2022 Air Quality Annual Status Report (ASR)

In fulfilment of Part IV of the Environment Act 1995

Local Air Quality Management

Date: March 2023

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Executive Summary: Air Quality in Our Area

Air Quality in Preston

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

The mortality burden of air pollution within the UK is equivalent to 28,000 to 36,000 deaths at typical ages[3], with a total estimated healthcare cost to the NHS and social care of £157 million in 2017[4].

Within Preston, the main pollutant of concern is nitrogen dioxide (NO_2), which is principally related to transport sources. Across the Preston district, the motorway network contributes 67.2% of the total emissions of 1,149 tonnes of NOx[5]. High concentrations of nitrogen dioxide are restricted to a number of hotspots within the Council Boundary. These hotspots are known as Air Quality Management Areas (AQMAs), details of which are provided within Table 2.1 below, and the locations can be seen by following this link.

During 2021, the Council carried out monitoring within and outside the AQMAs (results in Appendix A: Monitoring Results). No exceedances of the nitrogen dioxide or particulate matter objectives were recorded at any monitoring locations in 2021; the last recorded exceedance of the annual mean nitrogen dioxide objective of 40µg/m^3 was in AQMA 4 in 2019. Following a general reduction in concentrations in previous years, overall there has been a slight increase in annual mean nitrogen dioxide concentrations from 2020 to 2021,

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

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

[3] Defra. Air quality appraisal: damage cost guidance, July 2021

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

[5] Lancashire County Council. Preston district, 2023, online. Available: https://www.lancashire.gov.uk/lancashire-insight/area-profiles/local-authority-profiles/preston-district/

which appears to follow the national trend associated with the return to more 'typical' vehicle use patterns following the easing of Covid-19 restrictions. Concentrations in 2021 were, however, still lower than 2019 indicating an ongoing downward trend. 2020 was the year most hit by Covid restrictions, and hence reduction in travel and resulting emissions, with 2021 having some disruption, but not to the same extent. More information on air quality trends relating to the Covid pandemic can be found by following this link.

Preston City Council (PCC) is committed to work with local authorities and partners, including Lancashire County Council, to deliver improvements to air quality across Preston.

Actions to Improve Air Quality

Whilst air quality has improved significantly in recent decades, and will continue to improve due to national policy decisions, there are some areas where local action is needed to improve air quality further.

The 2019 Clean Air Strategy[6] sets out the case for action, with goals to reduce exposure to harmful pollutants. The Road to Zero[7] strategy sets out the approach to reduce exhaust emissions from road transport through a number of mechanisms; this is extremely important given that the majority of AQMAs are designated due to elevated concentrations heavily influenced by transport emissions.

The Central Lancashire Core Strategy has a dedicated air quality policy (Policy 30), which aims to '*Improve air quality through delivery of Green Infrastructure initiatives and through taking account of air quality when prioritising measures to reduce road traffic congestion*'. Air quality issues are a material consideration when reviewing development proposals. Ensuring air quality is considered within the planning system, along with encouraging the implementation of infrastructure for electric vehicles have been the main actions undertaken in 2021. The construction of the Preston Western Distributor Road has been ongoing and is due to be completed in 2023.

The main actions moving forward will be:

[6] Defra. Clean Air Strategy, 2019

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

- Continuing to ensure EV charging points are a requirement on planning applications through a standard planning condition.
- Conducting a feasibility study on locations to install EV charging points across Council car parks and buildings and acting on the findings.
- Completion of the Preston Western Distributor Road to ease congestion and transport emissions along the existing central road network.
- Continue the planning of local cycling and walking infrastructure plans.
- Finalise plans for the new public transport priority corridors along seven routes into Preston to further the provision of sustainable transport to the city centre.

Conclusions and Priorities

From the local monitoring data, while no exceedances of any of the air quality objectives have been recorded, an increase in annual mean nitrogen dioxide concentrations has been observed between 2020 and 2021, which appears to follow the national trend associated with the return to more 'typical' vehicle use patterns following the easing of Covid-19 restrictions. Concentrations in 2021 are, however, lower than in 2019, with improvements likely to be related partly to fleet improvements, as well as local improvements. No new AQMAs are necessary.

Even though Preston City Council are successfully working towards compliance with the current air quality objectives, it is noted that health effects of air pollution are apparent even below objective levels, and Preston City Council will continue to work towards reducing emissions of both NOx and particulate matter across the district. Due to new targets set within the Environment Act 2021, particulate matter, and especially $PM_{2.5}$, is likely to become a greater priority over the next few years.

Local Engagement and How to get Involved

The Council is working with key partners to deliver better air quality, in particular Lancashire County Council.

Walking and cycling ('Active Travel') provide opportunities to develop healthier communities and attractive places to live and work.

Lancashire Active Travel Strategy ('Actively Moving Forward' [8]) sets out the ways in which people living and working in the County can engage in active travel, including the schemes and routes available to the public. This involves collaborating with active travel providers and disability related group to enable Lancashire to be a place where many more people make cycling and walking part of their everyday lives.

There are 600 miles of on- and off-road cycle routes available for people of all cycling abilities in Lancashire, from quiet country lanes, gentle rides on promenades, canal towpaths, throughout cities, including Preston, and scenic hill routes. The Guild Wheel (link here) offers a 21 mile circular route around Preston that can be ridden or walked in any direction and joined at any point. It provides a safe and scenic route for people of all abilities.

As part of the Lancashire Actively Moving Forward strategy, Local Cycling and Walking Infrastructure Plans (LCWIPs) are being developed across the County to identify potential cycling and walking infrastructure improvements, including for central Lancashire, which includes Preston. More information about LCWIPs in Lancashire is available here, and the Plan covering Preston is available here.

Improvements to sections of the Penwortham to Preston Cycle Superhighway have commenced to make travel easier and safer for pedestrians and cyclists. More information on the works can be found here.

The Road Safety Team work with schools, workplaces and the community to encourage safe and sustainable modes of travel. Initiatives for schools are promoted though the Safer Travel Moodle (available here) and include: a series of cycling and walking safety training programmes; guidance and resources for teachers to encourage safe and active travel; and support for creating travel plans.

Further information on switching to cycling, training courses, and cycle routes available in Lancashire can be found by following this link here. Walking routes, locations of country parks, nature reserves and picnic sites in Lancashire are available here.

The Lancashire Insight website provides information on the sources and health impacts of air pollution across the county. Webpages include a Summary of Emissions Data, which

[8] Lancashire County Council. Actively Moving Forward. A ten year strategy for Cycling and Walking, 2018, online. Available: https://www.lancashire.gov.uk/media/917305/6469-cycling-and-walking-strategy.pdf

can be accessed by clicking here, Monitoring of Air Quality and Health Impacts, which can be accessed by clicking here, and an Air Quality and Health Dashboard, accessed by clicking here.

Information regarding the air quality within Preston and our contact details can be found on our website below:

https://www.preston.gov.uk/article/1015/Air-quality

Local Responsibilities and Commitment

This ASR was prepared by Air Quality Consultants Ltd on behalf of the Environmental Health Department of Preston City Council.

A copy of the ASR has been provided to the Cabinet Member for Planning and Regulation.

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

If you have any comments on this ASR please send them to Chris Hodson at:

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1 Local Air Quality Management

This report provides an overview of air quality in Preston City Council (PCC) during 2021. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) and the relevant Policy and Technical Guidance documents.

The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where an exceedance is considered likely, the local authority must declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives. This Annual Status Report (ASR) is an annual requirement showing the actions employed by Preston 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 in Appendix E: Summary of Air Quality Objectives in England.

2 Actions to Improve Air Quality

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 12 months setting out measures it intends to put in place in pursuit of compliance with the objectives.

A summary of AQMAs declared by Preston City Council can be found in Table 2.1. The table presents a description of the five AQMAs that are currently designated within Preston City Council. Appendix D: Maps of Monitoring Locations and AQMAs provides maps of the AQMAs and also the air quality monitoring locations in relation to the AQMAs. The air quality objectives pertinent to the current AQMA designations are as follows:

- Nitrogen dioxide (NO_2) annual mean (all AQMAs); and
- Nitrogen dioxide (NO_2) 1-hour mean (AQMA 3).

Policy 12 in the Preston City Transport Plan 2019 aims to revoke all AQMAs by 2028 through driving investment in greater choice, and reducing the impact of existing, non-car modes. This will occur through supporting the case of alternative fuel buses, reducing congestion and promoting walking and cycling. Policy 13 focuses on ensuring new development is granted with appropriate EV charging technology through the provision of standards for new homes and wider development. An assessment of the local power network is required to ensure the capacity of infrastructure is sufficient to cope with an increase in the demand for electrical power.

