2024 Air Quality Annual Status Report (ASR)

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

Date: June 2024

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Executive Summary: Air Quality in Our Area

Air Quality in Bristol

Health Effects

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

Air pollution particularly affects the most vulnerable in society, children, the elderly, and those with existing heart and lung conditions. Additionally, people living in less affluent areas are most exposed to dangerous levels of air pollution[2]. The pattern in Bristol between areas of deprivation and air pollution levels is complex. Whilst some less affluent areas are in locations with some of the highest levels of pollution, others are on the outskirts of the city, where air pollution levels are better than some more central, relatively affluent areas.

There is increasing evidence showing health effects of exposure to levels of pollutants below the legal limit values, and no obvious thresholds have been detected for the effects for air pollution at a population level. This evidence has been reflected by the updated World Health Organisation's (WHO) Global Air Quality Guidelines published in 2021. The WHO's annual average air quality guidelines were reduced from 10µg/m^3 to 5µg/m^3 for fine particulate matter ($PM_{2.5}$) and from 40µg/m^3 to 10µg/m^3 for NO_2. The absence of thresholds of effect for common air pollutants is likely to be partly due to variability between individuals' sensitivity to the pollutants studied[3].

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

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

[3] Chief Medical Officer's annual report (2022): Air Pollution. Chief Medical Officer's Annual Report 2022 (publishing.service.gov.uk)

There is evidence that short-term exposure to particulate matter (PM) is associated with hospital admissions for respiratory conditions. The US Environmental Protection Agency (US EPA) has an Integrated Science assessment for PM[4] which concluded that short-term exposures to $PM_{2.5}$ are likely to be causally associated with respiratory effects, particularly exacerbations of asthma and chronic obstructive pulmonary disease (COPD) and respiratory-related diseases. Short-term exposure to $PM_{2.5}$ causes cardiovascular effects, with the strongest evidence from epidemiological studies for ischaemic heart disease, stroke and heart failure emergency department and hospital admissions, along with cardiovascular-related mortality[3].

People in lower socio-economic groups are more likely to have pre-existing health conditions earlier in life, and the higher exposures to air pollution may add to the greater burden of poor health. Studies of hospital admissions and mortality show increased health risks associated with exposure to air pollution among those living in areas of higher socio-economic deprivation[3].

Air pollution has negative effects on health throughout the life course, from pre-birth to old age, summarised in Table ES 1.

Table ES 1 - Health Effects of Air Pollution Throughout Life[3]

Pregnancy	Children	Adults	Elderly
Low birth weight	Asthma	Asthma	Asthma
	Slower lung function development	Coronary heart disease	Accelerated decline in lung function
	Development problems	Stroke	Lung cancer
	More wheezing and coughs	Lung cancer	Diabetes
	Start of atherosclerosis (narrowing of arteries)	Chronic obstructive pulmonary disease (COPD)	Dementia
		Diabetes	Heart attack, heart failure and stroke

[4] Integrated Science Assessments (ISAs) | US EPA

Table ES 2 provides a brief explanation of the key pollutants relevant to Local Air Quality Management and the kind of activities they might arise from.

Table ES 2 - Description of Key Pollutants

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

Monitoring

Pollutants such as sulphur dioxide, carbon monoxide and some heavy metals used to be monitored in Bristol. However, this has ceased as compliance with health-based air quality objectives for these pollutants has been demonstrated. Extensive monitoring of nitrogen dioxide continues throughout the city. Nitrogen dioxide concentrations have demonstrated an improving trend since 2010; however, some exceedances of objectives for this pollutant were still measured in the city in 2023.

Air Quality Management Areas (AQMAs) are declared when there is an exceedance or likely exceedance of an air quality objective. Further information related to declared AQMAs can be found on the Defra website, including maps of AQMA boundaries.

Due to exceedance of the annual and hourly objectives for NO_2 and possible exceedance of PM_{10} objectives, Bristol City Council declared an AQMA in 2001. It covers the whole of the city centre and most of the main arterial routes into the city. Due to ongoing exceedances of national pollution objectives, the AQMA is still in place in 2023. Approximately 100,000 people live within Bristol's AQMA. It includes the central employment, leisure and shopping districts, major hospitals, and dozens of schools and therefore many more people are exposed to air pollution in the AQMA in their daily lives than just those living in the AQMA. There are also two small AQMAs in South Gloucestershire, in Kingswood\Warmley and Staple Hill.

Bristol's monitoring network is focused on nitrogen dioxide (NO_2), as the concentrations of

this pollutant near busy roads exceed the health-based UK objectives and EU limit values.

The Bristol City Council (BCC) and Defra monitoring network in 2023 consisted of:

- 8 real time NO_2 monitors, 7 of which are BCC operated. The site at St Pauls is part of the national Automatic Urban and Rural Network (AURN) operated by Defra. Data from all of these sites is uploaded automatically to a BCC Open Data Portal.
- 4 real time particulate monitors (2 x $PM_{2.5}$ and 2 x PM_{10}). The PM_{10} and $PM_{2.5}$ monitors operated at St Pauls and Temple Way are part of the Defra operated AURN network.
- 1 real time Ozone (O_3) monitor, operated by Defra as part of the AURN network
- 196 NO_2 diffusion tubes which provide a monthly and annual concentration for this pollutant.

Defra operate the Bristol St Pauls monitoring site which measures NO_2, particulate matter (PM_{10} and $PM_{2.5}$) and O_3. This site is in St Pauls at an “urban background” location away from busy roads. This Defra site is representative of general pollution levels over central Bristol but not of pollution levels at busy roadside locations in the city. Defra operate the PM_{10} monitor at the Temple Way site which also houses a BCC operated NO_2 analyser. This is known as an affiliate site where Defra and the local authority share infrastructure that houses monitoring equipment. All other sites are owned and operated by Bristol City Council.

Nitrogen Dioxide

The air quality data has shown that, on average, NO_2 pollution levels were lower in 2023 when compared to 2022. In November 2022 Bristol City Council introduced a Clean Air Zone (CAZ), under direction from Government, to achieve compliance with air quality limit values in the shortest time possible. Whilst annual air pollution concentrations can be impacted significantly year on year by factors such as the prevailing meteorological conditions, the data suggests that the CAZ has contributed to a significant fall in annual NO_2 concentrations. Out of the 193 NO_2 monitoring locations that had data collected for both 2022 and 2023, 176 showed a reduction in annual NO_2 levels when comparing 2023 concentrations to those measured in 2022. The average change in measured annual NO_2 concentrations between 2022 and 2023 showed a 13.2% decrease. Details of the locations where an increase in annual NO_2 concentrations were measured, when comparing 2023 to 2022 concentrations, are shown in Figure ES 3. In those 3 locations

where annual NO_2 concentrations were over 40µg/m^3 in 2023 and air pollution levels worsened when compared to 2022 (sites 3, 12 and 638), the worsening is thought to be due to non-road sources of pollution.

It should be remembered when comparing air pollution data from one year to the next that prevailing meteorological conditions can be one of the largest factors impacting on the measured differences annually between pollution levels. As a result, looking at longer term trends, over 5 years for example, can be useful. Other factors that impact roadside NO_2 pollution levels include overall traffic volumes, vehicle fleet composition and emissions and local dispersion characteristics that can be influenced by structures such as buildings, walls, and trees.

The number of vehicles on the roads, which are the main source of NO_2 pollution at our roadside monitoring locations, were significantly reduced on average during 2020 and 2021 due to Covid-19 restrictions. In 2022 however, vehicle movements returned closer to those experienced pre pandemic and this has continued into 2023. The national trend, when comparing 2023 roadside NO_2 concentrations to pre pandemic 2019 levels, is for a 30% reduction[5]. The data for Bristol shows a slightly smaller reduction at BCC roadside monitoring locations of 25.4% over this period. There are 85 monitoring locations for which 2019 and 2023 data is available. The trend analysis includes 2023 data from Sites 3 and 12. Both of these have been impacted by non-road pollution sources in 2023 and this has slightly skewed the trend results. When excluded from analysis the reduction in NO_2 concentrations in Bristol over this period is 27.3%.

Figure ES 1 shows the long-term trends in NO_2 concentrations at a selection of city centre monitoring sites at which monitoring has taken place since at least 2010. Monitoring at Rupert Street was stopped due to the change in road layout associated with the Metrobus works. The plot shows that NO_2 levels fell from 2010 to 2020 at all monitoring sites. Whilst many still exceeded objectives in 2019, 2020 was the first year in which all the sites shown achieved compliance with annual NO_2 objectives. The reduction in pollution and subsequent compliance with objectives in 2020 was a result of Covid-19 travel restrictions. In 2021, as travel restrictions were lifted, pollution levels increased accordingly. In 2023 however, all sites again achieved compliance with air quality objectives. As part of the CAZ monitoring, additional sites have been added to the monitoring network for which long

[5] Nitrogen dioxide (NO2) - GOV.UK (www.gov.uk)

terms trends cannot be shown. A small number of these sites showed monitored pollution levels that exceed the air quality objective for NO_2 in 2023. More detail will be provided in this report on the pollutant concentrations at these newer monitoring sites.

In those locations that exceed the nitrogen dioxide air quality objectives, over 80% of this pollution has been shown to be from local traffic sources. Actions and decisions by BCC and other West of England (WoE) authorities, and the decisions that citizens in the WoE make each day, with regards to how they move around the area, all directly impact upon the roadside levels of air pollution in the city.

Figure ES 1- Trends in Annual NO_2 at City Centre Sites (2010-2023)

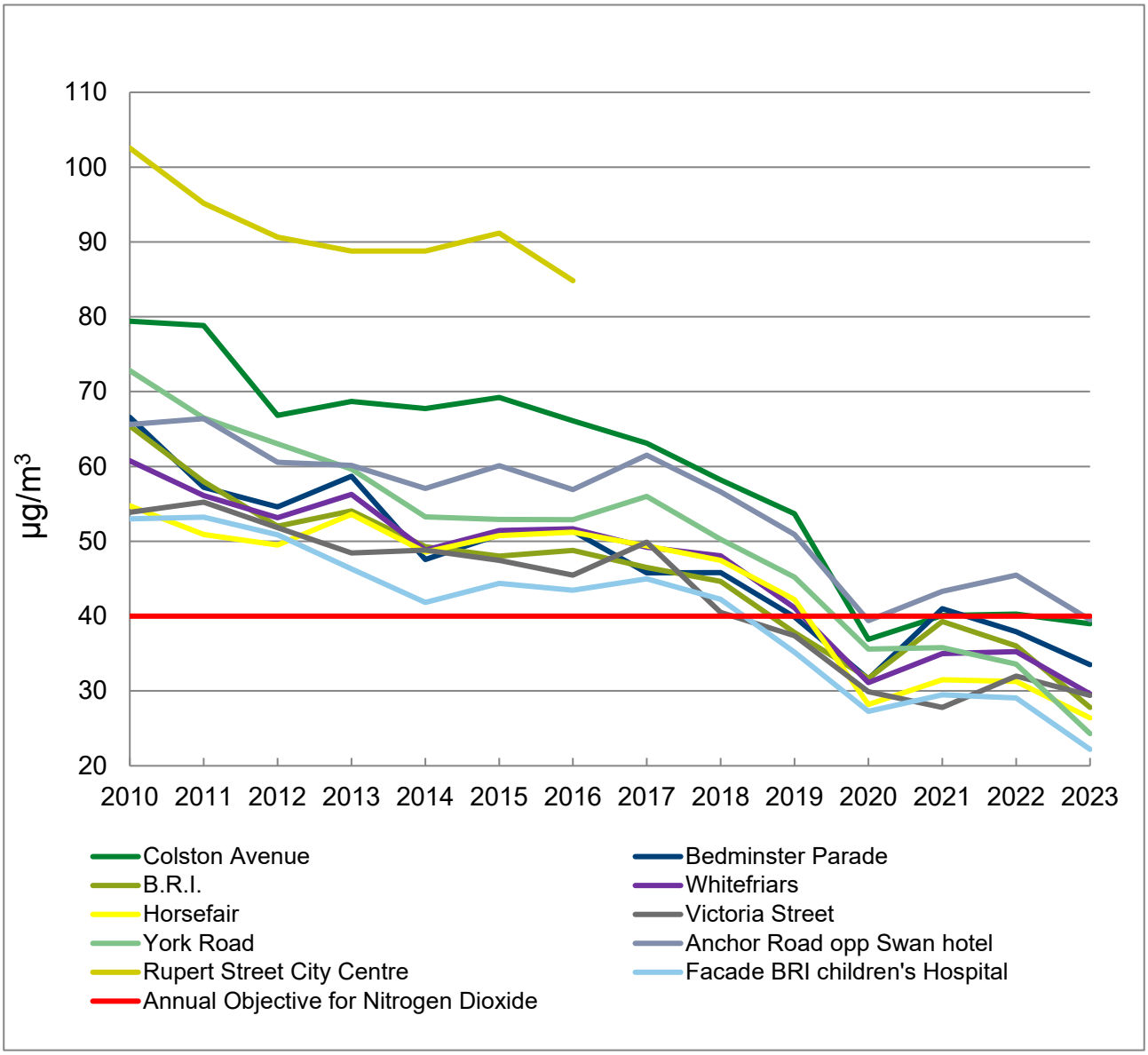


Figure ES 2 shows the locations in which monitored pollution concentrations exceed 36µg/m^3. 36µg/m^3 has been used to show locations at which there is a potential risk of exceedance of air pollution objectives in future years if vehicle movements change in a way that is detrimental to air pollution. It should be noted that these are monitoring concentrations and not the concentrations at relevant receptor locations as defined in the LAQM Technical Guidance (TG16) (e.g., facades of houses, schools, elderly people's homes, and hospitals). Monitoring at Rupert Street stopped as the monitoring location was lost due to the major changes made to the city centre layout.

Figure ES 2 - Monitoring Locations Where 2023 Annual NO_2 ≥ 36µg/m^3

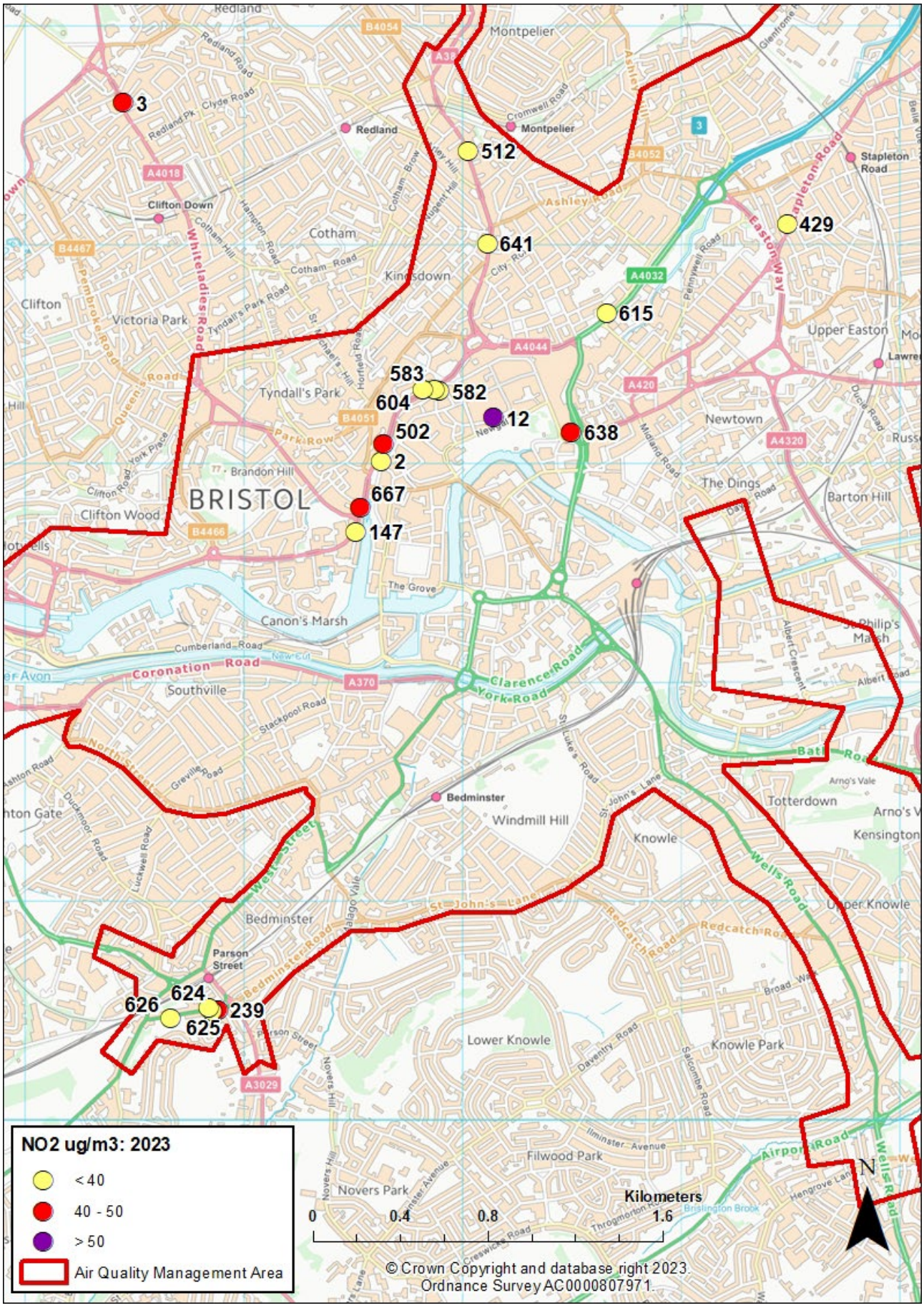
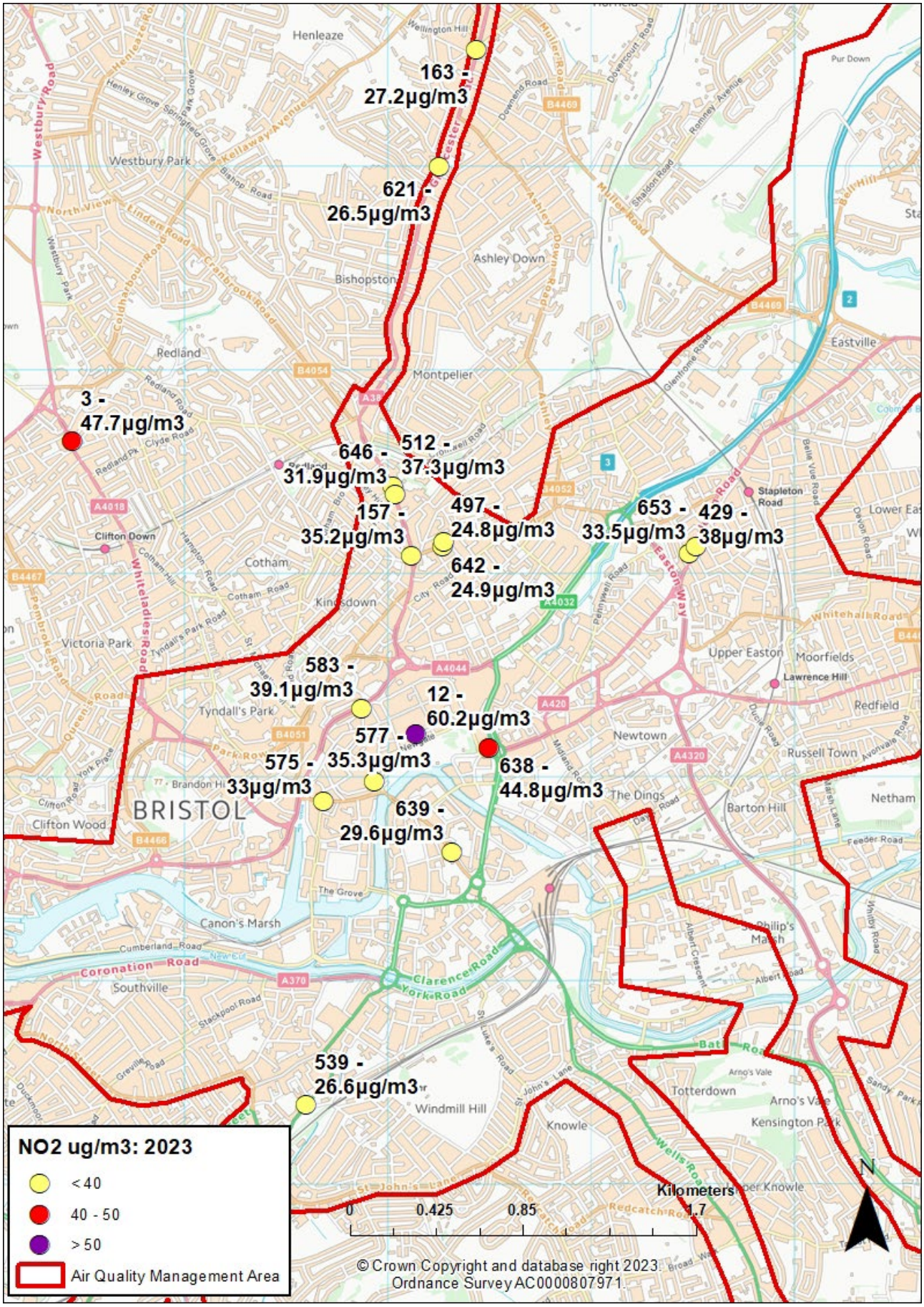


Figure ES 3 – Monitoring Locations Where Annual NO_2 Concentrations Increased in 2023 When Compared to 2022



Particulate Matter

The particulate matter (PM_{10}) trends for the past 5 years are available from an urban background site, Bristol St Pauls, and the Temple Way roadside site. At Bristol St Pauls annual PM_{10} concentrations were 15.8µg/m^3 in 2023, which is a decrease of 1.5µg/m^3 when compared to 2022. 2023 annual concentrations from the roadside Temple Way site were 17.5µg/m^3, this is a decrease of 3.4µg/m^3 compared to 2022 levels. Both sites meet the current UK annual and 24-hour objectives for PM_{10}.

$PM_{2.5}$ concentrations at Bristol St Pauls have seen a reduction since 2019 with a decrease from 10.8µg/m^3 in 2019 to 8.2µg/m^3 in 2023. 2023 annual $PM_{2.5}$ concentrations measured at the roadside site at Parsons Street School were 9.1µg/m^3. This is a decrease of 3.9µg/m^3 when compared to 2022. 2023 was the first year since monitoring started at Parsons Street that the measured $PM_{2.5}$ concentrations were below the new UK annual objective of 10µg/m^3. Both sites are above the WHO guideline value of 5µg/m^3 for $PM_{2.5}$.

Whilst much of the action to improve air pollution in the UK and Bristol has focussed on achieving compliance with nitrogen dioxide limits, it is acknowledged that it is important to take action to reduce particulate pollution to improve public health. In most cases, the measures to reduce nitrogen dioxide pollution will also reduce particulate pollution.

Particulate pollution (PM) has a range of sources, both local and regional. Vehicles are a source of PM and therefore measures to reduce NO_2 pollution from this source can also help reduce emissions of particulate matter. Combustion processes such as domestic heating (especially domestic solid fuel burning), construction activities and industry can also contribute locally. Additionally there is a contribution from sources outside of the local authority area. In the case of particulate pollution, contributions from agriculture, industry and natural sources are significant. Secondary particulate matter (PM) is formed in the atmosphere through chemical reactions between other air pollutant gases such as nitrogen oxides (NOx), ammonia (NH_3) and sulphur dioxide (SO_2).

Appliances that burn solid fuel contribute to local air pollution and evidence is that their contribution is increasing due to the popularity of solid fuel burning for occasional heating requirements, especially in the wintertime. The Department for Environment, Food & Rural Affairs (DEFRA) 2022 national emissions estimates demonstrate that domestic combustion contributes significantly to both PM_{10} and $PM_{2.5}$ emissions. Domestic combustion covers households burning a variety of fuels including wood, coal, solid smokeless fuels, and fuels derived from waste such as coffee logs. This was a major source of PM emissions in 2022, as it contributed 29% of total $PM_{2.5}$ emissions and 15% of

total PM_{10} emissions. Most emissions from this source come from households burning wood in stoves and open fires. Emissions of $PM_{2.5}$ and PM_{10} from domestic wood burning increased by 56% between 2012 and 2022. In the 1970s, 1980s and 1990s, coal combustion was the primary source of PM emissions from households; yet the use of coal as a fuel has fallen over time (in 2022 the combustion of coal contributed 12% of $PM_{2.5}$ emissions from domestic combustion)[6].

Bristol City Council commissioned a study, Impact of Solid Fuel Burning in Bristol: Policy Options for Reducing Emissions, to try to determine the scale of solid fuel burning in the city and the contribution that it has to particulate pollution. In additional to the report quantifying pollutant emissions from solid fuel use, a report into the emissions from construction Non-Road Mobile Machinery (NRMM) has also been commissioned by BCC.

Actions to Improve Air Quality

The national Environmental Improvement Plan[7] sets out actions that will drive continued improvements to air quality to meet the new national interim and long-term $PM_{2.5}$ targets. The National Air Quality Strategy, published in 2023, provided more information on Local Authorities' responsibilities to work towards these new targets and reduce $PM_{2.5}$ in their areas. The Road to Zero[8] 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.

As previously discussed, air pollution in those locations exceeding the health-based limits for nitrogen dioxide originates predominantly from motor vehicles. The approach to reducing NO_2 concentrations is focused on measures to reduce the number of vehicles on our roads, clean up the emissions from those vehicles and to reduce congestion.

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[6] Department for Environment, Food & Rural Affairs (Defra). Emissions of air pollutants in the UK – Particulate matter (PM10 and PM2.5). Updated 19 February 2024. Available from: https://www.gov.uk/government/statistics/emissions-of-air-pollutants/emissions-of-air-pollutants-in-the-uk-particulate-matter-pm10-and-pm25

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

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

Development of a Clean Air Zone

Bristol City Council has been directed by the UK Government to achieve compliance with air quality objectives in the shortest possible time. A small area Class D Clean Air Zone (CAZ) came into operation in November 2022. This Annual Status Report provides commentary of the air pollution data in the first full calendar year operation of the CAZ.

For updates on the progress with the Bristol Clean Air Plan please visit the Clean Air for Bristol Website.

Bristol Transport Strategy

The Bristol Transport Strategy was adopted in July 2019 and sets out a vision on how the city will:

- create an inclusive transport system that provides realistic transport options for everyone;
- create healthy places that promote active transport, improve air quality, and improve road safety;
- make better use of our streets to enable more efficient journeys;
- enable more reliable journeys by minimising the negative impact of congestion; and
- support sustainable growth by enabling efficient movement of people and goods, reducing carbon emissions.

Bristol City Council have developed a Shared Mobility Position Statement which is an annex of the Bristol Transport Strategy. This sets out a policy framework for how different shared mobility modes can help Bristol City Council meet transport and wider city objectives. Shared mobility refers to types of transport that are shared with other people, either concurrently or one after another. This includes car clubs, short term car rentals or micro mobility options such as e-bikes, e-cargo bikes, or e-scooters.

Transport Corridor Improvements

Over the next 10 years Bristol City Council and West of England Combined Authority are proposing to introduce significant improvements to key transport routes across the city.

This is an ambitious project to improve how people travel across the city along key transport routes, making it easier to connect people to jobs and leisure opportunities, anticipating a growing population and supporting the city's health and economic growth.

The aim is to make it easier and more convenient to use the bus, walk and cycle wherever possible, rather than use private cars. This project aims to make walking and cycling more attractive and to give priority to buses through infrastructure improvements. This would reduce air pollution to improve the health of everyone.

The scheme will support other transport initiatives such as the Local Cycling and Walking Infrastructure Plan. Details of the plans for the transport corridors can be found on the TravelWest website.

Liveable Neighbourhood Projects

Liveable neighbourhoods are areas of a city that are improved to be people-centred and more 'liveable'. They are safe, healthy, inclusive, and attractive places where everyone can breathe clean air, have access to better quality green spaces and safe spaces to play, and feel a part of a community. The improvements in a liveable neighbourhood aim to make it easier to catch a bus and to walk or cycle, with improved infrastructure and less through traffic.

An East Bristol pilot liveable neighbourhood is being developed in an area including Barton Hill and parts of Redfield and St George, south of Church Road and north of the river Avon. This pilot project is being designed with the local community to make sure it will meet local needs. The trial scheme has been approved by BCC after recent consultation and will be implemented in 2024.

Stakeholder engagement will start to take place in 2024 for a second liveable neighbourhood area in south Bristol. More information on the project can be found at the South Bristol Liveable Neighbourhood website.

School Streets

Bristol City Council is committed to making Bristol's streets safer for everyone living, working, and visiting the city. An area of priority are the streets outside our schools. One of the ways we are doing this is through the introduction of School Streets, whereby the street or streets immediately outside the school entrance are closed to non-essential vehicles at school opening and closing times. Only people walking, wheeling, cycling, and scooting are permitted access to the School Street zone while the restriction is in place, with exemptions given to emergency vehicles and Blue Badge holders. In some cases, permits will be given to residents and businesses living or working within the zone – this varies from scheme to scheme and is decided on an individual basis.

School Streets are now being rolled out by local authorities across the country. In February 2020 BCC launched a pilot scheme at two schools: St Peter's CofE Primary School and Wansdyke Primary School. In 2024 there are now eleven permanent school streets in place, with works planned for one more school in 2024.

Slow the Smoke Citizen Engagement Project

Bristol City Council were awarded £122,000 through the annual Defra Air Quality Grant fund to carry out a study into solid fuel use in Bristol. This project raised awareness of air pollution with a focus on particulate matter emissions from domestic solid fuel burning, which is an important and growing source of pollution. The project aim was to achieve air quality benefits in both the short and long term through the planned monitoring, engagement and awareness raising activities in a pilot area of the city (Ashley Ward which includes the areas of St Werburghs, St Pauls, Ashley, and Montpelier). A summary report of the project is available on the BCC Website. As a pilot project, the template was successful in promoting a greater understanding of the issues and testing a methodology that is scalable and transferrable. The pilot project illustrated the importance of continued and sustained engagement around the challenge going forward. Further information on the project and its outputs can be found on the website of one of the project partners, Knowle West Media Centre.

Bristol Climate Emergency Declaration

In November 2018 the Mayor declared a Climate Emergency and an initial plan of action has been developed to address this. The initial plan provided funding to work with city partners and stakeholders to develop a climate strategy for the city. For more details go to The Mayor's Climate Emergency Action Plan.

Whilst the climate emergency declaration focuses on reducing emissions of CO_2 pollution, many sources of CO_2 emissions are the same as those that emit pollutants that are directly harmful to health locally such as NO_2, particulate matter and SO_2 Many measures to reduce emissions of CO_2 from combustion sources will reduce emissions of these other pollutants that are harmful when breathed in. As a result, action to address the climate emergency are acknowledged here as important in reducing concentrations of local air pollution.

One City Climate Strategy

This Strategy provides more detail on the commitment within the One City Plan for Bristol to become carbon neutral by 2030. Within the One City Climate Strategy transport is an area where it has been identified that action is needed with a focus on:

> *switching to significantly more walking, cycling and zero carbon public transport modes; converting the remaining vehicles to zero carbon fuels; transforming freight, aviation, and shipping.*

TravelWest and West of England Combined Authority (WECA)

There is long-established collaboration between the three former Avon authorities (now referred to as the West of England authorities). In this regard, the Travel West brand acknowledges the fact that the commuter doesn't think in terms of authority boundaries.

TravelWest is part of the West of England Combined authority (WECA) and brings together partners to improve transport across the region, to provide sustainable, long-term solutions to help people move around the region more easily.

A website is available to help people plan journeys and to learn about the resources available to residents in the area to help them travel more sustainably.

The Joint Local Transport Plan, JTLP 4, was published in March 2020 and sets the West of England Combined Authority (WECA) regions transport vision through to 2036. A greater emphasis than previously is placed on air pollution compared to the superseded JLTP (3). The JLTP 4 document *"shows how we will aim to achieve a well-connected sustainable transport network that works for residents across the region; a network that offers greater, realistic travel choices and makes walking, cycling and public transport the natural way to travel".*

WECA are at the early stages of developing the JLTP 5 which will look to further increase use of active and sustainable transport options.

Local Cycling and Walking Infrastructure Plan (LCWIP)

The West of England Local Cycling and Walking Infrastructure Plan 2020-2036 is a detailed plan which identifies that over £400m of investment is needed and will be sought and channelled through the West of England Combined Authority. Working with Bath & North East Somerset, Bristol, North Somerset and South Gloucestershire councils, the aim is to provide high quality infrastructure to ensure the West of England is a region where

cycling and walking are the preferred choice for shorter trips.

