.uk/sites/default/files/2022-02/smoke-control-areas.pdf, with further details regarding SCAs found at: https://www.wolverhampton.gov.uk/sites/default/files/2019-03/Smoke%20Control%20Area%20Rules.pdf

The Council supports the establishment of SCAs and reduction in $PM_{2.5}$ across the city by actively assessing chimney heights in accordance with Section 14 of the Clean Air Act 1993, which highlights that unless the height of a chimney has been approved by the local authority and any conditions attached for approval have been adhered to, it is an offence to cause or knowingly permit a furnace to be used to:

- Burn pulverised fuel;
- Burn at a rate of 45.4 kg or more an hour any other solid matter; or
- Burn at a rate equivalent to 366.4 kW or more any liquid or gaseous matter.

An application for chimney height approval must be submitted to City of Wolverhampton Council and contain adequate information to enable the necessary calculations to be carried out. Applications may also need planning permission.

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

This section sets out the monitoring undertaken within 2022 by City of Wolverhampton Council and how it compares with the relevant air quality objectives. In addition, monitoring results are presented for a five-year period between 2018 and 2022 to allow monitoring trends to be identified and discussed.

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

City of Wolverhampton Council undertook automatic (continuous) monitoring at 4 sites during 2022. Table A.1 in Appendix A shows the details of the automatic monitoring sites. 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. The UK-Air website presents automatic monitoring results for City of Wolverhampton Council.

The Council confirmed in the 2022 ASR that 3 of 4 TEOM1400a automatic monitors would be retracted due to a lack of Volatile Correction Model (VCM) mode technical support for the instrumentation and following analysis of 2021 monitoring data. The remaining monitor, St Peter's Square, would be retained as an urban background site to continue monitoring PM_{10} trends within the city centre. However, it is noted that all automatic monitoring sites were active during the 2022 monitoring year, until 10th October 2022 when the logger in the Stafford Road automatic monitor (co-located site) failed and was not replaced. As such, 3 automatic monitors continue to report into the 2023 monitoring year; St Peter's Square (new co-located site), Penn Road and Willenhall Road.

Maps showing the location of the monitoring sites are provided in Appendix D. Further details on how the monitors are calibrated and how the data has been adjusted are included in Appendix C.

3.1.2 Non-Automatic Monitoring Sites

City of Wolverhampton Council undertook non-automatic (i.e. passive) monitoring of NO_2 at 65 sites during 2022. Table A.2 in Appendix A presents the details of the non-automatic 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 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)

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 AQS 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 2022 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. Additionally, the National Bias Adjustment Factor assumes monitoring is undertaken in accordance with the Defra calendar dates. It is noted that the monitoring dates do coincide with the Defra calendar dates during the survey period, whereby all changeovers conducted throughout the monitoring year were in line with Defra guidance. As such, there is a degree of certainty surrounding the monitoring results provided.

Majority of monitoring sites across the City of Wolverhampton continue to report annual mean NO_2 concentrations below the AQS, with the exception of Site IDs BRO and RR2 that exceeded the 40µg/m^3 NO_2 AQS by 1.4µg/m^3 and 1.3µg/m^3 respectively. Therefore, these two passive monitoring sites are not compliant and are an area of concern. Due to

the high monitored concentrations, fall-off with distance correction was required at two locations, Site IDs DUD and TRI. Although, the latter site is not located within 0.1m and 50m to the kerb, and as such a final NO_2 annual mean concentration at the receptor location was unable to be ascertained. Following bias adjustment and annualisation where necessary, the maximum reported concentration in 2022 is 41.4µg/m^3 at diffusion tube monitoring location BRO, a roadside site located along Broad Street, followed by Site ID RR2 reporting 41.3µg/m^3 along Ring Road St Davids (North East Quadrant), a roadside location. Site ID RR2 location reported the maximum concentration (42.0µg/m^3) in the 2022 report. Both locations are within the designated city AQMA, however neither have significant pedestrian activity nearby.

It is noted that Site ID's BIL4 and RR3 are within 10% of the AQO, 36.2µg/m^3 and 36.4µg/m^3 respectively. Both locations have a footpath and experience pedestrian activity, but the former is a more residential area. As such, monitoring should continue at these locations into 2023 alongside any possible mitigation to ensure greater compliance with the AQO is achieved and protection of public health.

Figures A.1 and A.2 present the 2022 annual mean NO_2 concentrations across City of Wolverhampton Council's monitoring sites. A total of 36 diffusion tube sites out of 65 (55.38%) recorded an increase in concentrations reported between 2021 and 2022, an overall reduction of 20 sites (30.77%) compared to the 2020-2021 monitoring year.

The overall increase in concentrations is most likely attributable to the re-establishment of pre-COVID-19 pandemic traffic volume and the return to business as usual following the COVID-19 pandemic, where Government advice was given to stay at home where possible. This resulted in decreased levels of traffic observed across the UK, and as such, reduced NO_2 concentrations recorded during 2020.

It is possible to infer the risk of exceedances of the 1-hour mean NO_2 AQS objective at diffusion tube monitoring sites. LAQM.TG(22) provides an empirical relationship that states exceedances of the 1-hour objective are unlikely when the annual mean concentration is below 60µg/m^3. Given that the highest recorded annual mean concentration at any of the diffusion tube monitoring sites is 45.2µg/m^3 in 2022, and 54.7µg/m^3 since 2018, it is possible to conclude that there have been no exceedances of the hourly mean NO_2 objective at all diffusion tube monitoring locations in the last few years.

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})

Concentrations of PM_{10} have decreased steadily in City of Wolverhampton over 10 years, with 2021 and 2022 highlighting no exceedances of the annual mean 40µg/m^3 AQS at the automatic monitoring stations: Stafford Road, St Peter's Square (new co-located site), Penn Road and Willenhall Road. It is noted that the Council revoked PM_{10} monitoring at automatic monitors Stafford Road, Penn Road and Willenhall Road due to a lack of VCM mode technical support for the TEOM1400a instrumentation. Thus, St Peter's Square is the only automatic monitor that reported PM_{10} concentrations in 2022, with an annual mean of 17µg/m^3. St Peter's Square | 2 days of exceedances of the PM_{10} daily mean value 50µg/m^3, with a maximum concentration reported of 63µg/m^3, 13µg/m^3 over the AQS, and provided an annual data capture of 82.7%. As the percentage data capture is below 85.0%, the 90.4th percentile was calculated achieving a value of 24. The automatic monitoring site St Peter's Square did remain compliant overall with the daily mean PM_{10} AQS, as fewer than 35 days of exceedances were reported.

Table A.6 in Appendix A: Monitoring Results compares the ratified and adjusted monitored PM_{10} 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, not to be exceeded more than 35 times per year.

The Council concluded in the 2022 ASR, that due to no reported exceedances of the PM_{10} objectives in 2021 monitoring year, the mitigation actions implemented in the City of Wolverhampton had enabled compliance with AQS. Thus, sought to revoke PM_{10} from the AQMA. However, the UK-Air website remains to report the city wide AQMA for both NO_2 annual mean and PM_{10} 24-hour mean, and in the 2022 monitoring year 2 exceedances (90.4th percentile achieving 24) of the PM_{10} 24-hour AQS were reported. Thus, it is recommended that the AQMA remains for NO_2 and PM_{10} pollutants with further assessment in the 2023 monitoring year with regards to revocation of PM_{10} from the AQMA conditions, as well as possible further mitigation action taken to support achieving complete compliance with no (zero) exceedances for the entire year.

3.2.3 Particulate Matter ($PM_{2.5}$)

Table A.8 in Appendix A presents the ratified and adjusted monitored $PM_{2.5}$ annual mean concentrations for 2017 to 2019. The results for these years provided little variation in

$PM_{2.5}$ concentrations between background and roadside locations across the city. Therefore, indicating that a significant proportion of $PM_{2.5}$ was not coming from local sources but instead transported into the city from alternate sources and through processes such as transboundary migration. As such, the Council reported that the $PM_{2.5}$ monitors proved to be variable, thus discontinued the usage from 2020 onwards. Hence, $PM_{2.5}$ is not monitored in the City of Wolverhampton.

3.2.4 Sulphur Dioxide (SO_2)

Sulphur Dioxide (SO_2) is not monitored in the City of Wolverhampton.

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)
A1*	Lichfield Street	Roadside	391654	298782	NO_2, PM_{10}, $PM_{2.5}$	Yes – Wolverhampton AQMA 2005	AQ Mesh	2.0	2.0	2.5
A2	Penn Road	Roadside	390374	296775	NO_2, PM_{10}	Yes – Wolverhampton AQMA 2005	Chemiluminescent; TEOM	N/A	6.5	2.5
A4**	Stafford Road	Roadside	391261	302199	NO_2, PM_{10}	Yes – Wolverhampton AQMA 2005	Chemiluminescent; TEOM	5.0	8.5	2.5
A5	Willenhall Road	Roadside	394754	298429	NO_2, PM_{10}, $PM_{2.5}$	Yes – Wolverhampton AQMA 2005	Chemiluminescent; TEOM; AQ Mesh	0.0	12.5	2.5
A9	St Peter's Road	Urban Background	391362	298934	NO_2, PM_{10}, $PM_{2.5}$	Yes – Wolverhampton AQMA 2005	Chemiluminescent; TEOM; AQ Mesh	N/A	30.0	2.5
A10***	Foxlands Avenue	Suburban	388841	295174	$PM_{2.5}$	Yes – Wolverhampton AQMA 2005	AQ Mesh	9.2	2.3	3.0

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

(3) * = Site closed 2019 onwards.

(4) ** = Site closed 10th October 2022 due to logger failure.

(5) *** = Site closed 2020 onwards.

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)
BIL1	Imperial Palace	Roadside	395057	296541	NO_2	Yes - Wolverhampton AQMA 2005	0.0	4.0	No	3.0
BIL2	Lampost 5	Roadside	395085	296475	NO_2	Yes - Wolverhampton AQMA 2005	0.5	4.5	No	3.0
BIL3	Lamp post in front of dentists	Roadside	395095	296492	NO_2	Yes - Wolverhampton AQMA 2005	0.0	3.0	No	3.0
BIL4	Bilston Wines	Roadside	395118	296454	NO_2	Yes - Wolverhampton AQMA 2005	0.0	2.5	No	3.0
LIC1	Moon Under the Water	Roadside	391689	298778	NO_2	Yes - Wolverhampton AQMA 2005	0.0	3.5	No	3.0
LIC2	Firkins opp Art Gallery	Roadside	391508	298744	NO_2	Yes - Wolverhampton AQMA 2005	0.0	3.0	No	3.0
LIC3	Red brick building by phone boxes	Roadside	391621	298773	NO_2	Yes - Wolverhampton AQMA 2005	1.5	6.0	No	3.0
LIC4	AMS	Roadside	391654	298782	NO_2	Yes - Wolverhampton AQMA 2005	1.5	3.0	No	3.0
LIC7	Post Office	Roadside	391654	298782	NO_2	Yes - Wolverhampton AQMA 2005	0.0	1.5	No	3.0
LIC8	Barclays Bank	Roadside	391454	298734	NO_2	Yes - Wolverhampton AQMA 2005	0.0	5.0	No	3.0

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)
LIC9	Britannia Hotel	Roadside	391707	298757	NO_2	Yes - Wolverhampton AQMA 2005	0.0	3.0	No	3.0
PIP1	Wulfrun Hotel	Roadside	391765	298663	NO_2	Yes - Wolverhampton AQMA 2005	0.0	2.0	No	3.0
PRI1	Palace Resturant	Roadside	391553	298931	NO_2	Yes - Wolverhampton AQMA 2005	0.0	3.0	No	3.0
PRI2	Royal London Building	Roadside	391566	298795	NO_2	Yes - Wolverhampton AQMA 2005	0.0	3.0	No	3.0
PRI4	Staff Building Soc	Roadside	391581	298686	NO_2	Yes - Wolverhampton AQMA 2005	0.0	5.0	No	3.0
QUE1	Becketts Jewellers	Roadside	391603	298651	NO_2	Yes - Wolverhampton AQMA 2005	0.0	2.5	No	3.0
QUE2	Express & Star	Roadside	391605	298635	NO_2	Yes - Wolverhampton AQMA 2005	0.0	4.5	No	3.0
QUE3	Opticians	Roadside	391664	298666	NO_2	Yes - Wolverhampton AQMA 2005	0.0	2.5	No	3.0
QUE4	Habib Restaurant	Roadside	391694	298657	NO_2	Yes - Wolverhampton AQMA 2005	0.0	4.5	No	3.0
STA1	5 Ways Island	Roadside	391389	299803	NO_2	Yes - Wolverhampton AQMA 2005	2.0	2.0	No	3.0

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)
STA5	AMS	Roadside	391261	302199	NO_2	Yes - Wolverhampton AQMA 2005	6.5	8.5	Yes	3.0
STA6	AMS	Roadside	391261	302199	NO_2	Yes - Wolverhampton AQMA 2005	6.5	8.5	Yes	3.0
STA7	AMS	Roadside	391261	302199	NO_2	Yes - Wolverhampton AQMA 2005	6.5	8.5	Yes	3.0
STA9a	2 - 17 Vine Island	Roadside	391535	303346	NO_2	Yes - Wolverhampton AQMA 2005	0.0	12.0	No	3.0
WIL1	On flats	Roadside	394187	298452	NO_2	Yes - Wolverhampton AQMA 2005	0.0	14.5	No	3.0
WIL2	Betting shop	Roadside	394712	298428	NO_2	Yes - Wolverhampton AQMA 2005	0.0	6.5	No	3.0
PAR	Lamp post 31	Roadside	392362	296550	NO_2	Yes - Wolverhampton AQMA 2005	4.5	3.5	No	3.0
BRI	Lampost by shops opp Swann pub	Roadside	388195	298787	NO_2	Yes - Wolverhampton AQMA 2005	0.0	11.0	No	3.0
BRO	Lamp post next to snooker hall	Roadside	391679	298867	NO_2	Yes - Wolverhampton AQMA 2005	0.0	3.0	No	3.0
CAN	Somerfield Ltd	Roadside	393004	300864	NO_2	Yes - Wolverhampton AQMA 2005	7.5	6.5	No	3.0