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 National Highways?	Level of Exceedance: Declaration	Level of Exceedance: Current Year	Name and Date of AQAP Publication	Web Link to AQAP
AQMA 1	September 2005	NO_2 Annual Mean	Area of residential at the Prison junction on the A59 Ringway	No	41 µg/m^3	26 µg/m^3 (No exceedance)	PCC Action Plan, 2009	https://www.preston.gov.uk/article/1015/Air-quality
AQMA 2	September 2005	NO_2 Annual Mean	Area of residential at the junction of Blackpool Road and Plungington Road	No	51 µg/m^3	29 µg/m^3 (No exceedance)	PCC Action Plan, 2009	https://www.preston.gov.uk/article/1015/Air-quality
AQMA 3	May 2012	NO_2 Annual Mean and NO_2 1 Hour Mean	Area of residential in the centre of Broughton Village (A6)	No	77 µg/m^3	16 µg/m^3 (No exceedance)	PCC Action Plan, 2014	https://www.preston.gov.uk/article/1015/Air-quality
AQMA 4	May 2012	NO_2 Annual Mean	Area of residential in the centre of Broughton Village (A6)	No	52 µg/m^3	35 µg/m^3 (No exceedance)	No plan	https://www.preston.gov.uk/article/1015/Air-quality
AQMA 5	March 2014	NO_2 Annual Mean	Area of residential on London Road	No	41 µg/m^3	30 µg/m^3 (No exceedance)	No plan	https://www.preston.gov.uk/article/1015/Air-quality

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

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

Progress and Impact of Measures to address Air Quality in Preston City Council

Preston City Council and Lancashire County Council continue to work towards reducing emissions and thereby improving local air quality. Details of Action Plan measures completed, in progress or planned are set out in Table 2.2. Nine measures are included within Table 2.2, with barriers restricting the implementation of the measure, these are also presented.

More detail on these measures can be found in their respective Action Plans.

Preston City Council and Lancashire County Council expects the following measures to be a priority for the next reporting year and beyond:

- Further progress on the completion of road and public transport improvements within the City as set out in the Central Lancashire Highways and Transport Masterplan (2013) (and Lancashire County Council Highways and Transport Strategy 2023 – 2025). Many of these improvements are incorporated within Action Plan 2014.
- Installation of further Electric Vehicle (EV) charging points within the City, including at Council car parks, buildings and with new developments, as appropriate.
- Completed construction of the Preston Western Distributor Road.
- Further the planning stages of local cycling and walking infrastructure across the City, construction of Cottam Parkway railway station and new public transport priority corridors into Preston.

Preston City Council's priorities for the coming year are:

- Continue delivery of EV charging infrastructure across the district.
- Ensure monitoring of pollutants continues and is reported on in the statutory LAQM process.

The measures stated above will help to contribute towards continued compliance in Preston City Council.

The principal challenges and barriers to implementation that Preston City Council anticipates facing are:

- Internal resources.

- Issues faced by two-tier authority position - Preston City Council has no direct control over highways and is reliant on joint working with Lancashire County Council.
- The local plan proposes additional development, particularly housing, within the district that will potentially result in additional road traffic.
- Funding – limiting the installation of EV charging and cycling and walking infrastructure across the City.
- Increased cost of living is likely to result in increase in the use of solid fuels, and potentially impact on the transition to electric vehicles.

Table 2.2 – Progress on Measures to Improve Air Quality

Measure No.	Measure	Category	Classification	Year Measure Introduced	Estimated / Actual Completion Year	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	Require electric vehicle recharging points on planning applications	Promoting Low Emission Transport	Other	2016	2016	PCC		NO	Funded	< £10k	Completed	N/A	N/A	Completed, standard planning condition used	N/A
2	Install electric vehicle recharge points to all Council car parks and buildings	Promoting Low Emission Transport	Other	2016		PCC/LCC		NO	Not Funded		Planning	N/A	N/A	Electric vehicle charging points installed in Avenham Car Park, Bus Station Car Park. Plus on street Chapel Street.	Funding, plus the need for a feasibility study on locations of EV points
3	Development and implementation of a Lancashire wide planning guidance	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance			Lancaster City Council, on behalf of all 14 Lancashire Authorities. PCC lead for implementation in Preston		NO	Not Funded	< £10k	Aborted	N/A	N/A	Aborted due to review of Central Lancs Core Strategy, Planning	N/A
4	Broughton Bypass	Transport Planning and Infrastructure	Other		2017	LCC		NO	Funded		Completed	Modelled average of 60% reduction in NO_2 concentrations	N/A	Completed, significant reductions, see monitoring data	N/A
5	Infrastructure improvements New Hall Lane	Transport Planning and Infrastructure	Other		2017	LCC		NO			Completed	AQMA 4 now compliant	N/A	Completed, help with compliance, Footpath width increased, moving traffic source slight away from residential, bus priority	N/A
6	Construction of Preston Western distributor Road	Transport Planning and Infrastructure	Other		2023	LCC/PCC	City Deal	NO	Funded	£100k - £500k	Implementation	Allows future development, reducing congestion on existing road network	N/A	Currently being Constructed	N/A
7	Local Cycling and Walking Infrastructure Plans	Transport Planning and Infrastructure	Cycle network		2032	LCC		NO	Not Funded		Planning	Potential to increase and improve Cycling and Walking infrastructure	N/A	In the planning process	Funding
8	Construction of Cottam Parkway railway station	Transport Planning and Infrastructure	Public transport improvements- interchanges stations and services		2025	LCC/PCC	Transforming Cities/City Deal	NO	Funded		Planning	Includes Park and Ride, provides alternative transport to Preston City Centre	N/A	In the Planning Process	N/A
9	New Public Transport priority corridors along 7 routes into Preston	Transport Planning and Infrastructure	Bus route improvements		2024	LCC		NO			Planning	May effect AQMA 4	N/A		

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

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

In Lancashire evidence on the population health impacts of air pollution is available from Public Health England's Public Health Outcomes Framework. This Framework estimates 'the fraction of mortality attributable to particulate air pollution ($PM_{2.5}$)' and shows that, the mortality rate from particulate air in Preston (2021 using new method) is 4.7% compared to 5.3% regionally and 5.5% England average[9].

Working with district councils, Lancashire County Council (LCC) has an important role to play in taking action to reduce the health impacts of air pollution. Responsible for transport planning, network management, highway maintenance, public health and procuring local vehicle fleets, there are a number of ways LCC can support local and county wide efforts to improve air quality. In summary, the following activities are underway or in development to address $PM_{2.5}$:

1. Encouraging the use of sustainable forms of travel

Lancashire's cycling and walking strategy, Actively Moving Forward, sets out an ambitious plan for increasing the number of people walking and cycling in the county by 2028. By improving and increasing access to cycling and walking infrastructure, alongside training and promotional activities, it aims to significantly increase the amount of cycling and walking people do across the county. Information on the County Council's ongoing activities in this area can be found on the Active Travel in Lancashire website (available here).

[9] https://fingertips.phe.org.uk/profile/public-health-outcomes-framework/data#page/1/gid/1000043/pat/6/par/E12000002/ati/101/are/E07000123/yrr/1/cid/4/tbm/1

As part of Lancashire's cycling and walking strategy, work has now commenced on developing Local Cycling and Walking Infrastructure Plans (LCWIPs) for Lancashire. LCWIP's have been defined for seven areas across Lancashire. These are:

- Lancaster
- Central Lancashire
- West Lancashire
- Fylde Coast
- Ribble Valley
- Burnley and Pendle
- Rossendale and Hyndburn.

As part of the LCWIP process extensive public and stakeholder engagement is underway. Following on from this, it is planned for all LCWIPs to be completed by early 2023. The Plans will include a network plan for cycling and walking infrastructure and a prioritised list of schemes for delivery over short, medium and long term timeframes. These plans will be used to support future infrastructure decisions and to access new funding schemes as they become available.

The Road Safety Team work with schools, workplaces and the community to encourage safe and sustainable modes of travel. Initiatives for schools are promoted though the Safer Travel Moodle (available here) and include: a series of cycling and walking safety training programmes; guidance and resources for teachers to encourage safe and active travel; and support for creating travel plans.

2. Supporting the transition to low emission vehicles

Lancashire County Council, working with BP Pulse, has installed 150 Electric Vehicle charge points[10] either at the side of the adopted highway or in county council carparks. These charge points are Ultra Chargers which will allow most vehicles to take a full charge in less than an hour and Fast Chargers that will take around three hours to charge the vehicles. The mix of these units depends on location, power supply and demand.

[10] Lancashire County Council. Installation of electric vehicle charge points throughout Lancashire, 2023, online. Available: https://www.lancashire.gov.uk/council/strategies-policies-plans/roads-parking-and-travel/installation-of-electric-vehicle-charge-points/

LCC is currently focussing on supporting residents who do not have off-street parking charge at home, this is a real issue in Lancashire, with up to 65% of households estimated to have no off-street parking. The Council is currently trailing an innovative footway cable tray which will provide a low cost and practical solution to support residents without off street parking charge at home. The cable-tray will enable residents to safely pass an electric cable across the footway from their property to the carriageway enabling charging their vehicle from their domestic supply. Two products (1 designed in-house and 1 adapted product) are currently being trialled in several residential properties in the county.

Almost £3m has been invested in new electric vehicles and charging points for County Council services. Following trials, the first service to go electric will be the County Council's parking enforcement team, with 12 new electric vehicles. Work will get underway to install charging infrastructure at the offices and depots where the vehicles are based, and where they regularly visit. Trials have also been undertaken on small and medium battery electric plant, for example hedge trimmers, mowers and mini-diggers that will inform a move to battery electric plant from conventional petrol and diesel plant.