E-Scooter Trial

Hop-on hop-off e-scooters are available in Bristol, Bath and in parts of South Gloucestershire to help residents and visitors to get around central areas. The E-scooter trial started in October 2020. In light of the success of e-scooters in the region, the West of England Mayoral Combined Authority has negotiated a contract with a different provider, TIER, that has taken over the running of the scooters in the region from October 2023.

Alongside the e-scooters, 1,500 new pedal-only e-bikes and 20 e-cargo bikes have been planned to be phased into the scheme along with 100 brand-new e-scooter parking racks to help to keep the fleet tidy.

Electric Buses

By the end of 2025, over 70 fully electric buses will be starting operation in Bristol and the West of England region. This will include 67 double-deckers and 7 single-deckers.

MetroWest

MetroWest will transform rail travel in the region, generating over a million new rail journeys and give 80,000 more people access to train services.

The first of the new stations in the programme, Portway Park and Ride, opened in August 2023. Construction began on the Ashley Down Station in March 2023 and platforms, footbridge and lifts are now in place.

Plans to re-open the Portishead line, with new stations at Pill and Portishead, have progressed into the detailed design phase. The project will provide an hourly direct link from Portishead to Bristol Temple Meads in 25 minutes.

Planning applications for new MetroWest rail stations at Charfield and North Filton have been approved. Detailed design works are being progressed in 2024 ahead of Full Business Case submissions in 2024. The target is for these stations to be open by 2027.

Figure ES 4 – MetroWest Map

GoUltraLowWest

As part of creating a better environment, all the West of England's local authorities are committed to encouraging the widespread use of electric cars, vans, and bikes.

Go Ultra Low West is a £7m project that aims to accelerate the purchase of electric vehicles across Bristol, South Gloucestershire, North Somerset and Bath & North East Somerset.

Over 120 new charge point connections have been installed to double the size of the existing public charging network. The Revive vehicle charging network was launched, taking over from the previous Source West network. This ensures that owners of electric

vehicles are able to charge at more destinations in the region.

The project included the delivery of 4 new rapid EV charging hubs, new electric car clubs, business grants for charge point installation, updating council fleet vehicles and providing residents in the WECA region the opportunity to try out an EV for two weeks.

Conclusions and Priorities

Monitoring – Pollutant Trends

In 2023 monitored NO_2 concentrations decreased, with an average reduction of 13.2% when compared to measured 2022 concentrations. When compared to 2019, the last full year of data before Covid-19 impacted travel patterns, annual NO_2 concentrations at roadside locations were 25.4% lower in 2023. This is similar to the 30% reduction seen nationally at roadside locations over this period[9].

Measured particulate matter (PM_{10}) concentrations decreased at both monitoring sites in Bristol in 2023 when compared to 2022 and both sites continue to meet the current UK annual and 24-hour objectives for PM_{10}.

$PM_{2.5}$ concentrations at Bristol St Pauls have seen a reduction since 2019 with a decrease from 10.8µg/m^3 in 2019 to 8.2µg/m^3 in 2023. 2023 annual $PM_{2.5}$ concentrations measured at the roadside site at Parsons Street School were 9.1µg/m^3. This is a relatively large decrease of 3.9µg/m^3 when compared to 2022. The monitored concentrations at both sites in 2023 were below the new UK target of 10µg/m^3, but both sites were above the WHO guideline value of 5µg/m^3.

The monitoring data indicates that a reduction in pollution levels is still needed to achieve compliance with annual NO_2 objectives in all parts of the city. It also demonstrates that, even at the relatively busy Parson Street roadside location, $PM_{2.5}$ concentrations already meet the new UK 2040 target of 10µg/m^3. There are only 2 locations in the city at which $PM_{2.5}$ pollution is measured using equivalence standard monitors. Neither of these is in a location where data indicate the highest levels of domestic solid fuel use takes place, so will not be representative of other background locations in the city where this activity is thought to be more prevalent. In 2024 BCC intend to install a new background $PM_{2.5}$

[9] Nitrogen dioxide (NO2) - GOV.UK (www.gov.uk)

monitor in a location with relatively high levels of solid fuel use, with the aim of gaining a better understanding of the impact solid fuel use has on $PM_{2.5}$ concentrations. The new UK $PM_{2.5}$ target is met at the one roadside monitoring location in the city, however, as this site is close to a junction, it does not technically meet the monitoring site criteria as defined in The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023. $PM_{2.5}$ concentrations at this site are likely to be indicative of $PM_{2.5}$ concentrations at similarly busy roadside locations in many parts of the city.

Measured exceedance of the annual objective outside of the AQMA boundary occurred at one location in Bristol in 2023, with an annual NO_2 concentration of 47.7µg/m^3. The location is on Blackboy Hill (Site 3). The diffusion tube is located within 30cm of a window on the façade of a fast food establishment and it is thought that air is passively venting from inside the cooking area, impacting on NO_2 concentrations, rather than the exceedance being caused by vehicle emissions. In 2024 a new monitoring location was installed on Blackboy Hill, close to Site 3, but away from the influence of the localised emission source. Data from the new site will allow BCC to check that the road contribution in this location is not leading to the measured exceedance at Site 3. It is expected that NO_2 concentrations will fall rapidly over a very short distance from the window and therefore, the potential for this source to impact on sensitive receptor locations is limited.

In 2022, another site exceeded the objectives outside of the AQMA, Site 567, located on Muller Road. 2022 measured concentrations here were 43.2µg/m^3, however, in 2023 NO_2 concentrations fell below the objective, to 35.3µg/m^3.

Details of these and other recent exceedances outside of the AQMA are contained within Table C. 1. Monitoring in these locations has continued in 2024.

Pollution Reduction Actions - Transport

Bristol City Council will continue to monitor the impact that the Clean Air Zone (CAZ) has on air pollution across the city. The work to monitor changes in pollution levels and assess the success of the CAZ is progressing with the Government's Joint Air Quality Unit (JAQU). Updates on progress on achieving compliance in relevant locations, as defined by the Air Quality Standards Regulations (AQSR)[10], will be published in 2024.

The other initiatives and plans, as described in this report, will continue to be taken

[10] The Air Quality Standards Regulations 2010 (legislation.gov.uk)

forward and developed. Additional actions on transport emissions are focussed on encouraging and facilitating modal shift by providing safe, convenient, and reliable alternatives to car use, alongside facilitating a shift towards cleaner vehicles where they still need to be used.

Pollution Reduction Actions – Solid Fuel/Bonfires

The BCC website contains information on Smoke Control Regulations and guidance on burning. This aims to raise awareness of the health effects of PM pollution from these sources, reduce the amount of burning in the city and to ensure best practice is used if burning still takes place. In addition, the Defra air quality grant funded 'Slow the Smoke' project, which involved citizens using low-cost pollution sensors, finished in late 2022. This raised awareness of air pollution in the city and used innovative engagement methods to talk about air pollution. The report for this project was published in 2023. A new equivalence standard $PM_{2.5}$ monitor will be installed as a legacy of this project in a location where high levels of solid fuel use occur.

Clean Air Night

Bristol City Council supported the first Clean Air Night, held on the 24th January 2024. Clean Air Night is intended to highlight the health risk associated with burning solid fuels and to challenge some of the myths around wood burning.

Adoption of New Powers for Fixed Penalty Notices in Smoke Control Areas.

In September 2023, Cabinet approval was given for Bristol City Council to adopt new Government Powers, designed to make it easier for local authorities to enforce smoke control regulations. At the time of writing this report, six reports of issues had been sent to the council, five of these were related to specific properties and one about general issues in an area. Two improvement notices have been issued and one final notice was about to be served.

Local Engagement and How to Get Involved

How Can Pollution Be Reduced? - Transport

There are many ways in which people can help contribute towards reducing air pollution in Bristol. Air pollution, at locations where we are recording high levels of nitrogen dioxide,

comes predominantly from emissions from vehicles. Choosing to travel around the city by foot, by bicycle or using public transport, whenever it is possible, can reduce an individual's personal contribution to air pollution in the city. To find out more information on sustainable transport options throughout the West of England region you can visit the Travel West Website or its sister website Better by Bike.

In 2022 Bristol introduced a charging clean air zone. If you are thinking of replacing your vehicle you can check to see if it will be compliant, and therefore not be subject to a daily charge to drive in the zone, by using this vehicle checker.

How Can Pollution Be Reduced? - Domestic Heating

From an air pollution perspective, if a property does not already have a stove or open fireplace, the best option is not to install one. Even the cleanest wood burning appliance emits significantly more particulate matter than a gas oil or gas appliance.

Within Bristol, as a minimum, a wood burning stove should be approved for use within a smoke control area, known as an 'exempt appliance'.

If you do chose to burn solid fuel it is important to ensure that you do not breach the Smoke Control Area regulations. The whole of Bristol is a smoke control area. This means that, for domestic heating purposes, wood can only be burnt in a Defra approved stove. It is not permitted to burn wood in an open fire in a domestic property in Bristol.

Whilst the type of solid fuel appliance used is an important factor in determining the level of pollution emitted, the way in which they are used is equally as important. Understanding which fuels emit less pollution and the least polluting way to use them is explained within guidance issued by Defra: Open fires and wood-burning stoves – A practical guide. The measures outlined for reducing emissions include:

- Choosing the right stove
- Considering burning less
- Buying 'Ready to Burn' fuel
- Season freshly chopped wood before use (wood can only be burnt in Bristol within a Defra exempt appliance. It is not permitted to burn even seasoned wood in an open fire, or an appliance not considered exempt by Defra for use in a smoke control area).
- NEVER burn treated waste wood (e.g., old furniture) or household rubbish

- Regularly service and maintain your stove (annually)
- Get your chimney swept regularly (up to twice a year)

In May 2021 the Air Quality (Domestic Solid Fuels Standards) (England) Regulations 2020 came into force. They have been introduced to reduce emissions of PM from residential burning of wood and other solid fuels. The regulations attempt to phase out the use of bituminous coal and unseasoned wood in residential heating appliances.

A study by The University of Sheffield and The University of Nottingham published in 2020 concluded that, even when best practice is used, solid fuels can emit significant levels of particulate matter pollution into the local atmosphere and can have a detrimental impact on indoor air pollution.

> "*The PM that is released into the home is not an aberration from normal use but results directly from it. This is because real-world operation cannot occur without opening the stove door. It may be that with regulatory encouragement stove designs can be modified in a way that limits such instances. In the meantime, or in the event that appropriate modification cannot be achieved, it is also recommended that new residential stoves be accompanied by a health warning at the point of sale in order to indicate the normative health risks posed to users".*

Local Responsibilities and Commitment

This ASR was prepared by the Sustainable City and Climate Change Service of Bristol City Council with the support and agreement of the following officers and departments:

Strategic City Transport

Public Health

Regulatory Services

Highways and Traffic

This ASR has been signed off by a Director of Public Health.

If you have any comments on this ASR please send them to Andrew Edwards at:

City Hall, PO Box 3399, Bristol, BS1 9NE: a.edwards@bristol.gov.uk

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Figures

Tables

1 Local Air Quality Management

This report provides an overview of air quality in Bristol during 2023. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995), as amended by the Environment Act (2021), and the relevant Policy and Technical Guidance (TG) 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 Bristol City 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 Bristol City Council can be found in Table 2.1. The table presents a description of the AQMA that is currently designated within the Bristol City Council area. Appendix D: Map(s) of Monitoring Locations and AQMAs provides maps of the AQMA and 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,
- <PM_{10} 24-hour mean.

The monitoring network in Bristol has changed considerably since the declaration of the Air Quality Management Area in 2001. There is an extensive air quality monitoring network throughout the city which provides annual NO_2 data. The monitoring locations in 2023 are not directly comparable to those in 2001 and therefore the comparison between exceedance levels at declaration in 2001 and 2023 would not provide a true reflection of trends in air pollution over that timeframe. For this reason, the corresponding columns in Table 2.1 below have not been completed. Distance adjusted (where relevant) data for all 196 nitrogen dioxide diffusion tube monitoring sites has been provided in Table B. 1. An indication of general trends in annual NO_2 values from 2010 are shown in Figure A. 1 to Figure A. 3 in Appendix A. This is considered more representative of trends in recent years than would be established from looking at data from one worst case site as requested in Table 2.1.

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
Bristol AQMA	Declared 01/05/2001. Amended on 01/05/2003 and 01/05/2008 and 26/10/2011	NO_2 Annual Mean	An area covering the city centre and parts of the main radial roads including the M32	YES	N/A	N/A	0	Clean Air Zone - 2022	Clean Air for Bristol Website for CAZ Plans
Bristol AQMA	Declared 01/05/2001. Amended on 01/05/2003 and 01/05/2008 and 26/10/2011	NO_2 1 Hour Mean	An area covering the city centre and parts of the main radial roads including the M32	YES	N/A	N/A	0	Clean Air Zone - 2022	Clean Air for Bristol Website for CAZ Plans
Bristol AQMA	Declared 01/05/2001. Amended on 01/05/2003 and 01/05/2008 and 26/10/2011	PM_{10} 24 Hour Mean	An area covering the city centre and parts of the main radial roads including the M32	YES	N/A	N/A	0	Clean Air Zone - 2022	Clean Air for Bristol Website for CAZ Plans

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

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

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

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

'the report is well structured, detailed, and provides the information specified in the Guidance. The following comments are designed to help inform future reports:'

- Continue with Reference to the Public Health Outcomes Framework, following the positive work made in this submission.
- Continue analysis of trends in the air quality data in comparison to the Air Quality Objectives.
- Continue maintaining high standards of QA/QC procedures with sufficient supporting evidence provided, with robust analysis shown in this submission.

These directions have been continued into the 2023 ASR.

Bristol City Council has taken forward a number of direct measures during the current reporting year of 2023 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2. 29 measures are included within Table 2.2, with the type of measure and the progress Bristol City Council have made during the reporting year of 2023 presented. Where there have been, or continue to be, barriers restricting the implementation of the measure, these are also presented within Table 2.2.

More detail on some of these measures can be found in their respective online portals, for example at the Clean Air for Bristol website or on the TravelWest website and within sections of this report.

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

- Monitoring the impact and effectiveness of the Bristol Clean Air Zone in agreement with the Government's Joint Air Quality Unit (JAQU), to deliver compliance with air quality objectives in the shortest time possible.
- Continue planning and implementing a range of actions intended to improve public transport provision, and the infrastructure for walking and cycling, to make these transport modes more attractive.

Table 2.2 – Progress on Measures to Improve Air Quality

Measure No.	Measure Title	Category	Classification	Year Measure Introduced in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
1	Bristol Clean Air Zone	Promoting Low Emission Transport	Low Emission Zone	TBC	2021	BCC	Government	No	Funded	> £10 million	Planning	Reduced vehicle emissions	Achieving Compliance within the shortest timeframe possible	CAZ introduced in November 2022. For latest Developments see https://www.cleanairforbristol.org/	
2	Make improvements to the city centre through the City Centre Framework	Alternatives to private vehicle use	Other	2020	2027	BCC	WECA/BCC	No	Funded	>£10	Planning	Improving conditions for active and public transport in the city centre	Improved bus journey times and reliability. Uplift in walking, cycling and scooting	Ongoing development and review of the measures introduced	
3	City Centre Freight Consolidation	Freight and Delivery Management	Freight Consolidation Centre	2022	Ongoing	BCC and logistics operators	JAQU	No	Funded	£1m-10m	Implementation	Reduction in HGV and LGV mileage in the city centre replaced by zero-emission last mile fleet	95% of deliveries in the city centre by EVs or bikes by 2030	Business Case for range of interventions complete. Trial measures to start in Autumn 2024 work ongoing to identify and develop last mile logistics hub	
4	Prioritising purchase of EV vehicles in public sector fleets	Promoting Low Emission Transport	Public Vehicle Procurement - Prioritising uptake of low emission vehicles	2017	2028	WoE Authorities	Govt, LA	No	Funded		Implementation	Reduce emissions from LA vehicle fleet	25% (100 vehicles) of BCC's fleet now EV with target to be fully electric by 2027/28	100 EV's incorporated into fleet of approx. 400	Charging Infrastructure
5	Car Clubs	Alternatives to private vehicle use	Car Clubs			WoE Authorities	Private and LA, EU H2020 - Replicate	No	Funded		Implementation	Reduced car ownership	120 car club cars currently in use in Bristol.	Ongoing	
6	School Streets	Promoting Travel Alternatives	Other	2020		BCC	LA Funded	No			Implementation	Lower pollution outside schools and increased active travel	Closing streets to motor vehicles outside schools at the start and end of the school day	Ongoing	
7	Residential electric vehicle charge points for those without off street parking	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging	2022	Ongoing	BCC	BCC	No	Not funded	£100-£500k	Planning	Promote low emission vehicle use	Install and operate 150 electric vehicle residential charge-points for drivers without off-street parking. 10 rapid charge points for use by taxi and private hire vehicles, and 2-3 ultra rapid chargepoints for commercial and public use	Planning phase, awaiting DfT funding decision	

Measure No.	Measure Title	Category	Classification	Year Measure Introduced in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
8	Install Rapid Charge points	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging	2022	Ongoing	BCC	Grant Funded	No	Funded		Implementation	Promote low emission vehicle use	Install 16 rapid chargers	Implementation ongoing	
9	Develop a freight strategy describing how we will help freight transported on Bristol roads to be zero carbon and efficient	Freight and Delivery Management	Freight Partnerships for city centre deliveries	2022	2024	BCC	BCC	No	Funded	£10k - 50k	Planning	Develop zero carbon freight delivery in Bristol	Delivery of Strategy	Development work undertaken	
10	Develop plans for a Mass Transit system together with neighbouring authorities	Transport Planning and Infrastructure	Other	2022		WECA authorities/BCC	WECA/Network Rail	No			Planning		Develop a viable business case for mass transit	Phase 1 A4 corridor being designed. Work ongoing	
11	Improve walking, cycling and public transport infrastructure through the A37/A4018 project	Transport Planning and Infrastructure	Other	2019	2027	BCC	WECA CRST/BCC	No		> £10 million	Planning	Increase public and active transport use along this corridor	Improvements to walking, cycling and public transport infrastructure along the A37/A4018 corridors	OBC signed off	
12	Develop mobility hubs to offer bike hire, e-scooters, bus, and e-cargo bikes in one place	Transport Planning and Infrastructure	Other	2022	2024	BCC/WECA Authorities	WECA	No	Funded		Planning	Increase active and public transport use	Hubs developed	Procurement of hub components	
13	Build a regional cycling centre for cycle training, rehabilitation, inclusive cycling, and a sports facility	Promoting Travel Alternatives	Promotion of cycling		2026	BCC	Unknown	No	Not Funded		Planning	Increase accessibility to cycling	Cycling centre built and operational	OBC complete and full planning permission to be sought next year	

Measure No.	Measure Title	Category	Classification	Year Measure Introduced in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
14	Scooter, e-bike and e-cargo bike trial	Promoting Travel Alternatives	Other	2021	Ongoing	WECA authorities/BCC		No	Funded		Completed	Trial e-scooters, e-bikes and e-cargo bikes in the WECA region	Reduction in vehicle trips	New trial partner – TIER – with the inclusion of e-cargo and e-bike rental	
15	Providing continuous bus priority and better walking and cycling links along the A4 Portway Strategic Corridor and the delivery of Portway rail station and associated access improvements	Transport Planning and Infrastructure	Other	2022	2027	BCC	WECA/DfT	No	Funded		Planning	Improved active and public transport offer on A4 corridor to encourage modal shift	New, effective Infrastructure delivered	Station and expanded P&R site delivered. Portway walking, cycling and PT improvements business case submitted for funding	
16	New train station at Ashley Down	Transport Planning and Infrastructure	Other	2023	2024	BCC/WECA/ Network Rail	WECA	No	Funded		Implementation	Improved access to rail network leading to modal shift away from private car use	Patronage figures	Station currently being built expected completion in summer/autumn 2024	
17	M32 Strategic Corridor: providing improved public transport infrastructure and delivery of a P&R	Transport Planning and Infrastructure	Bus route improvements	2021	2029	BCC/S.Glos/ WECA/National Highways	WECA	No	Part funded; full funding subject to CRSTS2 allocation		Planning	Improved public transport offer to reduce emissions from private car use	Improved M32 corridor to encourage public transport use	Strategic Outline Business Case being developed	Funding
18	Active Travel Fund walking and cycling improvements at Park Row, Old Market and Cotham Hill	Transport Planning and Infrastructure	Other	2021	2024	BCC	DfT	No	Funded	£5m	Implementation	Increase in active travel and reduction in private vehicle emissions	Infrastructure improvements made	Schemes currently being delivered on the ground	
19	Active Travel Fund 4, delivery of Old City-King Street pedestrianisation and Queen Charlotte Street cycle lane	Transport Planning and Infrastructure	Other	2023	2024	BCC	DfT via WECA	No	Funded	£1.6m	Implementation	Better enforcement of existing temporary pedestrianisation of Old City, including ban on mopeds; cycle lane on Queen Charlotte Street	Infrastructure improvements made	Scheme to start being implemented summer/autumn 2024	

Measure No.	Measure Title	Category	Classification	Year Measure Introduced in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
20	Active Travel Fund 4, design of 4 cycling schemes. Filwood Quietway, Malago Greenway, Deanery Road and Old Market Quietway	Transport Planning and Infrastructure	Cycle network	2023	2024	BCC	DfT via WECA	No	Funded	£850k	Concept design	Design and OBC of 4 cycling schemes to be 'shovel-ready' for future funding bids	4 approved OBCs	Engagement and designs complete	
21	Delivery of up to 10-30 cycle hangars at council owned properties	Promoting Travel Alternatives	Promotion of cycling	2022	2023	BCC	WECA	No	Not funded		Planning	Infrastructure leads to increase in cycling	Infrastructure delivered	Delivered	
22	Muller Road Sustainable Transport Improvements to improve walking, cycling and public transport links	Transport Planning and Infrastructure	Other	2020	2024	BCC	WECA/CIL/ HIF	No	Funded		Implementation	Increase use of sustainable transport options for trips	Infrastructure delivered	Delivered	
23	Joint Local Transport Plan 5	Policy Guidance and Development Control	Other policy	2023	2024	WECA, BCC, BANES, South Glos, N Somerset	WECA/BCC	No	Not funded	Circa £800k	Planning	Increase use of active and sustainable transport	Adopted Plan	Scoping stage	
24	Bedminster Green Transport improvements – New segregated cycle route on Whitehouse Lane, new bus priority on Malago Rd and Dalby Avenue, street scene enhancements	Transport Planning and Infrastructure		2023	2025	BCC	Government Funding/WE CA	No	Funded	£11m	Construction	Encouragement of modal shift through provision of quick reliable bus services, provision of off-carriageway cycle route, and better walking environment	Improved bus Services, quicker journey times and more reliable services, greater numbers of bus, cycle and pedestrian journeys within vicinity	In Development	
25	Walking and cycling improvements at Park Row	Transport Planning and Infrastructure	Other	2020	2025	BCC	DfT (ATF), match funding	No	Funded	£3.3m	Planning	Increase in active travel and reduction in private vehicle emissions	Infrastructure improvements made	Implementation	
26	Walking and cycling improvements at Old Market	Transport Planning and Infrastructure	Other	2021	2024	BCC	DfT (ATF and TCF), match funding	No	Funded	£922k	Implementation	Increase in active travel	Infrastructure improvements made	Implementation	

Measure No.	Measure Title	Category	Classification	Year Measure Introduced in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
27	Walking and cycling improvements at Cotham Hill	Traffic Management	Other	2021	2024	BCC	DfT (ATF and CRSTS)	No	Funded	£645k	Implementation	Increase in active travel and reduction in private vehicle emissions	Infrastructure improvements made	Delivered	
28	Local Plan Review	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	Ongoing	2023	BCC	LA Funded	No	Funded	£100k - £500k	Planning	Adoption of standalone policy for Air Quality and strengthen weight given to air pollution in Local Plan policy documents	Development and Adoption of New Local Plan Documents	Ongoing	
29	Liveable Neighbourhood trial in East Bristol	Promoting Travel Alternatives	Other	2021	2024	BCC	WECA	No	Funded		Planning	Prioritisation of safe and active travel by reducing impact of motor vehicles	Improved environment for active travel and increase in those modes	Implementation	

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

As detailed in Policy Guidance LAQM.PG22 (Chapter 8) and the Air Quality Strategy[11], local authorities are expected to work towards reducing emissions and/or concentrations of fine particulate matter ($PM_{2.5}$). There is clear evidence that $PM_{2.5}$ (particulate matter smaller than 2.5 micrometres) has a significant impact on human health, including premature mortality, allergic reactions, and cardiovascular diseases.

Bristol City Council have identified that the recent focus on NO_2 compliance at both a national and local level through the LAQM process has resulted in there being a lack of in-depth knowledge on the scale and local sources of primary $PM_{2.5}$ emissions. The clear evidence on health impacts and requirement to work towards reducing $PM_{2.5}$ emissions and/or concentrations led Bristol City Council to commission studies to develop a more in depth understanding of local emissions of this pollutant. Whilst many actions targeted at reducing emissions of NO_2 will also reduce $PM_{2.5}$ emissions, other potentially significant sources of local primary $PM_{2.5}$ have been identified that will not be directly addressed by actions aimed at achieving compliance with NO_2 limit values.

$PM_{2.5}$ is monitored at two locations in Bristol. Concentrations at Bristol St Pauls were 8.2µg/m^3 in 2023. $PM_{2.5}$ concentrations measured at the roadside site at Parsons Street School were 9.1µg/m^3. The maximum $PM_{2.5}$ concentration for 2023 using Defra background mapping was 11.0µg/m^3.

In 2020 two studies were commissioned by BCC. These attempted to quantify pollutant emissions from solid fuel and construction non-road mobile machinery (NRMM) and identify policy measures to reduce emissions from these sources.

The lowest estimate from the study into solid fuel showed that solid fuel burning accounted for a third of all PM_{10} emissions and half of $PM_{2.5}$ emissions in Bristol. The report provided recommendations that could reduce emissions from this source. In 2020/21 Bristol City Council launched a ‘Slow the Smoke’ communications campaign aimed at raising awareness of the health impacts of solid fuel and options for people to reduce emissions. Additionally, a Defra air quality grant funded project ran from 2021 through to 2023 which

[11] Defra. Air Quality Strategy – Framework for Local Authority Delivery, August 2023

used low-cost sensors and innovative citizen engagement to better understand the impact of solid fuel use on air pollution and to raise awareness of its impacts. A report on the Defra grant funded project was published in 2023. More information on the project, including videos and a song that were produced as part of the project are available on the website of one of the project partners, The Knowle West Media Centre.

Bristol City Council supported the first national Clean Air Night which was organised by Global Action Plan and held on the 24th January 2024. Clean Air Night is intended to highlight the health risk associated with burning solid fuels and to challenge some of the myths around wood burning.

Estimates of NRMM emissions using national data showed that this source accounts for approximately 3% of total PM_{10}, 5% of $PM_{2.5}$ and 6% of NOx emissions in Bristol. Whilst not representing a large proportion of total emissions it should be recognised that close to construction sites, NRMM will be a more significant source locally than the Bristol-wide emissions calculations suggest. The estimates are based on national data as local data is limited on this source.

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

- Amendments to the Clean Air Act 1993 made under Schedule 12 of the Environment Act 2021 came into force from 1 May 2022 by adding Section 19A and Schedule 1A, introducing civil financial penalties. In 2023 Bristol City Council Cabinet approved the adoption of these powers. Since their introduction, BCC has received 6 reports of issues. Two improvement notices have been issued with one final notice being prepared at the time of writing the ASR.
- In 2022/2023, BCC raised awareness of smoke control regulations and sales of fuels during routine site visits.
- Development of a Clean Air Zone to tackle NO_2 pollution and to achieve compliance with annual objectives for NO_2 in the shortest time possible. Whilst the plan is focussed on compliance with NO_2 objectives, it will have benefits for particulate pollution.
- The development of policy and infrastructure to support public and active travel will contribute to reducing particulate pollution.
- In 2024 the installation of a new equivalence method $PM_{2.5}$ monitor, and meteorology station is planned in order to gain a better understanding of the impact that solid fuel use has on particulate pollution levels at a very localised level.

- The projects, as outlined in Table 2.2, that provide investment in cleaner buses and electric vehicles will help to reduce particulate emissions from transport.

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

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

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

Bristol City Council undertook automatic (continuous) monitoring at 7 sites during 2023. Additionally, as part of the national network, Defra operate a station located in the St Pauls area of Bristol. Table A. 1 in Appendix A shows the details of the automatic monitoring sites. The Air Quality Dashboard (arcgis.com) page presents automatic monitoring results for Bristol.

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

Bristol City Council undertook non-automatic (i.e. passive) monitoring of NO_2 at 196 sites during 2023. 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 air quality objective of 40µg/m^3. Note that the concentration data presented represents the concentration at the location of the monitoring site, following the application of bias adjustment and annualisation, as required (i.e. the values are exclusive of any consideration to fall-off with distance adjustment).

For diffusion tubes, the full 2023 dataset of monthly mean values is provided in Appendix B. Note that the concentration data presented in Table B. 1 includes distance corrected values where relevant.

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

Data capture rates at all of the 8 automatic NO_2 monitoring sites were above the required 85% rate. The lowest capture rate of 95.1% was recorded at the Temple Way site.

The continuous monitoring data in 2023 shows a reduction in NO_2 pollution levels at all sites when compared to 2022 data. All automatic monitoring sites, with the exception of Colston Avenue, recorded annual NO_2 concentrations below air quality objectives. Annual average NO_2 levels at Colston Avenue in 2023 were 48µg/m^3, the next highest automatic site was Temple Way at 25.6µg/m^3.

2023 concentrations were lower at all automatic monitoring sites than they were in 2019, which was the last year before Covid-19 restrictions resulted in some changes to vehicle movements.

None of the automatic sites recorded hourly values greater than the 200 µg/m^3 hourly objective in 2023.

Figure 3.1 and Figure 3.2 show nitrogen dioxide diffusion tube monitoring locations in Bristol. Those sites shown in red or purple indicate locations where exceedance of the annual objective was measured in 2023. The data has been annualised but not distance adjusted in these maps.

All our air pollution monitoring data is available on the Bristol City Council open data portal.