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)
CLE	Wulfrun Centre	Roadside	391487	298351	NO_2	Yes - Wolverhampton AQMA 2005	0.0	5.0	No	3.0
CUL	Lamp post 4	Roadside	393364	297370	NO_2	Yes - Wolverhampton AQMA 2005	2.5	2.5	No	3.0
DUD	Lamp post 24	Roadside	391530	297313	NO_2	Yes - Wolverhampton AQMA 2005	-1.5	4.5	No	3.0
HOR	Lampost by new flats	Roadside	392116	298607	NO_2	Yes - Wolverhampton AQMA 2005	0.5	2.7	No	3.0
COR	Lampost by new flats	Roadside	391956	298683	NO_2	Yes - Wolverhampton AQMA 2005	10.0	2.0	No	3.0
NEA	Lamp post by new bungalows	Roadside	394715	299882	NO_2	Yes - Wolverhampton AQMA 2005	0.0	3.2	No	3.0
OXF	New flats	Roadside	395398	296283	NO_2	Yes - Wolverhampton AQMA 2005	0.0	3.2	No	3.0
TET	Lamp post 6	Roadside	389286	299894	NO_2	Yes - Wolverhampton AQMA 2005	0.0	3.2	No	3.0
WAT	Lamp post 37	Roadside	391127	298869	NO_2	Yes - Wolverhampton AQMA 2005	0.0	3.0	No	3.0
WOL	Lampost outside No5	Roadside	394032	297176	NO_2	Yes - Wolverhampton AQMA 2005	4.0	2.0	No	3.0

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)
PEN	Penn Rd Garage	Roadside	390386	296759	NO_2	Yes - Wolverhampton AQMA 2005	6.4	1.8	No	3.0
PRO	Bilston High School	Urban Background	394614	296090	NO_2	Yes - Wolverhampton AQMA 2005	0.0	28.0	No	3.0
TRI	Holy Trinity School	Urban Background	395541	296482	NO_2	Yes - Wolverhampton AQMA 2005	-10.0	73.0	No	3.0
COL	Perry Hall J&I School	Urban Background	395864	300595	NO_2	Yes - Wolverhampton AQMA 2005	0.0	48.0	No	3.0
MAR	Pendeford High School	Urban Background	390705	302736	NO_2	Yes - Wolverhampton AQMA 2005	0.0	165.0	No	3.0
WAR	Warstones Junior School	Urban Background	389051	296781	NO_2	Yes - Wolverhampton AQMA 2005	0.0	50.0	No	3.0
WRE	Parkfields High School	Roadside	392090	296095	NO_2	Yes - Wolverhampton AQMA 2005	0.0	50.0	No	3.0
CC1	Ladbrooks	Roadside	391368	298681	NO_2	Yes - Wolverhampton AQMA 2005	0.0	5.9	No	3.0
CC2	Bet Fred	Roadside	391309	298553	NO_2	Yes - Wolverhampton AQMA 2005	0.0	2.8	No	3.0
CC5	Miss Nails	Roadside	391531	298376	NO_2	Yes - Wolverhampton AQMA 2005	0.0	5.8	No	3.0

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)
CC7	Subway	Roadside	391597	298579	NO_2	Yes - Wolverhampton AQMA 2005	0.0	9.5	No	3.0
RR1	Anticlockwise Railway St car park	Roadside	391798	298836	NO_2	Yes - Wolverhampton AQMA 2005	0.0	2.9	No	3.0
RR2	Clockwise opp boat yard	Roadside	391828	298894	NO_2	Yes - Wolverhampton AQMA 2005	0.0	7.0	No	3.0
RR3	Clockwise opp Carvers	Roadside	391720	299027	NO_2	Yes - Wolverhampton AQMA 2005	0.0	3.6	No	3.0
RR4	Clockwise Railway Dr Cornhill car park	Roadside	391894	298721	NO_2	Yes - Wolverhampton AQMA 2005	0.0	1.2	No	3.0
RR5	Clockwise St Davids Court Nova Tel	Roadside	391901	298587	NO_2	Yes - Wolverhampton AQMA 2005	0.0	11.4	No	3.0
RR6	Anticlockwise Crown court	Roadside	391859	298522	NO_2	Yes - Wolverhampton AQMA 2005	0.0	3.0	No	3.0
STA10	STA10	Roadside	391600	303791	NO_2	Yes - Wolverhampton AQMA 2005	0.0	15.5	No	3.0
STA11	STA11	Roadside	391641	303249	NO_2	Yes - Wolverhampton AQMA 2005	0.0	2.5	No	3.0
STA12	STA12	Roadside	391616	303643	NO_2	Yes - Wolverhampton AQMA 2005	0.0	5.0	No	3.0

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)
LWS1	LWS1	Roadside	392156	298451	NO_2	Yes - Wolverhampton AQMA 2005	11.3	0.5	No	3.0
LWS2	LWS2	Roadside	392032	298468	NO_2	Yes - Wolverhampton AQMA 2005	6.8	2.0	No	3.0
WIL3	WIL3	Roadside	392991	298410	NO_2	Yes - Wolverhampton AQMA 2005	3.2	4.0	No	3.0
WIL4	WIL4	Roadside	393440	298379	NO_2	Yes - Wolverhampton AQMA 2005	0.0	7.0	No	3.0
WIL5	WIL5	Roadside	393639	298406	NO_2	Yes - Wolverhampton AQMA 2005	2.7	2.8	No	3.0

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 2022 (%) (2)	2018	2019	2020	2021	2022
A1*	391654	298782	Roadside	N/A	N/A	38.0	CLOSED	CLOSED	CLOSED	CLOSED
A2	390374	296775	Roadside	96.3	96.3	36.0	35.0	29.0	34.0	33.0
A4**	391261	302199	Roadside	92.2	71.5	29.0	28.0	23.0	23.0	26.5***
A5	394754	298429	Roadside	99.0	99.0	28.0	27.0	25.0	28.0	25.0
A9	391362	298934	Urban Background	95.7	95.7	24.0	23.0	17.0	19.0	21.0

☒ **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.**

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%).

(3) * = Site closed from 2019 onwards.

(4) ** = Site closed 10th October 2022 due to logger failure, data provided from January 2022 to October 2022.

(5) *** = NO_2 annual mean was annualised using the methodology in the LAQM.TG(22) as the annual data capture was less than 75% and there was at least 3 months monitoring.

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 2022 (%) (2)	2018	2019	2020	2021	2022
BIL1	395057	296541	Roadside	100	100	**40.6**	38.7	30.4	34.0	33.8
BIL2	395085	296475	Roadside	100	100	31.2	28.7	25.2	26.6	25.0
BIL3	395095	296492	Roadside	100	100	39.2	38.7	31.0	33.3	32.1
BIL4	395118	296454	Roadside	100	100	**43.2**	**42.0**	34.2	38.0	36.2
LIC1	391689	298778	Roadside	91.7	90.4	34.8	37.4	22.4	24.9	27.3
LIC2	391508	298744	Roadside	91.7	90.4	**42.0**	**40.2**	24.4	25.2	27.1
LIC3	391621	298773	Roadside	100	100	32.5	31.0	21.9	25.7	28.8
LIC4	391654	298782	Roadside	83.3	82.7	32.6	33.0	22.5	24.9	25.9
LIC7	391654	298782	Roadside	83.3	84.6	33.2	37.0	25.7	26.9	31.7
LIC8	391454	298734	Roadside	91.7	90.4	31.5	29.0	19.5	20.6	21.5
LIC9	391707	298757	Roadside	100	100	33.2	33.9	23.1	24.9	25.6
PIP1	391765	298663	Roadside	100	100	34.0	33.0	23.3	24.9	29.9
PRI1	391553	298931	Roadside	100	100	37.3	33.6	25.9	29.6	34.3

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 2022 (%) [2]	2018	2019	2020	2021	2022
PRI2	391566	298795	Roadside	91.7	90.4	36.6	34.5	23.4	25.4	26.2
PRI4	391581	298686	Roadside	100	100	25.2	22.1	16.7	16.8	18.4
QUE1	391603	298651	Roadside	100	100	23.5	24.2	16.3	19.4	21.2
QUE2	391605	298635	Roadside	91.7	92.3	28.6	26.4	19.2	25.0	21.6
QUE3	391664	298666	Roadside	91.7	92.3	24.0	22.3	17.3	19.2	20.0
QUE4	391694	298657	Roadside	100	100	26.3	28.2	17.3	19.9	21.5
STA1	391389	299803	Roadside	100	100	30.1	29.0	21.9	22.3	25.2
STA5, STA6, STA7	391261	302199	Roadside	83.3	100	33.0	30.4	29.3	26.4	26.2
STA9a	391535	303346	Roadside	91.7	90.4	30.1	29.5	23.1	26.4	24.6
WIL1	394187	298452	Roadside	100	100	22.0	21.6	16.8	18.3	17.4
WIL2	394712	298428	Roadside	100	100	39.1	37.5	30.0	31.8	30.0
PAR	392362	296550	Roadside	75	73.1	34.5	35.0	28.0	31.6	30.4
BRI	388195	298787	Roadside	91.7	90.4	19.8	18.6	14.3	15.6	15.8
BRO	391679	298867	Roadside	100	100	**45.5**	**43.0**	32.1	34.1	**41.4**

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 2022 (%) [2]	2018	2019	2020	2021	2022
CAN	393004	300864	Roadside	83.3	84.6	29.0	29.0	22.5	24.1	24.2
CLE	391487	298351	Roadside	100	100	28.4	27.3	20.3	24.4	25.4
CUL	393364	297370	Roadside	100	100	22.5	21.8	18.5	20.7	19.6
DUD	391530	297313	Roadside	91.7	90.4	27.0	25.0	19.2	21.0	21.4
HOR	392116	298607	Roadside	100	100	39.9	34.0	27.6	31.2	32.3
COR	391956	298683	Roadside	83.3	84.6	30.2	30.0	21.5	23.7	24.3
NEA	394715	299882	Roadside	100	100	21.7	23.0	18.2	19.2	19.7
OXF	395398	296283	Roadside	100	100	31.9	30.3	25.6	28.6	26.0
TET	389286	299894	Roadside	100	100	34.6	34.1	26.6	28.6	29.6
WAT	391127	298869	Roadside	91.7	92.3	35.0	34.8	27.0	27.5	30.1
WOL	394032	297176	Roadside	100	100	20.3	20.0	15.9	15.2	14.2
PEN	390386	296759	Roadside	83.3	82.7	38.0	35.0	28.8	30.8	32.6
PRO	394614	296090	Urban Background	100	100	25.1	25.3	19.8	19.2	18.7
TRI	395541	296482	Urban Background	100	100	24.1	27.5	18.5	19.3	18.5

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 2022 (%) (2)	2018	2019	2020	2021	2022
COL	395864	300595	Urban Background	100	100	15.7	15.5	11.4	11.3	11.6
MAR	390705	302736	Urban Background	41.7	42.3	14.3	13.9	10.4	8.7	11.7
WAR	389051	296781	Urban Background	100	100	11.7	12.6	9.7	10.5	9.7
WRE	392090	296095	Roadside	91.7	90.4	15.5	14.7	12.7	13.8	12.9
CC1	391368	298681	Roadside	100	100	30.3	27.2	19.5	21.9	23.3
CC2	391309	298553	Roadside	100	100	24.4	22.2	14.7	14.8	16.3
CC5	391531	298376	Roadside	100	100	28.9	25.9	19.3	23.1	23.0
CC7	391597	298579	Roadside	100	100	27.6	25.3	18.7	20.3	21.4
RR1	391798	298836	Roadside	91.7	92.3	33.6	27.3	25.9	22.7	22.4
RR2	391828	298894	Roadside	100	100	**54.7**	**51.7**	38.4	**42.0**	**41.3**
RR3	391720	299027	Roadside	100	100	**42.6**	**42.9**	31.4	33.8	36.4
RR4	391894	298721	Roadside	100	100	33.9	33.5	26.6	28.0	29.1
RR5	391901	298587	Roadside	91.7	90.4	39.3	36.2	26.2	31.3	32.1
RR6	391859	298522	Roadside	83.3	82.7	35.3	32.8	28.2	27.5	27.8

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 2022 (%) [2]	2018	2019	2020	2021	2022
STA10	391600	303791	Roadside	83.3	92.3	25.9	24.6	18.6	19.5	20.2
STA11	391641	303249	Roadside	100	100	35.2	33.9	25.6	28.8	27.7
STA12	391616	303643	Roadside	83.3	82.7	32.6	30.7	24.9	28.6	26.4
LWS1	392156	298451	Roadside	100	100	24.2	23.4	18.4	19.6	18.8
LWS2	392032	298468	Roadside	100	100	26.4	24.2	19.8	21.2	20.1
WIL3	392991	298410	Roadside	100	100	33.8	35.2	28.5	30.6	29.6
WIL4	393440	298379	Roadside	100	100	22.8	19.9	16.3	18.1	16.3
WIL5	393639	298406	Roadside	91.7	92.3	32.3	32.4	24.7	26.6	26.1