3. Creating cleaner, healthier road networks

Work to develop the next Local Transport Plan (LTP4) for Lancashire, Blackpool and Blackburn with Darwen is underway. The Public Health team has submitted an evidence base to inform the process, highlighting transport related health challenges affecting the population of Lancashire and making recommendations about how local transport planning policy can make a contribution to addressing these. Air quality is one of the key themes of the evidence base and will be an identified priority in LTP4. The local Highways and Transport Masterplans (available here) will be refreshed to align with the priorities of LTP4. This will provide an opportunity to identify longer-term network solutions that address issues in AQMAs and have a positive impact on air quality generally.

4. Embedding air quality into policy

The County Council works with district planners to ensure air quality is a key consideration of Local Plans, alongside wider public health issues. It supports district councils in developing policies that seek to ensure new developments do not contribute to increasing levels of air pollutants and that requirements for appropriate mitigation are in place.

The County Council, as part of its highways input into planning applications, actively encourages measures that aim to promote sustainable forms of travel. Working under the

direction of the National Planning Policy Framework, the County Council seeks measures that facilitate cycling and walking, increase the use of public transport and provide access to electric vehicle charge points. The County Council also seeks funding from developers, through section 106 contributions, to support existing bus services or to provide new bus services suitable to serve development sites once they are built.

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

This section sets out the monitoring undertaken within 2021 by Preston City Council and how it compares with the relevant air quality objectives. In addition, monitoring results are presented for a five-year period between 2017 and 2021. However, for 2020 and 2021, due to the impact of the Covid-19 pandemic, consideration of trends arising from these years' new data is considered not to be appropriate. Further trend analysis will be provided in next year's report.

Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

Preston City Council undertook automatic (continuous) monitoring at two sites during 2021. Table A.1 in Appendix A shows the details of the automatic monitoring sites. Automatic monitoring results are available at https://www.preston.gov.uk/article/1015/Air-quality, with results also presented through the UK-Air website.

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

Preston City Council undertook non-automatic (i.e. passive) monitoring of nitrogen dioxide (NO_2) at 27 sites during 2021. 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: Maps of Monitoring Locations and AQMAs. 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.

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.

3.1.3 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). No annualisation or distance correction has been required for the 2021 data.

For diffusion tubes, the full 2021 dataset of monthly mean values is provided in Appendix B. Note that the concentration data presented in Table B.1 includes distance corrected values, only where relevant (none are relevant for Preston in 2021).

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.

During 2021, no passive or automatic monitoring locations exceeded the nitrogen dioxide annual mean objective of 40µg/m^3. The last exceedance recorded in Preston was within AQMA 4 in 2019. AQMA 4 remains the site of most concern in Preston. There were no exceedances of the hourly mean nitrogen dioxide objective; a continuation of the trend in the last five years.

There were no objective exceedances monitored inside or outside the AQMAs, therefore no new AQMA designations are required or need consideration.

- AQMA 1 has no recorded exceedances since monitoring resumed in 2020, with concentrations below the objective.
- AQMA 2 has had no exceedances of the objectives for the last five years, with the highest value of 37.1µg/m^3 in 2019, compared to a value of 30.4µg/m^3 in 2021.

- AQMA 3 has been in compliance for the last four years, with a highest value of 41.0µg/m^3 measured in 2017, compared to 17.2µg/m^3 in 2021.
- AQMA 4 last recorded an exceedance of the objective (42.2µg/m^3) in 2019, with a concentration of 37.1µg/m^3 measured in 2021 (at monitor PR39 – see above).
- AQMA 5 has been in compliance for the last five years, with a maximim concentration of 36.0µg/m^3 measured in 2019, compared to 31.7µg/m^3 in 2021.

In relation to trends, it can be seen that following a general decrease in concentrations over the preceding four years, an increase in annual mean nitrogen dioxide concentrations has been observed from 2020 to 2021, which appears to follow the national trend associated with the return to more 'typical' vehicle use patters following the easing of Covid-19 restrictions. Concentrations in 2021 were, however, still lower than 2019 indicating an ongoing downward trend. 2020 was the year most hit by Covid restrictions, and hence reduction in travel and resulting emissions, with 2021 having some disruption, but not to the same extent. More information on air quality trends relating to the Covid pandemic can be found by following this link.

It is anticipated that the current monitoring network will be maintained in 2023.

3.1.4 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} monitoring of background concentrations in 2021 showed compliance with the annual mean objective, and was consistent with the previous years.

Despite PM_{10} objectives being anticipated to be met at all locations within the Preston district, particulate pollution is considered to be a non-threshold pollutant (i.e. there is no safe level) and needs to be as low as possible to protect health. Emission reduction is still a priority for Preston City Council.

No AQMAs are required for PM_{10}.

3.1.5 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.

During 2021, the $PM_{2.5}$ monitoring results at the urban background site (operated by Defra) has shown a slight increase of 1µg/m^3 since the previous year, but is lower than 2019.

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)
PRA1	Meadow Street	Roadside	354138	429863	NO_2	NO	Chemiluminescent;	7	5	2.5
PRA2	Bootle Street	Urban Background	355250	430126	NO_2, PM_{10}, $PM_{2.5}$, O_3	NO	Chemiluminescent, FIDAS	9	N/A	2.5

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

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
PR1	Red Rose Radio	Roadside	354307	429769	NO2	NO	0	3.3	NO	2.0
PR5	215 Plungington Road	Roadside	353072	431014	NO2	YES (AQMA 2)	0	2.5	NO	2.0
PR6	347 Blackpool Road	Roadside	353085	431045	NO2	YES (AQMA 2)	0	4.0	NO	2.0
PR7	336 Blackpool Road	Roadside	353111	431080	NO2	YES (AQMA 2)	0	3.0	NO	2.0
PR8	240 Plungington Road	Roadside	353054	431095	NO2	YES (AQMA 2)	0	2.3	NO	2.0
PR10	11 Lychgate	Roadside	354521	429639	NO2	YES (AQMA 1)	0	6.5	NO	2.0
PR21 [3]	Meadow Street 1	Roadside	354138	429864	NO2	NO	7.0	5.0	YES	2.0
PR22 [3]	Meadow Street 2	Roadside	354138	429864	NO2	NO	7.0	5.0	YES	2.0
PR23 [3]	Meadow Street 3	Roadside	354138	429864	NO2	NO	7.0	5.0	YES	2.0
PR24	Garrison PH	Roadside	354775	431481	NO2	NO	0	2.3	NO	2.0
PR25	160 Watling Street Road	Roadside	354751	431521	NO2	NO	4.5	4.5	NO	2.0

PR44A	39 Whittingham Lane	Roadside	352808	435283	NO2	NO	-10.0 [4]	24.0	NO	2.0
PR45	503 Garstang Road	Roadside	352471	435012	NO2	YES (AQMA 3)	0	1.5	NO	2.0
PR46	482 Garstang Road	Roadside	352483	435006	NO2	YES (AQMA 3)	0	1.6	NO	2.0
PR39	7 New Hall Lane	Roadside	354841	429594	NO2	YES (AQMA 4)	0	3.5	NO	2.0
PR40	23 New Hall Lane	Roadside	354880	429594	NO2	YES (AQMA 4)	0	3.5	NO	2.0
PR41	St Matts Church, New Hall Lane	Roadside	355556	429906	NO2	YES (AQMA 4)	0	11.0	NO	2.0
PR42	St Matts School, New Hall Lane	Roadside	355585	429908	NO2	YES (AQMA 4)	0	3.0	NO	2.0
PR38	149 London Road	Roadside	355070	429198	NO2	YES (AQMA 5)	0	4.0	NO	2.0
PR47	181 London Road	Roadside	355124	429106	NO2	YES (AQMA 5)	4.0	4.0	NO	2.0
PR48	119 London Road	Roadside	355015	429282	NO2	YES (AQMA 5)	0	3.0	NO	2.0
PR49	24 Grosvenor Street	Roadside	354849	429437	NO2	YES (AQMA 5)	0	13.5	NO	2.0
PR50	7 Moore Street	Roadside	355038	429207	NO2	YES (AQMA 5)	5.0	6.0	NO	2.0
PR55	14 Watery Lane	Roadside	352400	429950	NO2	NO	0	5.7	NO	2.0
PR56	Wheatsheaf Inn, Tulketh Road	Roadside	352442	430000	NO2	NO	0	2.6	NO	2.0
PR57	228 Strand Road	Roadside	352465	429971	NO2	NO	0	4.8	NO	2.0
PR58	291 Fylde Road	Roadside	352644	430082	NO2	NO	0	7.5	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.

(3) Triplicate

(4) The location of relevant exposure is closer to the kerb than the monitoring site, hence a negative value.

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 2021 (%) (2)	2017	2018	2019	2020	2021
PRA1	354138	429863	Roadside	99	99	26	23	24	20	21
PRA2	355250	430126	Urban Background	94	94	20	21	23	18	20

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

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

Notes:

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

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

No 'annualistaion' was required.