Figure 3.1 - Nitrogen Dioxide Monitoring Locations and Results 2023 – Central Area

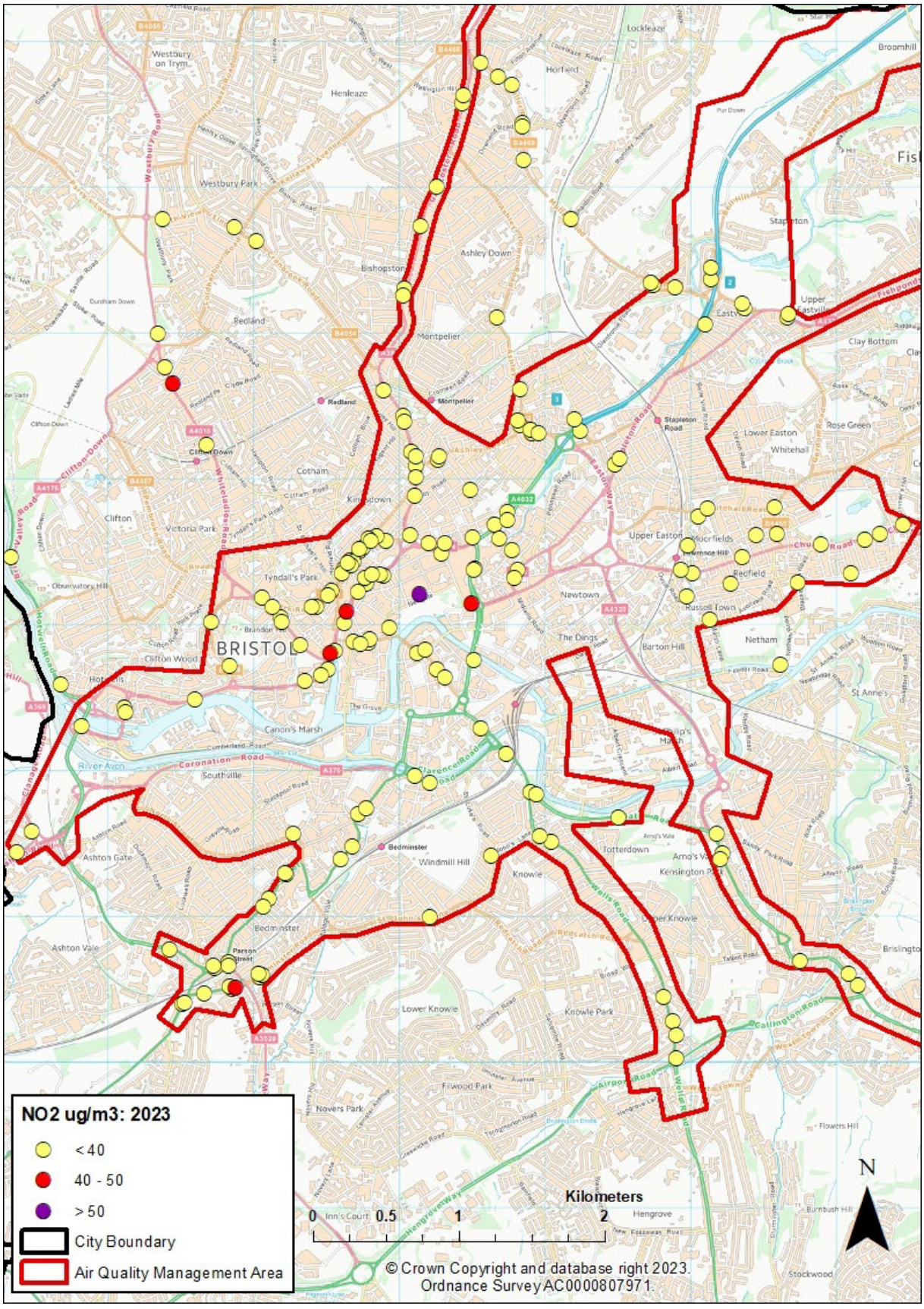
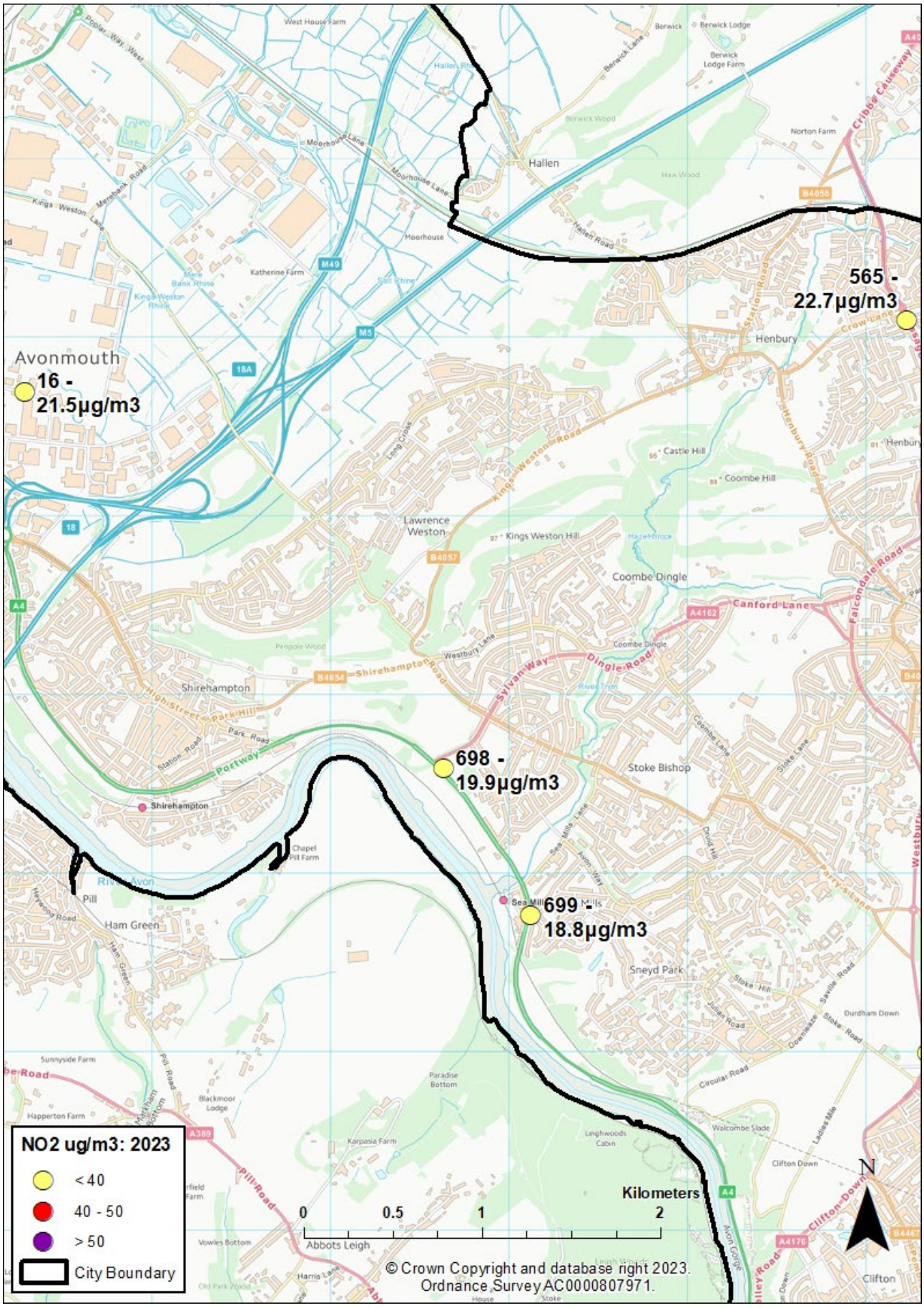


Figure 3.2 - Nitrogen Dioxide Monitoring Locations and Results 2022 – Avonmouth



3.2.2 Particulate Matter (PM_{10})

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.

PM_{10} was monitored at two locations in 2023, one urban background site and one roadside site. The PM_{10} monitor at Colston Avenue failed in July 2021 and it was not possible to fix and reinstate the data collection from this location. There are no exceedances of the annual mean or 24-hour mean objectives at either of the monitoring sites. Data for 2023 at the St Pauls urban background site shows a 1.5µg/m^3 decrease in annual concentrations compared to 2022 to 15.8µg/m^3, which is similar to the 2021 PM_{10} concentrations at this site. In 2023 there was one 24-hr period averaging above 50µg/m^3, this compares to none in 2019 and two in 2020, 2021 and 2022.

Data for 2022 from the Temple Way site did not show an exceedance of objectives with an annual PM_{10} concentration of 17.5µg/m^3 measured in 2023. As would be expected, the measured PM_{10} concentration is higher at this roadside site than the St Pauls urban background site. The data from Temple Way shows a decrease of 3.4µg/m^3 in 2023 when compared to 2022. This continues a recent trend of fluctuating annual PM_{10} concentrations at Temple Way between the region of 21 µg/m^3 and 17µg/m^3 with 2023 concentrations similar to those recorded in 2021. There were two days of the year when the 24-hour average was above the 50 µg/m^3 in 2023 compared to ten in 2019, four in 2020 and three in 2021. The number of days exceeding the 24-hour average of 50µg/m^3 were below the 35 days per year which are allowed to exceed this average value before breach of the air quality objective occurs.

Although no exceedances are reported from the monitoring data it is proposed that the AQMA declaration for PM_{10} is retained as a precautionary measure given the limited number of locations at which PM_{10} is measured in the city.

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 the past five years.

$PM_{2.5}$ is measured at the Bristol St Pauls AURN and the BCC operated Parsons Street School sites. The annual average for this pollutant in 2023 was 8.2µg/m^3 at St Pauls and 9.1µg/m^3 at Parsons Street School. For the St Pauls site this is a decrease of 0.2µg/m^3 when compared to the 2022 annual average of 8.4µg/m^3. The roadside Parsons Street School site recorded higher $PM_{2.5}$ concentrations than the urban background site, which is to be expected. In 2023 Parsons Street saw a decrease of 3.9µg/m^3 when compared to 2022. Both sites are above the WHO air quality annual guideline value of 5µg/m^3 for this pollutant but both sites are below the Government's newly introduced 2040 $PM_{2.5}$ target of 10.0µg/m^3.

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)
203	Brislington Depot	Urban background	361178	171566	NOX NO2 NO	No	Chemiluminescent	N/A	18	3.5
215	Parson Street School	Roadside	358042	170582	NOX NO2 NO PM2.5	Yes	Chemiluminescent (NOx) and Beta Attenuation (PM)	0	4	1.5
270	Wells Road	Roadside	360903	170024	NOX NO2 NO	Yes	Chemiluminescent	9	1	1.5
452	AURN St Pauls	Urban background	359488	173924	NOX NO2 NO PM2.5 PM10 O3	Yes	Chemiluminescent (NOx) and Beta Attenuation (PM)	N/A	N/A	4
463	Fishponds Road	Roadside	362926	175590	NOX NO2 NO	Yes	Chemiluminescent	0	3	1.5
500	AURN Temple Way	Roadside	359522	173381	NOX NO2 NO PM10	Yes	Chemiluminescent (NOx) and Beta Attenuation (PM)	0	5	1.5
501	Colston Avenue	Roadside	358640	173090	NOX NO2 NO	Yes	Chemiluminescent	3	2	1.5
672	Marlborough Street	Roadside	358728	173520	NOX NO2 NO	Yes	Chemiluminescent	0	3	1.5

Notes:

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

(2) N/A if not applicable.

Table A. 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)
2	Colston Avenue	Roadside	358628	173011	NO2	Yes	0.0	1.0	No	2.1
3	Blackboy Hill	Roadside	357448	174650	NO2	No	0.0	3.0	No	2.8
4	Three Lamps	Roadside	359903	171850	NO2	Yes	0.0	3.0	No	3.2
5	Bedminster Parade	Roadside	358723	171704	NO2	Yes	0.0	1.0	No	3.2
9	B.R.I.	Roadside	358729	173499	NO2	Yes	0.0	1.0	No	2.4
10	Bath Road	Roadside	361217	171429	NO2	Yes	5.0	4.0	No	3.2
11	Whitefriars	Roadside	358813	173342	NO2	Yes	0.0	5.0	No	3.2
12	Galleries	Roadside	359142	173211	NO2	Yes	0.0	1.0	No	2.4
14	Red Lion Knowle	Roadside	360877	170280	NO2	Yes	6.0	2.0	No	2.4
15	Horsefair	Roadside	359294	173485	NO2	Yes	0.0	2.0	No	2.2
16	Third Way	Roadside	352287	178698	NO2	No	0.0	2.0	No	2.7
21	Gloucester Road	Roadside	359035	175306	NO2	Yes	3.0	2.0	No	1.7
22	Stokes Croft	Roadside	359109	173886	NO2	Yes	0.0	2.0	No	2.5
113	Victoria Street	Roadside	359258	172696	NO2	Yes	2.0	3.0	No	2.8
125	York Road	Roadside	359214	171917	NO2	Yes	3.0	2.0	No	1.8
147	Anchor Road	Roadside	358514	172691	NO2	Yes	0.0	1.0	No	2.2
154	Hotwells Road	Roadside	357601	172483	NO2	Yes	0.0	1.0	No	2.4
155	Jacobs Wells Road South	Roadside	357838	172713	NO2	Yes	0.0	2.0	No	3.2
156	Jacobs Wells road opp Clifton hill	Roadside	357709	173018	NO2	Yes	0.0	2.0	No	2.5
157	Stokes Croft Ashley Road	Roadside	359119	174090	NO2	Yes	0.0	2.0	No	2.4
159	Cromwell Road	Roadside	358891	174608	NO2	Yes	4.0	2.0	No	2.7
161	Bishop Road	Roadside	359152	175733	NO2	Yes	4.0	2.0	No	2.2
163	Strathmore Road	Roadside	359435	176574	NO2	Yes	7.0	3.0	No	2.5
175	top of Brislington Hill	Roadside	362147	170525	NO2	Yes	13.0	2.0	No	3.2
239	Parson St. A38 East	Kerbside	357880	170506	NO2	Yes	8.3	0.7	No	3.2

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)
242	Parson Street Bedminster Down Road	Kerbside	357510	170401	NO2	Yes	5.0	0.5	No	3.2
254	Merchants Road Hotwells	Kerbside	357118	172429	NO2	Yes	3.7	0.8	No	2.6
260	Stapleton Road South	Roadside	361140	175366	NO2	Yes	1.5	3.5	No	2.4
261	Stapleton Road Heath Street	Roadside	361103	175059	NO2	Yes	5.0	3.0	No	2.1
295	Lamppost 16 Ashley Road St. Pauls	Roadside	359913	174315	NO2	Yes	0.0	2.0	No	2.8
300	Facade Haart Estate Agents 755 Fishponds Road Fishponds	Roadside	363365	175883	NO2	Yes	2.0	1.0	No	2.4
303	Facade 784 Muller Road Fishponds	Roadside	361368	175170	NO2	Yes	0.0	6.0	No	2.2
307	Lamppost Glenfrome Road \ Muller Road Horfield	Roadside	360747	175328	NO2	Yes	3.0	2.0	No	2.2
312	Lamppost Ashley Hill St. Pauls	Roadside	359832	174616	NO2	Yes	4.0	2.0	No	2.7
320_1, 320_2, 320_3	Monitor Bath Road Brislington	Urban background	361180	171567	NO2	Yes	0.0	18.0	Yes	6.0
325	Facade 258 Fishponds Road Fishponds	Roadside	361667	175103	NO2	Yes	0.0	8.0	No	2.4
363	5102 façade	Roadside	359075	173613	NO2	Yes	0.0	3.0	No	2.7
370	Great George Street lamppost	Roadside	359775	173513	NO2	Yes	0.0	2.0	No	2.5
371	Lamb Street façade	Roadside	359813	173373	NO2	Yes	14.0	1.0	No	2.6

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)
373	123 Newfoundland Street façade	Roadside	359747	173774	NO2	Yes	0.0	17.0	No	2.1
374	St. Paul Street	Roadside	359509	173595	NO2	Yes	0.0	8.0	No	2.3
403	Lamp post 48 230 Bath Road	Roadside	360508	171676	NO2	Yes	0.0	2.0	No	2.8
405	Whitehall Rd/Easton Rd lamppost 4TZ	Roadside	361051	173743	NO2	Yes	1.0	1.0	No	2.5
406	Whitehall Rd lamppost 17 nr juction with Chalks Rd	Roadside	361576	173806	NO2	Yes	0.0	2.0	No	2.3
407	lamppost sussex place	Roadside	359829	174370	NO2	Yes	6.7	1.8	No	3.2
413	Wells Rd bus lane sign just below junction with Knowle Rd	Roadside	360043	171508	NO2	Yes	4.0	3.0	No	3.2
417	St John's Lane No 26 lamppost 15 (just past roundabout)	Roadside	359635	171413	NO2	Yes	0.0	1.0	No	3.2
418	Bedminster Down Rd lamppost between Ashton Motors & Plough PH	Roadside	357737	170642	NO2	Yes	0.0	2.0	No	2.8
419	Parson St lamppost outside Bristol Scuba	Kerbside	357832	170686	NO2	Yes	4.0	0.5	No	2.8
420	North St/Dean Lane on roundabout sign	Roadside	358277	171562	NO2	Yes	1.0	1.0	No	2.8
423	facade BRI children's	Roadside	358623	173386	NO2	Yes	0.0	13.0	No	2.0

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)
429	facade villiers road stapleton road junction	Roadside	360484	174097	NO2	Yes	0.0	6.0	No	2.6
436	Shiners Garage	Roadside	361013	173352	NO2	Yes	0.0	3.0	No	2.5
438_1, 438_2, 438_3	A37 Junction w/ Airport Road	Kerbside	360903	170024	NO2	Yes	9.0	1.0	Yes	2.4
439_1, 439_2, 439_3	Parson Street School	Roadside	358042	170582	NO2	Yes	0.0	4.0	Yes	1.5
455_1, 455_2, 455_3	St. Pauls Day Nursery	Urban background	359487	173924	NO2	Yes	0.0	4.0	Yes	2.8
464_1, 464_2, 464_3	Fishponds Road	Roadside	362927	175592	NO2	Yes	0.0	3.0	Yes	3.0
470	Victoria Park Primary	Roadside	359213	170997	NO2	Yes	10.0	3.0	No	3.2
472	Jamiesons Autos	Roadside	358226	171284	NO2	Yes	0.0	4.0	No	2.4
473	B&G Snax West St	Roadside	358105	171124	NO2	Yes	0.0	2.0	No	2.8
487	Junction 3 Millpond Street	Roadside	360243	174327	NO2	Yes	4.0	5.0	No	2.0
492	On 1 way sign at bottom of Wellington Hill	Roadside	359445	176627	NO2	Yes	10.0	3.0	No	2.5
493	No 67 Filton Avenue on wall facing Muller Rd	Roadside	359677	176758	NO2	No	0.0	2.0	No	2.3
494	Muller Road - Adjacent to Darnley Avenue	Kerbside	359558	176850	NO2	No	5.5	0.5	No	2.1
496	385 Church Road Redfield	Roadside	362296	173620	NO2	Yes	0.0	3.0	No	2.3
497	20 Ashley Road	Roadside	359268	174132	NO2	Yes	4.0	1.0		2.3

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
499_1, 499_2, 499_3	Temple Way Nox site	Roadside	359522	173381	NO2	Yes	0.0	5.0	Yes	1.5
502_1, 502_2, 502_3	Co-located Colston Ave	Roadside	358640	173090	NO2	Yes	3.0	2.0	Yes	1.5
512	Montpelier High School	Roadside	359026	174432	NO2	Yes	2.0	3.0	No	2.0
525	Summer hill a420	Roadside	362455	173687	NO2	Yes	0.0	1.0	No	2.0
538	Dalby avenue	Roadside	358681	171478	NO2	Yes	0.0	1.2	No	2.0
539	Dalby avenue church lane	Roadside	358599	171391	NO2	Yes	2.0	2.0	No	2.0
545	Ashton park school	Roadside	356379	171436	NO2	Yes	0.0	4.0	No	2.0
550	Cathedral School	Roadside	358353	172613	NO2	Yes	0.0	9.0	No	2.0
555	420 Hotwell Road A4	Roadside	356679	172589	NO2	Yes	2.0	3.0	No	2.0
556	South Eastern stair access Plimsoll Bridge	Roadside	356827	172303	NO2	Yes	0.0	2.0	No	2.0
559	Except local buses sign Blackmoors Lane	Roadside	356485	171580	NO2	Yes	8.0	2.0	No	2.0
560_1, 560_2	Lamppost outside BRI CAZ	Roadside	358665	173439	NO2	Yes	2.0	2.5	No	2.0
561_1, 561_2	Lamppost opposite BRI CAZ	Roadside	358688	173431	NO2	Yes	3.0	5.0	No	2.0
565	A4018 Lamp post by layby before roundabout for Crow Ln/ Knole Ln	Roadside	357227	179101	NO2	No	0.0	1.0	No	2.0
567	Muller road/ Glenfrome road junction north	Roadside	360728	175345	NO2	No	1.5	1.5	No	2.0

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)
568	Traffic light on the corner of Shaldon road	Kerbside	360178	175779	NO2	No	3.5	0.5	No	2.0
569	Lampost on North corner of Draycott road junction with Muller road	Roadside	359855	176186	NO2	No	2.0	2.5	No	2.0
570	Muller road junction with Downend road lampost north of the junction	Kerbside	359847	176439	NO2	No	2.6	0.4	No	2.0
571	Muller road junction with Downend road traffic light to the south of the junction	Roadside	359848	176411	NO2	No	5.5	1.0	No	2.0
574	Whiteladies road, on loading sign next to Redland library	Roadside	357678	174229	NO2	No	0.0	3.0	No	2.0
575	Baldwin Street traffic light outside domino's	Kerbside	358685	172881	NO2	Yes	0.0	0.1	No	2.0
576	Baldwin Street lamp post by cycle way, opp St Stephens St	Roadside	358792	172874	NO2	Yes	0.0	1.0	No	2.0
577	High St lamp post outside Wards solicitors	Roadside	358935	172981	NO2	Yes	0.0	4.0	No	2.0
578	Church Road-CAZ-Outside Gurdwara	Roadside	361892	173552	NO2	Yes	4.0	2.0	No	2.5
579	Church Road-CAZ-Lamppost	Kerbside	362198	173580	NO2	Yes	1.9	0.1	No	2.5
580	Marlborough St-CAZ-Lamppost opposite hosp	Roadside	358754	173528	NO2	Yes	0.0	2.0	No	2.5

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)
581	Marlborough St-CAZ-Lamppost by coach station	Kerbside	358908	173574	NO2	Yes	0.0	0.1	No	2.5
582	Rupert St-CAZ-Post outside fire station	Roadside	358893	173333	NO2	Yes	0.0	2.0	No	2.5
583	Rupert St-CAZ-Post outside police station	Roadside	358870	173340	NO2	Yes	0.0	3.0	No	2.5
584	Rupert St-CAZ-Post outside Fusion Tower	Roadside	358773	173276	NO2	Yes	13.0	3.0	No	2.5
585	Park St-CAZ-Lamppost by Guild	Roadside	358192	173050	NO2	Yes	5.0	2.0	No	2.5
586	Park St-CAZ-Lamppost by Agora	Kerbside	358195	173018	NO2	Yes	3.9	0.1	No	2.5
587	Baldwin St-CAZ-Lamppost by Yelland House	Roadside	358802	172896	NO2	Yes	2.1	2.5	No	2.5
588	Baldwin St-CAZ-Drainpipe on building	Roadside	358739	172869	NO2	Yes	0.0	6.4	No	2.5
589	Marlborough St-CAZ-On sign leg	Roadside	358849	173606	NO2	Yes	6.0	1.0	No	2.5
590	Marlborough St-CAZ-Post by bollards	Roadside	358789	173589	NO2	Yes	0.0	2.1	No	2.5
591	Marlborough St-CAZ-Post	Roadside	358805	173575	NO2	Yes	0.0	0.4	No	2.5
592	Upper Maudlin St-CAZ-Crossing by BRI	Kerbside	358662	173409	NO2	Yes	0.0	0.1	No	2.5
593	Upper Maudlin St-CAZ-Post by BRI	Roadside	358610	173350	NO2	Yes	3.0	1.0	No	2.5

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)
594	Lower Park Row-CAZ-Post by Art shop	Roadside	358540	173234	NO2	Yes	0.0	2.0	No	2.5
595	Lower Park Row-CAZ-Post after OTR	Roadside	358510	173197	NO2	Yes	0.0	2.0	No	2.5
596	Park Row-CAZ-Lamppost by museum	Roadside	358431	173120	NO2	Yes	5.0	3.0	No	2.5
597	Park Row-CAZ-Post by house	Roadside	358403	173124	NO2	Yes	0.0	2.0	No	2.5
598	Queens Road-CAZ-Lamppost by UoB	Roadside	358061	173182	NO2	Yes	0.0	2.4	No	2.5
599	Park St-CAZ-Lamppost by bike stands	Roadside	358135	173123	NO2	Yes	4.0	2.0	No	2.5
600	Park St-CAZ-Lamppost by City Hall	Roadside	358322	172858	NO2	Yes	11.0	5.0	No	2.5
601	College Green-CAZ-Lamppost opp Denmark St	Roadside	358563	172818	NO2	Yes	0.0	2.6	No	2.5
602	Anchor Road-CAZ-Lamppost	Roadside	358469	172656	NO2	Yes	0.3	2.0	No	2.5
603	Lewins Mead-CAZ-Post by Evans Cycles	Roadside	358767	173320	NO2	Yes	0.0	1.5	No	2.5
604	Lewins Mead-CAZ-Post by PMT	Roadside	358817	173342	NO2	Yes	0.0	1.0	No	2.5
605	Rupert St-CAZ-Post by Courtrooms	Roadside	358718	173227	NO2	Yes	6.0	6.0	No	2.5
606	Victoria Street-CAZ-No entry sign	Roadside	359124	172803	NO2	Yes	11.6	1.0	No	2.5

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)
607	Counterslip-CAZ-Drainpipe on building	Roadside	359183	172826	NO2	Yes	2.5	1.1	No	2.5
608	Temple Gate-CAZ-Lamppost	Kerbside	359563	172290	NO2	Yes	2.6	0.4	No	2.5
609	Bath Road-CAZ-Lamppost or sign	Roadside	359740	172116	NO2	Yes	0.0	2.0	No	2.5
610	Wells Road-CAZ-Lamppost	Roadside	359967	171548	NO2	Yes	0.0	2.0	No	2.5
611	Winterstoke Road-CAZ-Lamppost	Roadside	357425	170769	NO2	Yes	0.0	1.0	No	2.5
612	Newfoundland St-CAZ-Lamppost by layby	Roadside	359206	173557	NO2	Yes	0.0	4.0	No	2.5
613	Newfoundland St-CAZ-Lamppost by crossing	Kerbside	359316	173554	NO2	Yes	0.0	0.1	No	2.5
614	Temple Way-CAZ-Sign by Champ Square	Roadside	359516	173374	NO2	Yes	0.0	1.0	No	2.5
615	Newfoundland Way-CAZ-Lamppost by petrol station	Kerbside	359659	173688	NO2	Yes	0.0	0.8	No	2.5
616	Newfoundland Way-CAZ-Road sign	Kerbside	359747	173717	NO2	Yes	0.0	0.7	No	2.5
617	Houlton St-CAZ-30mph sign	Kerbside	359686	173587	NO2	Yes	0.0	0.5	No	2.5
618	Cheltenham Rd-CAZ-Sign opp Tesco	Roadside	359086	174187	NO2	Yes	4.7	3.0	No	2.5
619	Cheltenham Rd-CAZ-Lamppost by Bite	Roadside	359119	174149	NO2	Yes	0.0	3.0	No	2.5

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)
621	Gloucester Rd-CAZ-Lamppost by bus stop	Roadside	359256	175999	NO2	Yes	0.0	3.0	No	2.5
622	Bedminster Rd-CAZ-Lamppost opp school	Roadside	358059	170597	NO2	Yes	2.5	2.0	No	2.5
623	Bedminster Rd-CAZ-Lamppost by school	Roadside	358034	170602	NO2	Yes	4.1	2.2	No	2.5
624	Bedminster Rd-CAZ-Post opp Van Sales	Roadside	357858	170499	NO2	Yes	8.0	2.0	No	2.5
625	Bedminster Rd-CAZ-Lamppost by Van Sales	Roadside	357842	170514	NO2	Yes	0.0	1.2	No	2.5
626	Bedminster Rd-CAZ-Post	Roadside	357667	170466	NO2	Yes	0.0	2.0	No	2.5
627	Parson St-CAZ-Lamppost by Station	Roadside	357829	170658	NO2	Yes	0.0	3.0	No	2.5
628	Lower Ashley Rd-CAZ-Lamppost by Geo Jones	Roadside	359899	174335	NO2	Yes	0.0	4.0	No	2.2
629	Lower Ashley Rd-CAZ-Lamppost opp London Rd	Roadside	359956	174314	NO2	Yes	1.0	2.0	No	2.5
630	Bedminster Down Rd-CAZ-Lamppost by billboard	Roadside	357533	170410	NO2	Yes	0.0	3.0	No	2.5
631	Bedminster Down Rd-CAZ-Roadsign by Winterstoke	Roadside	357729	170660	NO2	Yes	10.5	1.5	No	2.5
632	West St-CAZ-Lamppost by Argus Rd	Roadside	358073	171063	NO2	Yes	6.2	1.6	No	2.5

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)
633	West St-CAZ-Lamppost opp Jamiesons	Roadside	358217	171299	NO2	Yes	0.4	2.3	No	2.5
634	Bedminster Parade-CAZ-Lamppost by William Hill	Roadside	358772	171741	NO2	Yes	0.4	2.3	No	2.5
635	York Rd-CAZ-Sign after bridge	Kerbside	359106	171962	NO2	Yes	0.0	0.5	No	2.5
636	Bath Rd-CAZ-Lamppost by Bus Lane	Roadside	359940	171838	NO2	Yes	0.0	3.0	No	2.5
637	Bath Rd-CAZ-Lamppost by Kings Road	Roadside	361206	171390	NO2	Yes	0.0	1.5	No	2.5
638	A4044 Roundabout-CAZ-Lamppost	Roadside	359498	173144	NO2	Yes	0.0	17.0	No	2.5
639	Victoria St-CAZ-Lamppost opp Mitchell Lane	Roadside	359318	172634	NO2	Yes	3.0	1.0	No	2.5
640	Lamb Street-CAZ-One way sign by Church	Roadside	359792	173319	NO2	Yes	0.0	3.0	No	2.5
641	Stokes Croft-CAZ-Lamppost	Roadside	359114	174007	NO2	Yes	0.0	2.5	No	2.5
642	Ashley Road-CAZ-Lamppost opp Drumd Rd	Roadside	359276	174155	NO2	Yes	0.0	2.0	No	2.5
643	Sussex Place-CAZ-Lamppost	Kerbside	359817	174401	NO2	Yes	10.4	0.2	No	2.1
644	Ashley Down Rd-CAZ-Lamppost	Roadside	359676	175102	NO2	No	6.0	2.0	No	2.0
645	Gloucester Rd-CAZ-Lamppost opp Baths	Kerbside	359033	175259	NO2	Yes	5.9	0.1	No	2.5

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)
646	Cheltenham Rd-CAZ-Post by Papa Johns	Kerbside	359038	174391	NO2	Yes	2.9	0.1	No	2.5
647	Merchants Rd-CAZ-Lamppost by house	Roadside	357124	172400	NO2	Yes	2.8	1.7	No	2.5
648	Wells Rd-CAZ-Lamppost by Red Lion Carpets	Roadside	360905	170185	NO2	Yes	4.3	2.0	No	2.5
649	Bath Rd-CAZ-Lamppost	Roadside	362089	170606	NO2	Yes	10.5	2.0	No	2.5
650	Wells Rd-CAZ-Lamppost	Roadside	360818	170448	NO2	Yes	0.0	2.0	No	2.5
651	Church Rd-CAZ-Post by Barwaaqo Cafe	Roadside	360938	173376	NO2	Yes	0.0	2.0	No	2.5
652	Whitehall Rd-CAZ-Lamppost by house	Roadside	361119	173796	NO2	Yes	3.5	1.0	No	2.5
653	Stapleton Rd-CAZ-Lamppost by house	Roadside	360515	174134	NO2	Yes	2.5	1.5	No	2.5
654	Mina Rd-CAZ-Lamppost by house	Roadside	360207	174403	NO2	Yes	2.1	3.2	No	2.5
655	Muller Rd-CAZ-Lamppost opp LA DT	Roadside	361355	175203	NO2	Yes	0.0	2.0	No	2.5
656	Stapleton Rd-CAZ-Lamppost	Kerbside	361141	175446	NO2	Yes	7.6	0.5	No	2.5
657	Fishponds Rd-CAZ-Lamppost	Roadside	361676	175127	NO2	Yes	0.0	3.0	No	2.5
658	Fishponds Rd-CAZ-Lamppost	Roadside	363325	175803	NO2	Yes	3.8	1.5	No	2.5
659	Muller Rd-CAZ-Lamppost	Kerbside	359773	176702	NO2	No	8.8	0.1	No	2.5
660	Muller Rd-CAZ-Lamppost	Kerbside	360896	175312	NO2	Yes	5.8	0.2	No	2.5

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)
661	Linden Rd-CAZ-Lamppost by house	Kerbside	358022	175630	NO2	No	6.6	0.4	No	2.1
662	Linden Rd-CAZ-Lamppost by house	Roadside	357868	175723	NO2	No	10.5	3.0	No	2.5
663	Whiteladies Rd-CAZ-Lamppost after petrol station	Roadside	357396	174761	NO2	No	3.0	3.0	No	2.5
664	Westbury Rd-CAZ-Lamppost by hospital	Kerbside	357347	174992	NO2	No	0.0	0.1	No	1.7
665	Upper Maudlin St-CAZ-Lamppost opp BRI	Roadside	358675	173405	NO2	Yes	2.0	2.0	No	2.5
666	Upper Maudlin St-CAZ-Lamppost by BRI	Roadside	358646	173426	NO2	Yes	5.0	5.0	No	2.5
667	College Green-CAZ-Post by Toni&Guy	Kerbside	358531	172803	NO2	Yes	4.5	0.5	No	2.5
669	Temple Way Bridge-CAZ-Lamppost Temple Way Bridge	Roadside	359511	172754	NO2	Yes	0.0	3.0	No	2.5
670	Bristol Hill-CAZ-Lamppost Bristol Hill	Roadside	361749	170690	NO2	Yes	1.5	3.0	No	2.5
671	North View Downs Park West	Kerbside	357381	175781	NO2	No	1.0	0.3	No	2.0
673_1, 673_2, 673_3	Marlborough Street - co - located	Roadside	358728	173520	NO2	Yes	0.0	3.0	Yes	1.5
674	Troopers Hill Opposite No 30	Roadside	363157	173215	NO2	No	4.8	1.2	No	2.1
675	Netham Lock Junction	Roadside	361615	172728	NO2	No	0.0	1.5	No	2.1