☒ **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 – Automatic Sites

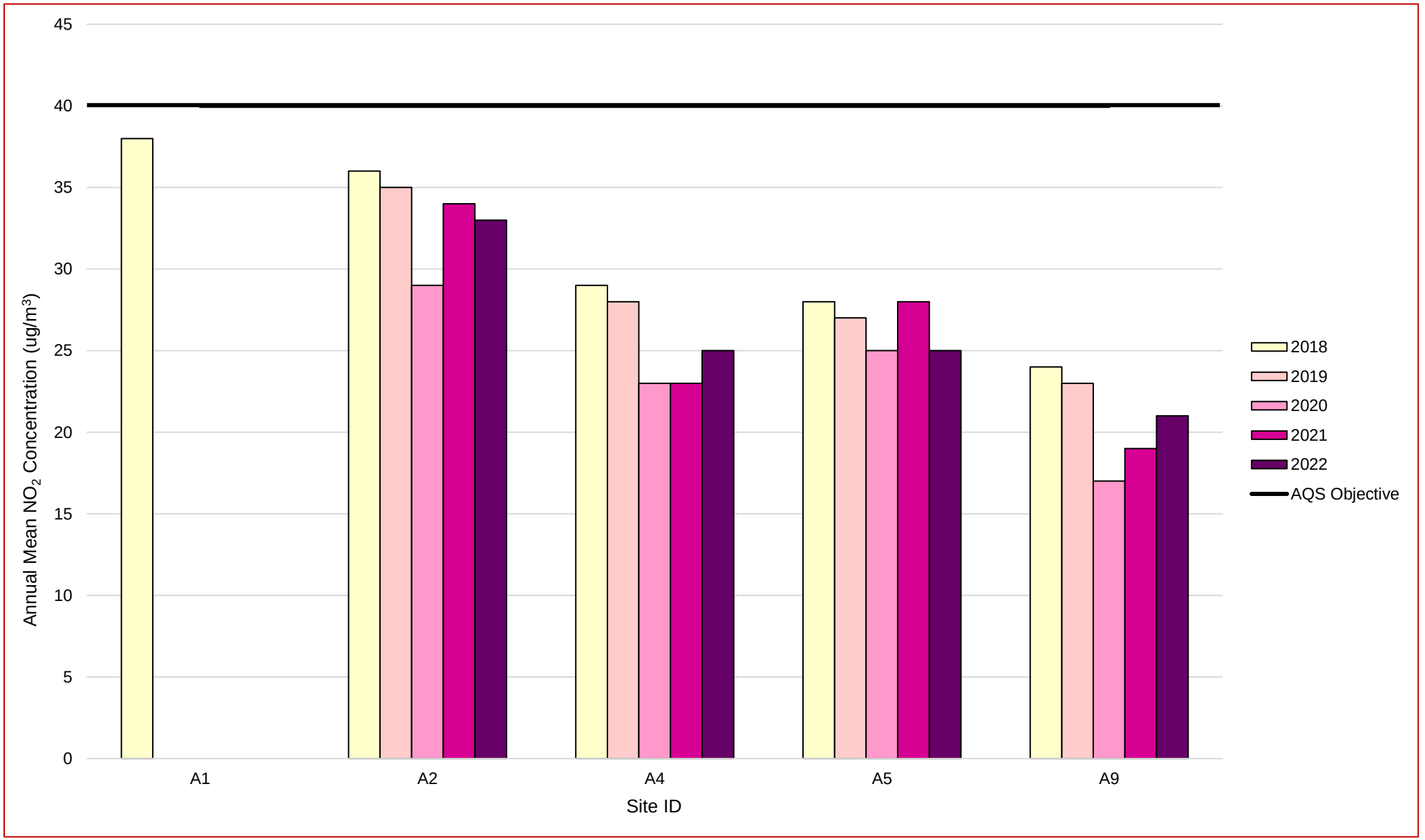
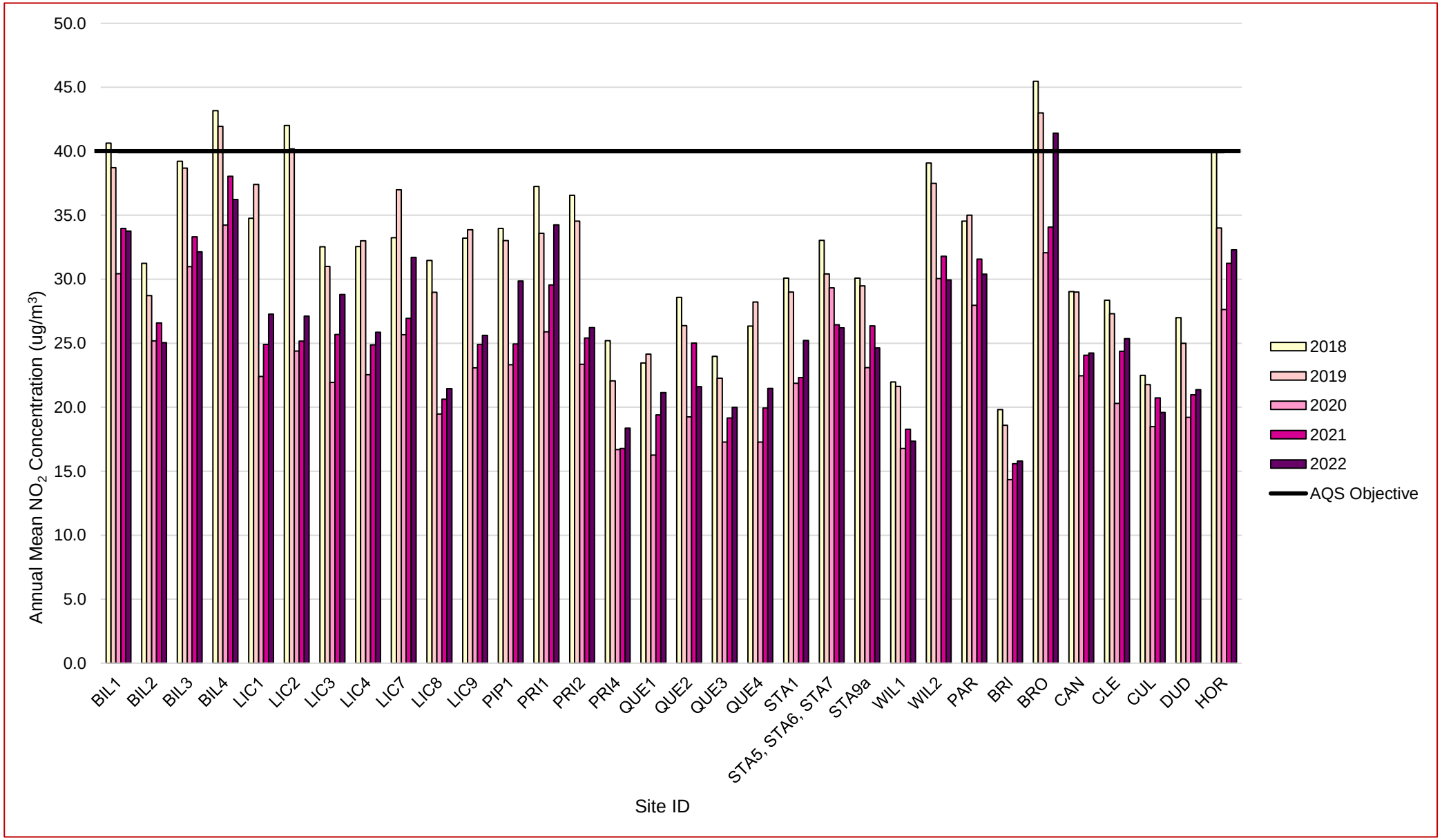


Figure A.2 – Trends in Annual Mean NO_2 Concentrations – Non-Automatic Sites



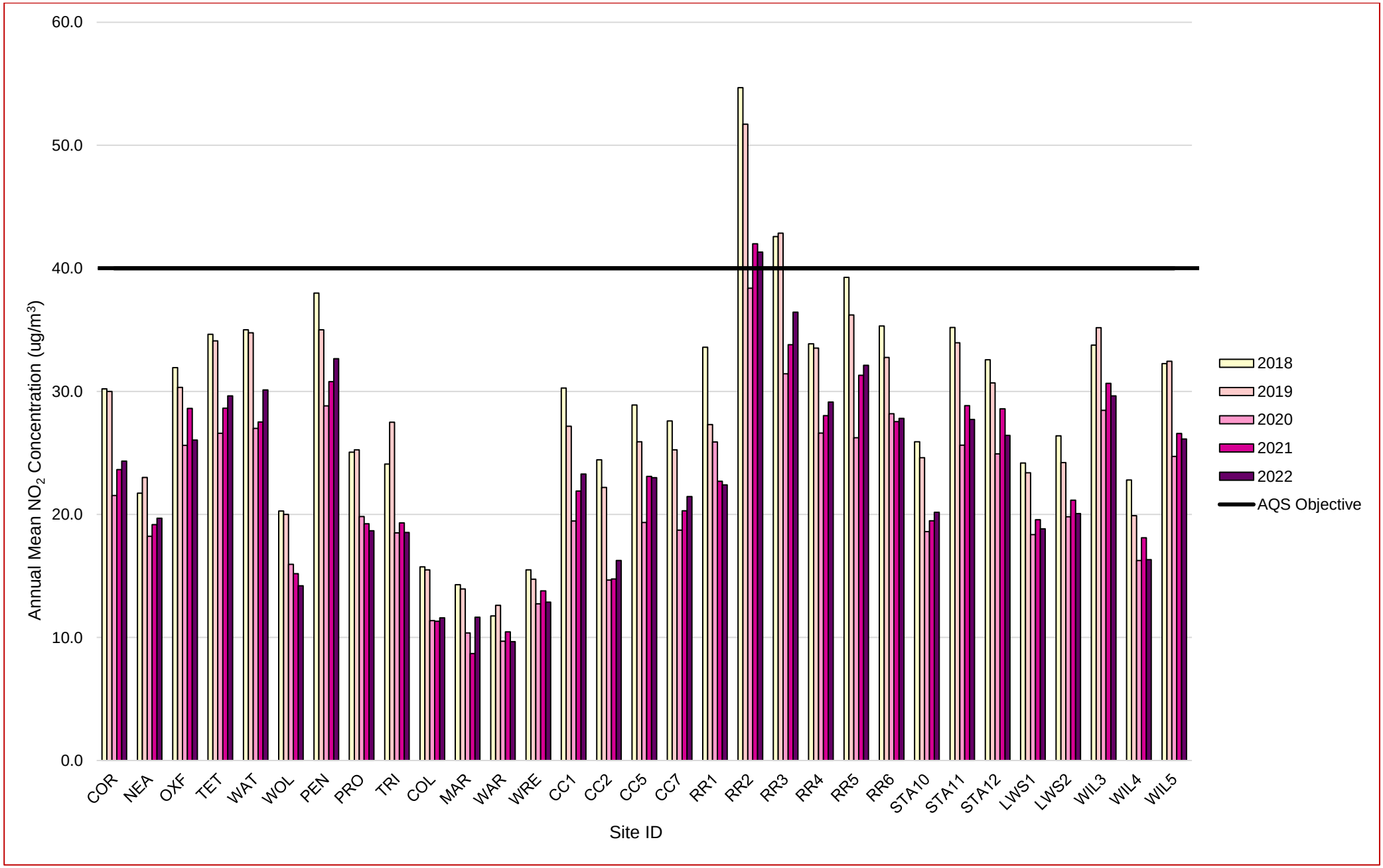

60.0
50.0
40.0
30.0
20.0
10.0
0.0
Annual Mean NO2 Concentration (ug/m3)
COR
NEA
OXF
TET
WAT
WOL
PEN
PRO
TRI
COL
MAR
WAR
WRE
CC1
CC2
CC5
CC7
RR1
RR2
RR3
RR4
RR5
RR6
STA10
STA11
STA12
LWS1
LWS2
WIL3
WIL4
WIL5
Site ID
2018
2019
2020
2021
2022
AQS Objective

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 2022 (%) (2)	2018	2019	2020	2021	2022
A1*	391654	298782	Roadside	N/A	N/A	0 (105)	CLOSED	CLOSED	CLOSED	CLOSED
A2	390374	296775	Roadside	96.3	96.3	0	0 (98)	0	0	0
A4**	391261	302199	Roadside	92.2	71.5	0	0	0	0 (78)	0 (94)
A5	394754	298429	Roadside	99.0	99.0	0	0 (134)	0	0 (90)	0
A9	391362	298934	Urban Background	95.7	95.7	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%).

(3) * = Site closed from 2019 onwards.

(4) ** = Site closed 10th October 2022 due to logger failure, data provided January 2022 to October 2022.

Table A.6 – Annual Mean PM_{10} 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 2022 (%) (2)	2018	2019	2020	2021	2022
A1*	391654	298782	Roadside	N/A	N/A	15.0	CLOSED	CLOSED	CLOSED	CLOSED
A2*	390374	296775	Roadside	N/A	N/A	17.0	16.0	CLOSED	CLOSED	CLOSED
A4*	391261	302199	Roadside	N/A	N/A	16.0	15.0	CLOSED	CLOSED	CLOSED
A5*	394754	298429	Roadside	N/A	N/A	14.0	11.0	CLOSED	CLOSED	CLOSED
A9	391362	298934	Urban Background	82.7	82.7	13.0	12.0	13.0	12.0	17.0

☒ **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.

Exceedances of the PM_{10} 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.

(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) * = Closed sites.