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 2021 (%) (2)	2017	2018	2019	2020	2021
PR1	354307	429769	Roadside	83	83	35	35	35	28	34
PR5	353072	431014	Roadside	100	100	35	37	37	29	30
PR6	353085	431045	Roadside	100	100	30	33	31	26	30
PR7	353111	431080	Roadside	100	100	30	29	29	24	25
PR8	353054	431095	Roadside	100	100	29	34	33	24	27
PR10	354521	429639	Roadside	83	83	-	-	-	26	28
PR21*	354138	429864	Roadside	100	100	25	24	24	21	21
PR22*	354138	429864	Roadside	100	100	25	25	25	20	21
PR23*	354138	429864	Roadside	100	100	26	25	24	20	21
PR24	354775	431481	Roadside	75	75	33	34	33	27	32
PR25	354751	431521	Roadside	83	83	33	31	32	27	29
PR44A	352808	435283	Roadside	100	100	-	27	23	18	19
PR45	352471	435012	Roadside	75	75	27	20	16	13	14
PR46	352483	435006	Roadside	100	100	**41**	23	18	15	17
PR39	354841	429594	Roadside	75	75	**44**	**44**	**42**	34	37
PR40	354880	429594	Roadside	100	100	35	37	38	31	32
PR41	355556	429906	Roadside	83	83	22	24	24	19	22
PR42	355585	429908	Roadside	75	75	32	31	32	24	26
PR38	355070	429198	Roadside	100	100	-	-	36	27	29
PR47	355124	429106	Roadside	100	100	35	32	32	27	29
PR48	355015	429282	Roadside	100	100	36	37	34	28	32
PR49	354849	429437	Roadside	100	100	21	24	22	17	19
PR50	355038	429207	Roadside	100	100	26	27	28	22	24
PR51	353139	432997	Roadside	-	-	-	26	25	21	-
PR52	353143	432977	Roadside	-	-	-	32	30	25	-
PR53	353065	432965	Roadside	-	-	-	29	27	22	-
PR54	353015	432965	Roadside	-	-	-	24	22	18	-
PR55	352400	429950	Roadside	100	100	-	24	-	-	20
PR56	352442	430000	Roadside	83	83	-	-	-	-	25
PR57	352465	429971	Roadside	100	100	-	-	-	-	28
PR58	352644	430082	Roadside	75	75	-	-	-	-	27

☐ **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**.

No 'annualistaion' was required.

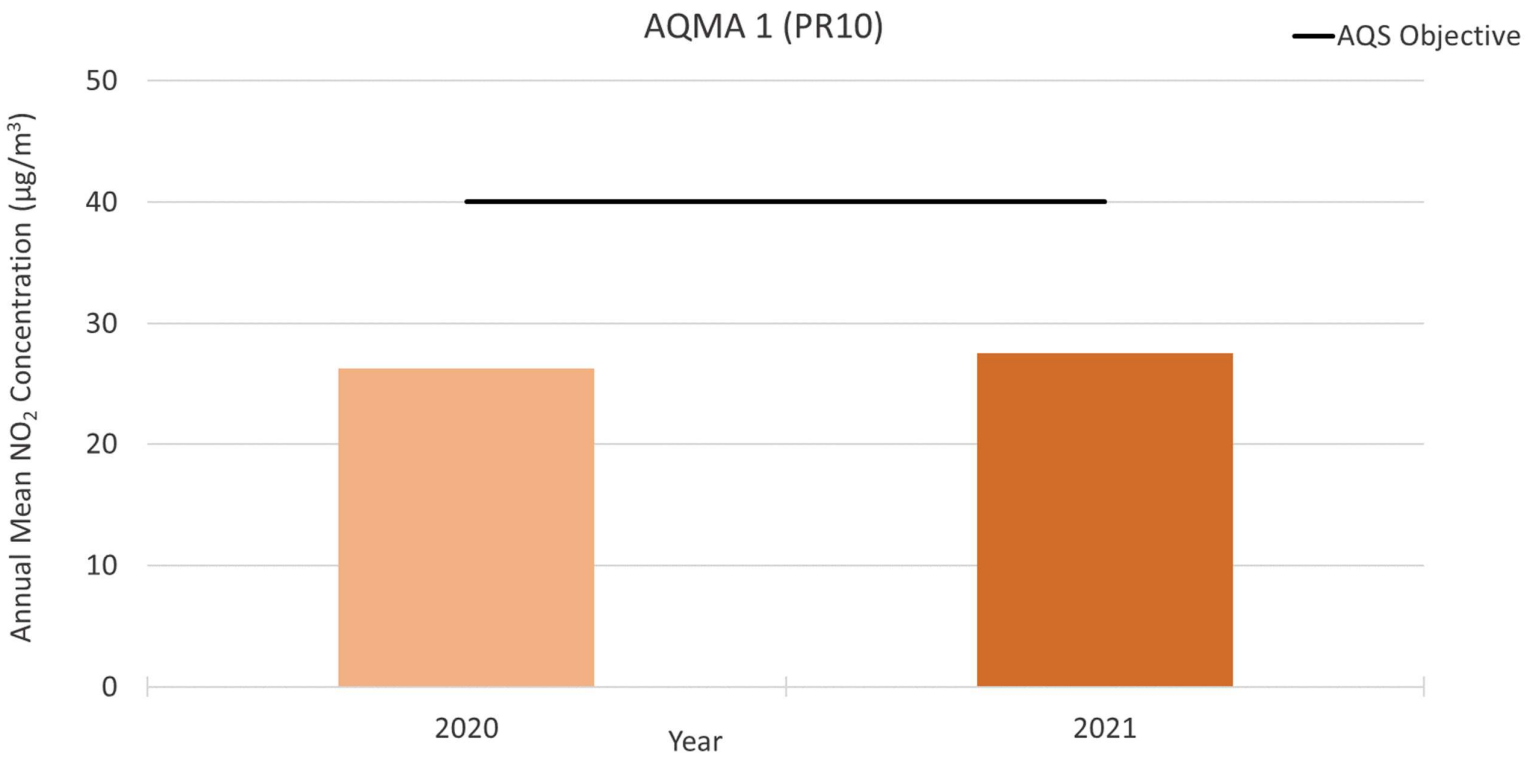
Concentrations are those at the location of monitoring and not those following any fall-off with distance adjustment.

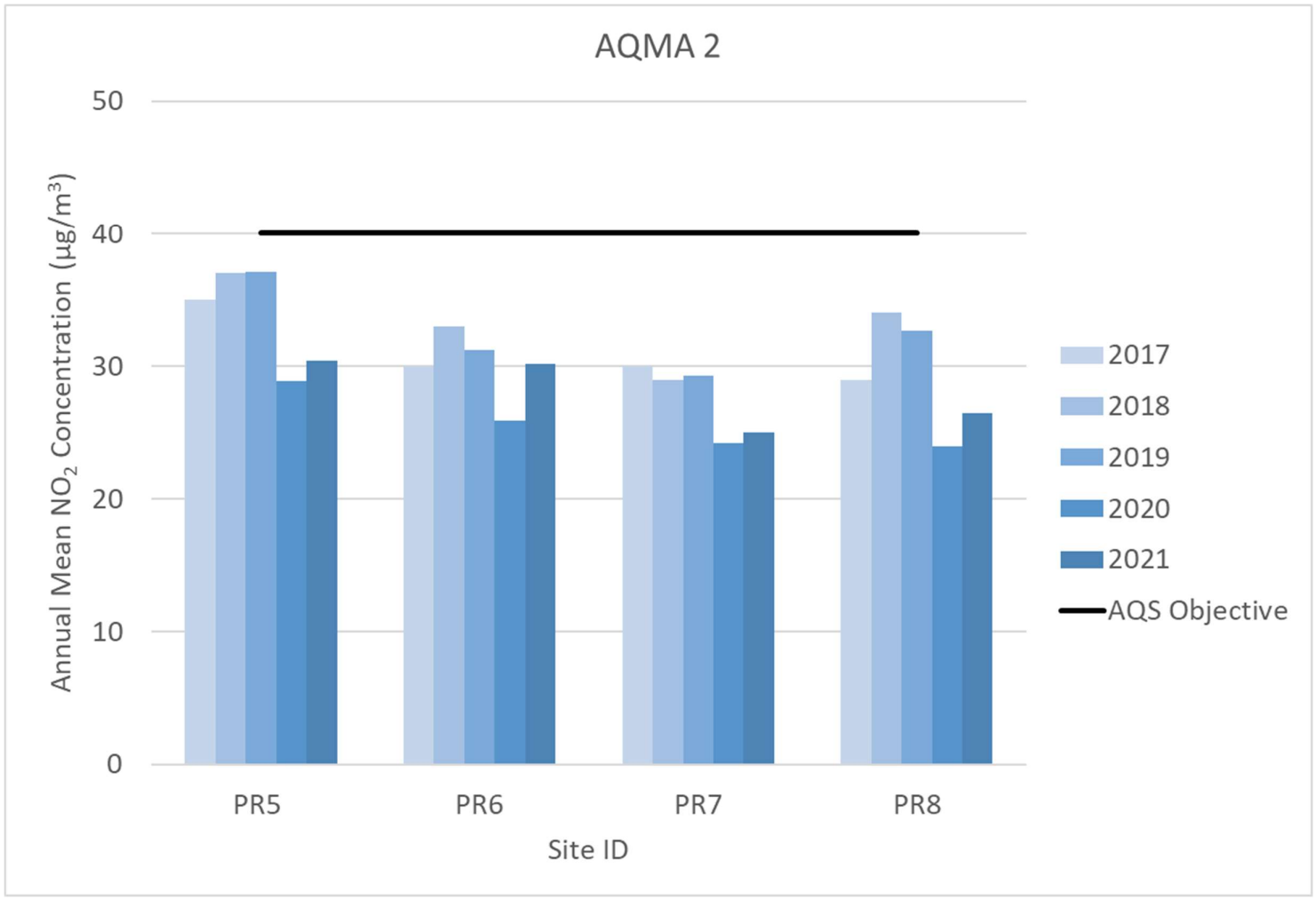
(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