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)
676	Blackswarth Road Opposite St Patrick's School	Roadside	361734	173291	NO2	Yes	3.8	2.2	No	2.1
677	Beaufort Road Opposite No 109	Kerbside	362105	173350	NO2	Yes	1.8	0.0	No	2.1
678	Victoria Avenue Opposite No 90	Roadside	361279	173283	NO2	Yes	0.0	1.5	No	2.1
679	Avonvale Road Opposite Bristol Futures Academy	Kerbside	361134	173034	NO2	Yes	2.0	0.3	No	2.1
680	Morely Street/Bright Street Ped Crossing	Roadside	360973	173193	NO2	Yes	4.0	1.5	No	2.1
681	Russel Town Avenue Opposite Pheonix Social Enterprise Club	Roadside	360985	173541	NO2	Yes	13.5	1.5	No	2.1
682	Church Road Miss Millies	Kerbside	361359	173460	NO2	Yes	2.0	0.5	No	2.1
683	Victoria Parade Opposite No 39	Roadside	361451	173617	NO2	Yes	1.5	1.5	No	2.1
684	Lyppiatt Road Opposite No 25	Kerbside	361597	173622	NO2	Yes	3.5	1.0	No	2.1
698	Portway - Sylvan Way	Roadside	354633	176588	NO2	No	0.0	2.0	No	2.0
699	Portway - Roman Way	Roadside	355122	175764	NO2	No	0.0	2.0	No	2.0
700	Portway - Bridge Valley Road	Kerbside	356336	173464	NO2	No	0.0	1.0	No	2.0

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 2023 (%) (2)	2019	2020	2021	2022	2023
203	361178	171566	Urban background	97.3	97.3	25.2	18.8	20	20.4	17.5
215	358042	170582	Roadside	96.8	96.8	32.3	28.6	31.4	28.8	25.3
270	360903	170024	Roadside	99.7	99.7	29.7	27.9	23.9	22.7	22.5
452	359488	173924	Urban background	98.7	98.7	23.4	15.2	17.5	19.2	17.4
463	362926	175590	Roadside	97.8	97.8	39.5	22.2	29.4	26.6	23.3
500	359522	173381	Roadside	95.1	95.1	39.2	28.3	32.1	31.2	25.6
501	358640	173090	Roadside	96	96	**65.5**	**45.2**	**49.8**	**66.2**	**48 (41.9)**
672	358728	173520	Roadside	98.9	98.9			32.7	28.5	23

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

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

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

Notes:

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

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

Annual averages over 60µg/m^3 are underlined, highlighting the potential for exceedance of the short-term hourly objective for NO_2

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

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

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

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

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

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2023 (%) [2]	2019	2020	2021	2022	2023
2	358628	173011	Roadside	82.7	82.7	**53.7**	36.9	**40.1**	**40.3**	39.0
3	357448	174650	Roadside	92.3	92.3	27.7	28.7	**44.4**	38.8	**47.7**
4	359903	171850	Roadside	100.0	100.0	**41.0**	36.8	38.9	38.4	29.3
5	358723	171704	Roadside	100.0	100.0	39.9	31.6	**41.0**	37.9	33.5
9	358729	173499	Roadside	100.0	100.0	37.8	31.7	39.3	36.0	27.8
10	361217	171429	Roadside	100.0	100.0	**42.2**	33.6	36.8	35.9	30.7
11	358813	173342	Roadside	100.0	100.0	**41.1**	31.1	35.0	35.3	29.6
12	359142	173211	Roadside	90.4	90.4	**51.8**	**41.9**	**46.5**	**50.2**	**60.2**
14	360877	170280	Roadside	100.0	100.0	38.7	32.4	32.7	30.3	27.0
15	359294	173485	Roadside	92.3	92.3	**42.2**	28.2	31.5	31.3	26.4
16	352287	178698	Roadside	92.3	92.3	28.7	23.2	24.9	25.8	21.5
21	359035	175306	Roadside	92.3	92.3	38.3	33.4	34.9	34.0	30.9
22	359109	173886	Roadside	90.4	90.4	**44.3**	34.3	37.5	36.7	35.9
113	359258	172696	Roadside	92.3	92.3	37.4	29.9	27.8	32.0	29.4
125	359214	171917	Roadside	92.3	92.3	**45.2**	35.6	35.8	33.6	24.3
147	358514	172691	Roadside	100.0	100.0	**50.9**	39.4	**43.3**	**45.5**	39.5
154	357601	172483	Roadside	92.3	92.3	30.0	22.1	25.4	26.1	17.8
155	357838	172713	Roadside	100.0	100.0	31.1	22.9	25.5	24.2	17.5
156	357709	173018	Roadside	100.0	100.0	30.5	20.7	24.9	25.9	19.1
157	359119	174090	Roadside	84.6	84.6	**43.1**	35.7	**40.3**	35.0	35.2
159	358891	174608	Roadside	92.3	92.3	35.8	28.5	31.9	32.1	28.9
161	359152	175733	Roadside	92.3	92.3	31.7	25.3	27.4	26.0	25.6
163	359435	176574	Roadside	92.3	92.3	30.8	24.5	27.4	27.2	27.2
175	362147	170525	Roadside	100.0	100.0	**44.6**	36.4	**41.4**	38.7	30.4
239	357880	170506	Kerbside	100.0	100.0	**54.4**	**47.6**	**51.4**	**48.6**	**40.5**
242	357510	170401	Kerbside	100.0	100.0	**41.0**	32.2	34.5	36.6	29.8
254	357118	172429	Kerbside	100.0	100.0	**40.5**	31.1	34.6	33.0	24.7
260	361140	175366	Roadside	92.3	92.3	36.2	29.5	33.2	31.6	26.5
261	361103	175059	Roadside	92.3	92.3	**41.5**	34.7	39.1	39.3	32.0
295	359913	174315	Roadside	65.4	65.4	**48.1**	37.2	**44.5**	**41.0**	34.0
300	363365	175883	Roadside	92.3	92.3	35.1	28.9	28.7	27.5	21.2
303	361368	175170	Roadside	82.7	82.7	36.5	29.2	31.8	31.2	24.1
307	360747	175328	Roadside	92.3	92.3	30.7	24.6	27.5	26.8	24.5
312	359832	174616	Roadside	92.3	92.3	32.8	26.2	29.5	29.8	24.8

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 2023 (%) [2]	2019	2020	2021	2022	2023
320_1, 320_2, 320_3	361180	171567	Urban background	100.0	100.0	23.5	19.3	20.8	20.6	17.7
325	361667	175103	Roadside	92.3	92.3	39.4	34.1	37.3	32.6	29.4
363	359075	173613	Roadside	100.0	100.0	34.0	23.5	26.8	28.0	23.8
370	359775	173513	Roadside	90.4	90.4	30.1		25.0	31.0	25.3
371	359813	173373	Roadside	82.7	82.7	34.1	25.8	29.4	29.0	25.5
373	359747	173774	Roadside	92.3	92.3	31.2	23.9	27.9	27.4	22.3
374	359509	173595	Roadside	100.0	100.0	39.9	29.9	35.0	33.7	27.1
403	360508	171676	Roadside	100.0	100.0	28.1	23.4	25.5	25.5	20.2
405	361051	173743	Roadside	100.0	100.0	**48.5**	38.7	**40.4**	38.0	33.5
406	361576	173806	Roadside	100.0	100.0	31.0	26.6	29.3	29.6	24.2
407	359829	174370	Roadside	92.3	92.3	37.3	26.7	30.2	29.5	24.8
413	360043	171508	Roadside	100.0	100.0	31.2	25.5	27.4	27.2	23.5
417	359635	171413	Roadside	100.0	100.0	31.0	26.3	27.9	27.0	22.7
418	357737	170642	Roadside	92.3	92.3	**51.1**	**40.2**	**45.9**	**44.1**	32.8
419	357832	170686	Kerbside	90.4	90.4	39.0	31.4	34.3	33.6	29.4
420	358277	171562	Roadside	92.3	92.3	30.4	23.2	25.6	28.8	23.7
423	358623	173386	Roadside	100.0	100.0	35.2	27.3	29.5	29.1	22.2
429	360484	174097	Roadside	51.9	51.9	**41.2**	38.8	36.4	35.5	38.0
436	361013	173352	Roadside	90.4	90.4	**42.0**	29.2	31.2	30.6	24.4
438_1, 438_2, 438_3	360903	170024	Kerbside	100.0	100.0	31.8	27.1	29.0	29.4	25.0
439_1, 439_2, 439_3	358042	170582	Roadside	82.7	82.7	31.7	25.4	28.6	27.2	24.0
455_1, 455_2, 455_3	359487	173924	Urban background	100.0	100.0	20.8	15.9	16.4	16.7	14.3
464_1, 464_2, 464_3	362927	175592	Roadside	92.3	92.3	29.7	24.2	23.7	24.0	20.8
470	359213	170997	Roadside	82.7	82.7	29.4	25.1	26.8	28.3	24.2
472	358226	171284	Roadside	82.7	82.7	33.7	26.2	28.7	29.0	25.8
473	358105	171124	Roadside	100.0	100.0	**42.4**	**40.0**	28.4	28.4	26.1
487	360243	174327	Roadside	59.6	59.6	35.1	27.7	29.6	36.8	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 2023 (%) [2]	2019	2020	2021	2022	2023
492	359445	176627	Roadside	92.3	92.3	31.3	25.2	26.4	27.5	25.6
493	359677	176758	Roadside	67.3	67.3	37.0	29.5	31.8	31.2	27.4
494	359558	176850	Kerbside	84.6	84.6	32.0	25.1	25.0	26.4	22.5
496	362296	173620	Roadside	92.3	92.3	33.0	25.0	25.9	26.7	22.9
497	359268	174132	Roadside	100.0	100.0	29.1	24.6	27.1	24.7	24.8
499_1, 499_2, 499_3	359522	173381	Roadside	82.7	82.7	33.6	26.0	31.1	30.9	26.2
502_1, 502_2, 502_3	358640	173090	Roadside	100.0	100.0	**68.7**	**52.1**	**58.0**	**54.1**	**48.9**
512	359026	174432	Roadside	92.3	92.3	**40.6**	30.7	36.1	36.2	37.3
525	362455	173687	Roadside	100.0	100.0	35.3	24.1	28.5	29.8	24.8
538	358681	171478	Roadside	100.0	100.0	26.6	20.4	22.5	21.3	19.5
539	358599	171391	Roadside	82.7	82.7	35.6	27.4	30.9	23.8	26.6
545	356379	171436	Roadside	100.0	100.0	28.6	22.0	24.3	23.3	17.2
550	358353	172613	Roadside	73.1	73.1	35.1	21.1	29.1	29.4	24.7
555	356679	172589	Roadside	100.0	100.0	32.0	26.5	28.0	28.0	19.3
556	356827	172303	Roadside	100.0	100.0	37.0	31.7	35.0	31.8	23.9
559	356485	171580	Roadside	90.4	90.4	29.0	19.8	24.5	24.2	20.4
560_1, 560_2	358665	173439	Roadside	90.4	90.4	**40.4**	30.2	32.2	31.5	25.6
561_1, 561_2	358688	173431	Roadside	82.7	82.7	**47.0**	33.8	36.7	34.8	24.7
565	357227	179101	Roadside	92.3	92.3	31.4	24.5	26.3	24.4	22.7
567	360728	175345	Roadside	82.7	82.7	**44.0**	**41.3**	**44.8**	**43.2**	35.3
568	360178	175779	Kerbside	75.0	75.0	36.2	29.0	32.9	32.2	28.2
569	359855	176186	Roadside	92.3	92.3	31.4	22.8	24.1	24.1	21.3
570	359847	176439	Kerbside	82.7	82.7	33.1	28.4	28.2	29.6	26.2
571	359848	176411	Roadside	92.3	92.3	**42.8**	31.3	33.1	32.3	28.4
574	357678	174229	Roadside	92.3	92.3		27.3	28.9	29.6	25.8
575	358685	172881	Kerbside	90.4	90.4		30.9	29.6	31.5	33.0
576	358792	172874	Roadside	100.0	100.0		23.9	26.8	29.8	27.9
577	358935	172981	Roadside	92.3	92.3		30.5	27.8	31.1	35.3
578	361892	173552	Roadside	92.3	92.3			33.0	31.1	27.5
579	362198	173580	Kerbside	100.0	100.0			35.4	32.2	27.2
580	358754	173528	Roadside	65.4	65.4			**47.9**	**41.8**	33.8

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 2023 (%) [2]	2019	2020	2021	2022	2023
581	358908	173574	Kerbside	90.4	90.4			**40.8**	39.1	30.4
582	358893	173333	Roadside	67.3	67.3			**50.0**	**43.7**	39.2
583	358870	173340	Roadside	75.0	75.0			**42.3**	37.9	39.1
584	358773	173276	Roadside	84.6	84.6			33.0	34.3	30.8
585	358192	173050	Roadside	92.3	92.3			30.5	32.1	24.7
586	358195	173018	Kerbside	100.0	100.0			38.6	**41.8**	32.6
587	358802	172896	Roadside	100.0	100.0			26.5	30.9	28.5
588	358739	172869	Roadside	90.4	90.4			26.5	31.5	29.2
589	358849	173606	Roadside	100.0	100.0			26.5	27.2	21.8
590	358789	173589	Roadside	100.0	100.0			**42.3**	**40.7**	31.0
591	358805	173575	Roadside	100.0	100.0			34.9	33.1	25.1
592	358662	173409	Kerbside	92.3	92.3			39.6	38.6	28.8
593	358610	173350	Roadside	40.4	40.4			35.2	36.3	24.8
594	358540	173234	Roadside	73.1	73.1			34.1	34.1	26.6
595	358510	173197	Roadside	57.7	57.7			32.2	30.6	23.0
596	358431	173120	Roadside	76.9	76.9			30.0	31.2	25.4
597	358403	173124	Roadside	100.0	100.0			32.7	33.0	21.7
598	358061	173182	Roadside	76.9	76.9			26.9	26.8	21.3
599	358135	173123	Roadside	73.1	73.1			33.3	31.0	28.9
600	358322	172858	Roadside	82.7	82.7			23.9	23.9	22.0
601	358563	172818	Roadside	100.0	100.0			29.4	30.8	25.4
602	358469	172656	Roadside	67.3	67.3			38.0	**42.7**	33.9
603	358767	173320	Roadside	100.0	100.0			39.6	**41.9**	34.5
604	358817	173342	Roadside	73.1	73.1			**43.0**	**43.1**	39.0
605	358718	173227	Roadside	48.1	48.1			32.4	30.2	23.6
606	359124	172803	Roadside	90.4	90.4			25.5	25.7	24.4
607	359183	172826	Roadside	100.0	100.0			27.8	28.4	23.3
608	359563	172290	Kerbside	61.5	61.5			39.4	38.4	31.9
609	359740	172116	Roadside	100.0	100.0			30.2	30.4	25.2
610	359967	171548	Roadside	100.0	100.0			32.3	32.4	25.6
611	357425	170769	Roadside	100.0	100.0			19.5	20.1	16.5
612	359206	173557	Roadside	100.0	100.0			29.9	30.9	25.1
613	359316	173554	Kerbside	100.0	100.0			**40.6**	**42.0**	33.3
614	359516	173374	Roadside	100.0	100.0			28.4	29.4	24.7
615	359659	173688	Kerbside	100.0	100.0			**53.0**	**49.4**	38.4
616	359747	173717	Kerbside	100.0	100.0			**44.0**	**42.5**	33.5
617	359686	173587	Kerbside	82.7	82.7			28.4	25.3	22.4

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2023 (%) [2]	2019	2020	2021	2022	2023
618	359086	174187	Roadside	67.3	67.3			33.8	31.5	30.8
619	359119	174149	Roadside	84.6	84.6			34.7	38.2	35.2
621	359256	175999	Roadside	55.8	55.8			24.9	25.4	26.5
622	358059	170597	Roadside	100.0	100.0			33.7	34.3	29.7
623	358034	170602	Roadside	100.0	100.0			30.6	28.4	25.6
624	357858	170499	Roadside	100.0	100.0			**49.7**	**48.4**	37.6
625	357842	170514	Roadside	100.0	100.0			**45.4**	**44.7**	37.6
626	357667	170466	Roadside	90.4	90.4			**43.0**	**43.3**	38.7
627	357829	170658	Roadside	82.7	82.7			34.0	33.3	27.9
628	359899	174335	Roadside	84.6	84.6			35.9	33.2	29.5
629	359956	174314	Roadside	92.3	92.3			38.9	34.8	34.6
630	357533	170410	Roadside	100.0	100.0			30.3	35.5	26.7
631	357729	170660	Roadside	100.0	100.0			24.8	25.9	22.6
632	358073	171063	Roadside	100.0	100.0			23.4	24.6	22.6
633	358217	171299	Roadside	92.3	92.3			36.5	34.6	31.4
634	358772	171741	Roadside	92.3	92.3			34.6	30.1	28.1
635	359106	171962	Kerbside	90.4	90.4			25.3	23.8	19.9
636	359940	171838	Roadside	100.0	100.0			26.2	25.5	22.1
637	361206	171390	Roadside	92.3	92.3			21.7	24.2	17.1
638	359498	173144	Roadside	90.4	90.4			**43.8**	**42.4**	**44.8**
639	359318	172634	Roadside	90.4	90.4			27.0	29.5	29.6
640	359792	173319	Roadside	100.0	100.0			28.1	27.1	23.6
641	359114	174007	Roadside	90.4	90.4			39.7	38.1	36.8
642	359276	174155	Roadside	92.3	92.3			28.9	24.6	24.9
643	359817	174401	Kerbside	92.3	92.3			39.7	35.6	28.8
644	359676	175102	Roadside	92.3	92.3			31.8	31.7	28.2
645	359033	175259	Kerbside	92.3	92.3			30.3	28.9	28.3
646	359038	174391	Kerbside	100.0	100.0			31.7	31.7	31.9
647	357124	172400	Roadside	92.3	92.3			34.3	30.9	22.9
648	360905	170185	Roadside	100.0	100.0			29.0	29.2	25.3
649	362089	170606	Roadside	100.0	100.0			30.1	30.0	27.1
650	360818	170448	Roadside	92.3	92.3			22.8	21.6	19.3
651	360938	173376	Roadside	48.1	48.1			35.2	33.9	26.6
652	361119	173796	Roadside	100.0	100.0			**41.5**	37.0	33.3
653	360515	174134	Roadside	59.6	59.6			26.0	30.9	33.5
654	360207	174403	Roadside	92.3	92.3			22.9	24.0	20.0
655	361355	175203	Roadside	82.7	82.7			29.2	28.6	26.9

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2023 (%) [2]	2019	2020	2021	2022	2023
656	361141	175446	Kerbside	92.3	92.3			28.8	27.3	23.3
657	361676	175127	Roadside	92.3	92.3			29.2	33.5	24.9
658	363325	175803	Roadside	84.6	84.6			23.6	24.1	22.9
659	359773	176702	Kerbside	92.3	92.3			26.5	25.1	22.3
660	360896	175312	Kerbside	75.0	75.0			32.1	32.4	28.1
661	358022	175630	Kerbside	84.6	84.6			23.3	22.0	20.2
662	357868	175723	Roadside	92.3	92.3			21.2	20.7	19.1
663	357396	174761	Roadside	100.0	100.0			24.7	25.9	22.4
664	357347	174992	Kerbside	92.3	92.3			25.5	24.8	19.7
665	358675	173405	Roadside	67.3	67.3			37.6	37.1	31.6
666	358646	173426	Roadside	71.2	71.2			32.8	31.3	25.4
667	358531	172803	Kerbside	100.0	100.0			**43.6**	**45.3**	**42.0**
669	359511	172754	Roadside	50.0	50.0			28.6	33.2	29.7
670	361749	170690	Roadside	100.0	100.0			39.9	38.8	32.8
671	357381	175781	Kerbside	92.3	92.3			26.1	23.5	21.3
673_1, 673_2, 673_3	358728	173520	Roadside	100.0	100.0			36.1	33.5	26.1
674	363157	173215	Roadside	100.0	100.0				15.2	14.2
675	361615	172728	Roadside	100.0	100.0				26.4	23.7
676	361734	173291	Roadside	100.0	100.0				19.8	19.0
677	362105	173350	Kerbside	100.0	100.0				21.4	17.6
678	361279	173283	Roadside	92.3	92.3				17.7	15.6
679	361134	173034	Kerbside	92.3	92.3				21.0	20.3
680	360973	173193	Roadside	84.6	84.6				20.8	19.9
681	360985	173541	Roadside	92.3	92.3				24.8	22.4
682	361359	173460	Kerbside	82.7	82.7				26.7	22.9
683	361451	173617	Roadside	80.8	80.8				18.6	17.2
684	361597	173622	Kerbside	67.3	67.3				20.1	17.0
698	354633	176588	Roadside	32.7	32.7					19.9
699	355122	175764	Roadside	67.3	67.3					18.8
700	356336	173464	Kerbside	59.6	59.6					25.8

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

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

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

Notes:

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

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

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

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

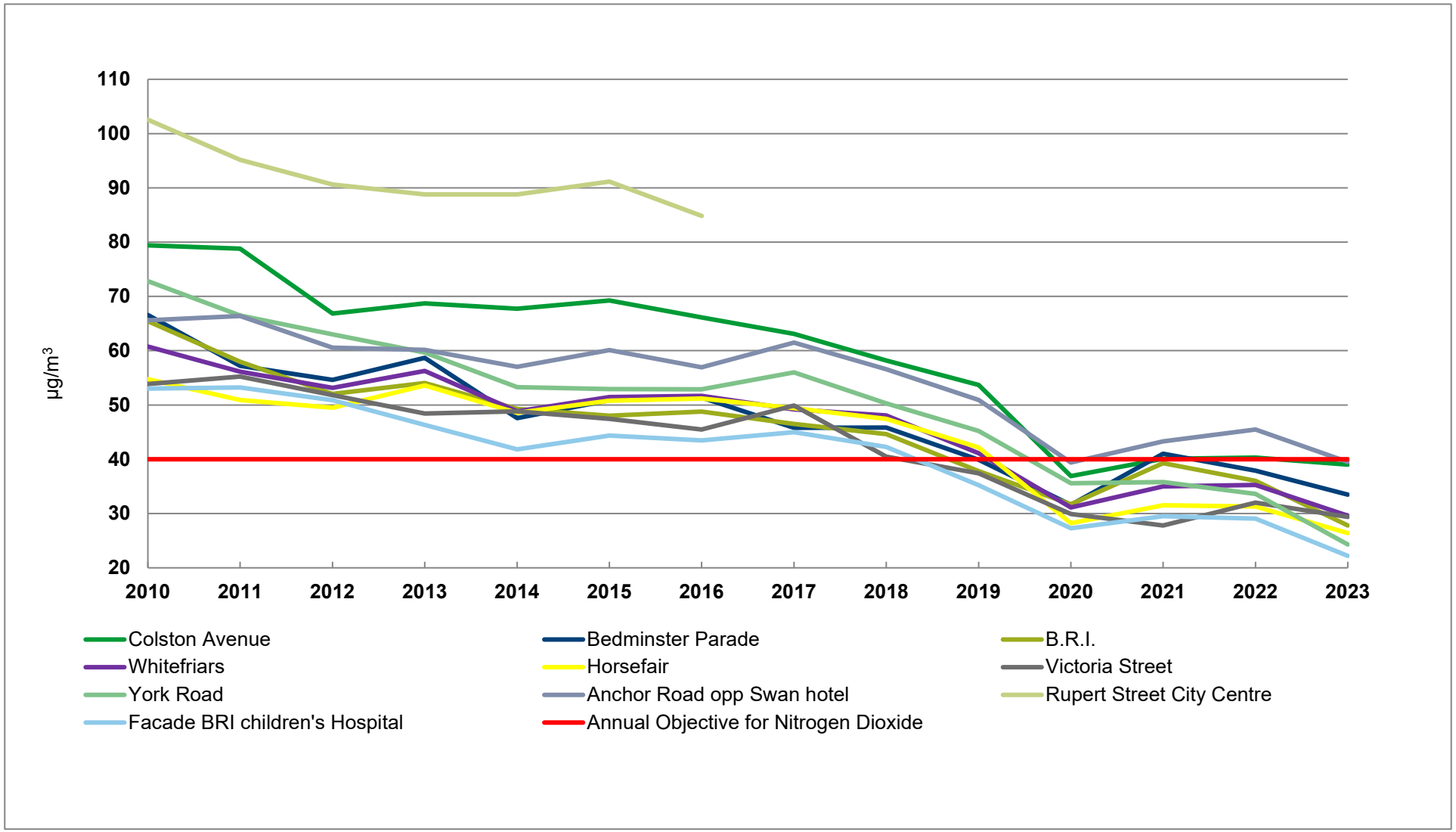
Concentrations are those at the location of monitoring and not those following any fall-off with distance adjustment.

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

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

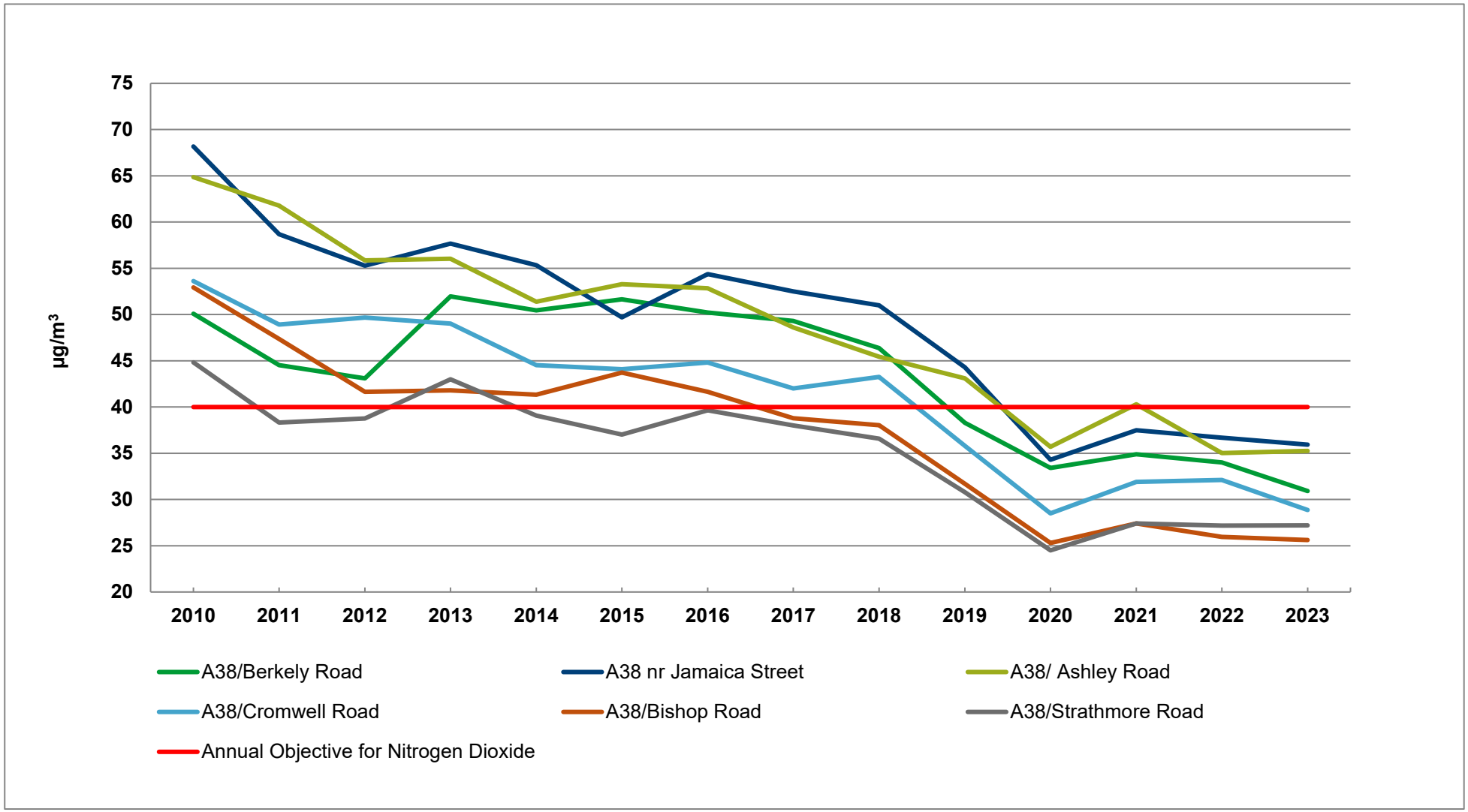
Consideration of trends in NO_2 concentrations at a selection of kerb/roadside sites on the busiest road corridors throughout Bristol, since 2010, show that a similar pattern is observed in all parts of the city. Monitoring has shown consistent exceedance of the annual objectives for NO_2 at many locations but with a reduction in concentrations of NO_2 over this period. Concentrations in 2021 increased when compared to 2020 due to 2020 being a year with significant restrictions on movements due to the Covid-19 pandemic. There was a reduction in NO_2 concentrations at all locations in 2023 when compared to 2022. Trends for three areas of Bristol from 2010 to 2023 are shown in Figure A. 1 to Figure A. 3.

Figure A. 1 - Trends in Annual Nitrogen Dioxide at Central Locations 2010 to 2023



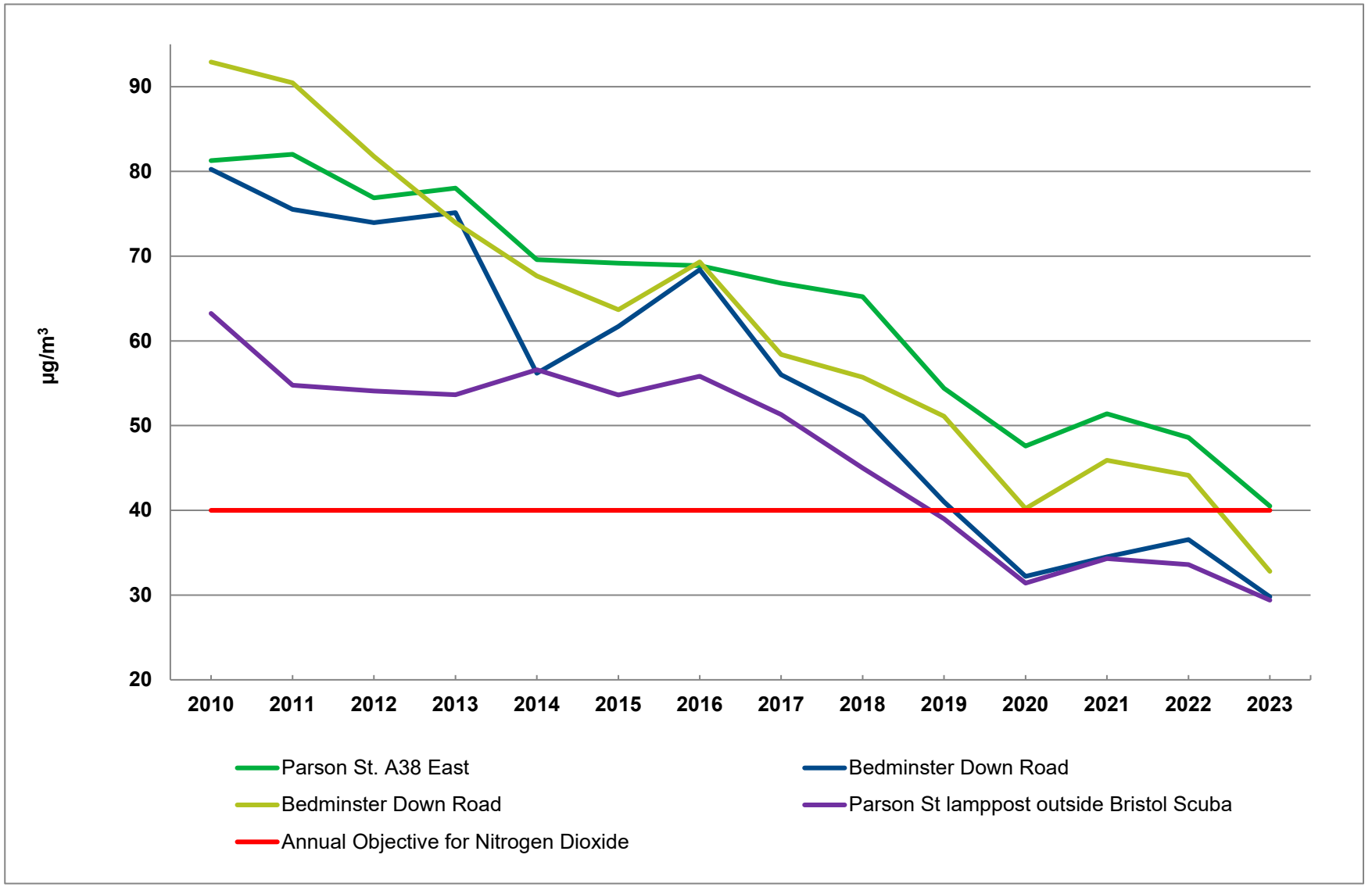
*Data bias adjusted, annualised but not distance adjusted.