Figure A.2 – Trends in Annual Mean PM_{10} Concentrations

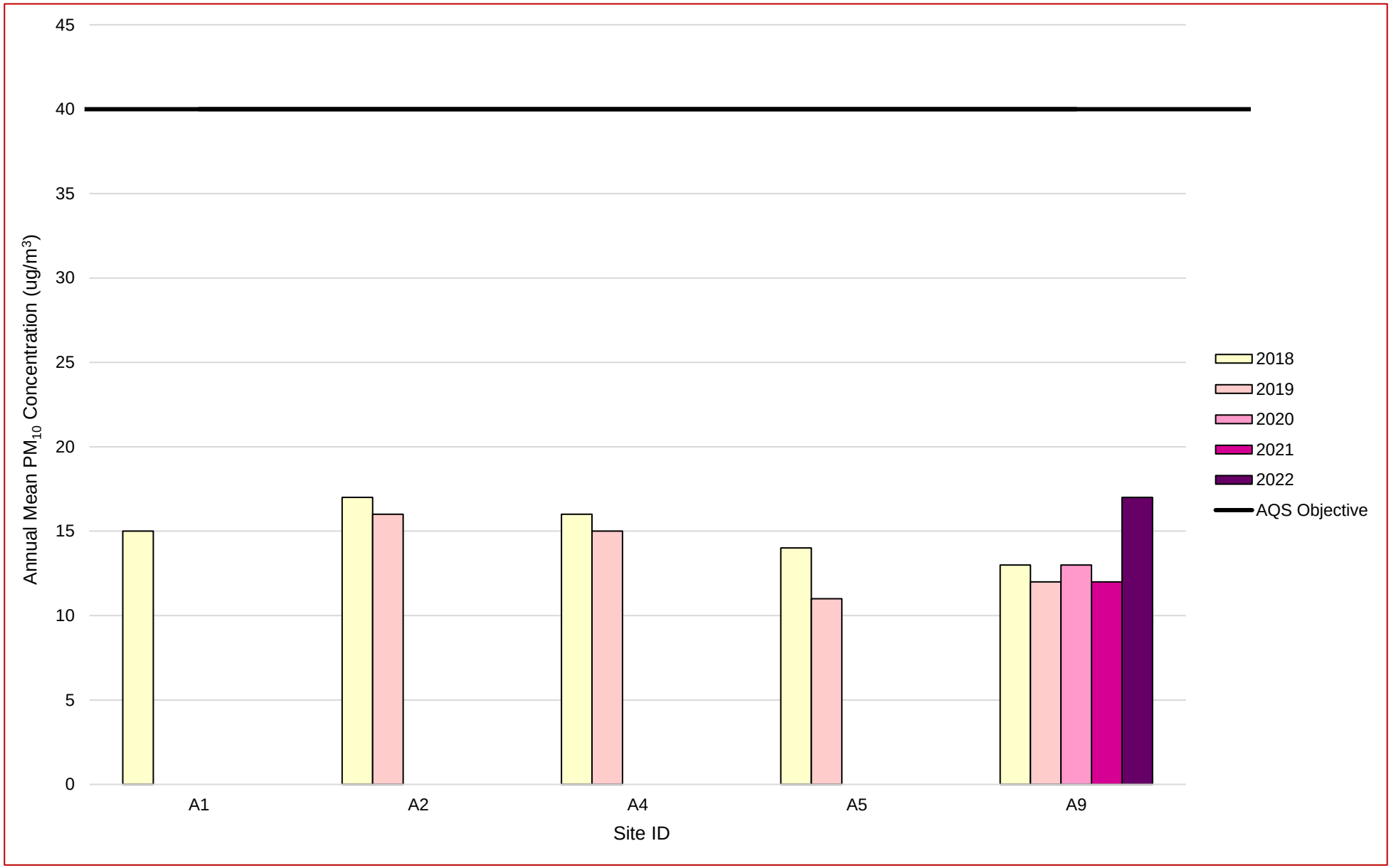


Table A.7 – 24-Hour Mean PM_{10} Monitoring Results, Number of PM_{10} 24-Hour Means > 50µg/m^3

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2022 (%) (2)	2018	2019	2020	2021	2022
A1*	391654	298782	Roadside	N/A	N/A	0	CLOSED	CLOSED	CLOSED	CLOSED
A2*	390374	296775	Roadside	N/A	N/A	0	0 (25)	CLOSED	CLOSED	CLOSED
A4*	391261	302199	Roadside	N/A	N/A	0	0 (27)	CLOSED	CLOSED	CLOSED
A5*	394754	298429	Roadside	N/A	N/A	0	0 (20)	CLOSED	CLOSED	CLOSED
A9	391362	298934	Urban Background	82.7	82.7	0	1	1	0	2 (24)

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%).

(3) * = Closed sites.

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 2022 (%) (2)	2018	2019	2020	2021	2022
A1*	391654	298782	Roadside	N/A	N/A	9.0	5.0	CLOSED	CLOSED	CLOSED
A5*	394754	298429	Roadside	N/A	N/A	7.0	7.0	CLOSED	CLOSED	CLOSED
A9*	391362	298934	Urban Background	N/A	N/A	8.0	3.0	CLOSED	CLOSED	CLOSED
A10*	388841	295174	Suburban	N/A	N/A	-	7.0	CLOSED	CLOSED	CLOSED

☒ **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%).

(3) * = Closed sites.

Appendix B: Full Monthly Diffusion Tube Results for 2022

Table B.1 – NO_2 2022 Diffusion Tube Results (µg/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 0.76	Annual Mean: Distance Corrected to Nearest Exposure	Comment
BIL1	395057	296541	49.8	29.1	60.2	47.5	39.8	39.2	32.2	47.7	48.0	58.8	32.8	48.1	44.4	33.8	-	
BIL2	395085	296475	45.4	22.6	51.9	35.1	25.0	25.7	23.0	34.0	31.3	39.1	21.4	41.0	33.0	25.0	-	
BIL3	395095	296492	62.4	33.0	58.3	46.9	36.7	36.2	30.4	46.1	43.3	49.8	23.9	40.6	42.3	32.1	-	
BIL4	395118	296454	64.7	43.8	54.0	46.2	45.6	44.3	32.1	44.8	48.0	60.4	33.9	54.3	47.7	36.2	-	
LIC1	391689	298778	43.3	27.3	50.7	35.0	-	29.6	32.4	29.6	38.6	32.0	33.0	43.3	35.9	27.3	-	
LIC2	391508	298744	41.8	30.9	51.4	-	31.9	30.7	30.2	31.6	37.2	35.5	27.3	44.1	35.7	27.1	-	
LIC3	391621	298773	38.9	35.1	53.1	33.7	32.4	28.8	32.4	31.4	42.6	35.4	44.4	46.6	37.9	28.8	-	
LIC4	391654	298782	44.7	26.1	54.1	-	31.3	28.8	30.9	-	42.9	25.8	13.5	42.2	34.0	25.9	-	
LIC7	391654	298782	62.0	-	50.4	34.9	35.7	33.7	35.2	32.8	45.3	38.7	-	48.6	41.7	31.7	-	
LIC8	391454	298734	36.6	21.8	40.2	-	25.1	22.1	24.1	30.8	27.4	22.3	24.1	36.0	28.2	21.5	-	
LIC9	391707	298757	42.6	31.5	49.9	30.6	31.7	28.6	28.8	28.0	35.9	33.7	20.3	43.0	33.7	25.6	-	
PIP1	391765	298663	44.4	28.6	64.2	39.4	30.5	26.6	31.4	34.7	38.6	45.3	42.6	45.2	39.3	29.9	-	
PRI1	391553	298931	45.1	34.1	60.9	48.9	39.2	34.0	30.1	48.0	48.4	55.4	-	51.7	45.1	34.3	-	
PRI2	391566	298795	37.5	32.5	48.5	-	32.6	29.4	30.7	31.4	36.6	31.5	29.4	39.3	34.5	26.2	-	
PRI4	391581	298686	31.0	18.4	41.6	23.8	18.8	17.9	19.2	21.0	24.8	22.5	19.9	31.2	24.2	18.4	-	
QUE1	391603	298651	31.9	22.5	45.1	29.9	22.5	18.6	22.1	28.3	28.2	22.8	30.9	31.2	27.8	21.2	-	
QUE2	391605	298635	29.6	-	45.1	25.9	22.9	20.3	21.1	25.4	28.5	27.6	31.4	35.1	28.4	21.6	-	
QUE3	391664	298666	36.2	-	38.6	25.9	20.7	17.2	21.2	23.8	26.4	22.2	26.0	31.2	26.3	20.0	-	
QUE4	391694	298657	34.0	23.7	44.8	27.9	23.3	18.7	22.3	25.2	26.7	28.2	30.4	33.8	28.3	21.5	-	
STA1	391389	299803	43.7	26.7	47.0	31.2	24.9	25.3	27.4	28.3	34.9	43.4	33.0	32.4	33.2	25.2	-	
STA5	391261	302199	46.1	-	38.4	29.5	34.3	31.2	27.9	27.1	33.1	36.1	21.1	39.9	-	-	-	Triplicate Site with STA5, STA6 and STA7 - Annual data provided for STA7 only
STA6	391261	302199	47.7	37.4	40.6	30.4	33.7	30.3	29.4	27.2	33.1	36.9	24.5	41.5	-	-	-	Triplicate Site with STA5, STA6 and STA7 - Annual data provided for STA7 only
STA7	391261	302199	48.5	-	39.5	30.7	34.0	34.6	34.4	-	32.6	31.9	34.3	41.1	34.5	26.2	-	Triplicate Site with STA5, STA6 and STA7 - Annual data provided for STA7 only
STA9a	391535	303346	42.9	23.0	49.5	34.2	30.0	25.1	29.8	33.6	33.4	-	18.9	36.0	32.4	24.6	-	
WIL1	394187	298452	33.5	21.2	35.5	22.8	18.9	13.6	20.8	20.9	24.4	21.5	15.7	25.2	22.8	17.4	-	
WIL2	394712	298428	38.0	36.8	52.6	45.4	40.6	34.6	30.2	36.8	39.4	57.6	13.4	47.5	39.4	30.0	-	

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 0.76	Annual Mean: Distance Corrected to Nearest Exposure	Comment
PAR	392362	296550	47.2	34.7	57.1	-	36.0	33.9	-	39.7	40.8	-	28.6	41.9	40.0	30.4	-	
BRI	388195	298787	30.9	17.7	33.9	20.5	16.9	13.4	17.1	18.3	18.3	-	14.5	27.2	20.8	15.8	-	
BRO	391679	298867	60.6	49.8	68.2	53.4	48.3	43.2	35.1	45.9	50.6	85.9	46.9	66.1	54.5	**41.4**	-	
CAN	393004	300864	45.6	29.8	-	32.9	28.0	27.7	29.0	34.2	-	36.3	11.2	44.2	31.9	24.2	-	
CLE	391487	298351	44.0	24.0	46.2	30.0	28.1	26.1	27.4	29.6	33.0	30.0	39.5	42.5	33.4	25.4	-	
CUL	393364	297370	40.1	21.1	37.9	25.6	20.7	19.1	17.3	20.3	25.4	29.2	19.3	33.2	25.8	19.6	-	
DUD	391530	297313	33.6	23.4	47.2	-	21.1	19.3	23.7	29.2	30.4	27.3	19.4	34.6	28.1	21.4	21.9	
HOR	392116	298607	61.3	34.5	50.9	44.2	38.8	40.5	31.7	44.7	46.7	45.7	26.2	44.7	42.5	32.3	-	
COR	391956	298683	-	-	45.7	33.5	30.7	23.6	22.0	28.1	34.5	44.5	19.3	38.3	32.0	24.3	-	
NEA	394715	299882	35.7	20.5	39.2	23.5	19.2	18.3	20.8	20.8	25.9	25.0	30.0	32.1	25.9	19.7	-	
OXF	395398	296283	42.8	23.2	48.5	40.6	31.0	28.8	26.1	42.0	38.4	42.9	10.5	36.4	34.3	26.0	-	
TET	389286	299894	50.6	42.6	48.9	32.4	43.1	35.2	35.4	31.8	36.8	39.3	33.3	38.5	39.0	29.6	-	
WAT	391127	298869	43.4	-	63.5	40.2	32.4	25.0	31.2	39.5	38.2	43.0	35.9	43.7	39.6	30.1	-	
WOL	394032	297176	26.6	16.4	29.3	17.2	19.1	13.3	11.2	14.0	16.4	22.7	14.7	23.3	18.7	14.2	-	
PEN	390386	296759	53.4	-	51.8	-	44.2	42.9	44.7	42.6	42.1	40.7	21.3	45.9	43.0	32.6	-	
PRO	394614	296090	42.1	26.4	37.3	28.4	12.0	15.1	14.4	21.2	22.9	26.7	16.0	32.4	24.6	18.7	-	
TRI	395541	296482	35.7	23.4	41.2	25.0	18.7	14.2	14.6	20.3	21.0	34.2	12.6	31.8	24.4	18.5	-	
COL	395864	300595	26.9	12.6	26.0	14.9	10.4	9.5	10.9	10.4	14.6	15.4	9.0	22.6	15.3	11.6	-	
MAR	390705	302736	21.4	11.2	27.3	14.5	-	-	-	-	-	-	-	21.8	19.2	11.7	-	
WAR	389051	296781	20.6	8.5	21.0	12.6	9.6	8.1	10.2	11.0	11.0	8.0	12.5	19.4	12.7	9.7	-	
WRE	392090	296095	23.0	13.1	27.1	-	13.9	11.1	15.2	12.8	14.3	16.1	15.4	24.2	16.9	12.9	-	
CC1	391368	298681	39.2	30.3	41.6	30.6	28.6	29.4	30.2	23.9	26.9	23.6	27.6	35.7	30.6	23.3	-	
CC2	391309	298553	30.4	20.5	31.9	20.4	16.7	15.0	21.2	16.6	19.8	16.5	21.2	26.6	21.4	16.3	-	
CC5	391531	298376	37.7	23.9	41.1	31.6	26.6	-	27.5	31.1	31.7	23.3	28.5	29.7	30.2	23.0	-	
CC7	391597	298579	32.8	21.3	45.8	27.6	22.3	19.2	21.3	26.2	27.3	26.9	33.3	34.6	28.2	21.4	-	
RR1	391798	298836	38.0	24.4	55.1	35.2	25.4	20.6	27.1	31.1	-	24.9	7.1	35.3	29.5	22.4	-	
RR2	391828	298894	69.6	52.0	63.9	52.4	57.0	52.5	56.1	46.5	56.5	48.5	41.5	56.1	54.4	**41.3**	-	
RR3	391720	299027	49.9	49.0	64.9	40.0	49.3	37.5	40.1	31.8	45.5	54.2	59.7	53.3	47.9	36.4	-	
RR4	391894	298721	54.2	39.0	47.0	31.4	34.6	31.3	32.6	29.6	37.2	34.6	39.4	49.0	38.3	29.1	-	
RR5	391901	298587	46.5	31.0	62.8	42.8	38.3	33.8	38.1	43.7	44.3	39.2	44.3	-	42.3	32.1	-	
RR6	391859	298522	45.4	31.1	43.2	35.9	32.0	32.4	39.6	36.4	38.8	31.0	-	-	36.6	27.8	-	
STA10	391600	303791	32.5	19.5	42.4	30.2	18.0	16.0	17.9	27.3	25.0	28.3	-	34.9	26.5	20.2	-	

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 0.76	Annual Mean: Distance Corrected to Nearest Exposure	Comment
STA11	391641	303249	50.8	24.6	40.0	38.5	32.3	32.6	33.6	31.9	36.4	33.9	39.2	43.8	36.5	27.7	-	
STA12	391616	303643	50.4	9.4	44.0	35.8	30.2	29.8	32.5	36.6	34.9	-	-	44.2	34.8	26.4	-	
LWS1	392156	298451	41.9	24.3	34.5	24.2	19.2	17.2	14.5	20.6	24.9	24.4	16.4	35.1	24.8	18.8	-	
LWS2	392032	298468	42.9	25.5	39.2	28.2	22.4	-	16.2	23.1	27.5	33.2	6.7	25.6	26.4	20.1	-	
WIL3	392991	298410	49.2	36.7	49.7	39.6	34.9	27.8	26.8	35.8	34.9	55.9	32.7	43.8	39.0	29.6	-	
WIL4	393440	298379	32.6	17.3	33.3	25.5	15.9	14.8	12.7	19.9	20.4	24.3	15.3	25.7	21.5	16.3	-	
WIL5	393639	298406	49.2	29.2	47.6	39.8	29.1	26.1	21.5	30.2	31.6	38.3	-	35.7	34.4	26.1	-	

☒ **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.**

☒ **City of Wolverhampton Council confirm that all 2022 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 City of Wolverhampton Council During 2022

City of Wolverhampton Council has identified no new potential developments or biomass plant sources that required an Air Quality Assessment (AQA) within the reporting year of 2022.