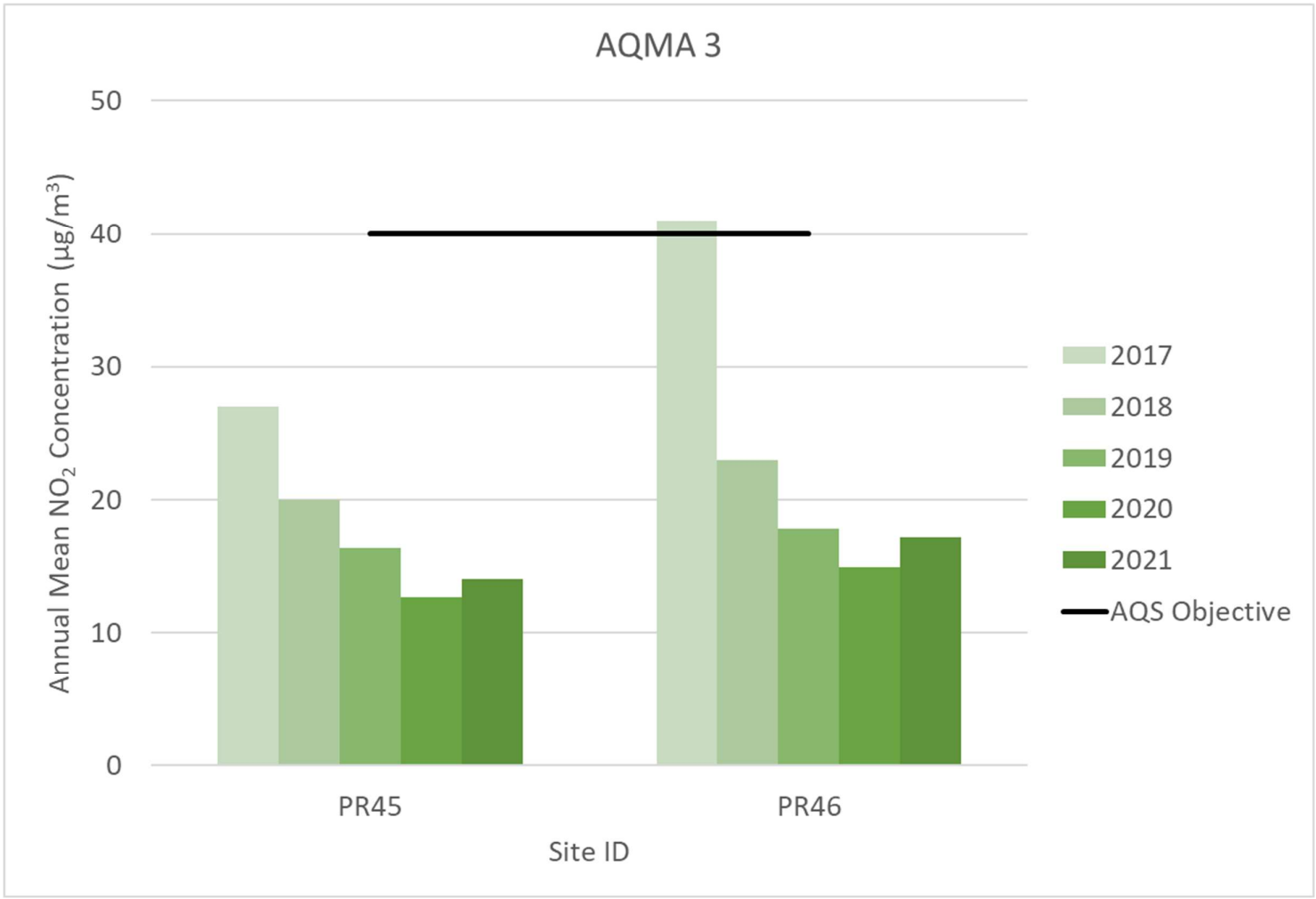
(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