Figure A. 2 - Trends in Annual Nitrogen Dioxide at Gloucester Road/Cheltenham Road Locations 2010 to 2023



*Data bias adjusted, annualised but not distance adjusted.

Figure A. 3 - Trends in Annual Nitrogen Dioxide at Parson Street Gyratory Locations 2010 to 2023



*Data bias adjusted, annualised but not distance adjusted.

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

203	361178	171566	Urban background	97.3	97.3	0	0	0	0	0
215	358042	170582	Roadside	96.8	96.8	0	0	0	0	0
270	360903	170024	Roadside	99.7	99.7	0	0	0	0	0
452	359488	173924	Urban background	98.7	98.7	0	0	0	0	0
463	362926	175590	Roadside	97.8	97.8	0 (118)	0 (81.3)	0	0	0
500	359522	173381	Roadside	95.1	95.1	0	0	0	0	0
501	358640	173090	Roadside	96	96	8	6	0	9	0
672	358728	173520	Roadside	98.9	98.9			0 (80.2)	0	0

Notes:

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

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

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

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

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

Table A. 6 – Annual Mean PM_{10} Monitoring Results (µg/m^3)

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2023 (%) [2]	2019	2020	2021	2022	2023
452	359488	173924	Urban background	97.5	97.5	16	17.3	15.7	17.3	15.8
500	359522	173381	Roadside	95.5	95.5	20.9	19.7	17.9	20.9	17.5
501	358640	173090	Roadside	N/A	N/A	21.8	19.4	18.2		

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%).

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

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2023 (%) (2)	2019	2020	2021	2022	2023
452	359488	173924	Urban background	97.5	97.5	0	2	2	2	1
500	359522	173381	Roadside	95.5	95.5	10	4	3	4 (31.7)	2
501	358640	173090	Roadside	N/A	N/A	4	0	2 (27.4)		

Notes:

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

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

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

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

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

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

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2023 (%) (2)	2019	2020	2021	2022	2023
215	358042	170582	Roadside	87.6	87.6		11.8	12	13	9.1
452	359488	173924	Urban background	76.9	76.9	10.8	9.7	8.3	8.4	8.2

Notes:

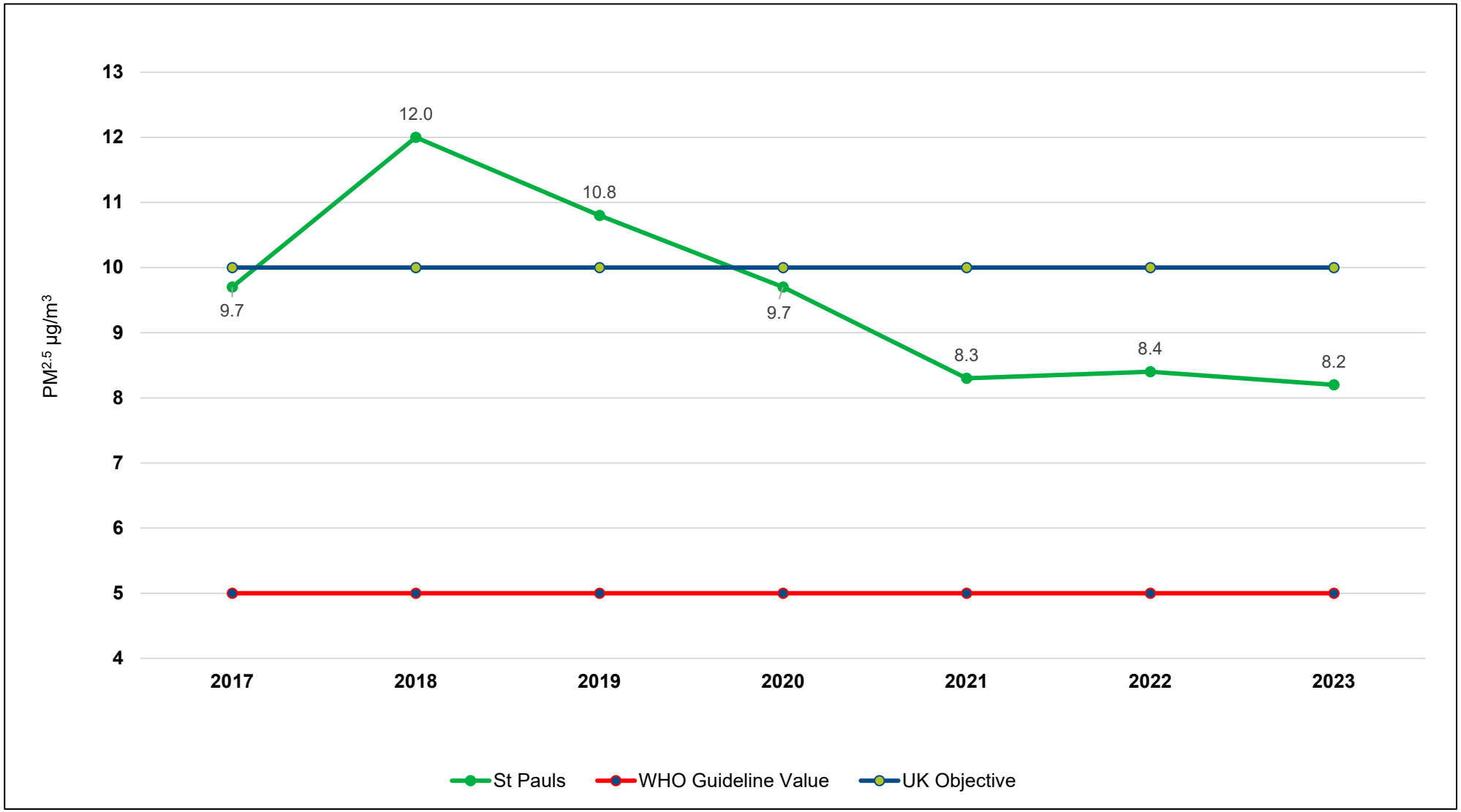
The annual mean concentrations are presented as µg/m^3.

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%).

Figure A. 4 – Trends in Annual Mean $PM_{2.5}$ Concentrations – AURN St Pauls



Appendix B: Full Monthly Diffusion Tube Results for 2023

Table B. 1 – NO_2 2023 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 <(x.x)>	Annual Mean: Distance Corrected to Nearest Exposure	Comment
2	358628	173011	42.9	39.9	42.0	49.1			43.4	37.2	58.1	57.9	40.9	47.1	45.9	39.0	-	
3	357448	174650		76.4	58.8	67.9	84.4	48.7	36.6	53.7	56.7	54.3	49.4	30.9	56.2	**47.7**	-	
4	359903	171850	36.9	38.1	31.3	37.4	35.0	25.3	29.8	34.0	40.3	39.5	37.4	28.8	34.5	29.3	-	
5	358723	171704	44.1	40.8	34.7	40.1	40.3	31.9	34.3	36.0	45.7	45.6	44.3	34.6	39.4	33.5	-	
9	358729	173499	37.6	38.2	33.1	33.2	29.6	30.4	25.1	27.6	38.8	40.0	31.6	26.8	32.7	27.8	-	
10	361217	171429	37.4	43.3	36.8	44.6	36.5	37.5	28.2	31.5	38.0	40.6	31.6	28.1	36.2	30.7	-	
11	358813	173342	33.7	38.1	32.7	40.4	29.8	33.3	27.1	32.9	37.3	43.6	33.9	34.7	34.8	29.6	-	
12	359142	173211	41.3	48.3	41.0	52.8	45.4	46.1	39.8		29.7	220.9	169.7	43.8	70.8	**60.2**	-	
14	360877	170280	30.9	37.6	26.1	39.6	37.6	31.3	25.5	30.0	30.6	39.4	31.9	21.2	31.8	27.0	-	
15	359294	173485	32.0	32.8	28.6	34.4	27.0	28.9	25.9	31.6		37.7	33.2	28.9	31.0	26.4	-	
16	352287	178698		32.2	22.9	24.3	19.4	17.6	22.2	23.9	29.0	29.3	29.4	28.1	25.3	21.5	-	
21	359035	175306		29.0	36.6	37.5	34.1	31.9	32.7	32.1	46.6	43.5	32.5	43.6	36.4	30.9	-	
22	359109	173886	44.1	44.6	40.5	43.2	43.5	44.6	30.1	40.2	46.0	51.5		36.6	42.3	35.9	-	
113	359258	172696	38.1	41.9	34.2	35.8	24.9	28.6	28.8	30.9	42.2		36.7	38.5	34.6	29.4	-	
125	359214	171917		36.1	30.2	31.6	24.6	27.0	24.9	17.4	31.6	36.2	33.3	21.7	28.6	24.3	-	
147	358514	172691	51.2	46.2	49.8	45.1	36.3	40.2	41.8	43.7	54.4	46.2	41.8	61.3	46.5	39.5	-	
154	357601	172483	29.1	27.7	23.0		17.0	17.6	12.8	16.4	21.3	24.5	20.5	20.8	21.0	17.8	-	
155	357838	172713	24.3	26.9	21.5	24.2	19.4	18.3	10.4	17.5	23.8	23.7	22.0	15.0	20.6	17.5	-	
156	357709	173018	25.5	31.2	21.3	22.8	16.4	17.8	15.7	19.7	24.3	25.5	29.2	19.9	22.4	19.1	-	
157	359119	174090	37.3	47.7	38.9			40.1	34.0	37.1	44.2	52.6	40.5	42.3	41.5	35.2	-	
159	358891	174608		38.0	34.6	35.6	28.9	33.3	26.5	28.8	41.6	39.5	35.0	31.7	34.0	28.9	-	
161	359152	175733		34.8	31.4	28.9	24.8	24.5	24.5	24.8	36.4	36.7	36.7	27.9	30.1	25.6	-	
163	359435	176574		37.0	32.3	33.2	29.8	32.2	26.8	30.0	37.5	33.0	33.5	26.8	32.0	27.2	-	
175	362147	170525	37.1	42.0	35.4	28.6	33.2	38.7	19.7	38.1	43.6	44.7	36.5	31.3	35.7	30.4	-	
239	357880	170506	52.7	58.3	51.8	47.1	42.8	49.0	30.1	43.2	52.3	56.0	46.0	42.4	47.6	**40.5**	27.5	
242	357510	170401	35.4	42.2	33.6	37.2	32.5	34.1	26.8	34.5	37.5	41.2	38.3	27.1	35.0	29.8	-	
254	357118	172429	36.1	36.8	29.0	27.5	23.5	20.5	21.9	25.5	30.7	32.1	37.8	28.0	29.1	24.7	-	

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 <(x.x)>	Annual Mean: Distance Corrected to Nearest Exposure	Comment
260	361140	175366		34.5	33.5	31.4	26.3	26.0	28.3	30.1	35.8	32.8	34.7	30.1	31.2	26.5	-	
261	361103	175059		48.2	39.2	41.5	36.1	31.1	28.7	35.8	28.0	45.5	45.7	34.5	37.7	32.0	-	
295	359913	174315		44.7	41.7	43.2	28.8				49.6	47.8	45.3	41.1	42.8	34.0	-	
300	363365	175883		28.6	39.5	21.7	17.7	16.8	19.3	17.0	25.0	26.4	32.8	29.4	24.9	21.2	-	
303	361368	175170		38.5	30.1	25.9	22.9		22.5	23.9	30.6	30.9	32.7	25.4	28.3	24.1	-	
307	360747	175328		33.0	31.3	31.2	23.8	22.4	33.6	22.9	31.0	32.6	28.2	26.6	28.8	24.5	-	
312	359832	174616		38.6	31.3	29.3	23.8	22.8	21.3	27.9	34.0	31.9	33.1	26.9	29.2	24.8	-	
320_1	361180	171567	26.6	26.8	19.6	18.6	16.0	15.2	16.5	20.3	22.6	25.9	24.6	20.2	-	-	-	Triplicate Site with 320_1, 320_2 and 320_3 - Annual data provided for 320_3 only
320_2	361180	171567	26.2	27.3	19.8	18.9	16.0	14.5	16.5	20.1	21.0	26.1	26.8	19.7	-	-	-	Triplicate Site with 320_1, 320_2 and 320_3 - Annual data provided for 320_3 only
320_3	361180	171567	23.9	26.8	18.7	18.4	16.2	14.2	16.6	19.1	23.7	24.5	23.8		20.9	17.7	-	Triplicate Site with 320_1, 320_2 and 320_3 - Annual data provided for 320_3 only
325	361667	175103		39.7	33.3	34.2	29.4	30.6	29.8	35.5	40.1	40.8	36.9	30.8	34.6	29.4	-	
363	359075	173613	32.9	34.8	25.6	28.6	17.5	22.1	21.1	27.4	29.5	34.7	33.1	28.2	28.0	23.8	-	
370	359775	173513	37.0	37.1	30.1	29.8	18.9	23.0	27.6	28.3	33.8	36.6		25.6	29.8	25.3	-	
371	359813	173373	33.3	36.7	26.3	28.5	22.2	23.0			30.7	33.8	32.8	32.9	30.0	25.5	-	
373	359747	173774	30.5	31.8	26.4	28.6	17.3	21.8	21.0	24.3	27.8		31.2	28.1	26.3	22.3	-	
374	359509	173595	36.0	31.4	33.8	35.4	24.8	25.7	25.0	28.1	34.1	39.4	38.2	31.2	31.9	27.1	-	
403	360508	171676	36.1	28.5	24.2	22.3	18.1	17.1	19.0	25.6	25.0	23.3	27.1	19.1	23.8	20.2	-	
405	361051	173743	41.9	45.9	26.2	41.6	38.2	37.4	30.8	38.3	46.5	46.7	42.3	36.5	39.4	33.5	-	
406	361576	173806	37.8	40.9	27.1	27.9	26.9	24.3	20.8	19.1	26.4	30.4	34.9	24.7	28.4	24.2	-	
407	359829	174370		35.8	31.8	37.0	26.7	25.7	20.2	20.2	33.8	33.4	32.0	24.7	29.2	24.8	-	
413	360043	171508	31.1	33.9	24.8	28.1	22.9	23.6	23.3	24.8	27.2	37.0	31.2	23.3	27.6	23.5	-	
417	359635	171413	33.1	36.0	28.7	25.2	21.0	19.7	19.5	24.0	27.4	29.9	33.1	23.0	26.7	22.7	-	
418	357737	170642	41.0	51.4	44.5		32.5	16.5	31.3	31.1	49.6	49.5	42.9	33.9	38.6	32.8	-	
419	357832	170686	38.6	39.1	35.9	36.9	23.7		17.7	30.1	37.5	42.9	44.5	33.9	34.6	29.4	-	
420	358277	171562	32.8	33.3	25.8	28.1	21.5	21.6		24.5	28.6	31.3	34.7	23.9	27.8	23.7	-	
423	358623	173386	31.1	32.8	23.4	24.7	17.7	19.5	21.1	20.8	29.9	33.9	32.1	27.1	26.2	22.2	-	
429	360484	174097			36.4				35.3	35.0	43.7		44.3	44.2	39.8	38.0	-	
436	361013	173352	32.2	34.9	29.3	29.3	19.7		27.5	26.2	18.5	35.0	34.6	28.3	28.7	24.4	-	
438_1	360903	170024	32.5	32.8	28.9	26.8	20.1	22.9	27.4	26.0	35.0	36.6	31.9	32.7	-	-	-	Triplicate Site with 438_1, 438_2 and 438_3 - Annual data provided for 438_3 only

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted <(x.x)>	Annual Mean: Distance Corrected to Nearest Exposure	Comment
438_2	360903	170024	34.4	36.0	27.9	26.6	19.8	26.8	24.3	28.9	34.1	37.1	35.7	30.1	-	-	-	Triplicate Site with 438_1, 438_2 and 438_3 - Annual data provided for 438_3 only
438_3	360903	170024	31.8	36.0	28.6	29.4	21.3	23.2	27.3	28.0	27.5	33.1	31.0	28.1	29.5	25.0	-	Triplicate Site with 438_1, 438_2 and 438_3 - Annual data provided for 438_3 only
439_1	358042	170582	30.7	34.2	30.3	24.3	24.1	24.4			31.4	32.2	29.0	22.5	-	-	-	Triplicate Site with 439_1, 439_2 and 439_3 - Annual data provided for 439_3 only
439_2	358042	170582	28.9	33.8	30.8	23.4	23.4	25.7			30.9	30.6	29.8	22.3	-	-	-	Triplicate Site with 439_1, 439_2 and 439_3 - Annual data provided for 439_3 only
439_3	358042	170582	30.1	34.4	30.9	23.7	23.0	25.6			32.1	32.1	30.8	23.1	28.3	24.0	-	Triplicate Site with 439_1, 439_2 and 439_3 - Annual data provided for 439_3 only
455_1	359487	173924	23.9	24.2	18.4	14.8	8.5	4.9	13.4	17.4	17.1	23.5	22.0	19.5	-	-	-	Triplicate Site with 455_1, 455_2 and 455_3 - Annual data provided for 455_3 only
455_2	359487	173924	24.9	23.0	14.8		6.9	10.6	12.4	14.6	19.0	23.8	21.7	16.9	-	-	-	Triplicate Site with 455_1, 455_2 and 455_3 - Annual data provided for 455_3 only
455_3	359487	173924	20.9	24.7	8.5			12.2	12.7	15.0	19.6	22.9	20.3	17.1	16.9	14.3	-	Triplicate Site with 455_1, 455_2 and 455_3 - Annual data provided for 455_3 only
464_1	362927	175592		31.9	21.3	22.0	16.7	17.4	21.1	19.1	26.2	25.7	32.4	27.5	-	-	-	Triplicate Site with 464_1, 464_2 and 464_3 - Annual data provided for 464_3 only
464_2	362927	175592		33.7	22.2	24.6	16.9	18.3	22.5	19.4	29.7	29.8	27.4	24.6	-	-	-	Triplicate Site with 464_1, 464_2 and 464_3 - Annual data provided for 464_3 only
464_3	362927	175592		31.9	23.1	23.5	16.1	19.9	24.3	21.2	29.4	30.2	32.9	23.9	24.4	20.8	-	Triplicate Site with 464_1, 464_2 and 464_3 - Annual data provided for 464_3 only
470	359213	170997	31.5	35.0	27.4	27.3	26.5			25.8	26.8	29.1	36.5	18.9	28.5	24.2	-	
472	358226	171284	29.7			34.5	26.0	27.9	15.0	28.6	38.3	42.5	35.0	26.0	30.4	25.8	-	
473	358105	171124	33.8	35.3	27.8	30.0	28.7	29.2	20.8	32.8	32.6	33.7	38.0	25.2	30.7	26.1	-	
487	360243	174327			30.5	28.1	23.6	25.1	28.6				36.2	32.2	29.2	27.8	-	
492	359445	176627		34.4	28.4	30.6	24.3	24.8	28.9	26.0	35.2	37.2	32.3	29.4	30.1	25.6	-	
493	359677	176758		39.6	31.6	32.3	27.8			25.2	36.2		38.2	31.7	32.8	27.4	-	
494	359558	176850		33.8	23.5	26.5	21.4	21.1	22.8	24.7	33.3	28.1	29.0		26.4	22.5	-	
496	362296	173620	33.3	34.8	23.2	25.6		23.4	21.2	23.0	27.6	28.1	29.8	26.3	26.9	22.9	-	
497	359268	174132	34.4	33.0	28.2	30.9	20.9	21.1	24.0	27.1	32.6	34.7	34.9	28.6	29.2	24.8	-	
499_1	359522	173381	38.7	30.6	32.2	33.1	28.8		23.6	26.4		36.1	36.5	29.1	-	-	-	Triplicate Site with 499_1, 499_2 and 499_3 - Annual data provided for 499_3 only
499_2	359522	173381	34.5	33.5	30.7	30.9	29.0		25.3	26.3		35.2	34.5	28.5	-	-	-	Triplicate Site with 499_1, 499_2 and 499_3 - Annual data provided for 499_3 only

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499_3	359522	173381	32.7	34.6	32.3		30.6		23.6	26.9		33.8	29.1	26.2	30.8	26.2	-	Triplicate Site with 499_1, 499_2 and 499_3 - Annual data provided for 499_3 only
502_1	358640	173090	58.5	59.7	49.4	53.2	40.1	51.5	55.3	73.0	81.6	47.2	57.3	61.2	-	-	-	Triplicate Site with 502_1, 502_2 and 502_3 - Annual data provided for 502_3 only
502_2	358640	173090	61.7	54.3	50.4	57.3	36.9	51.3	64.2	81.8	76.9	45.0		61.1	-	-	-	Triplicate Site with 502_1, 502_2 and 502_3 - Annual data provided for 502_3 only
502_3	358640	173090	60.0	55.5	54.3	55.9	37.5	50.9	57.8	75.9	72.1			63.0	57.6	**48.9**	**42.7**	Triplicate Site with 502_1, 502_2 and 502_3 - Annual data provided for 502_3 only
512	359026	174432	40.6	42.2	38.6	41.6	35.3	41.7	44.8	42.8	50.2	52.4	51.9		43.8	37.3	34.3	
525	362455	173687	36.1	33.8	30.3	30.4	21.2	28.1	28.7	26.3	27.0	30.1	33.0	24.7	29.1	24.8	-	
538	358681	171478	28.6	30.3	22.9	25.0	21.4	21.2	19.7	22.0	23.5	25.5	19.9	15.2	22.9	19.5	-	
539	358599	171391	31.9	31.1	24.0	24.5	19.4			35.1	36.2	31.6	45.3	34.1	31.3	26.6	-	
545	356379	171436	20.3	22.1	21.7	22.8	15.1	20.2	18.9	17.7	22.8	24.6	19.9	17.1	20.3	17.2	-	
550	358353	172613	27.7	35.1	27.1	31.2	35.6			22.3	31.0	29.7		21.7	29.0	24.7	-	
555	356679	172589	25.3	28.0	22.4	26.6	23.8	23.2	14.4	19.8	25.0	25.6	24.8	13.9	22.7	19.3	-	
556	356827	172303	31.7	32.3	27.4	26.0	23.2	25.7	29.9	23.1	31.8	30.7	32.3	22.7	28.1	23.9	-	
559	356485	171580	27.0	27.0	25.2	26.3	19.7	20.6	16.1		27.8	23.6	29.7	20.8	24.0	20.4	-	
560_1	358665	173439	40.8	33.3		26.7	22.8	22.9	23.4	19.6	39.3	35.7	33.9	25.0	-	-	-	Duplicate Site with 560_1 and 560_2 - Annual data provided for 560_2 only
560_2	358665	173439		36.8		30.1	22.9	24.7	26.6	24.7	35.9	34.0	36.5	26.4	30.1	25.6	-	Duplicate Site with 560_1 and 560_2 - Annual data provided for 560_2 only
561_1	358688	173431	38.4			32.7	21.5	30.4	19.5	20.3	30.4	31.6	33.4	33.1	-	-	-	Duplicate Site with 561_1 and 561_2 - Annual data provided for 561_2 only
561_2	358688	173431	31.4				25.4	26.7	21.9	24.5	33.6	29.4	37.7	25.9	29.0	24.7	-	Duplicate Site with 561_1 and 561_2 - Annual data provided for 561_2 only
565	357227	179101		30.8	24.9	25.8	25.3	25.7	22.0	25.7	29.0	25.7	33.1	25.9	26.7	22.7	-	
567	360728	175345		52.3	44.6	48.1	33.8		23.8	37.7	51.1	40.3	38.8	45.1	41.6	35.3	-	
568	360178	175779		38.0	36.5	33.5	32.7	30.4	25.7	30.8	37.7	32.8			33.1	28.2	-	
569	359855	176186		31.2	22.6	26.6	21.1	16.4	20.4	20.2	31.9	28.0	32.7	24.2	25.0	21.3	-	
570	359847	176439		33.9	30.3	29.5	18.8		26.1	26.4	39.4	34.8	38.4	30.1	30.8	26.2	-	
571	359848	176411		44.8	34.7	32.7	27.5	28.3	28.3	26.9	38.2	36.6	37.5	32.0	33.4	28.4	-	
574	357678	174229	35.4	38.6	29.6	28.7	21.9	26.9		24.8	33.6	33.6	35.2	25.4	30.3	25.8	-	
575	358685	172881	39.9	43.8	41.3	38.8	32.9	32.6	33.0	30.7	46.0	44.5		43.9	38.9	33.0	-	
576	358792	172874	33.5	37.1	33.8	34.2	23.1	28.2	31.9	27.7	37.0	37.9	35.6	33.5	32.8	27.9	-	

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577	358935	172981	44.7	46.5	36.6	38.6	29.9	39.4		39.2	48.5	47.7	44.9	40.5	41.5	35.3	-	
578	361892	173552	37.3	43.2	30.8	33.2	28.4	35.0		26.5	32.8	32.0	31.9	25.2	32.4	27.5	-	
579	362198	173580	38.5	40.1	31.4	32.1	21.9	26.2	24.4	28.4	44.6	35.4	35.5	25.6	32.0	27.2	-	
580	358754	173528	47.2			44.2	31.6	38.6			39.2	50.5	43.1	37.6	41.5	33.8	-	
581	358908	173574	39.8	43.7	39.1	38.2	26.5	31.1	30.4	30.5	38.7	42.4		32.8	35.7	30.4	-	
582	358893	173333	45.5	57.3	48.5				43.0	44.1	57.8		47.7	45.1	48.6	39.2	-	
583	358870	173340	65.5		40.0		33.6		41.9	36.8	51.2	53.8	45.3	45.5	46.0	39.1	-	
584	358773	173276	35.9		38.4	38.8	40.1	32.1	22.4	28.0	38.9	38.1	49.5		36.2	30.8	-	
585	358192	173050	32.7		30.2	33.9	27.5	24.5	23.5	27.2	31.4	34.1	32.8	22.4	29.1	24.7	-	
586	358195	173018	44.1	46.8	36.8	37.2	27.1	34.1	29.8	34.0	45.0	45.9	44.1	35.3	38.4	32.6	-	
587	358802	172896	41.2	43.2	29.3	30.5	26.9	33.5	26.4	28.1	34.3	39.7	38.3	30.4	33.5	28.5	-	
588	358739	172869	36.5	40.0	29.7	34.3	23.4		34.6	26.0	38.6	43.1	37.8	33.9	34.4	29.2	-	
589	358849	173606	31.0	31.9	23.6	29.0	22.1	18.7	13.4	21.9	28.5	32.4	31.2	24.2	25.7	21.8	-	
590	358789	173589	42.2	46.6	32.1	30.9	26.3	30.3	32.1	31.0	46.1	44.0	39.3	37.1	36.5	31.0	-	
591	358805	173575	32.7	35.4	28.6	32.1	18.8	21.5	24.6	24.4	33.3	39.0	34.2	29.2	29.5	25.1	-	
592	358662	173409	40.1	44.0	31.0		28.7	28.0	26.8	25.1	41.6	45.0	34.1	27.8	33.8	28.8	-	
593	358610	173350	34.6								36.5	38.8	35.2	25.3	34.1	24.8	-	
594	358540	173234	37.1	39.5		27.7	25.9			23.8	30.5	35.8	34.9	26.4	31.3	26.6	-	
595	358510	173197	34.9	37.6						20.0	33.1	33.2	34.3	23.0	30.9	23.0	-	
596	358431	173120		37.3	28.5			24.1	25.1	25.4	33.9	35.8	31.6	27.3	29.9	25.4	-	
597	358403	173124	31.6	35.2	24.6	25.5	20.9	20.4	22.4	21.2	29.1	27.0	27.7	20.6	25.5	21.7	-	
598	358061	173182	31.5		26.4			21.0	18.3	21.5	27.9	27.3	32.6	18.5	25.0	21.3	-	
599	358135	173123	34.6	40.8		33.0	27.1			24.6	41.3	39.3	39.6	26.0	34.0	28.9	-	
600	358322	172858	28.1	33.5	25.2	26.0	18.8			21.0	26.9	28.2	29.8	21.5	25.9	22.0	-	
601	358563	172818	37.4	38.3	32.3	33.0	26.5	25.8	31.3	28.8	15.9	33.0	14.6	41.9	29.9	25.4	-	
602	358469	172656	47.9	44.9	43.4	47.0	39.6	38.1					37.1	52.4	43.8	33.9	-	
603	358767	173320	43.1	48.0	39.1	44.6	35.1	32.3	34.5	35.1	46.9	45.7	43.1	39.6	40.6	34.5	-	
604	358817	173342	44.6	46.2		48.6	41.3	42.0		40.3	56.2	51.0		42.5	45.9	39.0	-	
605	358718	173227	36.4	11.6			28.7	27.4				38.4		35.3	29.6	23.6	-	
606	359124	172803	31.8	31.0	31.5	32.7	24.4	21.4	21.5	24.9	32.6	33.5		30.8	28.7	24.4	-	
607	359183	172826	29.0	36.0	26.3	27.4	24.1	21.8	23.6	23.7	28.9	35.5	28.3	24.0	27.4	23.3	-	

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 <(x.x)>	Annual Mean: Distance Corrected to Nearest Exposure	Comment
608	359563	172290		45.9	34.1			30.2	26.1	37.3			40.6	32.9	35.3	31.9	-	
609	359740	172116	32.6	37.4	30.2	34.0	32.5	23.5	19.2	24.9	31.4	30.5	34.0	25.3	29.6	25.2	-	
610	359967	171548	35.9	36.0	31.2	29.6	25.4	22.2	27.4	30.1	38.3	27.3	34.1	23.7	30.1	25.6	-	
611	357425	170769	23.8	25.5	18.9	20.9	16.9	16.7	12.4	17.9	19.8	21.3	25.4	13.4	19.4	16.5	-	
612	359206	173557	31.0	37.1	28.2	31.2	27.9	22.1	21.9	26.2	31.0	36.1	32.9	29.4	29.6	25.1	-	
613	359316	173554	41.7	45.3	34.1	40.7	33.0	31.8	29.7	35.4	46.5	50.0	44.2	38.0	39.2	33.3	-	
614	359516	173374	37.4	33.0	31.2	29.0	20.6	22.0	21.9	26.3	31.5	35.0	32.5	28.1	29.0	24.7	-	
615	359659	173688	48.0	49.9	41.9	44.2	34.0	36.7	46.5	42.0	52.7	54.5	48.6	43.2	45.2	38.4	-	
616	359747	173717	47.6	48.6	34.6	39.2	37.1	50.0	28.5	22.4	44.6	43.5	43.7	32.6	39.4	33.5	-	
617	359686	173587	31.3	30.2		26.3	17.8	18.1	19.2	24.1	29.2	32.6	34.9		26.4	22.4	-	
618	359086	174187	40.9	39.5	33.9			28.0	37.8			48.3	41.3	39.3	38.6	30.8	-	
619	359119	174149	45.6	49.6	37.4			34.7	35.4	38.6	45.4	50.2	46.1	31.0	41.4	35.2	-	
621	359256	175999		35.7	28.0	27.4			28.2		32.7	31.8		28.0	30.3	26.5	-	
622	358059	170597	41.8	34.6	31.0	34.2	26.9	28.7	30.1	30.1	39.8	38.0	52.2	32.5	35.0	29.7	-	
623	358034	170602	41.6	40.1	29.5	29.5	21.5	22.7	25.2	25.7	32.3	33.4	32.1	27.8	30.1	25.6	-	
624	357858	170499	49.3	55.1	45.9	46.5	32.3	37.0	36.8	27.2	58.3	48.6	46.6	47.7	44.3	37.6	28.5	
625	357842	170514	53.2	56.0	40.0	48.8	34.4	37.1	28.4	42.0	53.1	51.0	48.0	38.9	44.2	37.6	-	
626	357667	170466	46.1	51.7	43.7	49.6	33.9		45.9	38.0	58.6	50.5	46.7	36.4	45.6	38.7	-	
627	357829	170658	41.1		36.8	43.6	29.2	31.5	22.6	35.4	18.3	39.8		30.0	32.8	27.9	-	
628	359899	174335		40.8	35.0	41.6	36.9	35.7	17.1	33.2		39.0	38.2	29.4	34.7	29.5	-	
629	359956	174314		54.7	40.7	48.7	34.1	37.7	19.5	39.4	49.7	47.7	36.4	39.2	40.7	34.6	-	
630	357533	170410	30.6	37.2	39.3	40.0	32.0	23.8	26.5	30.6	32.3	32.1	29.1	23.7	31.4	26.7	-	
631	357729	170660	25.9	35.4	26.0	28.1	23.7	22.1	28.4	21.2	28.9	30.7	28.5	20.2	26.6	22.6	-	
632	358073	171063	29.4	30.9	26.8	29.4	21.3	23.7	20.1	25.9	27.8	30.7	31.3	22.0	26.6	22.6	-	
633	358217	171299	37.8	46.7	36.6		30.7	33.0	36.8	38.4	43.3	19.6	47.3	35.8	36.9	31.4	-	
634	358772	171741		36.0	31.8	34.7	27.6	32.7	30.2	34.2	39.0	39.7	31.1	26.2	33.0	28.1	-	
635	359106	171962	26.6	30.5	22.7	22.7	18.9	17.7	20.5		25.5	26.2	28.1	18.4	23.4	19.9	-	
636	359940	171838	29.9	35.6	23.5	23.9	17.9	18.0	19.7	25.2	28.7	30.5	30.4	28.2	26.0	22.1	-	
637	361206	171390	27.1	30.6	25.3		15.7	8.8	15.5	17.9	13.0	18.0	27.9	21.2	20.1	17.1	-	
638	359498	173144	58.9	59.8	53.4	60.3	44.7		45.5	44.9	48.1	50.0	51.8	62.8	52.7	**44.8**	-	
639	359318	172634	33.7	42.2	36.9	41.6	27.1	26.2	28.3	30.7	38.4	41.2		36.9	34.8	29.6	-	