Additional Air Quality Works Undertaken by City of Wolverhampton Council During 2022

City of Wolverhampton Council has not completed any additional works within the reporting year of 2022.

QA/QC of Diffusion Tube Monitoring

City of Wolverhampton Council's diffusion tubes in 2022 were supplied and analysed by SOCOTEC Didcot, using the 50% Triethanolamine (TEA) in acetone preparation method. SOCOTEC's laboratory is UKAS accredited, participating in the AIR-PT Scheme for NO_2 tube analysis and the Annual Field Inter-Comparison Exercise. These provide strict performance criteria for participating laboratories to meet, thereby ensuring NO_2 concentrations reported are of a high calibre. The lab follows the procedures set out in the Harmonisation Practical Guidance. In the AIR PT intercomparison scheme for comparing spiked Nitrogen Dioxide diffusion tubes, SOCOTEC currently holds the highest rank of a 'Satisfactory' laboratory.

Local authority co-location studies which use tubes supplied by SOCOTEC with the 50% TEA in acetone preparation method in 2022, with 26 studio rated as 'good', as shown by the precision summary results. This precision reflects the laboratory's performance and consistency in preparing and analysing the tubes, as well as the subsequent handling of the tubes in the field. Tubes are considered to have a "good" precision where the

coefficient of variation of duplicate or triplicate diffusion tubes for eight or more monitoring periods during a year is less than 20%.

Monitoring in 2022 throughout City of Wolverhampton was completed in adherence with the 2022 Diffusion Tube Monitoring Calendar, whereby all changeovers throughout the monitoring year were completed in line with Defra guidance.

Diffusion Tube Annualisation

The LAQM.TG22 states that annualisation is required for any site which has a data capture of less than 75%, but greater than 25%, or has 3 months of data collected for the monitoring year in line with the Diffusion Tube Monitoring Calendar. Diffusion tube site MAR required annualisation due to insufficient data capture in 2022. The site reported data capture of 42.3% with over 3 months of data during the 2022 monitoring period in line with the Diffusion Tube Monitoring Calendar which was sufficient for annualisation.

Annualisation was completed using version 3.0 of the 'Diffusion Tube Data Processing Tool'. Due to there being insufficient continuous monitoring data by local analysers in the City of Wolverhampton due to closure of sites during the monitoring year and missing periods of data due to instrument failure, the four nearest AURN monitoring stations selected to annualise the data are:

- Cannock A5190;

- Walsall Woodlands;

- Birmingham Ladywood; and

- West Bromwich Kenrick Park.

The continuous background monitoring sites were suitable to use as they all had >85% data capture and therefore could be used for annualisation. Table C.1 presents the annualisation summary, taken from the 'Diffusion Tube Data Processing Tool'.

Data capture for the automatic monitor A4 (Stafford Road) was below 75% for the annual period, 92.2% for the monitored period, therefore annualisation in accordance with LAQM.TG22 is required for the instrument. Results were annualised by Dean Gooch of City of Wolverhampton Council using the guidance as per Chapter 7: NO_x and NO_2 Monitoring in LAQM.TG22, and the 2022 annualised annual mean was confirmed for the site as 26.5µg/m^3. Results from annualisation are presented in Table C.1.

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

Site ID	Annualisation Factor Cannock A5190	Annualisation Factor Walsall Woodlands	Annualisation Factor Birmingham Ladywood	Annualisation Factor West Bromwich Kenrick Park	Average Annualisation Factor	Raw Data Annual Mean	Annualised Annual Mean
MAR	0.7764	0.7725	0.8336	0.8056	0.7970	19.2	15.3
A4	1.03	1.13	1.08	1.02	1.06	25.0	26.5

Diffusion Tube Bias Adjustment Factors

The diffusion tube data presented within the 2022 ASR have 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.

City of Wolverhampton Council have applied a national bias adjustment factor of 0.76 to the 2022 monitoring data. A summary of bias adjustment factors used by City of Wolverhampton Council over the past five years is presented in Table C.2.

One co-location study is carried out by City of Wolverhampton Council, triplicate site STA5, STA6 and STA7 alongside automatic monitor Stafford Road. The results from the co-location study are submitted to the Local Air Quality Management (LAQM) Helpdesk for inclusion in the national co-location studies database. The output from the local bias adjustment spread sheet is shown in Table C.3.

Due to failure of the Stafford Road automatic site logger and subsequent closure in October 2022 alongside poor overall data capture, it was confirmed to apply a national factor. The national factor for SOCOTEC Didcot 50% TEA in acetone, as presented in the Diffusion Tube Bias Factors Spreadsheet v03/23, was 0.76 based on 26 studies. The National Bias Adjustment Spreadsheet is presented in Figure C.1.

Table C.2 – Bias Adjustment Factor

Monitoring Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2022	National	03/23	0.76
2021	National	09/22	0.77

2020	National	09/21	1.01
2019	National	06/20	1.05
2018	National	09/19	1.07

Table C.3 – Local Bias Adjustment Calculation

Variables	Local Bias Adjustment Input 1
Periods used to calculate bias	6
Bias Factor A	0.74 (0.68-0.83)
Bias Factor B	35% (21%-48%)
Diffusion Tube Mean (µg/m^3)	34.9
Mean CV (Precision)	4.1%
Automatic Mean (µg/m^3)	26.0
Data Capture	99%
Adjusted Tube Mean (µg/m^3)	26 (24-29)
Overall Diffusion Tube Precision	Good Overall Precision
Overall Continuous Monitor Data Capture	Poor Overall Data Capture
Local Bias Adjustment Factor	0.74

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/NO_2 fall-off with distance calculator available on the LAQM Support website. Where appropriate, non-automatic annual mean NO_2 concentrations corrected for distance are presented in Table B.1.

City of Wolverhampton Council required NO_2 fall off distance calculations on Site ID's DUD and TRI, the calculation data is presented in Table C.4. The monitoring location TRI is not located between 0.1m to 50m, thus no concentration predicted at the receptor was determined.

Table C.4 – NO_2 Fall off With Distance Calculations (concentrations presented in µg/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
DUD	4.5	3.0	21.4	17.0	21.9	
TRI	73.0	63.0	18.5	18.2	-	Warning: Monitoring Site to Kerb must be between 0.1m and 50m to calculate

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
						concentration. Please check distances and update STEP 2 - Diffusion Tube Inputs tab Columns Distance to Relevant Exposure and Distance to Kerb of Nearest Road.

QA/QC of Automatic Monitoring

The City of Wolverhampton Council outsources the data management of automatic monitoring data to Geoff Broughton of Air Quality Data Management (AQDM) organisation and undertakes the Local Site Operative (LSO) duties within the Council.

The Council follows the QA/QC procedures outlined in Chapter 7 of LAQM.TG22 in order to minimise data loss and achieve the required data capture.

The chemiluminescent monitors are calibrated daily by the Council using on site calibration gases, which involves feeding zero air gas, followed by a span gas containing a known concentration of NO_2 through the analyser. A correction factor is then applied based on the analyser's response. Data is stored in both raw and corrected form and Geoff Broughton of AQDM analyses and corrects it where necessary, alongside Dean Gooch of City of Wolverhampton Council.

A site visit is conducted each month to automatic monitoring locations to change filters and undertake a manual calibration which is compared to the automatic daily calibrations. Copies of the calibration reports, calibration gas logs and engineer's reports are retained on file. These can be obtained by contacting the Environmental Protection Team at the Council.

All sites are covered by a service contract provided by Enviro Technology Services Plc (ET) and are serviced every 6 months by an ET service engineer in accordance with the manufacturer's instructions and warranty conditions. ET also provide a 48-hour call out response to cover breakdowns. Data is examined by Geoff Broughton and Dean Gooch on a regular basis to screen out erroneous and unusual measurements in accordance with the guidance in Chapter 7 of LAQM.TG22. The data presented in the report has been

ratified by Geoff Broughton and Dean Gooch, and data is available upon request to the Environmental Protection Team at the Council.

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

It is noted that the Council revoked PM_{10} and $PM_{2.5}$ monitoring at automatic monitors Lichfield Street, Foxlands Avenue, Stafford Road, Penn Road and Willenhall Road due to a lack of VCM mode technical support for the TEOM1400a instrumentation. Thus, all instruments besides one have ceased to monitor PM and the PM_{10} data presented by the remaining automatic monitor St Peter's Square has not been corrected and is used for trend data only.

Automatic Monitoring Annualisation

Data capture for the automatic monitor A4 (Stafford Road) was below 75% for the annual period, 92.2% for the monitored period, therefore annualisation in accordance with LAQM.TG22 is required for the instrument. Results were annualised by Dean Gooch of City of Wolverhampton Council using the guidance as per Chapter 7: NO_x and NO_2 Monitoring in LAQM.TG22, and the 2022 NO_2 annualised annual mean was confirmed for the site as 26.5µg/m^3. Results from annualisation are presented in Table C.1. All remaining automatic monitors achieved data capture above 90%, thus do not require annualisation.

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 NO_2 fall-off with distance calculator available on the LAQM Support website. Where appropriate, non-automatic annual mean NO_2 concentrations corrected for distance are presented in Table B.1.

No automatic NO_2 monitoring locations with City of Wolverhampton Council required distance correction during 2022.

Figure C.1 – National Bias Adjustment Factor Spreadsheet (03/23)

National Diffusion Tube Bias Adjustment Factor Spreadsheet — Spreadsheet Version Number: 03/23

Follow the steps below **in the correct order** to show the results of **relevant** co-location studies
Data only apply to tubes exposed monthly and are not suitable for correcting individual short-term monitoring periods
Whenever presenting adjusted data, you should state the adjustment factor used and the version of the spreadsheet
This spreadhseet will be updated every few months: the factors may therefore be subject to change. This should not discourage their immediate use.

This spreadsheet will be updated at the end of June 2023

LAQM Helpdesk Website

The LAQM Helpdesk is operated on behalf of Defra and the Devolved Administrations by Bureau Veritas, in conjunction with contract partners AECOM and the National Physical Laboratory.

Spreadsheet maintained by the National Physical Laboratory. Original compiled by Air Quality Consultants Ltd.

Step 1: Select the Laboratory that Analyses Your Tubes from the Drop-Down List

If a laboratory is not shown, we have no data for this laboratory.

Step 2: Select a Preparation Method from the Drop-Down List

If a preparation method is not shown, we have no data for this method at this laboratory.

Step 3: Select a Year from the Drop-Down List

If a year is not shown, we have no data[2]

Step 4:

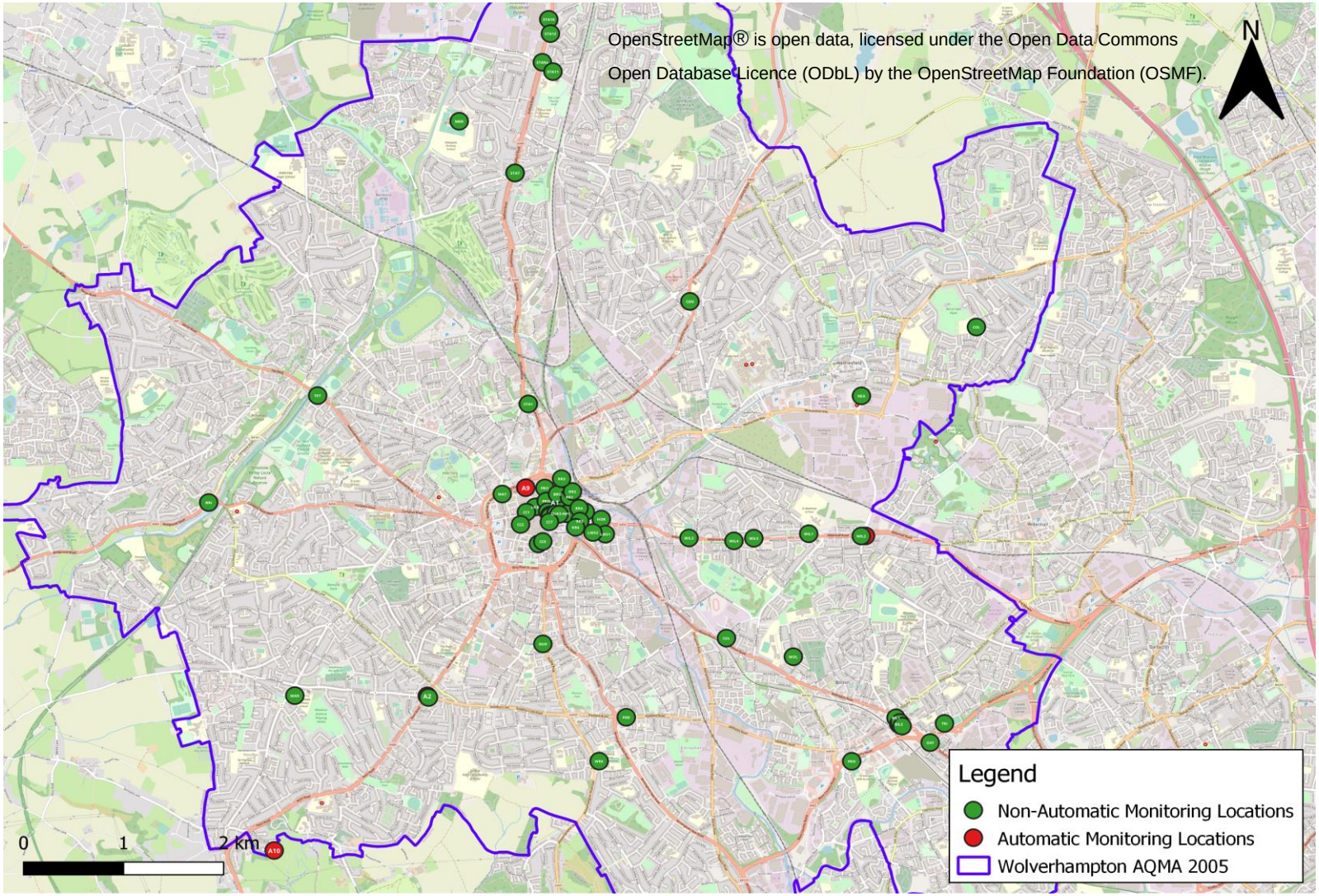
Where there is only one study for a chosen combination, you should use the adjustment factor shown with caution. Where there is more than one study, use the overall factor[3] shown in blue at the foot of the final column.