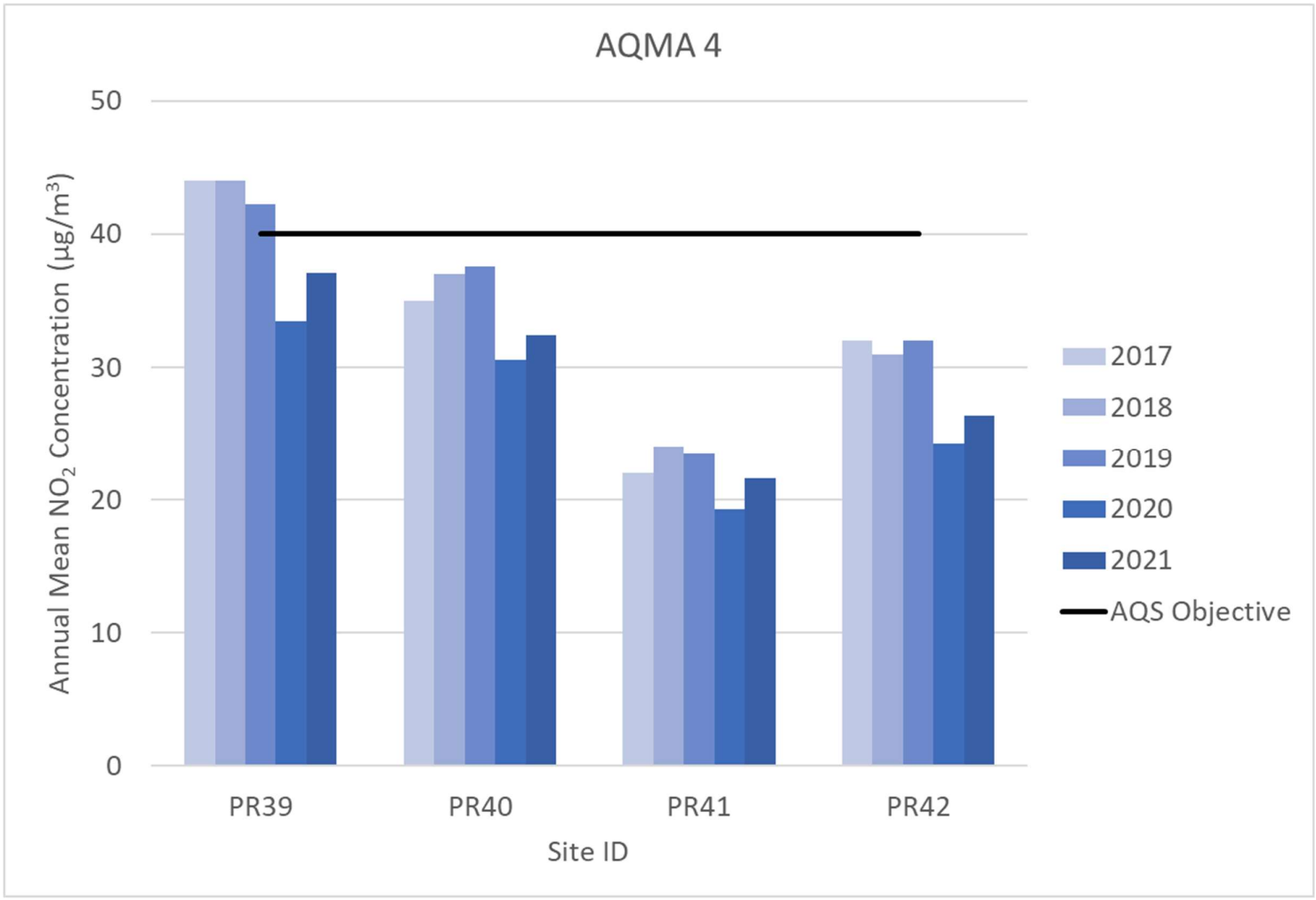
* Triplicate monitoring site

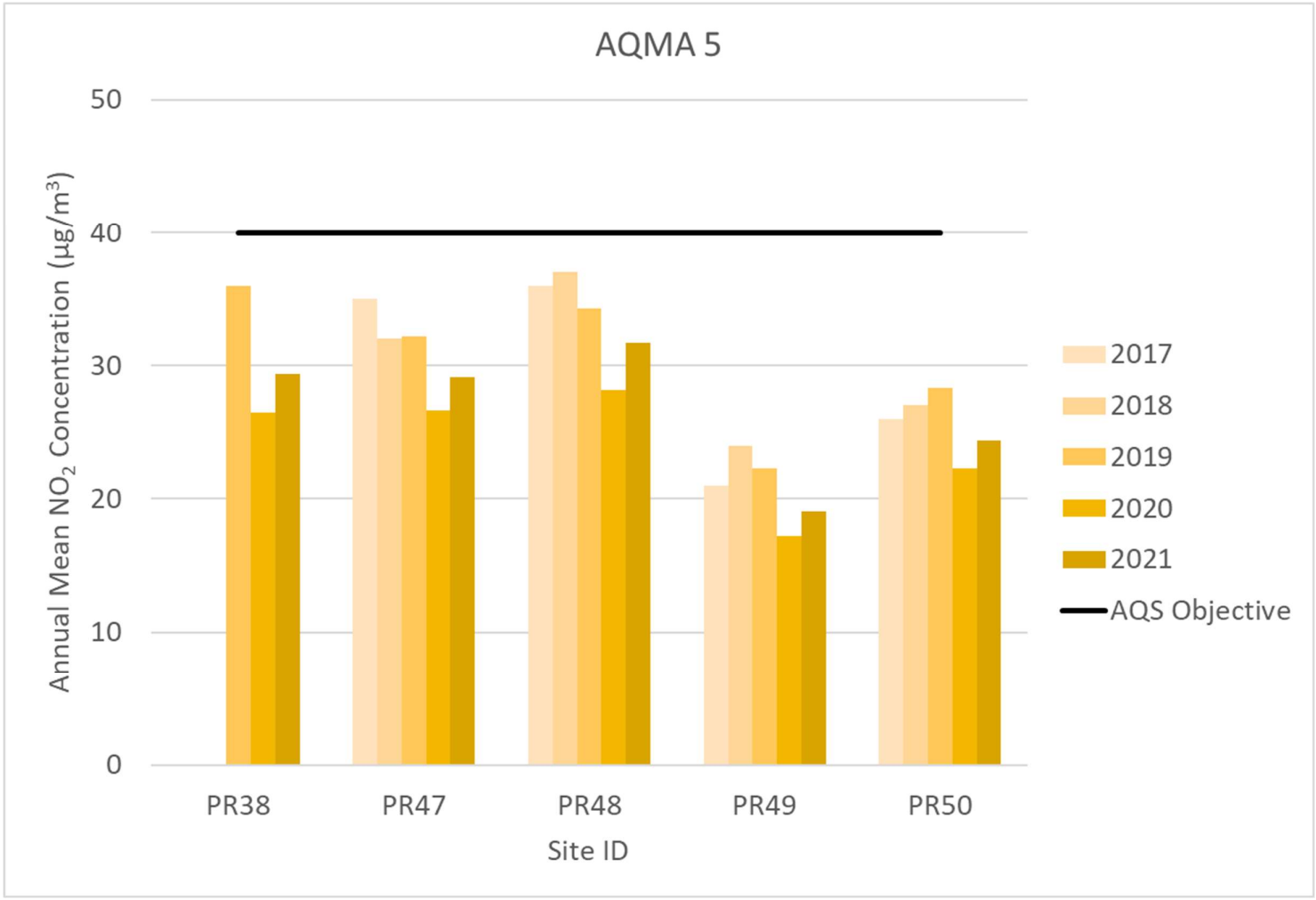
Figure A.1 – Trends in Annual Mean NO_2 Concentrations




AQMA 2
50
40
30
20
10
0
Annual Mean NO2 Concentration (µg/m3)
PR5
PR6
PR7
PR8
Site ID
2017
2018
2019
2020
2021
AQS Objective


AQMA 3
50
40
30
20
10
0
Annual Mean NO2 Concentration (µg/m3)
PR45
PR46
Site ID
2017
2018
2019
2020
2021
AQS Objective


AQMA 4
50
40
30
20
10
0
Annual Mean NO2 Concentration (µg/m3)
PR39
PR40
PR41
PR42
Site ID
2017
2018
2019
2020
2021
AQS Objective


AQMA 5
50
40
30
20
10
0
Annual Mean NO2 Concentration (µg/m3)
PR38
PR47
PR48
PR49
PR50
Site ID
2017
2018
2019
2020
2021
AQS Objective

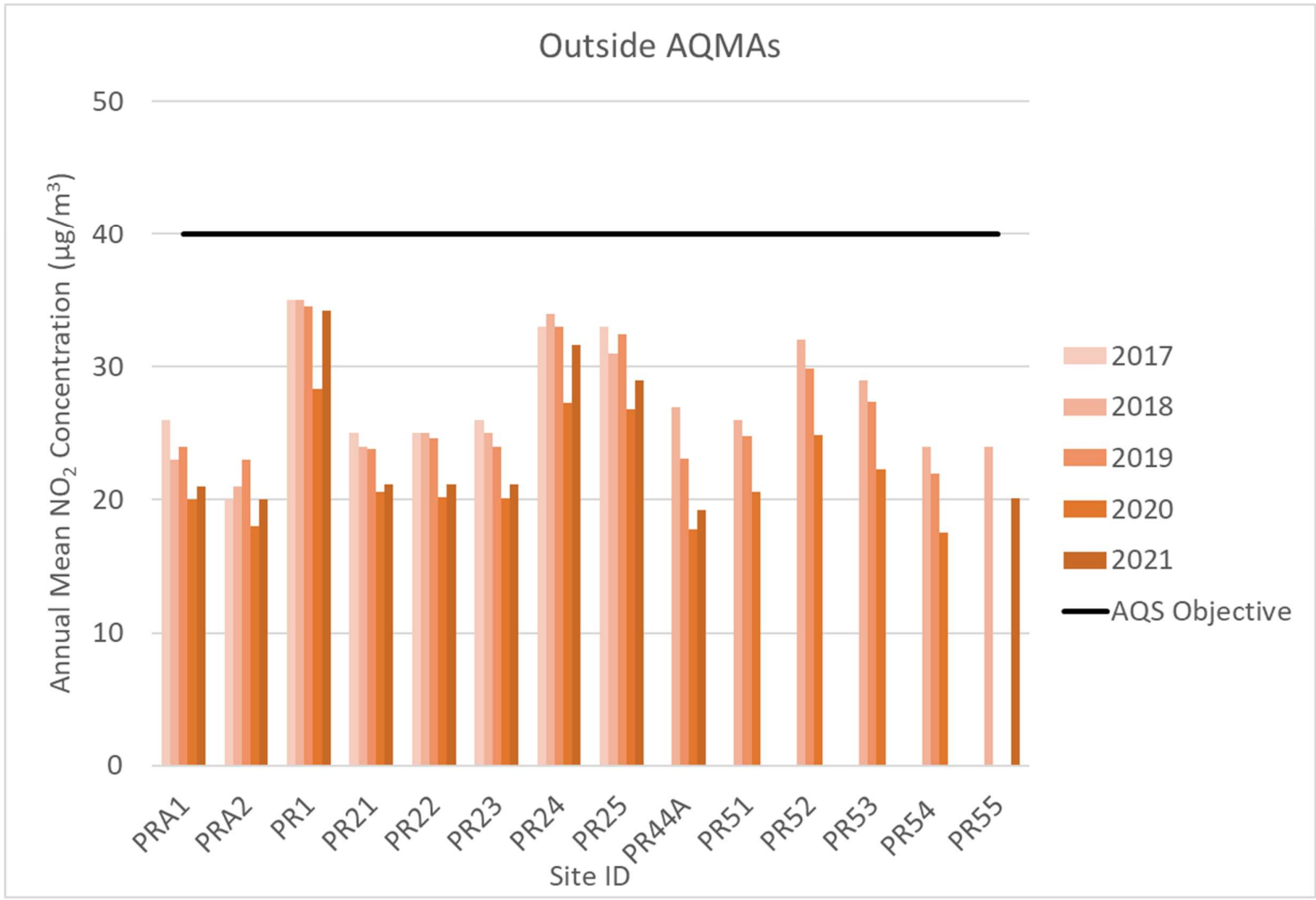

Outside AQMAs
50
40
30
20
10
0
Annual Mean NO2 Concentration (µg/m3)
PRA1
PRA2
PR1
PR21
PR22
PR23
PR24
PR25
PR44A
PR51
PR52
PR53
PR54
PR55
Site ID
2017
2018
2019
2020
2021
AQS Objective

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

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
PRA1	354138	429863	Roadside	99	99	0	0	0	0	0
PRA2	355250	430126	Urban Background	94	94	0	0	0	0	0

Notes:

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

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

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

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

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

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

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
PRA2	355250	430126	Urban Background	99	99	-	-	12	13	13

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

Notes:

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

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

No 'annualistaion' was required.