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 <(x.x)>	Annual Mean: Distance Corrected to Nearest Exposure	Comment
640	359792	173319	32.8	36.7	28.8	29.8	20.6	22.1	13.6	24.2	28.9	33.5	33.6	29.2	27.8	23.6	-	
641	359114	174007	41.4	40.5		42.6	37.8	41.4	35.3	41.5	45.9	53.1	50.6	45.7	43.3	36.8	-	
642	359276	174155	31.8	36.2	30.3	30.9	22.5	24.9	21.0	27.6		34.9	34.5	27.9	29.3	24.9	-	
643	359817	174401		45.7	36.6	36.0	28.1	29.5	31.5	18.6	39.1	39.8	30.9	36.5	33.8	28.8	-	
644	359676	175102		40.4	33.0	31.5	26.1	26.6	31.8	31.4	33.4	37.6	39.8	33.7	33.2	28.2	-	
645	359033	175259		38.4	30.9	38.6	29.6	31.0	26.2	26.3	43.1	38.8	34.8	29.0	33.3	28.3	-	
646	359038	174391	38.9	40.5	33.2	38.3	29.4	32.3	35.0	37.9	41.7	40.0	50.0	33.0	37.5	31.9	-	
647	357124	172400	21.8	29.9	22.1		21.0	24.6	26.0	26.1	32.8	32.5	31.6	28.0	26.9	22.9	-	
648	360905	170185	34.3	34.8	29.3	30.5	23.6	24.0	25.1	25.6	34.1	35.5	34.2	25.5	29.7	25.3	-	
649	362089	170606	32.9	33.6	28.8	36.9	32.9	30.5	40.4	27.7	34.7	32.9	31.6	19.0	31.8	27.1	-	
650	360818	170448	28.6	27.4	22.2	31.0		15.8	16.5	19.9	22.5	24.9	26.4	15.2	22.8	19.3	-	
651	360938	173376	42.0	43.0							37.1	36.6	38.9	33.6	38.5	26.6	-	
652	361119	173796	50.4	51.6	35.7	41.7	36.1	37.4	33.2	24.9	31.5	37.8	47.4	42.6	39.2	33.3	-	
653	360515	174134				34.6	23.2	27.3	28.1	27.0			67.0	27.3	33.5	33.5	-	
654	360207	174403		27.6	22.4	26.2	18.0	17.0	18.9	24.3	29.5	23.4	26.7	24.4	23.5	20.0	-	
655	361355	175203		41.6	28.2	30.4	17.8		28.8	29.1	34.3	34.0	39.6	32.9	31.7	26.9	-	
656	361141	175446		32.8	29.6	24.6	21.5	20.5	22.2	23.9	33.4	31.9	31.8	29.1	27.4	23.3	-	
657	361676	175127		43.2	22.9	29.6	20.9	23.6	26.5	28.6	20.4	34.5	38.6	33.3	29.3	24.9	-	
658	363325	175803			28.3	25.0	25.0	25.3	23.4	27.8	34.0	32.8	27.5	20.6	27.0	22.9	-	
659	359773	176702		32.0	25.3	27.5	20.3	18.3	18.9	22.6	33.6	29.8	34.3	25.7	26.2	22.3	-	
660	360896	175312		43.3	32.2	35.2	28.0	27.7	22.5			35.6	41.6	31.2	33.0	28.1	-	
661	358022	175630		28.5	23.2	23.0		15.9	23.0	18.8	26.9	27.5	30.9	20.1	23.8	20.2	-	
662	357868	175723		30.6	21.6	24.4	19.4	18.2	18.2	18.3	27.8	23.6	26.0	19.0	22.5	19.1	-	
663	357396	174761	27.7	33.3	24.0	26.9	25.6	23.6	18.8	27.0	30.8	27.9	31.2	19.5	26.4	22.4	-	
664	357347	174992		31.0	23.6	31.1	19.6	15.8	18.5	21.0	20.3	26.8	26.0	21.2	23.2	19.7	-	
665	358675	173405			35.3		27.3	28.2	26.1	24.3	37.5	27.0		31.5	29.7	31.6	-	
666	358646	173426	32.7	37.0		25.7	23.3		19.1	25.8	34.2	43.0		28.2	29.9	25.4	-	
667	358531	172803	48.8	54.3	51.5	42.4	35.4	39.5	49.7	50.0	68.4	36.0	47.1	69.9	49.4	**42.0**	32.1	
669	359511	172754		39.0				19.0	23.8			53.6	38.7	34.7	34.8	29.7	-	
670	361749	170690	42.5	46.7	36.7	40.7	34.2	34.1	26.5	38.5	45.9	47.2	42.9	27.6	38.6	32.8	-	
671	357381	175781		30.1	22.7	25.5	18.3	18.9	17.2	25.8	36.8	29.0	31.5	19.2	25.0	21.3	-	

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 <(x.x)>	Annual Mean: Distance Corrected to Nearest Exposure	Comment
673_1	358728	173520	31.8	37.8	30.7	25.4	27.6	28.2	25.4	27.6	35.3	32.5	45.3	26.5	-	-	-	Triplicate Site with 673_1, 673_2 and 673_3 - Annual data provided for 673_3 only
673_2	358728	173520	31.7	37.4	29.7	26.2	27.6	28.9	24.5	22.3	35.2	36.7	36.5	26.8	-	-	-	Triplicate Site with 673_1, 673_2 and 673_3 - Annual data provided for 673_3 only
673_3	358728	173520	33.5	39.8	29.0	29.0	27.1		23.5	22.5	33.0	36.3	34.2	30.1	30.7	26.1	-	Triplicate Site with 673_1, 673_2 and 673_3 - Annual data provided for 673_3 only
674	363157	173215	22.7	23.4	15.4	13.3	11.0	16.3	12.1	13.7	17.1	17.1	22.9	15.5	16.7	14.2	-	
675	361615	172728	36.8	36.8	27.5	26.5	17.8	24.9	23.2	24.0	32.2	29.7	28.3	27.3	27.9	23.7	-	
676	361734	173291	29.2	28.9	18.2	19.3	13.8	19.7	16.0	17.3	38.9	21.9	27.8	17.6	22.4	19.0	-	
677	362105	173350	28.6	25.2	18.3	19.5	13.6	15.6	17.7	18.6	21.0	20.6	30.5	19.1	20.7	17.6	-	
678	361279	173283	24.7	23.8	16.1	17.5	10.2	12.8	18.1	15.6	19.2		26.5	17.9	18.4	15.6	-	
679	361134	173034	33.4		21.2	23.0	14.2	19.0	19.8	20.3	28.8	24.9	32.6	26.1	23.9	20.3	-	
680	360973	173193		28.6	23.3	21.8	12.8	18.5	19.6	16.7		33.1	32.1	27.5	23.4	19.9	-	
681	360985	173541		32.7	25.0	26.2	15.3	20.5	22.9	25.5	32.4	32.0	33.9	23.7	26.4	22.4	-	
682	361359	173460	33.4	37.1	25.8	26.3			13.3	23.0	27.3	24.9	36.4	22.2	27.0	22.9	-	
683	361451	173617	25.7	25.0		18.6	9.7	21.6	14.3	16.6	33.9	18.7		18.3	20.2	17.2	-	
684	361597	173622	28.2	25.7	18.4				15.3	17.6	19.1	24.3	25.2		21.7	17.0	-	
698	354633	176588		31.4	20.3	28.2								20.5	25.1	19.9	-	
699	355122	175764		26.2	21.9	22.5		11.9	13.8	23.5	18.6			18.4	19.6	18.8	-	
700	356336	173464			26.5	19.8		23.6	19.2	32.1	26.1			22.2	24.2	25.8	-	

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

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

☒ **Local bias adjustment factor used.**

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

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

Notes:

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

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

See Appendix C for details on bias adjustment and annualisation.

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

New or Changed Sources Identified Within Bristol During 2023

Bristol City Council has not identified any new sources relating to air quality within the reporting year of 2023.

Additional Air Quality Works Undertaken by Bristol During 2023

Bristol City Council has not completed any additional action planning works within the reporting year of 2023. Monitoring and reporting have continued in relation to the assessment of the CAZ in achieving the pollutant reductions required to achieve compliance, as defined by the Joint Air Quality Unit.

Locations Recording Exceedance Outside the AQMA

The next section of the report discusses the locations which have shown some exceedances of the annual objective for NO_2 in the past 5 years that are located outside of the AQMA. Table C. 1 shows these locations and provides measured pollutant concentrations for the past 5 years where available. In 2023, Site 3 was the only location that recorded an exceedance of annual air pollution objectives. This indicates that there has been a general improvement in air pollution levels across Bristol in 2023 when compared to 2022 in locations outside of the Clean Air Zone and Air Quality Management Area.

Table C. 1 - Tubes Outside AQMA Exceeding the Annual Air Quality Objective for NO_2 Since 2019

Site Location	Site ID	Annual Mean Concentrations (µg/m³)					Action
		2019	2020	2021	2022	2023	
Blackboy Hill	3	27.7	28.7	**44.4**	38.8	**47.7**	Until the monitored exceedance in 2021, 2013 was the last year in which this site exceeded the objective for NO_2. In 2020 it was the only location to show an increase in NO_2 levels when compared to 2019. It has been identified that there were some changes to the façade of a fast-food outlet which resulted in the diffusion tube being directly adjacent to an opening window, from which kitchen air is being passively vented. Additional monitoring was installed in 2024 to determine that a non-road source of pollution is impacting this site. Analysis of Site 3 data alongside the new roadside location will take place in 2024.
Muller Road/ Glenfrome Road junction north	567	**44.0** (39.9)	**41.3** (37.3)	**44.8 (40.2)**	**43.2** (38.7)	35.3	This site was set up in 2019 to investigate possible exceedances along Muller Road. Monitoring data exceeds air quality objectives at this location for all years, however 2021 has been the only year during which the distance adjusted concentration to the nearest receptor was in breach of objectives at 40.2µg/m³. 2023 data shows a significant reduction in pollution at this site, with compliance at the monitoring location being achieved for the first time since monitoring began in 2019. No immediate action required. Monitoring will continue at this location.

Distance adjusted data reported in ().

Site 3 - Blackboy Hill

2021 monitoring data for this site showed an exceedance of the annual air quality objective for NO_2 at 44.4µg/m^3, however, in 2022 it fell to 38.8µg/m^3 before increasing again in 2023 to 47.7µg/m^3. Analysis of the monthly diffusion tube monitoring data from 2020 indicates that there is a new local source of pollution, other than traffic, impacting upon NO_2 concentrations at this monitoring site. During this time, the façade of a fast-food establishment was refurbished. A façade that previously had no openable windows was replaced with one where there were openable windows, one of which is within around 30cm of the diffusion tube at Site 3. The diffusion location is indicated in Figure C. 1 by the red arrow.

Figure C. 1 - Site 3 Blackboy Hill

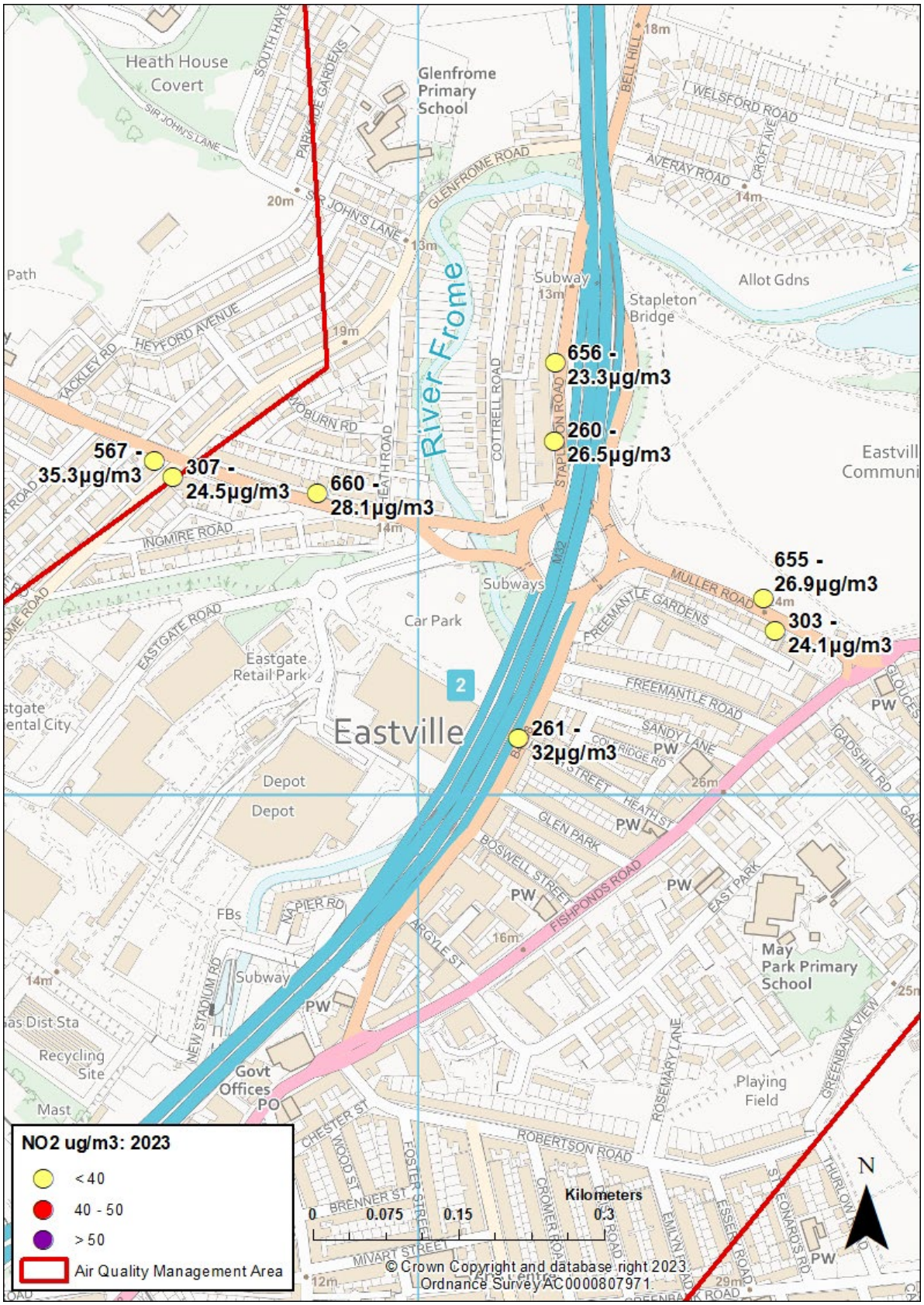
A new monitoring location was set up on Blackboy Hill in January 2024. The new site is approximately 20m from Site 3 but is located on a pillar at the roadside, not on the façade of the buildings, to provide a worst-case kerbside concentration. 2024 data from this new tube will be used to determine if Site 3 exceedances are being caused by a non-road source of pollution.

Site 567 – Muller Road/Glenfrome Road

Compliance with air quality objectives have been achieved at Site 567, when distance adjusted, for the second consecutive year. Other tubes on Muller Road, which were included in this section of the report in the 2023 ASR, have all been compliant with air quality objectives since 2019.

As no locations outside of the AQMA in 2023, with the exception of Site 3, were shown to exceed air quality objectives at locations at which there is relevant exposure, it is not proposed to consider any extensions to the AQMA. It is proposed to continue monitoring in the current locations on Muller Road and on Blackboy Hill.

Figure C.2 - Muller Road 2023 Measured Annual NO_2 Concentrations – South



Local Pollution Hotspots – Measured Data

In the review of the 2019 ASR provided by Defra, a request was made for future ASRs to highlight and identify pollution hotspots in the city.

To identify the locations in the city with the highest monitored pollution levels, a summary of data in locations where annual NO_2 concentrations above 36µg/m^3 were measured in 2023 has been included within the 2024 ASR. These are shown in Table C.2. 18 monitoring locations had measured concentrations above 36µg/m^3 (at risk of exceedance) in 2023, with 6 of these over 40µg/m^3. This compares to 41 sites over 36µg/m^3 and 27 over 40µg/m^3 in 2019. These summaries are based on measured concentrations and do not necessarily represent relevant exposure. It should be noted that in 2023 there were an additional 104 diffusion tube monitoring locations when compared to 2019. Most of these additional tubes were added as part of the CAZ assessment work. Despite the increase in the number of monitoring locations, the summary data of exceedances still shows a clear downward trend in pollution levels over this time.

The locations with measured NO_2 concentrations in 2023 over 40µg/m^3 are discussed in more detail in the following section of the report.

Figure C.3 to Figure C.7 contain maps showing the spatial distribution of sites that exceeded 36µg/m^3 in 2023, alongside maps showing all 2023 monitoring locations.

Site 12 – Galleries

This tube is located in a tunnel and therefore not representative of relevant exposure, however, there is public access to this location. It is a tube that has been in the network for a long time and is one of the more polluted locations. As a result we have decided to continue to monitor and report pollution concentrations. In 2023 annual NO_2 concentrations of 60.2µg/m^3 were measured here, this figure was however heavily skewed by emissions from NRMM that was placed inside the tunnel during some temporary works that took place in October and November of 2023. In October and November 2023 the monthly average NO_2 concentrations at this site were 220.9µg/m^3, and 169.7µg/m^3 respectively. Without these two anomalous months of data, and assuming that October and November averages were the same as those measured in December (43.8µg/m^3), the annual average at this site for 2023 would have been in the region of 36µg/m^3.

Site 502 – Colston Avenue

In 2021 the annual NO_2 concentration at Site 502 was 58.0µg/m^3, this has fallen gradually

since then to 48.9µg/m^3 in 2023. Excluding the anomalous data from Diffusions Tube Site 12, Site 502 has the highest recorded annual NO_2 concentration of any diffusion tube in Bristol. It is a city centre location impacted by large numbers of vehicles, including many buses, with high levels of congestion and restricted pollutant dispersion. It is also located next to a bus stop. At the nearest location of relevant exposure, concentrations of 42.7µg/m^3 have been calculated. Monitoring will continue here and work will be carried out, in conjunction with the Joint Air Quality Unit, in order to ensure that compliance is achieved here in the shortest time possible.

Site 3 – Blackboy Hill

This tube has been discussed in the section of the report on exceedances outside of the AQMA.

Tube 638 – A4404 Roundabout

This tube is located at a distance of 17m from the roadside and as a result, the high annual NO_2 concentrations recorded here in 2023 indicate that there is a non-transport source of pollution in this location. The site is not representative of relevant exposure for the annual objective for NO_2. The tube is located by vents which appear to be part of a hotel extraction system. In 2024 a new monitoring location was placed at the kerbside to determine whether this monitoring site is being impacted by a non-transport emission source. 2024 data from the new monitoring site will be compared to data from Site 638 in the 2025 ASR.

Site 667 – College Green

Site 667 is at the kerbside of a busy city centre location. When corrected for distance to the nearest relevant receptor location, NO_2 concentrations fall to 32.1µg/m^3, indicating that compliance with objectives is met. Monitoring will continue at this location.

Site 239 – Parsons Street

Site 239 is at the kerbside of a busy arterial route, with 3 lanes of traffic with a relatively steep uphill gradient at the tube location. When corrected for distance to the nearest relevant receptor location, NO_2 concentrations fall to 27.5µg/m^3, indicating that compliance with objectives is met. Monitoring will continue at this location.

Table C.2 – Locations at which NO_2 Concentrations Above 36µg/m^3 were Measured in 2023

Site ID	Site Name	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	NO_2 Annual Mean Concentration (µg/m^3)					
				2019	2020	2021	2022	2023	2023 Distance Adjusted
12	Galleries	359142	173211	**51.8**	**41.9**	**46.5**	**50.2**	**60.2**	
502	Co-located Colston Ave	358640	173090	**68.7**	**52.1**	**58.0**	**54.1**	**48.9**	**42.7**
3	Blackboy Hill	357448	174650	27.7	28.7	**44.4**	38.8	**47.7**	
638	A4044 Roundabout-CAZ-Lamppost	359498	173144			**43.8**	**42.4**	**44.8**	
667	College Green-CAZ-Post by Toni&Guy	358531	172803			**43.6**	**45.3**	**42.0**	32.1
239	Parson St. A38 East	357880	170506	**54.4**	**47.6**	**51.4**	**48.6**	**40.5**	**27.5**
147	Anchor Road	358514	172691	**50.9**	39.4	**43.3**	**45.5**	39.5	
582	Rupert St-CAZ-Post outside fire station	358893	173333			**50.0**	**43.7**	39.2	
583	Rupert St-CAZ-Post outside police station	358870	173340			**42.3**	37.9	39.1	
604	Lewins Mead-CAZ-Post by PMT	358817	173342			**43.0**	**43.1**	39.0	
2	Colston Avenue	358628	173011	**53.7**	36.9	**40.1**	**40.3**	39.0	
626	Bedminster Rd-CAZ-Post	357667	170466			**43.0**	**43.3**	38.7	
615	Newfoundland Way-CAZ-Lamppost by petrol station	359659	173688			**53.0**	**49.4**	38.4	
429	facade villiers road stapleton road junction	360484	174097	**41.2**	38.8	36.4	35.5	38.0	
624	Bedminster Rd-CAZ-Post opp Van Sales	357858	170499			**49.7**	**48.4**	37.6	28.5
625	Bedminster Rd-CAZ-Lamppost by Van Sales	357842	170514			**45.4**	**44.7**	37.6	
512	Montpelier High School	359026	174432	**40.6**	30.7	36.1	36.2	37.3	34.3
641	Stokes Croft-CAZ-Lamppost	359114	174007			39.7	38.1	36.8	

Figure C.3 – Locations with Measured Annual NO_2 Concentrations ≥ 36µg/m^3 in 2023 – Central Area

Figure C.4 – All NO_2 Monitoring Sites – Central Area

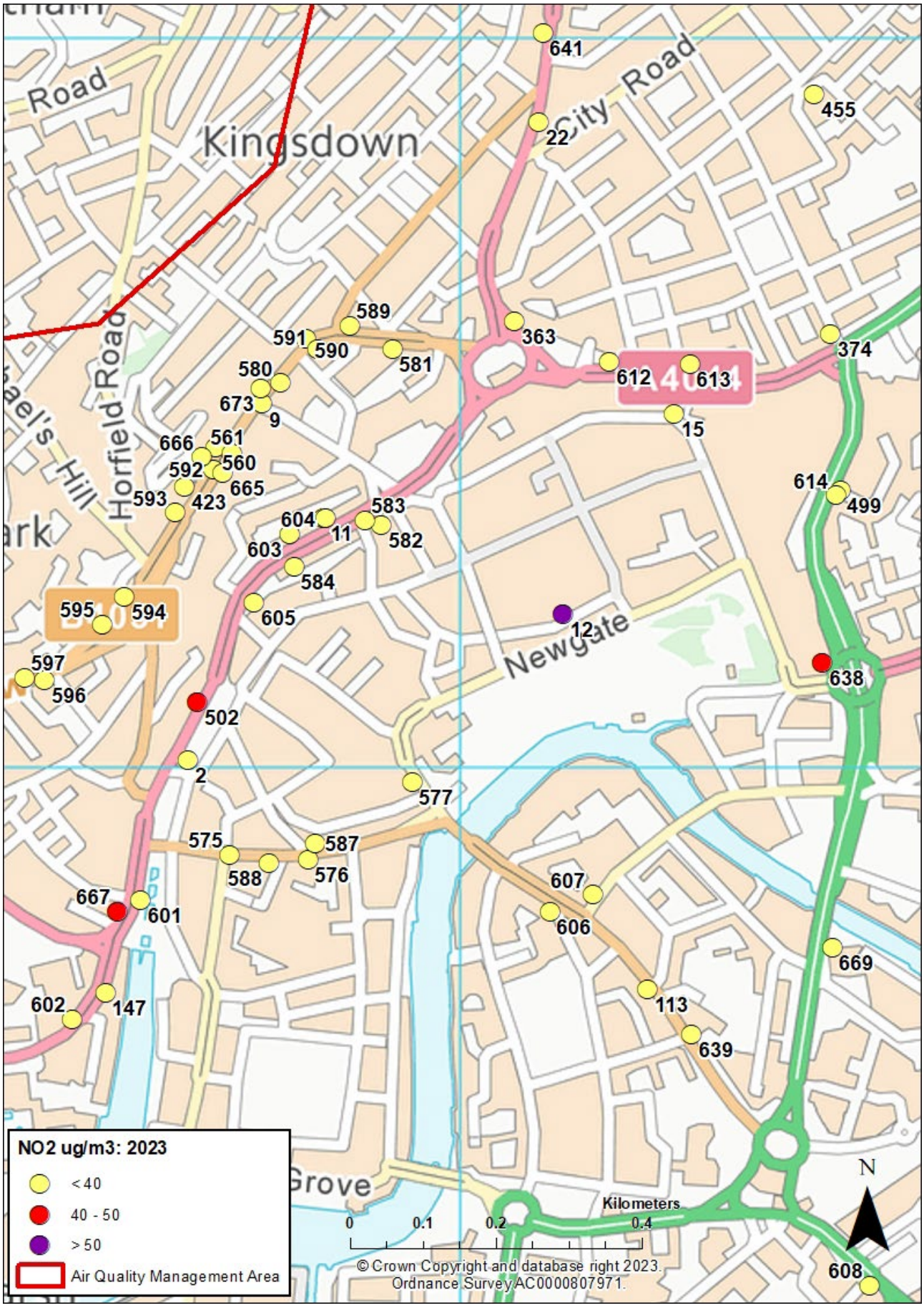


Figure C.5 - Locations with Measured Annual NO_2 Concentrations ≥ 36µg/m^3 in 2023 – Parsons Street Gyratory