If you have your own co-location study then see footnote[4]. If uncertain what to do then contact the Local Air Quality Management Helpdesk at LAQMHelpdesk@bureauveritas.com or 0800 0327953

Analysed By[1]	Method	Year[5]	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m³)	Automatic Monitor Mean Conc. (Cm) (µg/m³)	Bias (B)	Tube Precision[6]	Bias Adjustment Factor (A) (Cm/Dm)
Socotec Didcot	50% TEA in acetone	2022	UB	Torfaen County Borough Council	13	13	10	33.4%	G	**0.75**
Socotec Didcot	50% TEA in acetone	2022	R	Bridgend Council	12	37	27	40.6%	G	**0.71**
Socotec Didcot	50% TEA in Acetone	2022	R	Cardiff Council / Shared Regulatory Services	11	42	33	27.3%	G	**0.79**
Socotec Didcot	50% TEA in Acetone	2022	R	Dacorum Borough Council	12	24	18	30.8%	G	**0.76**
Socotec Didcot	50% TEA in Acetone	2022	UB	Gravesham Borough Council	11	22	18	19.6%	G	**0.84**
Socotec Didcot	50% TEA in Acetone	2022	UB	Gravesham Borough Council	11	26	22	17.0%	G	**0.85**
Socotec Didcot	50% TEA in acetone	2022	R	Kingston Upon Hull City Council	12	30	23	27.9%	G	**0.78**
Socotec Didcot	50% TEA in acetone	2022	UB	Kingston Upon Hull City Council	12	24	18	35.0%	G	**0.74**
SOCOTEC Didcot	50% TEA in acetone	2022	UB	City Of York Council	12	16	13	31.6%	G	**0.76**
SOCOTEC Didcot	50% TEA in acetone	2022	R	City Of York Council	12	25	19	28.7%	G	**0.78**
SOCOTEC Didcot	50% TEA in acetone	2022	R	City Of York Council	11	23	17	37.2%	G	**0.73**
SOCOTEC Didcot	50% TEA in acetone	2022	R	City Of York Council	11	37	27	37.6%	G	**0.73**
SOCOTEC Didcot	50% TEA in acetone	2022	R	East Suffolk Council	11	32	23	38.6%	G	**0.72**
SOCOTEC Didcot	50% TEA in acetone	2022	R	Ipswich Borough Council	11	42	28	50.4%	G	**0.66**
SOCOTEC Didcot	50% TEA in acetone	2022	KS	Marylebone Road Intercomparison	12	60	42	40.7%	G	**0.71**
SOCOTEC Didcot	50% TEA in acetone	2022	R	North East Lincolnshire Council	10	46	31	49.4%	G	**0.67**
SOCOTEC Didcot	50% TEA in acetone	2022	R	North East Lincolnshire Council	10	28	27	3.7%	G	**0.96**
SOCOTEC Didcot	50% TEA in acetone	2022	R	Wrexham County Borough Council	12	16	14	15.5%	G	**0.87**
SOCOTEC Didcot	50% TEA in Acetone	2022	R	Horsham District Council	11	25	22	14.4%	G	**0.87**
SOCOTEC Didcot	50% TEA in acetone	2022	R	Leeds City Council	12	40	29	37.8%	G	**0.73**
SOCOTEC Didcot	50% TEA in acetone	2022	KS	Leeds City Council	11	33	23	44.6%	G	**0.69**
SOCOTEC Didcot	50% TEA in acetone	2022	R	Leeds City Council	12	43	34	26.0%	G	**0.79**
SOCOTEC Didcot	50% TEA in acetone	2022	R	Leeds City Council	11	41	30	34.2%	G	**0.75**
SOCOTEC Didcot	50% TEA in acetone	2022	R	Leeds City Council	12	30	22	36.3%	G	**0.73**
SOCOTEC Didcot	50% TEA in acetone	2022	UC	Leeds City Council	12	30	22	34.1%	G	**0.75**
SOCOTEC Didcot	50% TEA in Acetone	2022	R	Thanet District Council	12	23	17	29.1%	G	**0.77**
SOCOTEC Didcot	50% TEA in acetone	2022		**Overall Factor[3] (26 studies)**				**Use**		**0.76**

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

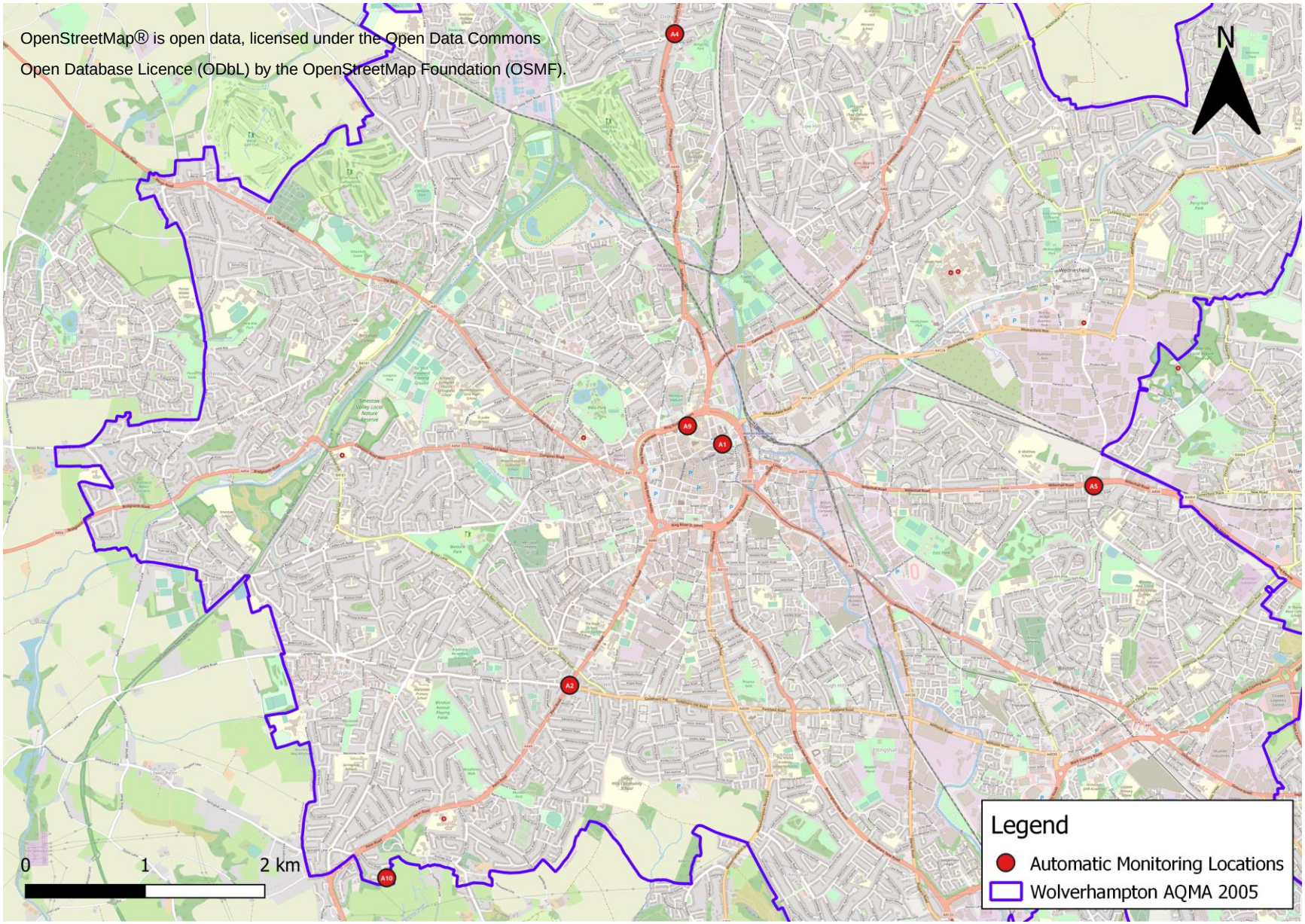
Figure D.1 – Map of All Monitoring Sites



NOTE: Automatic locations paired with non-automatic monitoring stations, thus overlap on Figure D.1 –

- A1 – LIC7;
- A2 – PEN;
- A4 – STA7; and
- A5 – WIL2.

Figure D.2 – Map of All Automatic Monitoring Sites



NOTE:

Automatic locations discontinued in Figure D.2 –

- A1;
- A4; and
- A10.