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

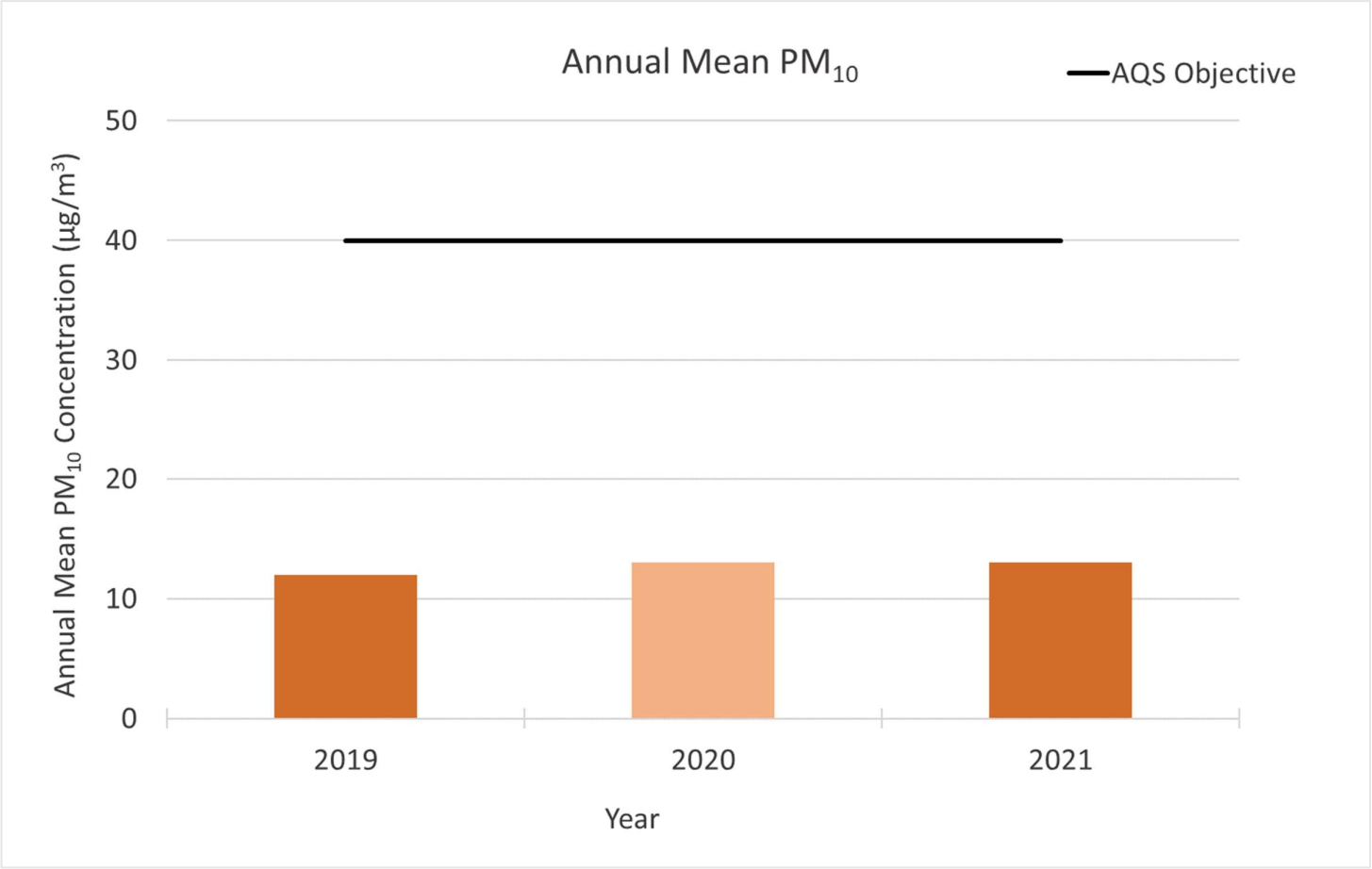


Table A.7 – 24-Hour Mean PM_{10} Monitoring Results, Number of PM_{10} 24-Hour Means > 50µg/m^3

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
PRA2	355250	430126	Urban Background	99	99	-	-	0	0	0

Notes:

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

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

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

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

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

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

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2021 (%) [2]	2017	2018	2019	2020	2021
PRA2	355250	430126	Urban Background	99	99	-	-	9	7	8

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

Notes:

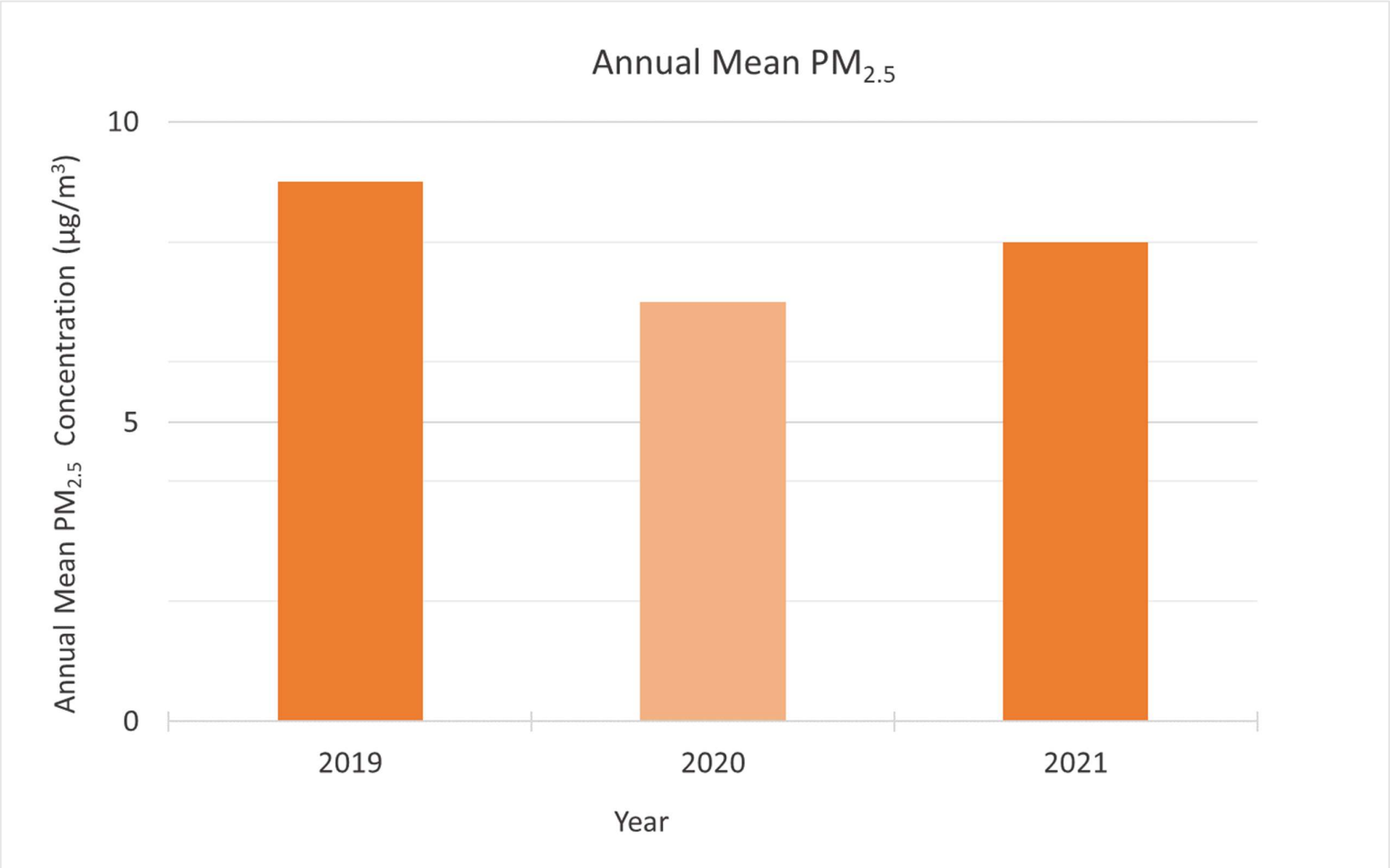
The annual mean concentrations are presented as µg/m^3.

No 'annualistaion' was required.

(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.3 – Trends in Annual Mean $PM_{2.5}$ Concentrations



Appendix B: Full Monthly Diffusion Tube Results for 2021

Table B.1 – NO_2 2021 Diffusion Tube Results (µg/m^3)