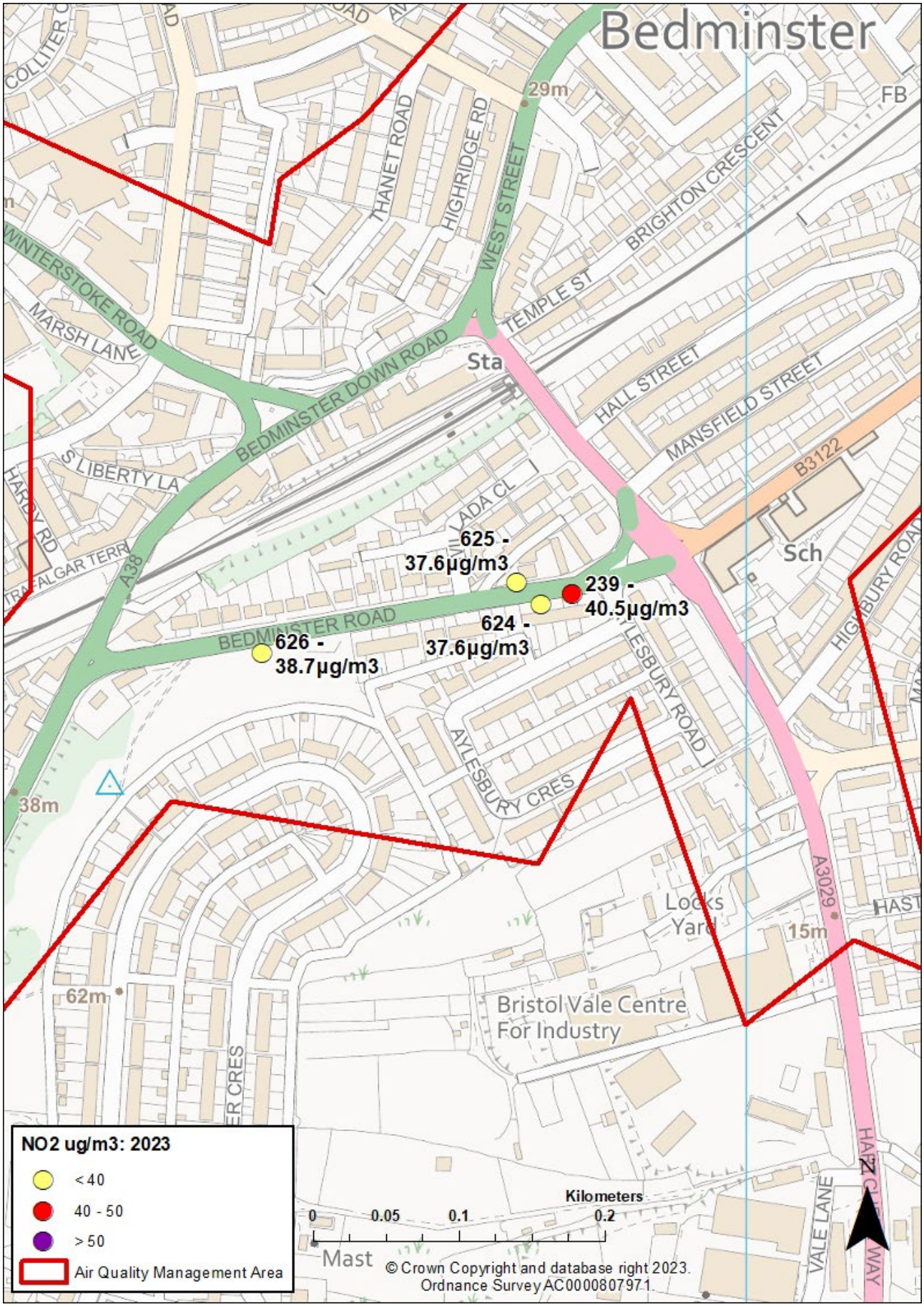


Figure C.6 - All NO_2 Monitoring Sites – Parsons Street Gyratory

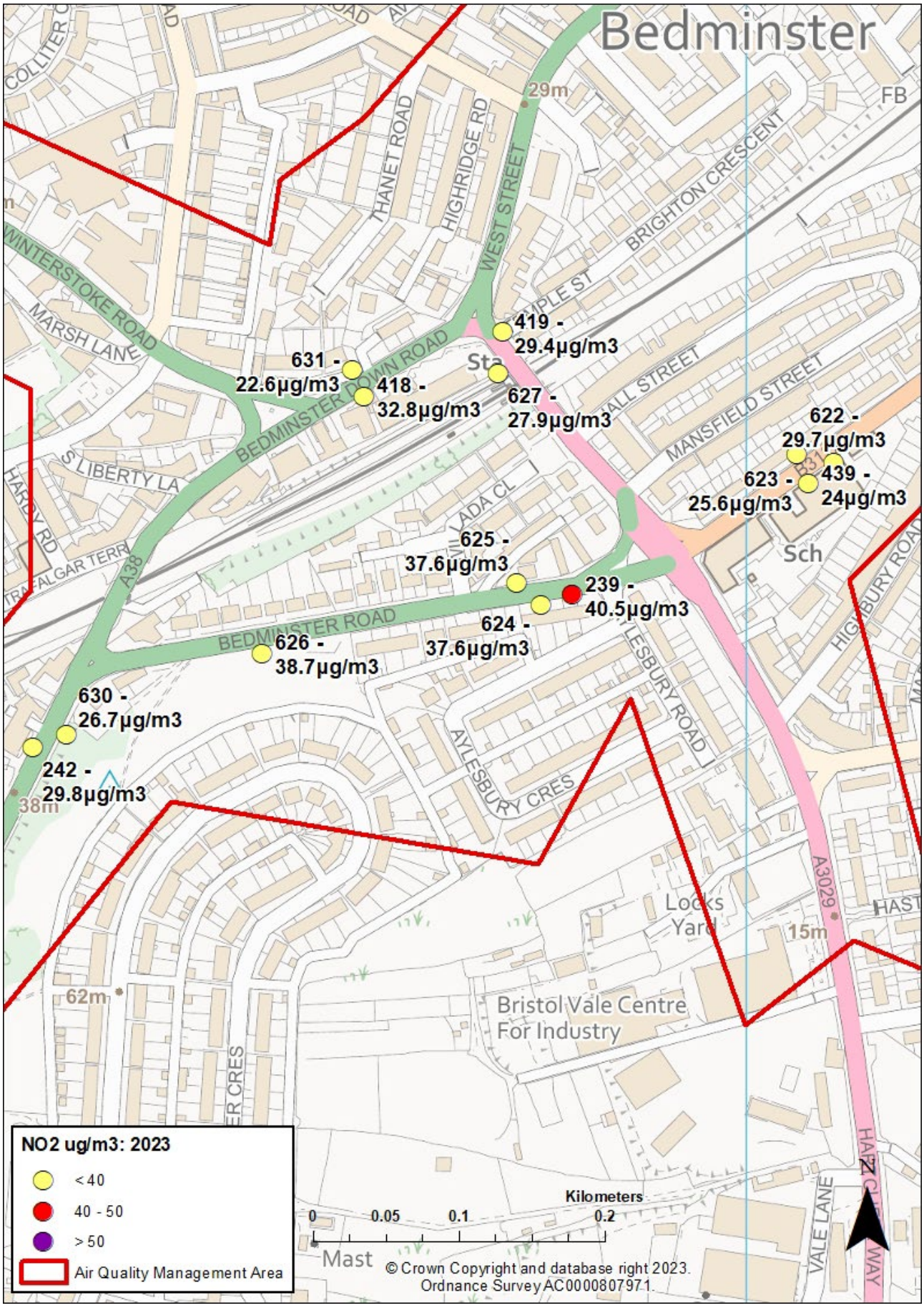
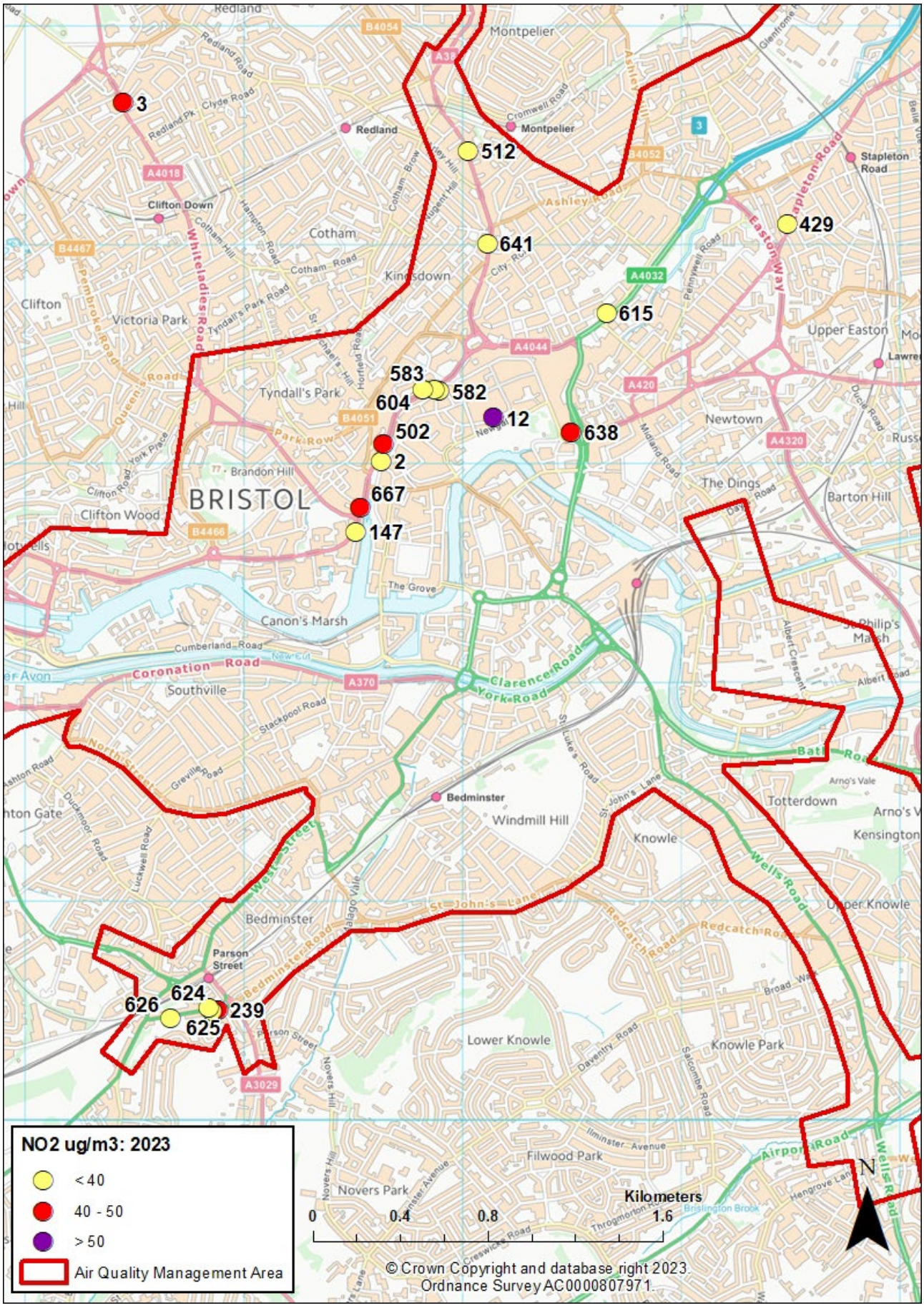


Figure C.7 – Sites with Measured Annual NO_2 Concentrations ≥ 36µg/m^3 in 2023



QA/QC of Diffusion Tube Monitoring

Somerset Scientific Services were used throughout the whole of 2023 to provide and analyse diffusion tubes for BCC. This lab is not United Kingdom Accreditation Service (UKAS) accredited for diffusion tube analysis but does participate in the AIR PT Scheme for nitrogen dioxide tubes. All reference materials are of at least analytical grade or equivalent. Standards are prepared using equipment that is all within the normal quality system. The tubes used are recycled Gradko tubes prepared and set on a monthly basis. The tube changing frequency is as per the calendar on the Air Quality Archive web site and is carried out by Bristol City Council officers. On December 19th 2022, 43 of the January 2023 tubes were placed out, instead of being placed out during the week of the 4th January, as required by the Defra diffusion tube calendar. The LAQM helpdesk were consulted ref #8425. The advice given was that:

> "*As some of the diffusion tubes have been changed on 19/12/2022, the exposure period for December 2022 is approx. 3 weeks and the exposure period for January 2023 (next changeover date 01/02/2022) will be 6 weeks. The exposure period of both these months are outside the recommended four to five weeks. As a result, this may lead to erroneous results which are not representative of the monitoring period. In this case, the monitoring results of December 2022 and January 2023 will need to be excluded when calculating the annual mean concentration".*

The January monthly values for all affected tubes have been excluded from the results as per the instructions from the LAQM Helpdesk. Annual values have been reported for these sites and as with all sites, the values have been annualised where required.

The tubes are prepared with 50 µL of 20% triethanolamine in water. The method follows that set out in the practical guidance document.

Table C.3 – AIR PT Scheme Results for Somerset County Council

Air PT Round	Percent of tubes submitted found to be satisfactory
Air PT AR055 – January/February 2023	100%
Air PT AR056 – May/June 2023	75%
Air PT AR058 – July/August 2023	100%
Air PT AR059 – September/October 2023	100%

Diffusion Tube Annualisation

Data capture rates for 21 tube sites were below 75%. This is mostly as a result of tubes

being tampered with by members of the public and taken from their sites.

Annualisation of diffusion tube data for all sites with less than 75% data capture was carried out in accordance with the methodology in Box 7.10 of LAQM TG16[12]. Data from the Background AURN monitoring sites at Swindon Walcot, Bournemouth, Bristol St Paul's and Newport were used in the process.

The calculations made to annualise the data for these sites are included in Table C. 4.

[12] Defra, Local Air Quality Management Technical Guidance TG16 (Feb 2018)

Table C. 4 – Annualisation Summary (concentrations presented in µg/m^3)

Site ID	Annualisation Factor Bristol St Pauls	Annualisation Factor Bournemouth	Annualisation Factor Newport	Annualisation Factor Swindon Walcot	Average Annualisation Factor	Raw Data Annual Mean	Annualised Annual Mean
295	0.9144	0.9645	0.9385	0.9245	0.9355	42.8	40.0
429	1.0482	1.1653	1.0989	1.1827	1.1238	39.8	44.7
487	1.1119	1.1445	1.1074	1.1211	1.1212	29.2	32.7
493	0.9715	0.9984	0.9722	0.9808	0.9807	32.8	32.2
580	0.9571	0.9654	0.9674	0.9480	0.9595	41.5	39.8
582	0.9457	0.9513	0.9575	0.9423	0.9492	48.6	46.2
593	0.8251	0.8898	0.8743	0.8373	0.8566	34.1	29.2
595	0.8674	0.8920	0.8832	0.8580	0.8752	30.9	27.0
602	0.9497	0.8967	0.9220	0.8711	0.9099	43.8	39.9
605	0.9802	0.9122	0.9515	0.9041	0.9370	29.6	27.8
608	1.0740	1.0671	1.0518	1.0638	1.0642	35.3	37.6
618	0.9492	0.9383	0.9535	0.9106	0.9379	38.6	36.2
621	0.9792	1.0526	1.0363	1.0588	1.0317	30.3	31.2
651	0.8121	0.8264	0.8348	0.7804	0.8134	38.5	31.3
653	1.1638	1.2149	1.1399	1.1918	1.1776	33.5	39.4
665	1.1872	1.2584	1.2134	1.3626	1.2554	29.7	37.2
669	1.0037	1.0249	1.0068	0.9793	1.0037	34.8	34.9
684	0.9118	0.9240	0.9285	0.9119	0.9190	21.7	20.0
698	0.9304	0.9491	0.9422	0.9138	0.9339	25.1	23.4
699	1.1194	1.1040	1.1156	1.1812	1.1301	19.6	22.1
700	1.1951	1.2407	1.2181	1.3693	1.2558	24.2	30.4

Diffusion Tube Bias Adjustment Factors

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

Bristol City Council have applied a local bias adjustment factor of 0.85 to the 2023 monitoring data.

Discussion of Choice of Factor to Use

Box 7.1 of LAQM TG16 was used in order to determine the most appropriate bias adjustment factor (BAF) to use in 2023. Bristol has a relatively large network of automatic NO_X analysers that are operated using robust QA/QC procedures. In 2023, 8 of these sites recorded data capture rates of more than 90%. Precision calculations were undertaken for all sites in the co-location study. The precision checks indicated a “good” precision rating for all measurement periods at all sites when two or more tubes were available for analysis with the exception of Bristol St Pauls in June. Automatic monitor data capture rates were good at all sites for all months with the exception of Brislington in May and Colston Avenue in December.

The locally derived bias adjustment factor calculated for 2023 was 0.85.

The national diffusion tube BAF spreadsheet at the time of writing contained 4 studies for sites that are not BCC sites. In 2023 the national BAF for Somerset Scientific Services, before the additional of the BCC co-location studies was 0.79, therefore, using our own BAF, excluding the additional 4 tubes from the national calculations, provides a worst case BAF.

Bias adjustment factors used since 2019 have been provided in Table C. 5 to provide transparency and put the 2023 BAF in context to those used in previous years.

Table C. 5 – Bias Adjustment Factor

Monitoring Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2023	Local	N/A	0.85
2022	Local	N/A	0.86
2021	Local	N/A	0.87
2020	Local	N/A	0.85
2019	Local	N/A	0.82

Table C. 6 – Local Bias Adjustment Calculation

	Local Bias Adjustment Site 320/203	Local Bias Adjustment Site 438/270	Local Bias Adjustment Site 439/215	Local Bias Adjustment Site 455/452	Local Bias Adjustment Site 464/463	Local Bias Adjustment Site 499/500	Local Bias Adjustment Site 502/501	Local Bias Adjustment Site 673/672
Periods used to calculate bias	11	12	10	9	11	10	10	12
Bias Factor A	0.83 (0.77 – 0.9)	0.75 (0.7 – 0.81)	0.97 (0.81 – 1.22)	0.98 (0.86 – 1.14)	0.94 (0.83 – 1.07)	0.85 (0.79 – 0.1)	0.82 (0.72 – 0.96)	0.74 (0.64 – 0.89)
Bias Factor B	21% (12% - 30%)	33% (23% - 44%)	3% (-18% -24%)	2% (-12% - 16%)	7% (-6% - 20%)	18% (10% - 27%)	22% (4% - 40%)	34% (12% - 56%)
Diffusion Tube Mean (µg/m^3)	21	29	28	18	24	31	57	31
Mean CV (Precision)	3	6	2	7	6	4	4	6
Automatic Mean (µg/m^3)	18	22	28	18	23	26	47	23
Data Capture	100%	100%	96%	99%	98%	97%	99%	99%
Adjusted Tube Mean (µg/m^3)	18 (16 – 19)	22 (21 – 24)	27 (23 – 35)	18 (16 – 21)	23 (20 – 26)	26 (25 – 28)	47 (41 – 55)	23 (20 – 27)

Notes: A combined local bias adjustment factor of 0.85 has been used to bias adjust the 2023 diffusion tube results.

The precision and accuracy details from the 8 BCC co-location sites that have been used to calculate the local bias adjustment factor are shown in Figure C.8 to Figure C.15. The Diffusion Tube Data Processing Tool (DTDPT) currently only allows data from 7 co-location sites to be included within it. As BCC have 8 co-location sites, the locally derived BAF has been calculated using the Defra diffusion tube precision and accuracy bias spreadsheet tool for all 8 sites and the locally derived BAF calculated using the methodology outlined in Section 7 of the Local Air Quality Management Technical Guidance (TG22). This locally derived BAF has then been entered into the DTDPT as a national factor to allow it to be applied to the Bristol City Council diffusion tube results. This has been done as per advice from the LAQM helpdesk.

Figure C.8 - Brislington Co-Location Precision and Accuracy

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements										Automatic Method		Data Quality Check	
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 µgm^{-3}	Tube 2 µgm^{-3}	Tube 3 µgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean	Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
1	04/01/2023	02/02/2023	26.60	26.20	23.90	26	1.5	6	3.6	27	99.9	Good	Good
2	02/02/2023	01/03/2023	26.80	27.30	26.80	27	0.3	1	0.7	20	99.7	Good	Good
3	01/03/2023	05/04/2023	19.60	19.80	18.70	19	0.6	3	1.5	15	98.5	Good	Good
4	05/04/2023	04/05/2023	18.60	18.90	18.40	19	0.3	1	0.6	14	99.9	Good	Good
5	04/05/2023	01/06/2023	16.00	16.00	16.20	16	0.1	1	0.3	13	70.7	Good	or Data Capture
6	01/06/2023	07/07/2023	15.20	14.50	14.20	15	0.5	4	1.3	12	99.8	Good	Good
7	07/07/2023	02/08/2023	16.50	16.50	16.60	17	0.1	0	0.1	12	99.8	Good	Good
8	02/08/2023	06/09/2023	20.30	20.10	19.10	20	0.6	3	1.6	16	99.8	Good	Good
9	06/09/2023	04/10/2023	22.60	21.00	23.70	22	1.4	6	3.4	18	99.6	Good	Good
10	04/10/2023	01/11/2023	25.90	26.10	24.50	26	0.9	3	2.2	20	99.7	Good	Good
11	01/11/2023	08/12/2023	24.60	26.80	23.80	25	1.6	6	3.9	25	99.5	Good	Good
12	08/12/2023	03/01/2024	20.20	19.70		20	0.4	2	3.2	15	99.7	Good	Good
13													

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

Overall survey --> Good precision | Good Overall DC

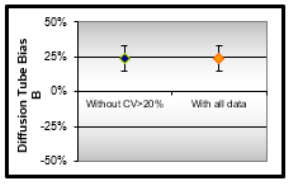
(Check average CV & DC from Accuracy calculations)

Site Name/ ID: 320/203 Brislington

Precision: 12 out of 12 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval) without periods with CV larger than 20%
Bias calculated using 11 periods of data
Bias factor A: 0.83 (0.77 - 0.9)
Bias B: 21% (12% - 30%)
Diffusion Tubes Mean: 21 µgm^{-3}
Mean CV (Precision): 3
Automatic Mean: 18 µgm^{-3}
Data Capture for periods used: 100%
Adjusted Tubes Mean: 18 (16 - 19) µgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA
Bias calculated using 11 periods of data
Bias factor A: 0.83 (0.77 - 0.9)
Bias B: 21% (12% - 30%)
Diffusion Tubes Mean: 21 µgm^{-3}
Mean CV (Precision): 3
Automatic Mean: 18 µgm^{-3}
Data Capture for periods used: 100%
Adjusted Tubes Mean: 18 (16 - 19) µgm^{-3}



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Version 04 - February 2011

Figure C.9 - Wells Road Co-Location Precision and Accuracy

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements

Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 µgm^{-3}	Tube 2 µgm^{-3}	Tube 3 µgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean
1	04/01/2023	02/02/2023	32.50	34.40	31.80	33	1.3	4	3.3
2	02/02/2023	01/03/2023	32.80	36.00	36.00	35	1.8	5	4.6
3	01/03/2023	05/04/2023	28.90	27.90	28.60	28	0.5	2	1.3
4	05/04/2023	04/05/2023	26.80	26.60	29.40	28	1.6	6	3.9
5	04/05/2023	01/06/2023	20.10	19.80	21.30	20	0.8	4	2.0
6	01/06/2023	07/07/2023	22.90	26.80	23.20	24	2.2	9	5.4
7	07/07/2023	02/08/2023	27.40	24.30	27.30	26	1.8	7	4.4
8	02/08/2023	06/09/2023	26.00	28.90	28.00	28	1.5	5	3.7
9	06/09/2023	04/10/2023	35.00	34.10	27.50	32	4.1	13	10.2
10	04/10/2023	01/11/2023	36.60	37.10	33.10	36	2.2	6	5.4
11	01/11/2023	08/12/2023	31.90	35.70	31.00	33	2.5	8	6.2
12	08/12/2023	03/01/2024	32.70	30.10	28.10	30	2.3	8	5.7
13									

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

Automatic Method		Data Quality Check	
Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
27	99.9	Good	Good
24	99.9	Good	Good
22	99.7	Good	Good
21	99.7	Good	Good
16	99.2	Good	Good
18	99.9	Good	Good
16	99.8	Good	Good
19	99.8	Good	Good
24	99.8	Good	Good
29	99.9	Good	Good
30	99.3	Good	Good
19	99.8	Good	Good
Overall survey -->		Good precision	Good Overall DC

Site Name/ ID: 438/270 Wells Road

Precision: 12 out of 12 periods have a CV smaller than 20%

(Check average CV & DC from Accuracy calculations)

Accuracy (with 95% confidence interval) without periods with CV larger than 20%	
Bias calculated using 12 periods of data	
Bias factor A	0.75 (0.7 - 0.81)
Bias B	33% (23% - 44%)
Diffusion Tubes Mean:	29 µgm^{-3}
Mean CV (Precision):	6
Automatic Mean:	22 µgm^{-3}
Data Capture for periods used:	100%
Adjusted Tubes Mean:	22 (21 - 24) µgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA	
Bias calculated using 12 periods of data	
Bias factor A	0.75 (0.7 - 0.81)
Bias B	33% (23% - 44%)
Diffusion Tubes Mean:	29 µgm^{-3}
Mean CV (Precision):	6
Automatic Mean:	22 µgm^{-3}
Data Capture for periods used:	100%
Adjusted Tubes Mean:	22 (21 - 24) µgm^{-3}

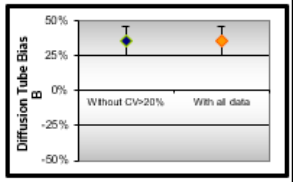

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Figure C.10 - Parsons Street Co-Location Precision and Accuracy

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements

Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 µgm^{-3}	Tube 2 µgm^{-3}	Tube 3 µgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean
1	04/01/2023	02/02/2023	30.70	28.90	30.10	30	0.9	3	2.3
2	02/02/2023	01/03/2023	34.20	33.80	34.40	34	0.3	1	0.8
3	01/03/2023	05/04/2023	30.30	30.80	30.90	31	0.3	1	0.8
4	05/04/2023	04/05/2023	24.30	23.40	23.70	24	0.5	2	1.1
5	04/05/2023	01/06/2023	24.10	23.40	23.00	24	0.6	2	1.4
6	01/06/2023	07/07/2023	24.40	25.70	25.90	25	0.8	3	2.0
7	07/07/2023	02/08/2023							
8	02/08/2023	06/09/2023							
9	06/09/2023	04/10/2023	31.40	30.90	32.10	31	0.6	2	1.5
10	04/10/2023	01/11/2023	32.20	30.60	32.10	32	0.9	3	2.2
11	01/11/2023	08/12/2023	29.00	29.80	30.80	30	0.9	3	2.2
12	08/12/2023	05/01/2024	22.50	22.30	23.10	23	0.4	2	1.0
13									

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

Automatic Method		Data Quality Check	
Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
32	99.9	Good	Good
44	99.9	Good	Good
32	99.9	Good	Good
35	87.7	Good	Good
22	75.1	Good	Good
21	99.7	Good	Good
13	98.8		Good
16	100		Good
19	99.8	Good	Good
22	99.9	Good	Good
28	99.4	Good	Good
20	99.8	Good	Good
Overall survey -->		Good precision	Good Overall DC

Site Name/ ID: 439/215 Parsons Street

Precision: 10 out of 10 periods have a CV smaller than 20%

(Check average CV & DC from Accuracy calculations)

Accuracy (with 95% confidence interval) without periods with CV larger than 20%	
Bias calculated using 10 periods of data	
Bias factor A	0.97 (0.81 - 1.22)
Bias B	3% (-18% - 24%)
Diffusion Tubes Mean:	28 µgm^{-3}
Mean CV (Precision):	2
Automatic Mean:	28 µgm^{-3}
Data Capture for periods used:	96%
Adjusted Tubes Mean:	27 (23 - 35) µgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA	
Bias calculated using 10 periods of data	
Bias factor A	0.97 (0.81 - 1.22)
Bias B	3% (-18% - 24%)
Diffusion Tubes Mean:	28 µgm^{-3}
Mean CV (Precision):	2
Automatic Mean:	28 µgm^{-3}
Data Capture for periods used:	96%
Adjusted Tubes Mean:	27 (23 - 35) µgm^{-3}

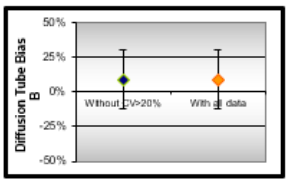

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Figure C.11 - St Pauls Co-Location Precision and Accuracy

Checking Precision and Accuracy of Triplicate Tubes

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From the AEA group

Diffusion Tubes Measurements

Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 µgm^{-3}	Tube 2 µgm^{-3}	Tube 3 µgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean
1	05/01/2023	03/02/2023	23.90	24.90	20.90	23	2.1	9	5.2
2	03/02/2023	02/03/2023	24.20	23.00	24.70	24	0.9	4	2.2
3	02/03/2023	06/04/2023	18.40						
4	06/04/2023	05/05/2023	14.80						
5	05/05/2023	02/06/2023	8.50	6.90		8	1.1	15	10.2
6	02/06/2023	06/07/2023	4.90	10.60	12.20	9	3.8	42	9.5
7	06/07/2023	04/08/2023	13.40	12.40	12.70	13	0.5	4	1.3
8	04/08/2023	07/09/2023	17.40	14.60	15.00	16	1.5	10	3.8
9	07/09/2023	05/10/2023	17.10	19.00	19.60	19	1.3	7	3.2
10	05/10/2023	03/11/2023	23.50	23.80	22.90	23	0.5	2	1.1
11	03/11/2023	05/12/2023	22.00	21.70	20.30	21	0.9	4	2.3
12	05/12/2023	02/01/2024	19.50	16.90	17.10	18	1.4	8	3.6
13									

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

Automatic Method		Data Quality Check	
Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
23.8	99.3	Good	Good
23.7	97.8	Good	Good
17.6	97.1		Good
18.6	99.4		Good
12	96.3	Good	Good
10	99.8	Poor Precisior	Good
10	95.3	Good	Good
14	99.8	Good	Good
17	99.7	Good	Good
21	99.4	Good	Good
24.5	99.7	Good	Good
16.4	100	Good	Good
	Overall survey -->	Good precision	Good Overall

(Check average CV & DC from Accuracy calculations)

Site Name/ ID: 455/452 St Pauls

Precision 9 out of 10 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval) without periods with CV larger than 20%

Bias calculated using 9 periods of data

Bias factor A 0.98 (0.86 - 1.14)

Bias B 2% (-12% - 16%)

Diffusion Tubes Mean: 18 µgm^{-3}

Mean CV (Precision): 7

Automatic Mean: 18 µgm^{-3}

Data Capture for periods used: 99%

Adjusted Tubes Mean: 18 (16 - 21) µgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA

Bias calculated using 10 periods of data

Bias factor A 0.99 (0.88 - 1.13)

Bias B 1% (-12% - 14%)

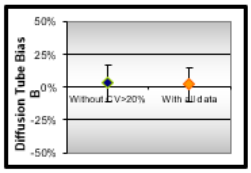
Diffusion Tubes Mean: 17 µgm^{-3}

Mean CV (Precision): 10 caution

Automatic Mean: 17 µgm^{-3}

Data Capture for periods used: 99%

Adjusted Tubes Mean: 17 (15 - 20) µgm^{-3}



Jaume Targa, for AEA
Version 04 - February 2011

Figure C.12 - Fishponds Co-Location Precision and Accuracy

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements

Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 µgm^{-3}	Tube 2 µgm^{-3}	Tube 3 µgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean
1	19/12/2022	31/01/2023							
2	31/01/2023	27/02/2023	31.90	33.70	31.90	33	1.0	3	2.6
3	27/02/2023	03/04/2023	21.30	22.20	23.10	22	0.9	4	2.2
4	03/04/2023	02/05/2023	22.00	24.60	23.50	23	1.3	6	3.2
5	02/05/2023	30/05/2023	16.70	16.90	16.10	17	0.4	3	1.0
6	30/05/2023	03/07/2023	17.40	18.30	19.90	19	1.3	7	3.1
7	03/07/2023	31/07/2023	21.10	22.50	24.30	23	1.6	7	4.0
8	31/07/2023	04/09/2023	19.10	19.40	21.20	20	1.1	6	2.8
9	04/09/2023	02/10/2023	26.20	29.70	29.40	28	1.9	7	4.8
10	02/10/2023	30/10/2023	25.70	29.80	30.20	29	2.5	9	6.2
11	30/10/2023	05/12/2023	32.40	27.40	32.90	31	3.0	10	7.6
12	05/12/2023	04/01/2024	27.50	24.60	23.90	25	1.9	8	4.7
13									

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

Automatic Method		Data Quality Check	
Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
40	99.5	Good	Good
29	99.8	Good	Good
20	99.9	Good	Good
15	99.3	Good	Good
19	91.7	Good	Good
16	96.5	Good	Good
18	99.8	Good	Good
24	93	Good	Good
25	96.4	Good	Good
27	99.5	Good	Good
19	99.7	Good	Good
	Overall survey -->	Good precision	Good Overall

(Check average CV & DC from Accuracy calculations)

Site Name/ ID: 464/463 Fishponds Road

Precision 11 out of 11 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval) without periods with CV larger than 20%

Bias calculated using 11 periods of data

Bias factor A 0.94 (0.83 - 1.07)

Bias B 7% (-6% - 20%)

Diffusion Tubes Mean: 24 µgm^{-3}

Mean CV (Precision): 6

Automatic Mean: 23 µgm^{-3}

Data Capture for periods used: 98%

Adjusted Tubes Mean: 23 (20 - 26) µgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA

Bias calculated using 11 periods of data

Bias factor A 0.94 (0.83 - 1.07)

Bias B 7% (-6% - 20%)

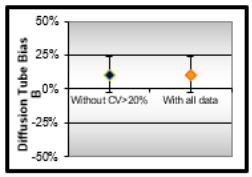
Diffusion Tubes Mean: 24 µgm^{-3}

Mean CV (Precision): 6

Automatic Mean: 23 µgm^{-3}

Data Capture for periods used: 98%

Adjusted Tubes Mean: 23 (20 - 26) µgm^{-3}



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Version 04 - February 2011

Figure C.13 - Temple Way Co-Location Precision and Accuracy

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements										Automatic Method		Data Quality Check	
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 µgm^{-3}	Tube 2 µgm^{-3}	Tube 3 µgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean	Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
1	05/01/2023	03/02/2023	38.70	34.50	32.70	35	3.1	9	7.6	28.5	80.4	Good	Good
2	03/02/2023	02/03/2023	30.60	33.50	34.60	33	2.1	6	5.1	33.6	94.8	Good	Good
3	02/03/2023	06/04/2023	32.20	30.70	32.30	32	0.9	3	2.2	27.7	99.4	Good	Good
4	06/04/2023	05/05/2023	33.10	30.90		32	1.6	5	14.0	28.3	99.7	Good	Good
5	05/05/2023	02/06/2023	28.80	29.00	30.60	29	1.0	3	2.5	26	99.4	Good	Good
6	02/06/2023	06/07/2023								20	78.7		Good
7	06/07/2023	04/08/2023	23.60	25.30	23.60	24	1.0	4	2.4	17	99.4	Good	Good
8	04/08/2023	07/09/2023	26.40	26.30	26.90	27	0.3	1	0.8	22	95.8	Good	Good
9	07/09/2023	05/10/2023								24	99.1		Good
10	05/10/2023	03/11/2023	36.10	35.20	33.80	35	1.2	3	2.9	28	99.7	Good	Good
11	03/11/2023	05/12/2023	36.40	36.50	34.50	36	1.1	3	2.8	30.5	99.9	Good	Good
12	05/12/2023	02/01/2024	29.10	28.50	26.20	28	1.5	5	3.8	21.7	99.7	Good	Good
13													

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

Overall survey --> Good precision | Good Overall DC

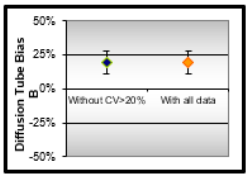
(Check average CV & DC from Accuracy calculations)

Site Name/ ID: 499/500 Temple Way

Precision: 10 out of 10 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval) without periods with CV larger than 20%
Bias calculated using 10 periods of data
Bias factor A 0.85 (0.79 - 0.91)
Bias B 18% (10% - 27%)
Diffusion Tubes Mean: 31 µgm^{-3}
Mean CV (Precision): 4
Automatic Mean: 26 µgm^{-3}
Data Capture for periods used: 97%
Adjusted Tubes Mean: 26 (25 - 28) µgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA
Bias calculated using 10 periods of data
Bias factor A 0.85 (0.79 - 0.91)
Bias B 18% (10% - 27%)
Diffusion Tubes Mean: 31 µgm^{-3}
Mean CV (Precision): 4
Automatic Mean: 26 µgm^{-3}
Data Capture for periods used: 97%
Adjusted Tubes Mean: 26 (25 - 28) µgm^{-3}



Jaume Targa, for AEA
Version 04 - February 2011

Figure C.14 - Colston Avenue Co-Location Precision and Accuracy

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements										Automatic Method		Data Quality Check	
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 µgm^{-3}	Tube 2 µgm^{-3}	Tube 3 µgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean	Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
1	03/01/2023	01/02/2023	58.50	61.70	60.00	60	1.6	3	4.0	50	99.6	Good	Good
2	01/02/2023	28/02/2023	59.70	54.30	55.50	57	2.8	5	7.0	49	99.8	Good	Good
3	28/02/2023	04/04/2023	49.40	50.40	54.30	51	2.6	5	6.4	43	99.8	Good	Good
4	04/04/2023	03/05/2023	53.20	57.30	55.90	55	2.1	4	5.2	45	99.8	Good	Good
5	03/05/2023	31/05/2023	40.10	36.90	37.50	38	1.7	4	4.2	40	99.3	Good	Good
6	31/05/2023	05/07/2023	51.50	51.30	50.90	51	0.3	1	0.8	44	95	Good	Good
7	05/07/2023	01/08/2023	55.30	64.20	57.80	59	4.6	8	11.4	45	99.4	Good	Good
8	01/08/2023	05/09/2023	73.00	81.80	75.90	77	4.5	6	11.1	44	99.8	Good	Good
9	05/09/2023	03/10/2023	81.60	76.90	72.10	77	4.8	6	11.8	54	99.8	Good	Good
10	03/10/2023	31/10/2023	47.20	45.00		46	1.6	3	14.0	55	99.8	Good	Good
11	31/10/2023	07/12/2023	57.30							56	99.2		Good
12	07/12/2023	02/01/2024	61.20	61.10	63.00	62	1.1	2	2.7	59	49.5	Good	or Data Capture
13													