Figure D.3 – Map of All Non-Automatic Monitoring Sites

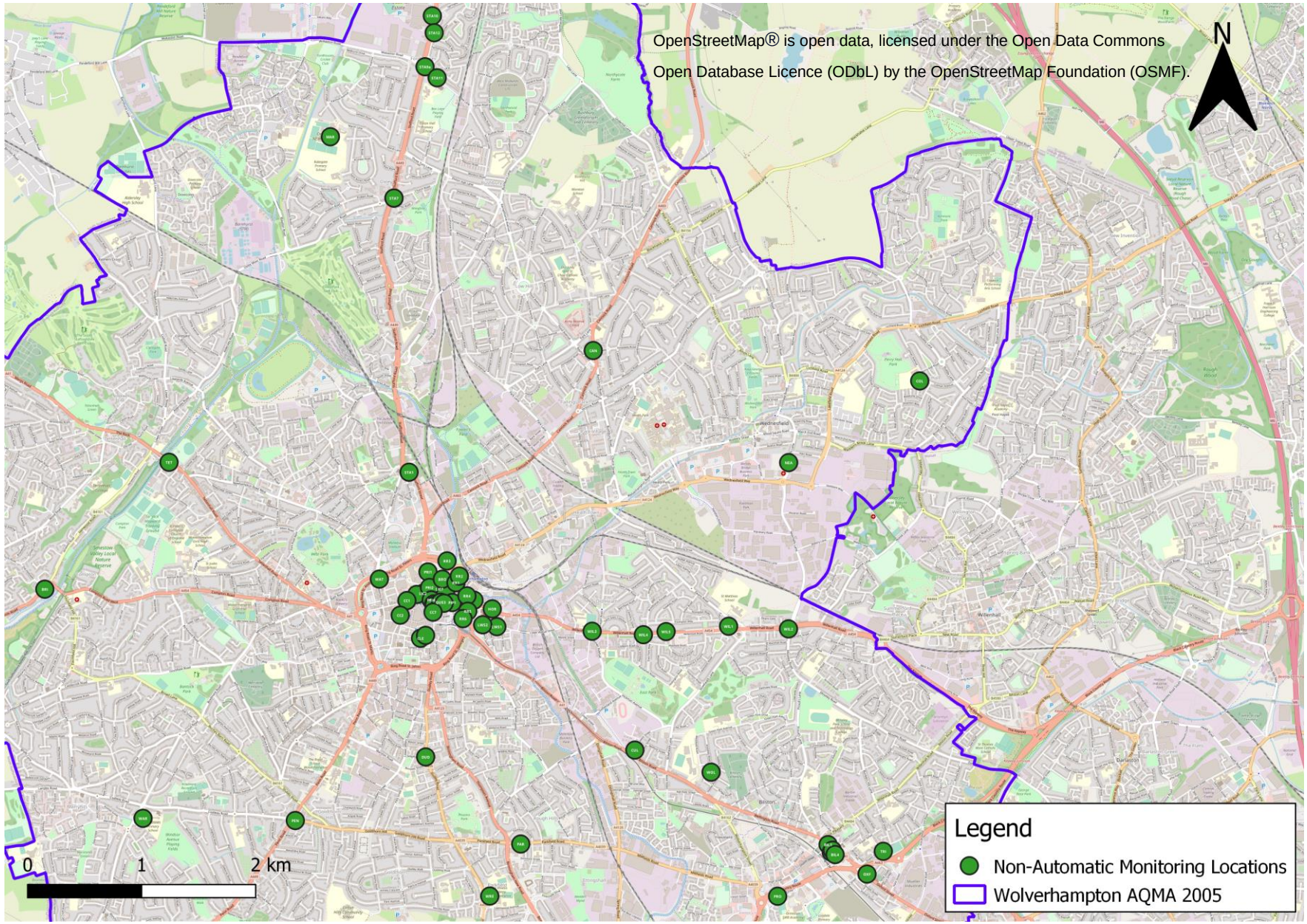


Figure D.4 – Map of Non-Automatic Monitoring Sites – Pendeford

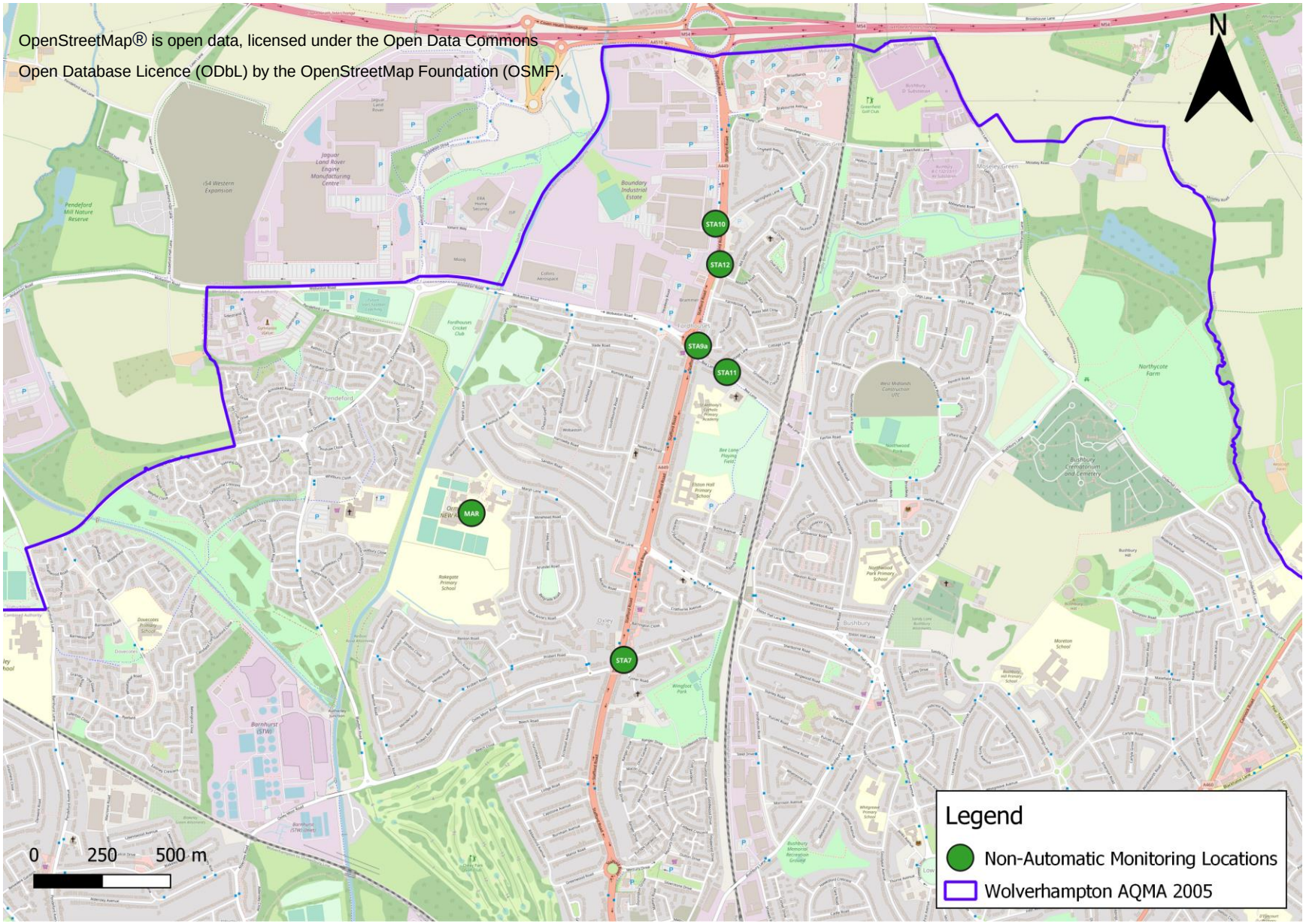


Figure D.5 – Map of Non-Automatic Monitoring Sites - Wednesfield

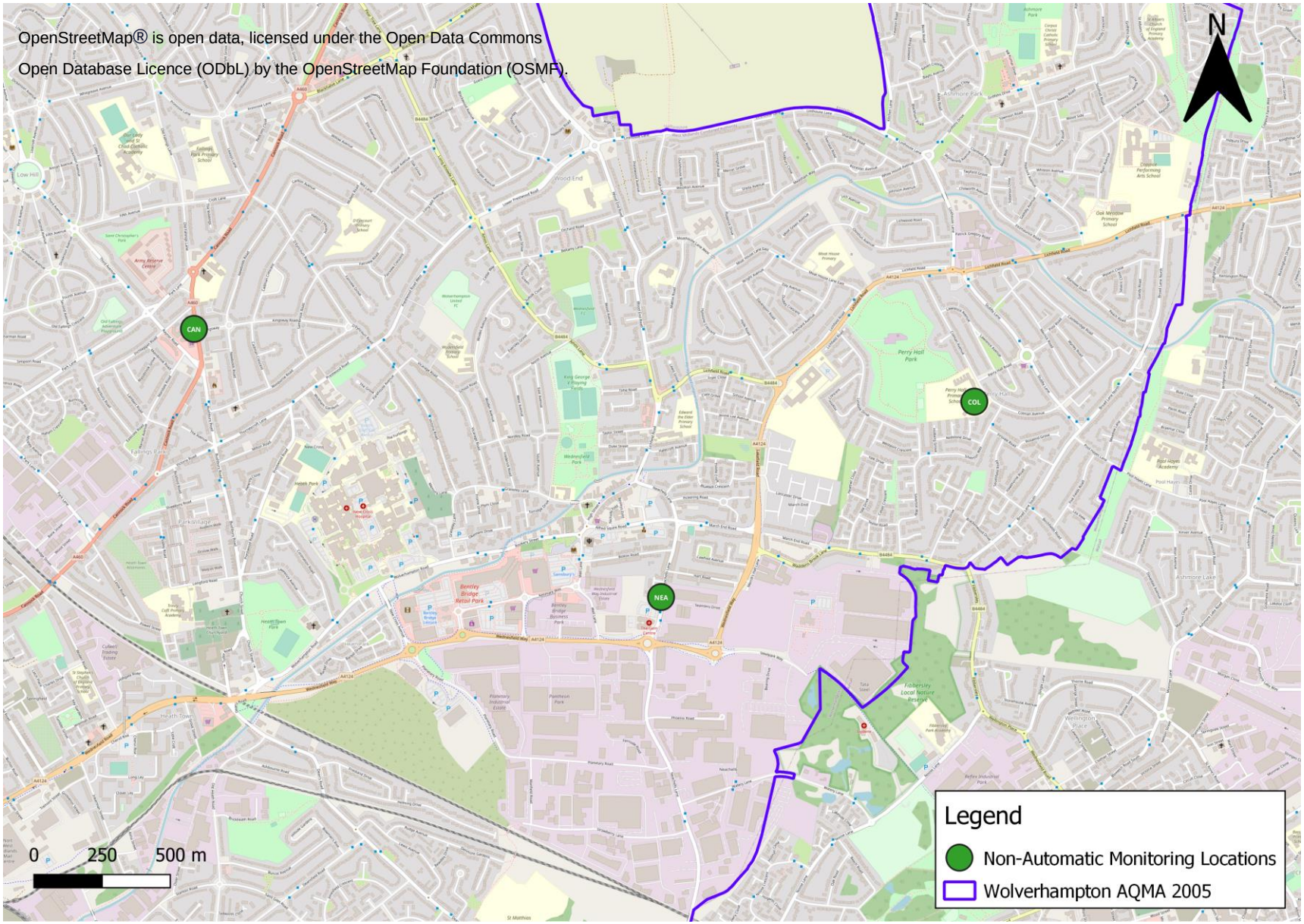


Figure D.6 – Map of Non-Automatic Monitoring Sites – East Park

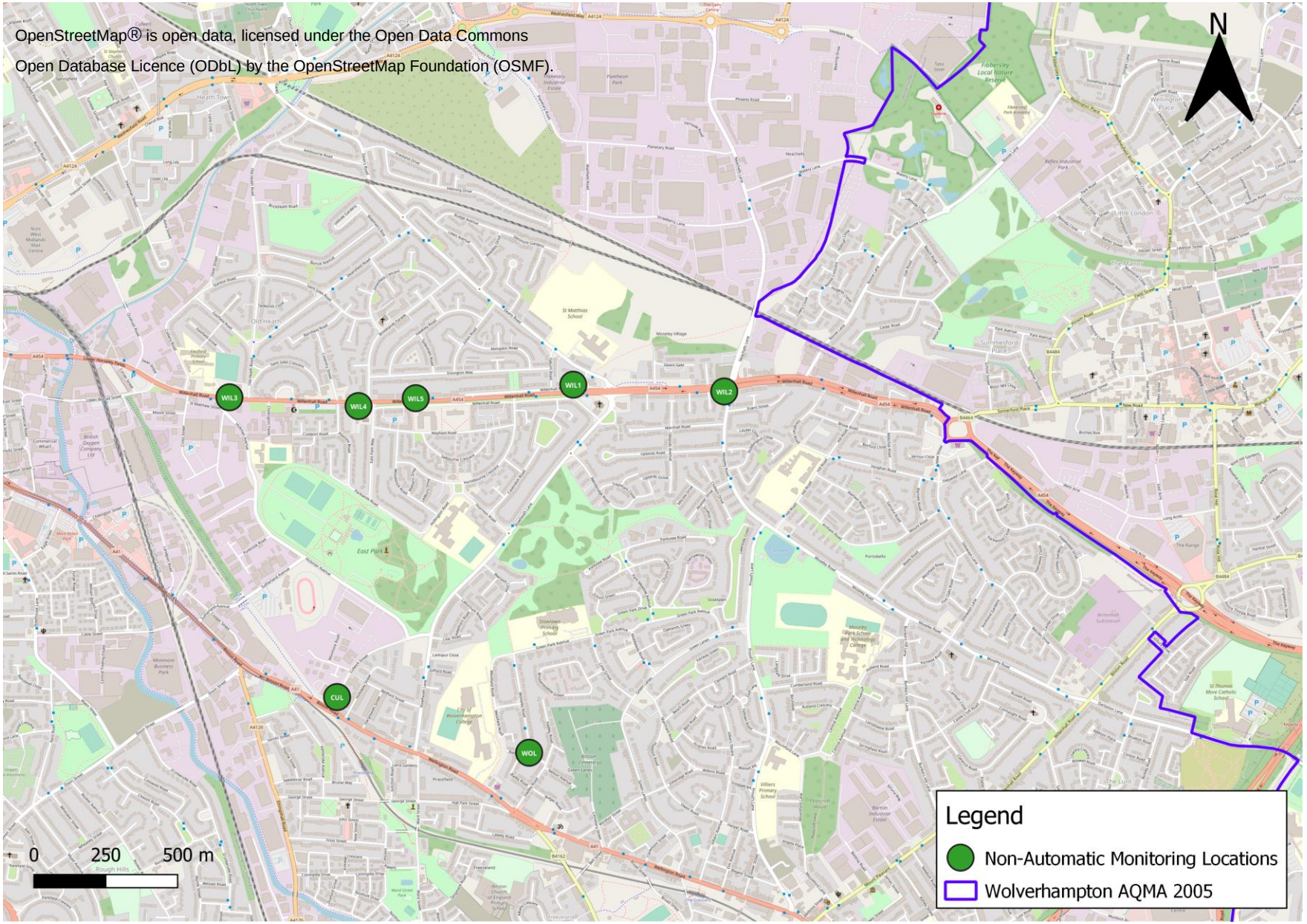


Figure D.7 – Map of Non-Automatic Monitoring Sites – Bilston

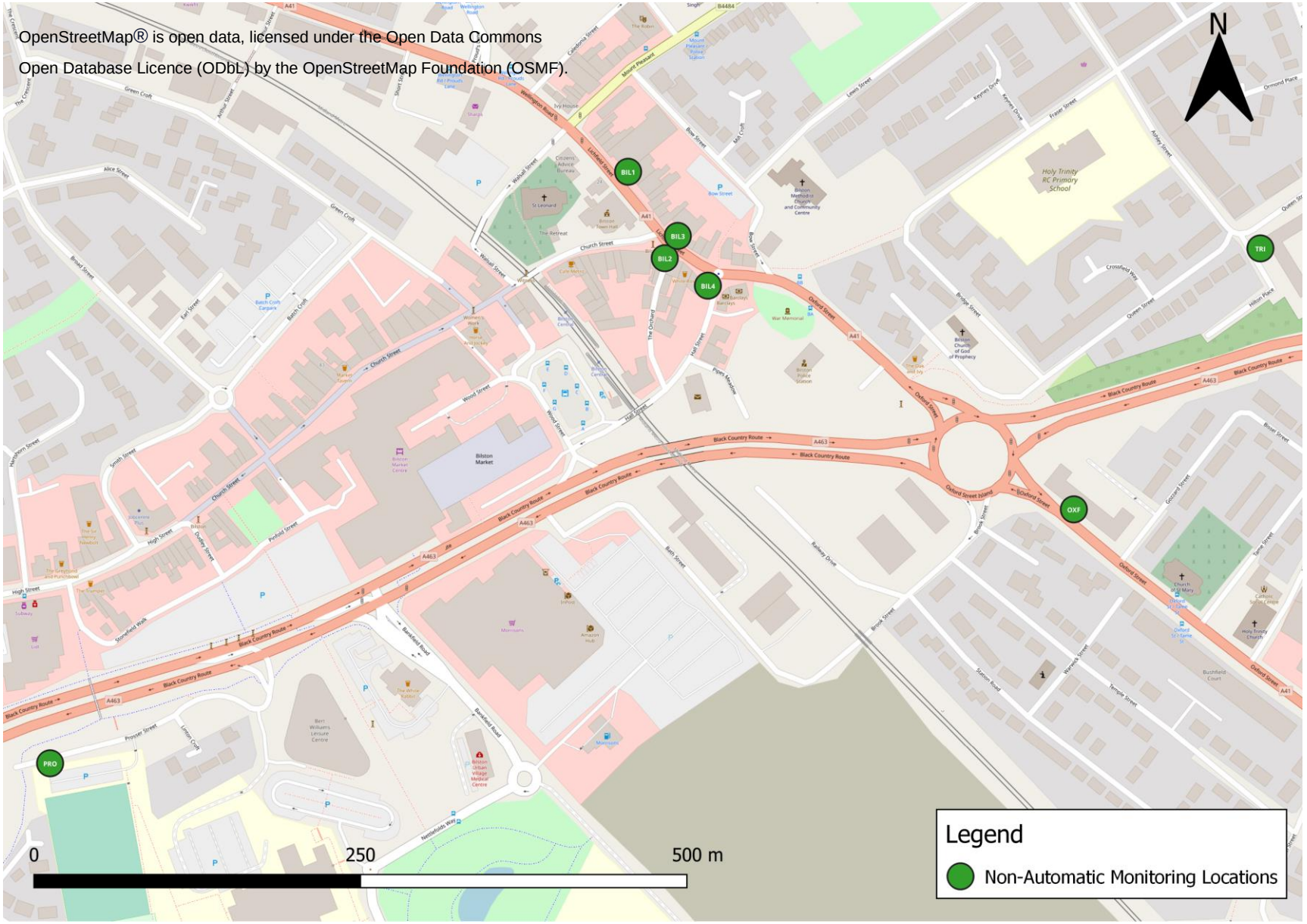


Figure D.8 – Map of Non-Automatic Monitoring Sites – Tettenhall and Compton

Figure D.9 – Map of Non-Automatic Monitoring Sites – Penn

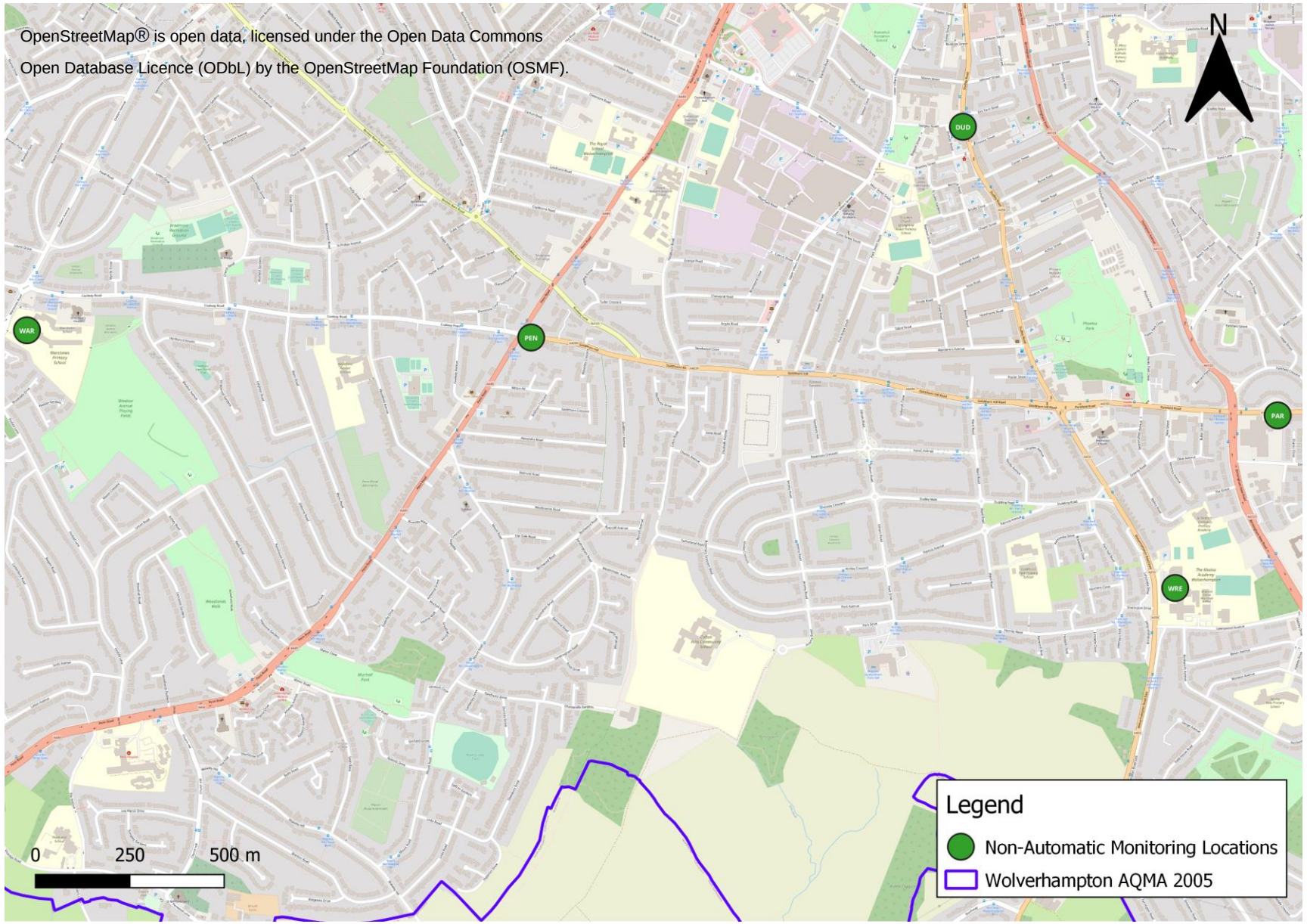


Figure D.10 – Map of Non-Automatic Monitoring Sites – City Centre

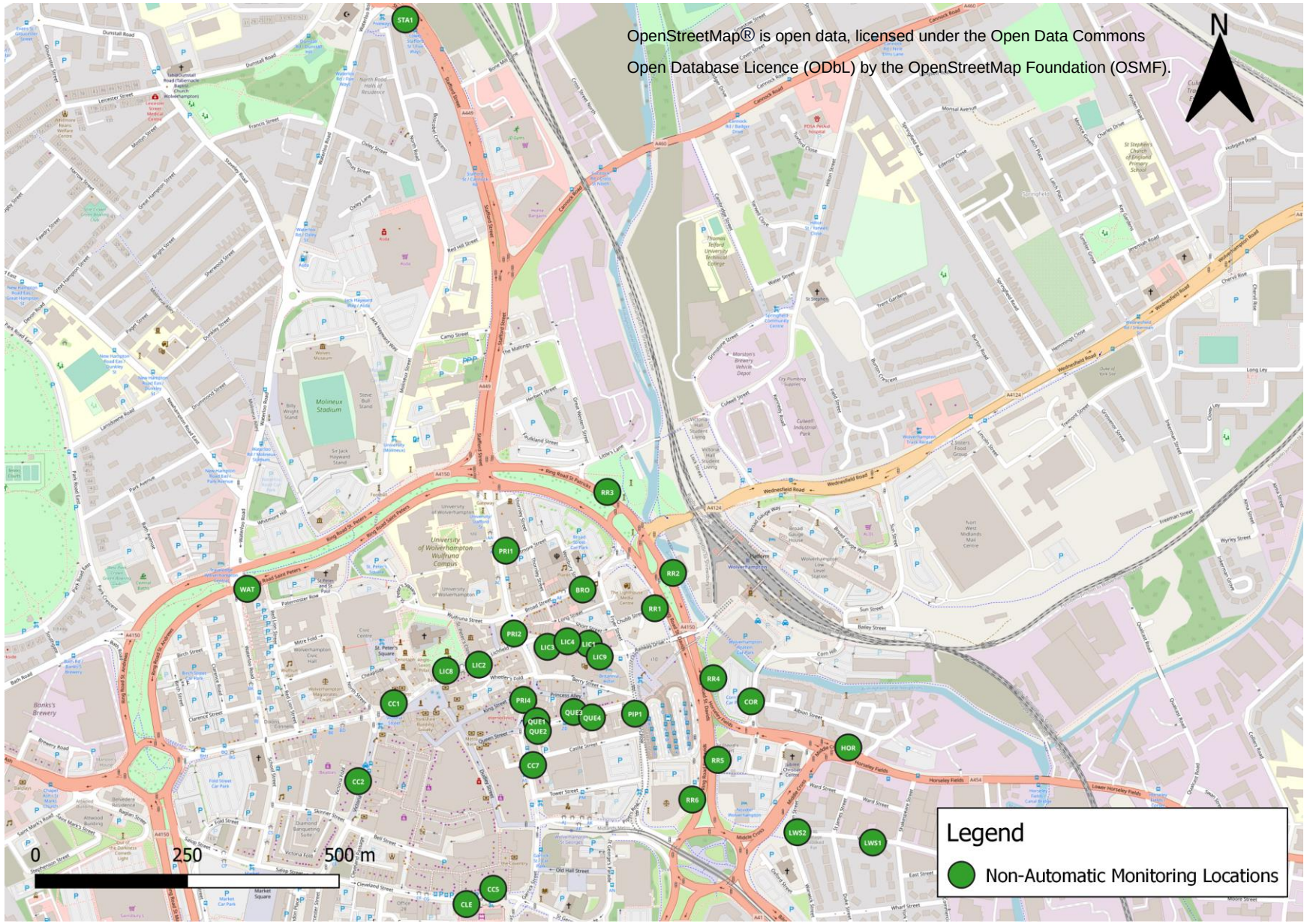
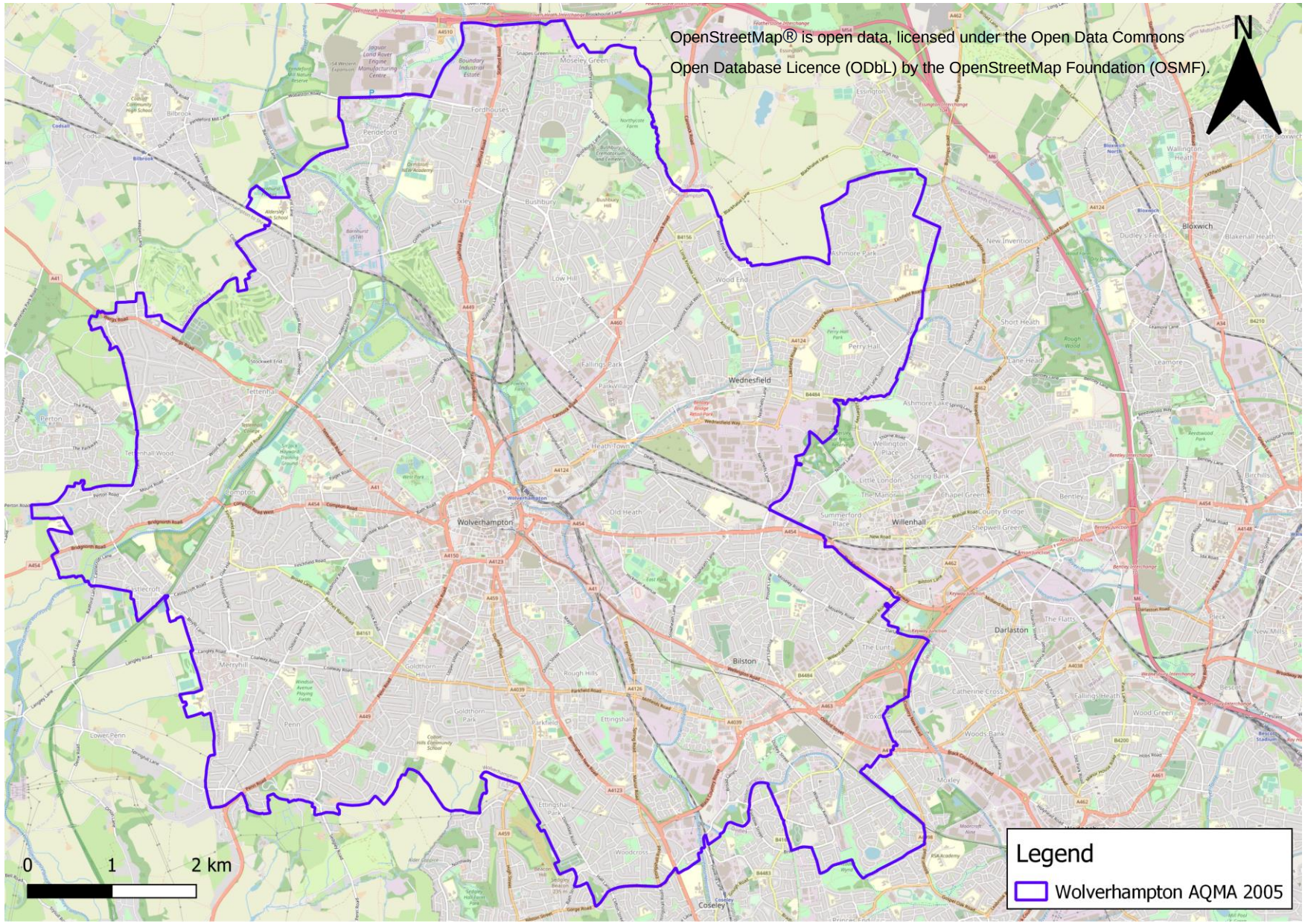


Figure D.11– Map of Wolverhampton Air Quality Management Area (AQMA) 2005



Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England[7]

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

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

Glossary of Terms

Abbreviation	Description
AONB	Area of Outstanding Natural Beauty
AQA	Air Quality Assessment
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'
AQDM	Air Quality Data Management
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
AQS	Air Quality Standard
ASR	Annual Status Report
CO_2	Carbon Dioxide
COVID-19	Coronavirus-19 – An acute disease in humans caused by a coronavirus, which is characterized mainly by fever and cough and is capable of progressing to severe symptoms and in some cases death, especially in older people and those with underlying health conditions. It was originally identified in China in 2019 and became pandemic in 2020
CWZ	Core Walking Zone
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by National Highways
ET	Enviro Technology Services Plc
EV	Electric Vehicle
LAQM	Local Air Quality Management
LCWIP	Local Cycling and Walking Infrastructure Plan
LEV	Low Emission Vehicle
LiveTAP	Live Visualisation of Emissions – Towards Informed Avoidance of Pollution Hotspots
LSO	Local Site Operative
NHS	National Health Service
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides

Abbreviation	Description
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
SCA	Smoke Control Area
SO_2	Sulphur Dioxide
SSSI	Sites of Special Scientific Interest
TEA	Triethanolamine
TfWM	Transport for West Midlands
ULEV	Ultra Low Emission Vehicle
VCM	Volatile Correction Model
WFH	Working From Home

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.
- City of Wolverhampton ASR 2022.
- National Diffusion Tube Bias Adjustment Factor Spreadsheet, published March 2023.
- Diffusion Tube Data Processing Tool version 3.0, published March 2023, Defra.
- Public Health Outcomes Framework, Public Health England.