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

Overall survey --> Good precision | Good Overall DC

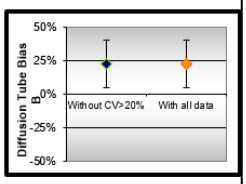
(Check average CV & DC from Accuracy calculations)

Site Name/ ID: 502/501 Colston Avenue

Precision: 11 out of 11 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval) without periods with CV larger than 20%
Bias calculated using 10 periods of data
Bias factor A 0.82 (0.72 - 0.96)
Bias B 22% (4% - 40%)
Diffusion Tubes Mean: 57 µgm^{-3}
Mean CV (Precision): 4
Automatic Mean: 47 µgm^{-3}
Data Capture for periods used: 99%
Adjusted Tubes Mean: 47 (41 - 55) µgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA
Bias calculated using 10 periods of data
Bias factor A 0.82 (0.72 - 0.96)
Bias B 22% (4% - 40%)
Diffusion Tubes Mean: 57 µgm^{-3}
Mean CV (Precision): 4
Automatic Mean: 47 µgm^{-3}
Data Capture for periods used: 99%
Adjusted Tubes Mean: 47 (41 - 55) µgm^{-3}



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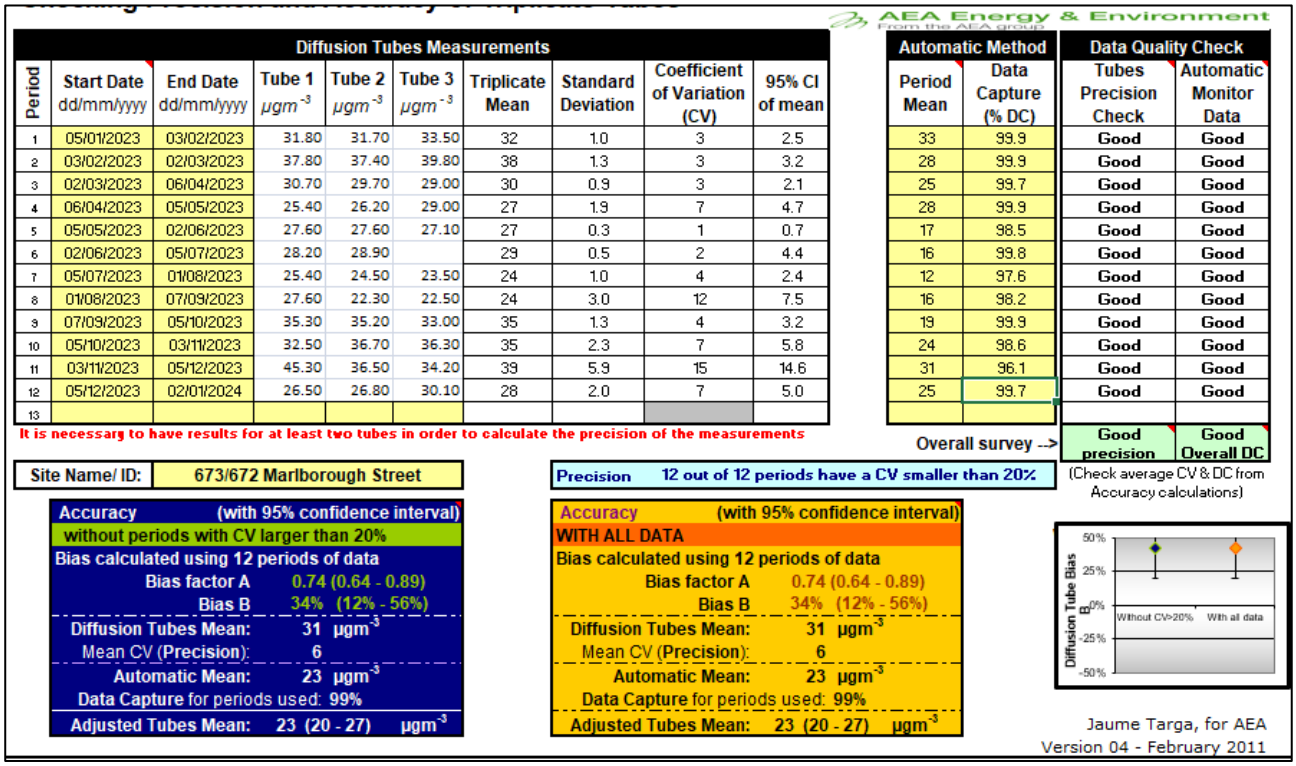
Version 04 - February 2011

Figure C.15 - Marlborough Street Co-Location Precision and Accuracy



AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements

Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 µgm^{-3}	Tube 2 µgm^{-3}	Tube 3 µgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean
1	05/01/2023	03/02/2023	31.80	31.70	33.50	32	1.0	3	2.5
2	03/02/2023	02/03/2023	37.80	37.40	39.80	38	1.3	3	3.2
3	02/03/2023	06/04/2023	30.70	29.70	29.00	30	0.9	3	2.1
4	06/04/2023	05/05/2023	25.40	26.20	29.00	27	1.9	7	4.7
5	05/05/2023	02/06/2023	27.60	27.60	27.10	27	0.3	1	0.7
6	02/06/2023	05/07/2023	28.20	28.90		29	0.5	2	4.4
7	05/07/2023	01/08/2023	25.40	24.50	23.50	24	1.0	4	2.4
8	01/08/2023	07/09/2023	27.60	22.30	22.50	24	3.0	12	7.5
9	07/09/2023	05/10/2023	35.30	35.20	33.00	35	1.3	4	3.2
10	05/10/2023	03/11/2023	32.50	36.70	36.30	35	2.3	7	5.8
11	03/11/2023	05/12/2023	45.30	36.50	34.20	39	5.9	15	14.6
12	05/12/2023	02/01/2024	26.50	26.80	30.10	28	2.0	7	5.0
13									

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

Automatic Method		Data Quality Check	
Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
33	99.9	Good	Good
28	99.9	Good	Good
25	99.7	Good	Good
28	99.9	Good	Good
17	98.5	Good	Good
16	99.8	Good	Good
12	97.6	Good	Good
16	98.2	Good	Good
19	99.9	Good	Good
24	98.6	Good	Good
31	96.1	Good	Good
25	99.7	Good	Good
Overall survey -->		Good precision	Good Overall DC

Site Name/ ID: 673/672 Marlborough Street

Precision: 12 out of 12 periods have a CV smaller than 20%

(Check average CV & DC from Accuracy calculations)

Accuracy (with 95% confidence interval) without periods with CV larger than 20%	
Bias calculated using 12 periods of data	
Bias factor A	0.74 (0.64 - 0.89)
Bias B	34% (12% - 56%)
Diffusion Tubes Mean:	31 µgm^{-3}
Mean CV (Precision):	6
Automatic Mean:	23 µgm^{-3}
Data Capture for periods used:	99%
Adjusted Tubes Mean:	23 (20 - 27) µgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA	
Bias calculated using 12 periods of data	
Bias factor A	0.74 (0.64 - 0.89)
Bias B	34% (12% - 56%)
Diffusion Tubes Mean:	31 µgm^{-3}
Mean CV (Precision):	6
Automatic Mean:	23 µgm^{-3}
Data Capture for periods used:	99%
Adjusted Tubes Mean:	23 (20 - 27) µgm^{-3}

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

Table C. 7 – Non-Automatic 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
239	0.7	9.0	**40.5**	13.4	27.5	
502_1, 502_2, 502_3	2.0	5.0	**48.9**	19.8	**42.7**	*Predicted concentration at Receptor above AQS objective.*
512	3.0	5.0	37.3	15.1	34.3	
624	2.0	10.0	37.6	13.4	28.5	
667	0.5	5.0	**42.0**	17.6	32.1	

QA/QC of Automatic Monitoring

The Council's monitoring network is operated and run by officers trained in all aspects of the monitoring processes including routine site operations, field calibrations and data ratification. The QA/QC for the AURN Bristol St Pauls and Temple Way sites is carried out by Ricardo-AEA. Live and historic air quality data can be found on the Bristol City Council open data portal. This is a new portal, which replaced a previous portal platform. During 2024 the portal will continue to be developed to improve the functionality.

Routine Site Operations

The Council's monitoring sites have a programme of routine operational checks and programmed fortnightly site visits including:

- Daily communications checks on lines, data transfer and analyser operation;
- Daily checks of data quality;
- Repairs of faulty equipment under arrangements with outside contractors;
- Fortnightly site inspections of equipment operational status, site safety, security, and calibration checks; and
- Planned six monthly servicing and re-calibration of analysers by equipment suppliers under contract to the Council.

The Temple Way site is an affiliate site which is owned and maintained by Bristol City Council but also incorporated in the Defra AURN network. This site is maintained in accordance with the QA/QC processes as required for sites that form part of the National AURN network.

Equipment Servicing and Maintenance Regimes

BCC analysers have planned maintenance schedules that broadly follow those assigned to the AURN and affiliated site network. All analysers are maintained following manufacturers' instructions and have a six-monthly full service and re-calibration conducted under the servicing contract. Since November 2022 these have been carried out by Enviro Technology Ltd.

BCC's internal data ratification procedures have been used to ensure that the reported data is valid and meets the required standards. Results of the servicing, calibrations and repairs that were carried out by ESU1 Ltd and Enviro Technology are fully documented

and stored centrally. BCC staff carry out routine maintenance during regular fortnightly site visits where all associated equipment such as sample lines, modem, and electrical system are examined, and sample inlet filters are changed. Any faults, repairs or changes made to the equipment are also recorded and stored centrally and at analyser locations.

Calibration Methods

The calibration procedures are the same for all the Council's continuous analysers, with a two point zero/span calibration check being performed at regular intervals of two weeks. The methodology for the calibration procedure being derived from the manufacturers' instruction handbooks and from the AURN Site Operator's Manuals, as follows:

- Pre-calibration check - the site condition and status of the analyser is recorded prior to the zero/span check being conducted;
- Zero check – the response of the analyser to the absence of the gas being monitored;
- Span check – the response of the analyser to the presence of the gas of a known concentration; and
- Post calibration check - the site condition and status of the analyser upon completion of all checks.

Each analyser zero/span check is fully documented with records being kept centrally using Google Sheets. Diagnostics data is recorded automatically through Envista ARM. Calibration factors are calculated in Google Sheets and are used in the scaling and ratification process.

Colston Avenue Calibration Issues 2023

In 2023 it was noted that scaling data from the Colston Avenue site using BCC calibration data resulted in a step change in the data from the end of January 2023 onwards. This was caused by a step change in the span gas values being returned in the calibrations carried out by BCC. From the end of January onwards calibration span values were in the region of 550-650ppb relatively consistently, whereas before they were often closer to 300-400ppb. This step change did not occur at other sites being calibrated by BCC. After some in depth analysis and consultation with the LAQM Helpdesk (LAQM reference code #9567) an approach was agreed whereby 2023 data from this site was scaled using calibration data from the BCC Equipment Support Unit (ESU), which is Enviro Technology

Ltd. They carried out a number of site visits in 2023 and performed 6 calibrations over the year. When using the Enviro Technology calibration figures to scale the raw data the step change in the scaled data was eliminated and real time data for the year closely matched the annual average at the site from the triplicate diffusion tubes. When using the BCC calibration data the annual average NO_2 concentration for the site in 2023 was 34µg/m^3, however, when using the Enviro Technology data the annual average for this site was 48µg/m^3. This compares well to the triplicate diffusion tube average for the same location of 48.9µg/m^3. From late 2023 the calibration issue has been resolved with a few site alterations and adjustment to the calibration procedures at this particular site.

Analyser Calibration

A two-point calibration is conducted on Bristol City Council analysers with a reference NO mixture at a concentration of approximately 470ppb. Gases are supplied and certified by BOC or Air Liquide.

Zero Air Generation

The contents of the portable scrubber (hopcalite, activated charcoal, purafil and drierite) are changed when necessary or at least every six months.

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

The type of PM_{10}/$PM_{2.5}$ monitors utilised within Bristol do not require the application of a correction factor.

Automatic Monitoring Annualisation

All automatic NO_2 monitoring locations within Bristol recorded data capture of greater than 75% therefore it was not required to annualise any monitoring data.

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

Figure D.1 – Extent of Air Quality Management Area

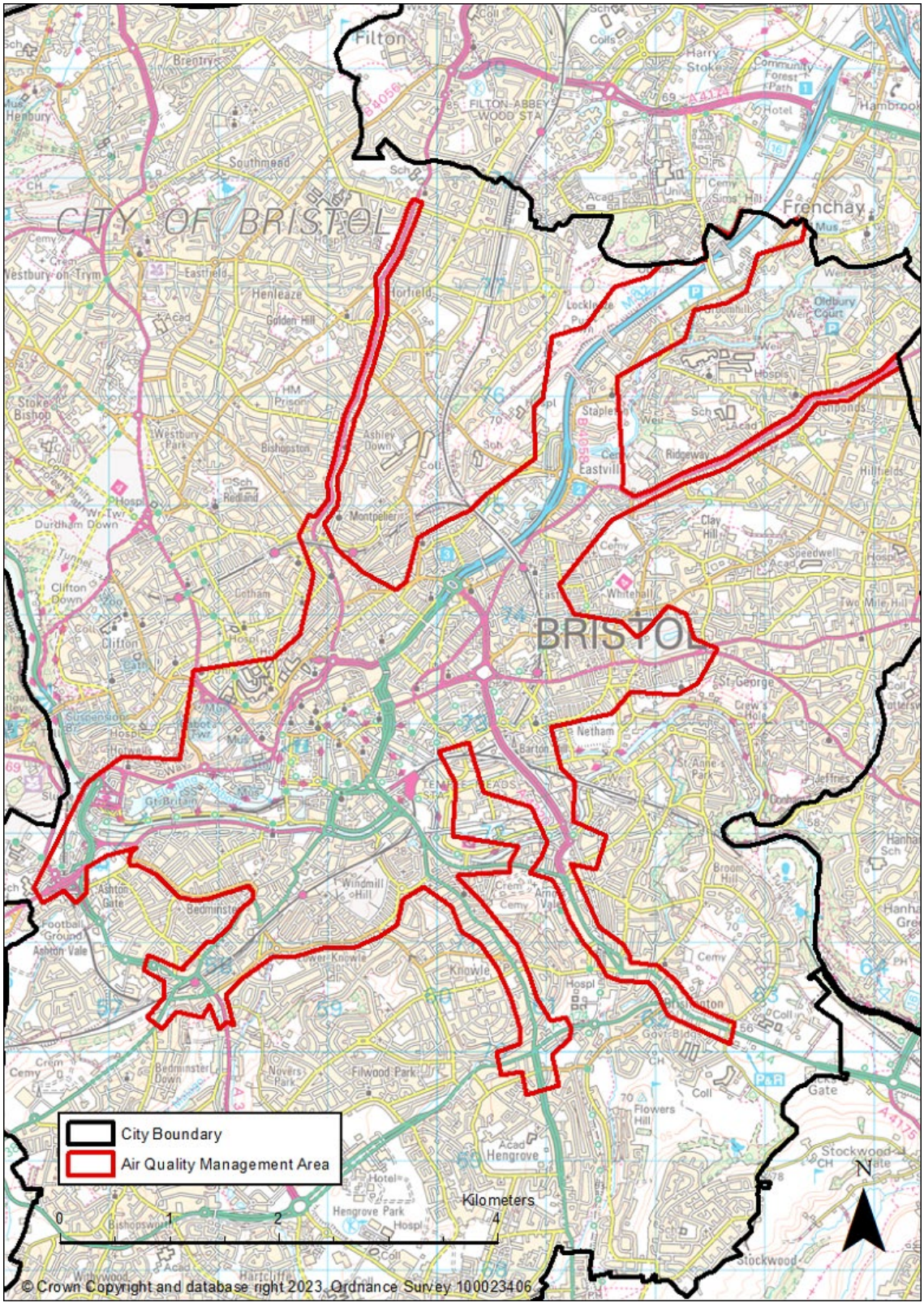


Figure D.2 - Central Monitoring Locations: 2023 Annual NO_2 Concentrations

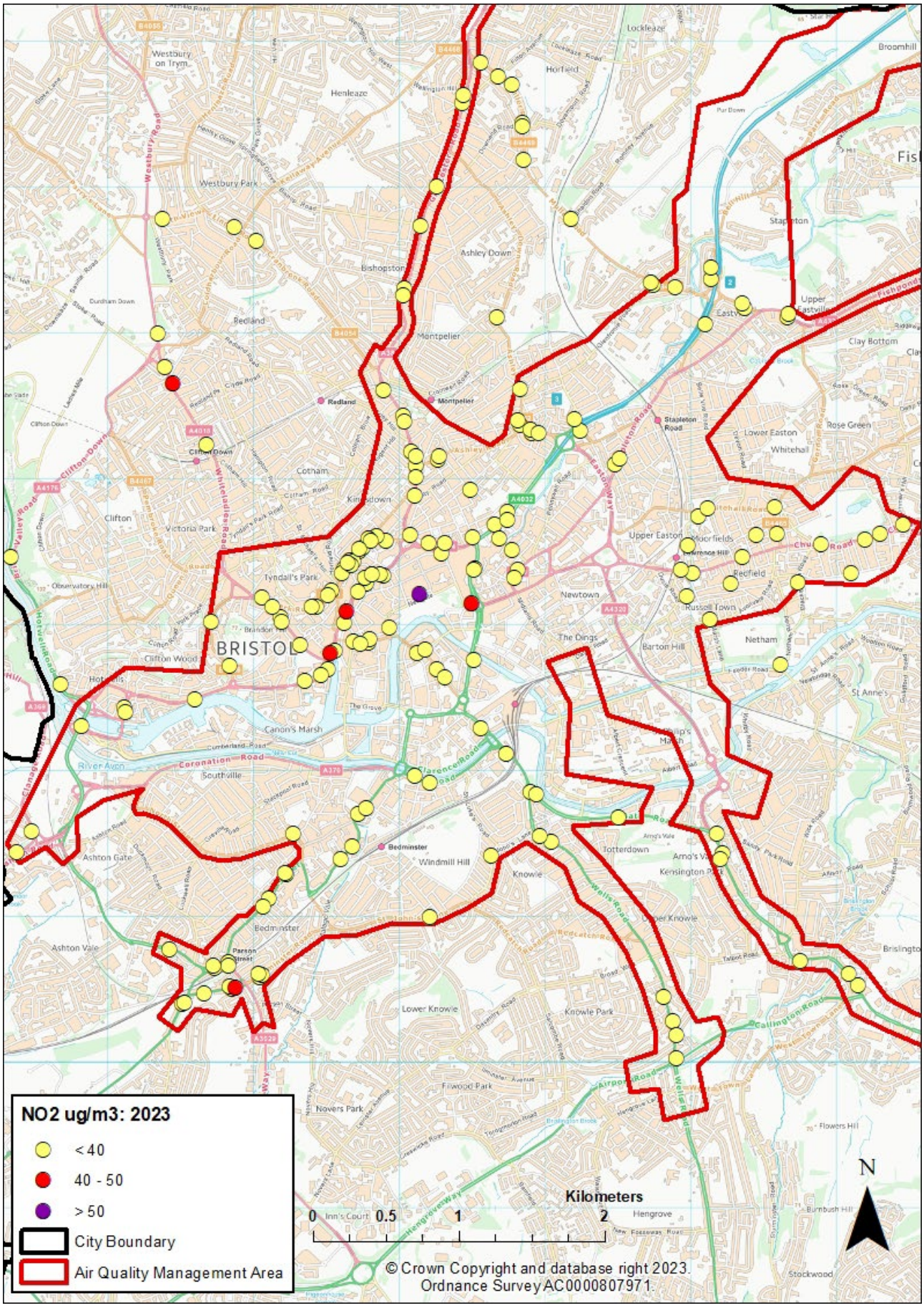


Figure D.3 - Central Monitoring Locations: 2023 Annual NO_2 Concentrations Distance Adjusted (where relevant)

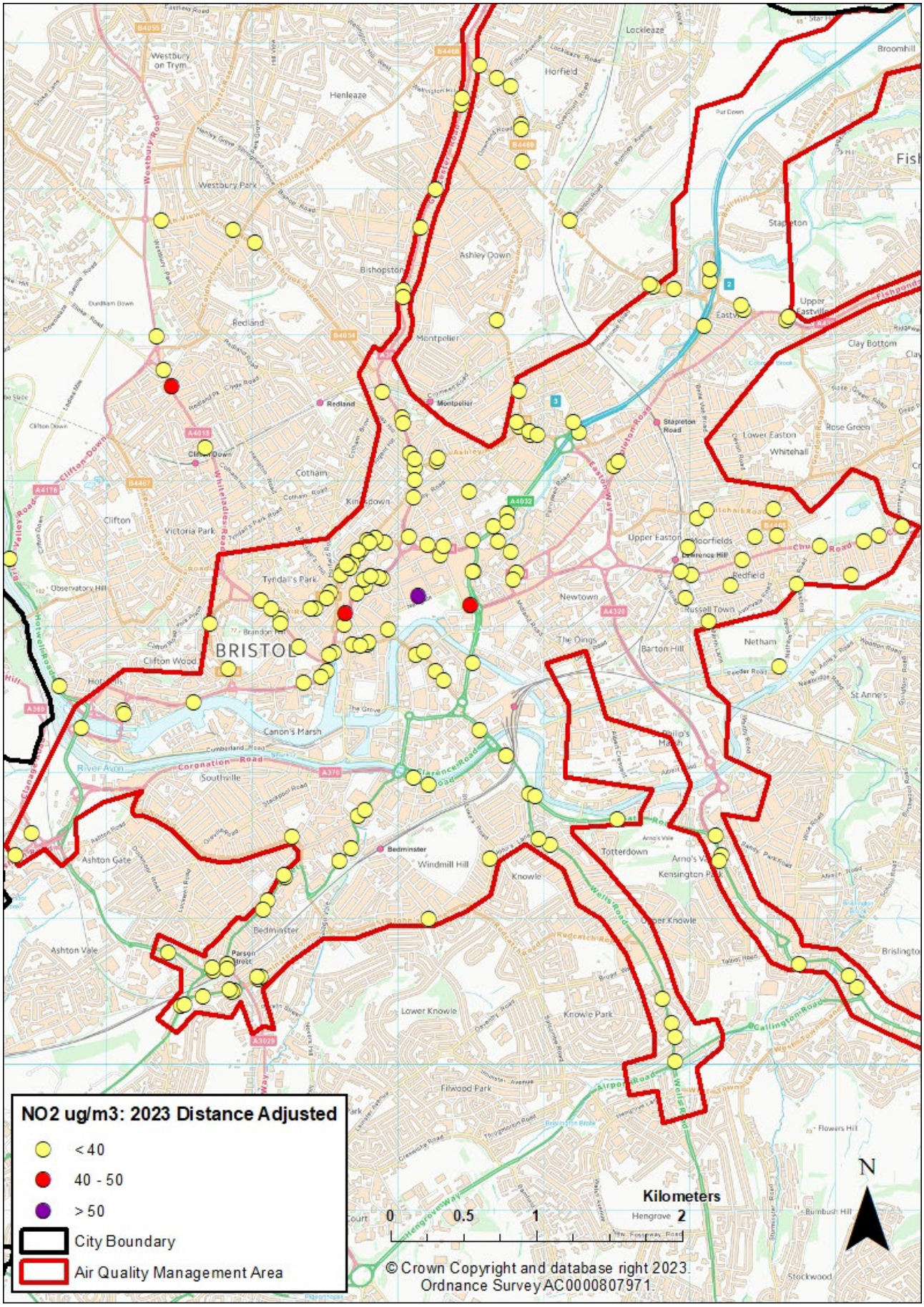


Figure D.4 – Avonmouth 2023 Annual NO_2 Concentrations

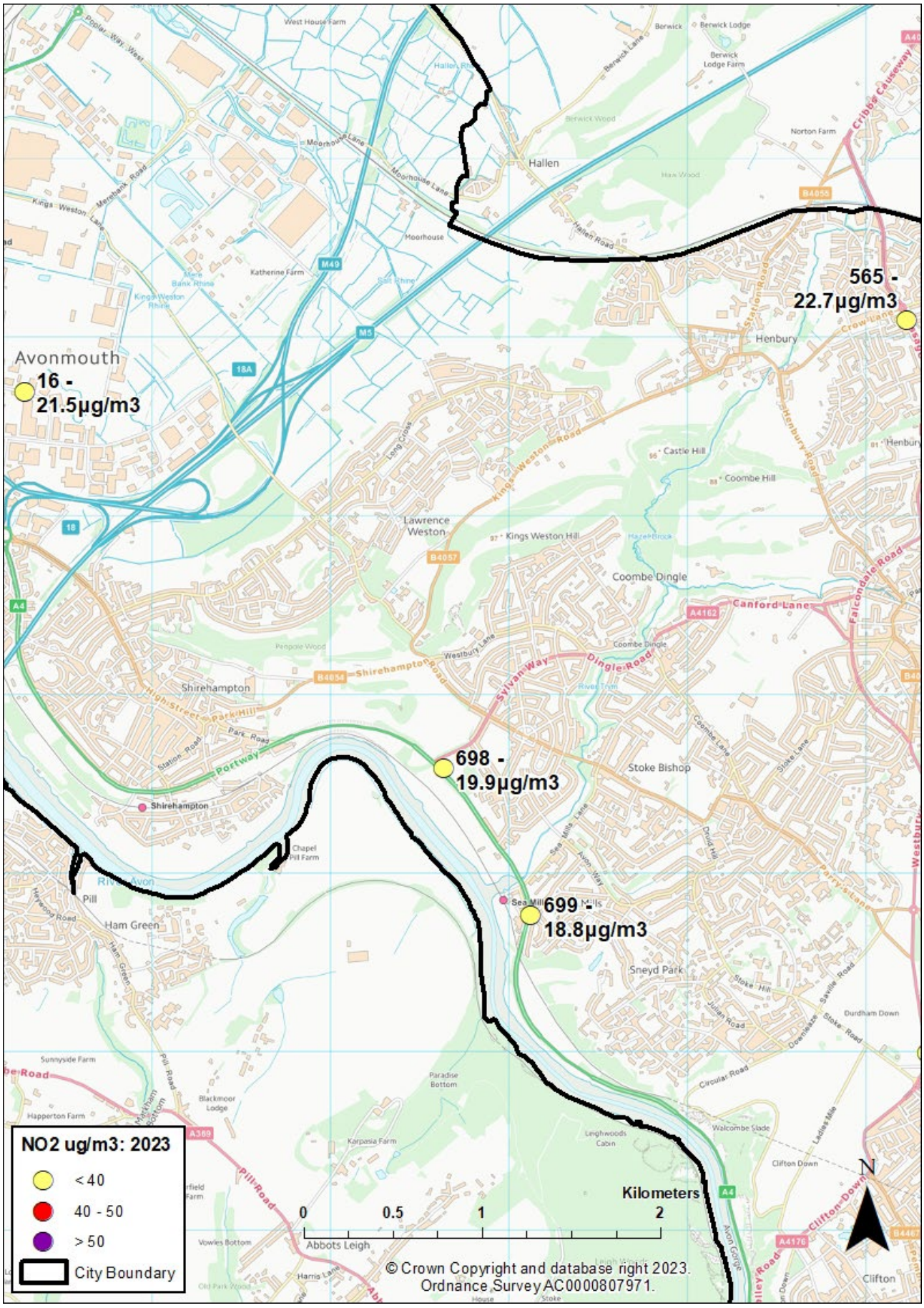
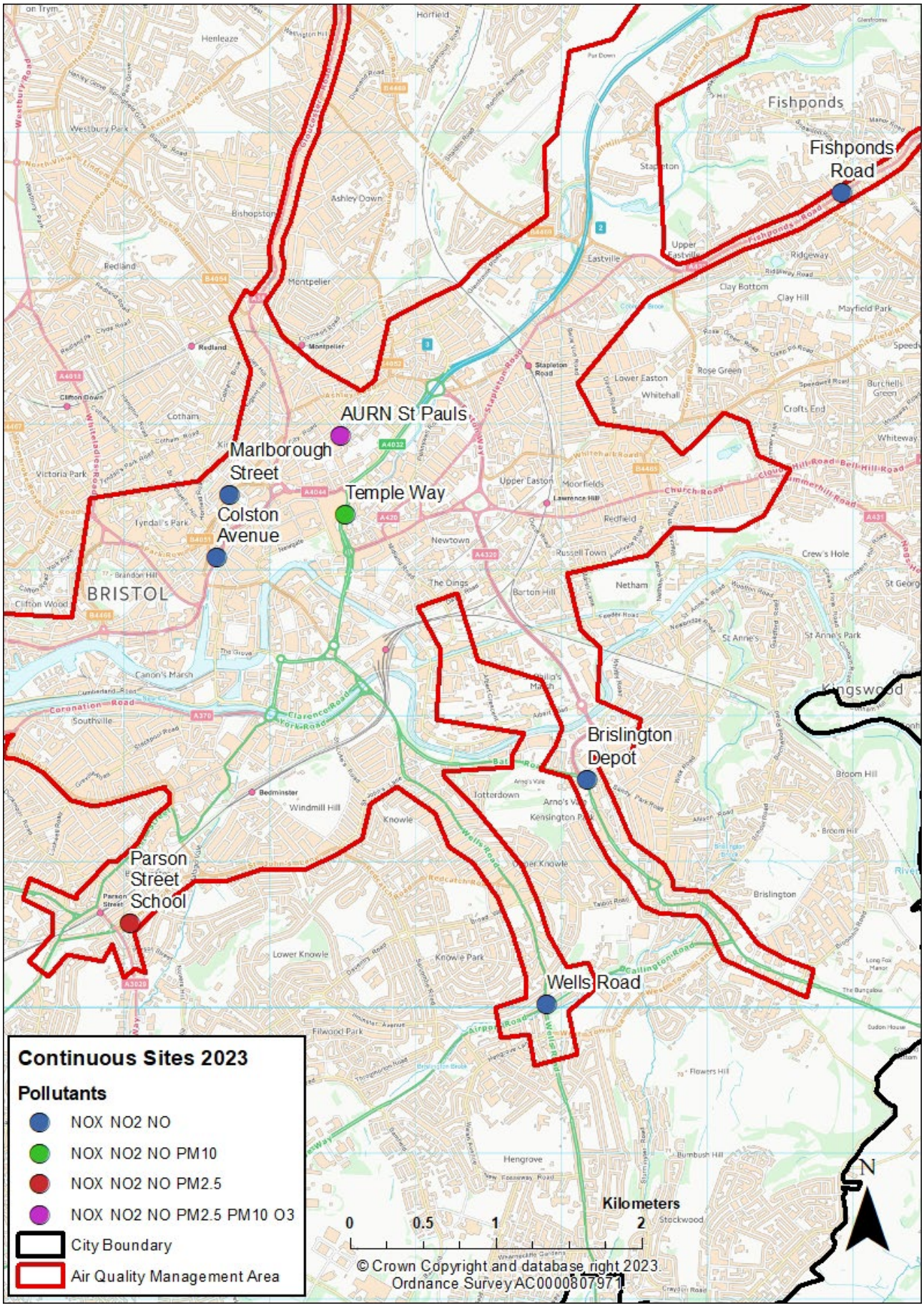


Figure D.5 - Continuous (real-time) Monitoring Locations in 2023



Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England[13]

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

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

Glossary of Terms

Abbreviation	Description
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the local authority intends to achieve air quality limit values'
AQMA	Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives
ASR	Annual Status Report
AURN	Automatic Urban and Rural Network
BAF	Bias adjustment factor
BCC	Bristol City Council
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by National Highways
EU	European Union
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
NRMM	Non-road mobile machinery
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
PM_{10}	Airborne particulate matter with an aerodynamic diameter of 10µm or less
$PM_{2.5}$	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO_2	Sulphur Dioxide

References

- Local Air Quality Management Technical Guidance LAQM.TG22. August 2022. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.
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