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted (0.89)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
PR1	354307	429769	37.2		34.8	35.0	38.6	37.0	26.7	33.3	43.6	50.6	38.3	46.9	38.4	34.2		
PR5	353072	431014	36.7	38.7	29.2	18.8	34.3	32.3	32.1	25.2	36.3	43.9	45.1	37.3	34.2	30.4		
PR6	353085	431045	34.9	40.1	25.5	38.3	33.0	31.2	24.6	25.2	35.1	41.1	39.0	38.9	33.9	30.2		
PR7	353111	431080	34.3	35.6	21.9	26.9	22.2	22.7	21.2	20.3	29.8	34.5	32.5	35.7	28.1	25.0		
PR8	353054	431095	48.7	30.1	19.7	36.4	26.0	24.1	19.1	25.2	24.7	37.1	32.0	34.9	29.8	26.5		
PR10	354521	429639	34.7	32.2	23.6	37.3	30.3	32.0	27.6	27.7	30.1	28.9	35.9		30.9	27.5		
PR21	354138	429864	24.4	30.6	18.0	22.6	20.2	18.3	17.2	16.9	25.4	32.9	29.1	32.4	24.0	21.4		
PR22	354138	429864	28.7	30.0	18.1	21.8	19.7	18.4	17.9	17.8	23.9	29.4	29.3	32.2	23.9	21.3		
PR23	354138	429864	29.6	30.0	16.5	20.9	19.7	16.5	17.0	17.3	24.7	32.4	30.2	29.1	23.7	21.1		
PR24	354775	431481	34.0	35.0			34.3	34.3	28.0	31.2	35.3	42.3	43.3	37.3	35.5	31.6		
PR25	354751	431521	38.0	37.4	25.4	35.9	28.9	29.8	23.2	25.2		34.7	40.2	39.3	32.5	29.0		
PR44A	352808	435283	23.3	28.9	14.9	19.9	16.2	16.1	16.1	17.6	20.3	29.0	25.2	30.9	21.5	19.2		
PR45	352471	435012	22.8	16.2	12.4		11.9	12.7	12.4	12.9	19.3		19.4	17.6	15.8	14.0		
PR46	352483	435006	22.8	21.9	13.4	20.5	15.8	15.5	14.6	16.7	17.9	23.2	23.3	26.1	19.3	17.2		
PR39	354841	429594	36.7	38.5	39.8	42.0	41.9		37.3	44.7	41.0	45.7	49.1		41.7	37.1		
PR40	354880	429594	37.7	36.0	31.5	36.3	35.4	35.3	26.8	38.4	37.2	39.4	42.9	39.9	36.4	32.4		
PR41	355556	429906	29.8	28.5	18.1	20.4	16.7	16.8	15.5	18.1		32.9	32.4	37.2	24.2	21.6		
PR42	355585	429908	32.7	33.8	23.9	29.6	26.6	28.4	21.8	24.0			39.9	36.4	29.7	26.4		
PR38	355070	429198	32.4	37.0	25.5	33.1	29.9	29.7	25.5	21.9	36.8	41.0	44.0	39.3	33.0	29.4		
PR47	355124	429106	36.0	32.0	27.0	35.7	31.2	28.7	22.4	26.1	31.9	36.5	43.4	41.4	32.7	29.1		
PR48	355015	429282	39.7	36.4	31.0	41.3	32.1	36.6	26.2	27.8	32.3	38.5	42.4	43.0	35.6	31.7		
PR49	354849	429437	25.4	24.1	14.8	23.8	19.5	18.4	17.3	19.7	18.8	22.6	25.5	27.1	21.4	19.1		
PR50	355038	429207	34.0	31.6	20.9	29.7	23.3	21.7	22.3	20.3	24.6	29.7	34.9	36.0	27.4	24.4		
PR55	352400	429950	31.2	26.9	17.8	24.5	16.6	19.8	15.9	20.1	18.6	24.3	26.5	29.4	22.6	20.1		
PR56	352442	430000	33.2	33.8	19.5	31.5	25.7	24.3	17.8	26.4	25.9		33.1	37.6	28.1	25.0		
PR57	352465	429971	36.7	38.9	25.7	33.9	25.7	26.9	21.4	24.3	28.9	37.6	39.2	36.4	31.3	27.9		
PR58	352644	430082	41.5	36.7	26.9	35.0	26.8	28.4	19.2	27.7	24.2			38.7	30.5	27.2		

☒ **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.**

☒ **Preston City Council confirm that all 2021 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 ‘annualistaion’ or ‘distance correction’ was required.

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 Preston City Council During 2021

Preston City Council has not identified any new sources relating to air quality within the reporting year of 2021.

Additional Air Quality Works Undertaken by Preston City Council During 2021

Preston City Council has not completed any additional works within the reporting year of 2021.

As detailed above, Preston City Council is working with Lancashire County Council to develop transport plans for the city centre that benefit air quality.

QA/QC of Diffusion Tube Monitoring

The NO_2 diffusion tubes used for monitoring were provided and analysed by Gradko International Ltd. The preparation method was 20% TEA in water.

Diffusion Tube Annualisation

All diffusion tube monitoring locations within Preston City Council recorded data capture of 75% or more, therefore it was not required to annualise any monitoring data. In addition, any sites with a data capture below 25% do not require annualisation.

Diffusion Tube Bias Adjustment Factors

The diffusion tube data presented within the 2021 ASR have been corrected for bias using an adjustment factor. Bias represents the overall tendency of the diffusion tubes to under or over-read relative to the reference chemiluminescence analyser. LAQM.TG22 provides guidance with regard to the application of a bias adjustment factor to correct diffusion tube monitoring. Triplicate co-location studies can be used to determine a local bias factor

based on the comparison of diffusion tube results with data taken from NO_x/NO_2 continuous analysers. Alternatively, the national database of diffusion tube co-location surveys provides bias factors for the relevant laboratory and preparation method.

Preston City Council have applied a local bias adjustment factor of 0.89 to the 2021 monitoring data, based on a local co-location study at automatic site PRA1 and diffusion tube sites PR21, PR22 and PR23, as is in line with the adjustment method used over the last five years. A summary of bias adjustment factors used by Preston City Council over the last five years is presented in Table C.1. The local factor is slightly higher than the National Bias Adjustment Factor for 2021 of 0.84 (see below), providing a worst-case approach to bias adjustment.

Table C.1 – Bias Adjustment Factor

Monitoring Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2021	Local	-	0.89
2020	Local	-	0.87
2019	Local	-	0.94
2018	Local	-	0.96
2017	Local	-	0.81

National Diffusion Tube Bias Adjustment Spreadsheet Studies for 2021 (Gradko / 20% TEA in water) (Spreadsheet Version Number: 09/22)

National Diffusion Tube Bias Adjustment Factor Spreadsheet — Spreadsheet Version Number: 09/22

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

This spreadsheet will be updated at the end of March 2023

LAQM Helpdesk Website

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

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

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

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

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

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

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

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

Step 4:

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

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

Analysed By[1]	Method	Year[5]	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m³)	Automatic Monitor Mean Conc. (Cm) (µg/m³)	Bias (B)	Tube Precision[6]	Bias Adjustment Factor (A) (Cm/Dm)
Gradko	20% TEA in water	2021	R	Gedling Borough Council	12	32	26	23.1%	G	**0.81**
Gradko	20% TEA in water	2021	UB	West Northamptonshire Council	11	14	10	32.1%	G	**0.76**
Gradko	20% TEA in water	2021	R	Ards and North Down Borough Council	10	30	22	36.4%	G	**0.72**
Gradko	20% TEA in water	2021	R	Birmingham City Council	10	33	25	35.2%	G	**0.74**
Gradko	20% TEA in water	2021	R	Cheshire West and Chester	12	34	29	14.1%	G	**0.88**
Gradko	20% TEA in water	2021	R	Cheshire West and Chester	12	33	29	12.6%	G	**0.89**
Gradko	20% TEA in water	2021	R	Lisburn & Castlereagh City Council	12	25	19	31.9%	G	**0.76**
Gradko	20% TEA in water	2021	R	Nottingham City Council	12	32	35	-8.1%	G	**1.09**
Gradko	20% TEA in water	2021	R	SOUTHAMPTON CITY COUNCIL	12	34	32	5.2%	G	**0.95**
Gradko	20% TEA in water	2021	R	SOUTHAMPTON CITY COUNCIL	12	34	27	28.6%	G	**0.78**
Gradko	20% TEA in water	2021	R	Bath & North East Somerset	12	31	27	15.1%	G	**0.87**
Gradko	20% TEA in water	2021	R	Bedford Borough Council	11	34	31	7.6%	G	**0.93**
Gradko	20% TEA in water	2021	R	Bedford Borough Council	11	19	17	11.7%	G	**0.90**
Gradko	20% TEA in water	2021	R	Blackburn with Darwen Borough Council	12	27	20	32.3%	G	**0.76**
Gradko	20% TEA in water	2021	R	Brent Council	12	51	46	9.3%	G	**0.91**
Gradko	20% TEA in water	2021	R	Gateshead Council	10	23	19	23.8%	G	**0.81**
Gradko	20% TEA in water	2021	R	Gateshead Council	12	25	22	13.7%	G	**0.88**
Gradko	20% TEA in water	2021	R	Gateshead Council	11	27	25	8.6%	G	**0.91**
Gradko	20% TEA in water	2021	R	Gateshead Council	12	31	25	26.6%	G	**0.79**
Gradko	20% TEA in water	2021	R	Gateshead Council	12	32	34	-4.1%	G	**1.04**
Gradko	20% TEA in water	2021	KS	Marylebone Road Intercomparison	11	53	42	25.0%	G	**0.80**
Gradko	20% TEA in Water	2021	R	Monmouthshire County Concil	11	35	29	21.8%	G	**0.82**
Gradko	20% TEA in water	2021	R	Belfast City Council	12	25	21	20.9%	G	**0.83**
Gradko	20% TEA in water	2021	UC	Belfast City Council	11	26	21	25.4%	G	**0.80**
Gradko	20% TEA in water	2021	R	Belfast City Council	12	42	36	17.7%	G	**0.85**
Gradko	20% TEA in water	2021	R	Belfast City Council	12	38	27	39.4%	G	**0.72**
Gradko	20% TEA in water	2021	UB	Dudley MBC	12	20	15	36.0%	G	**0.74**
Gradko	20% TEA in water	2021	R	Dudley MBC	12	30	29	4.2%	G	**0.96**
Gradko	20% TEA in water	2021	R	Dudley MBC	12	42	40	5.5%	G	**0.95**
Gradko	20% TEA in Water	2021	R	Lambeth	10	31	62	46.6%	G	**0.68**
Gradko	20% TEA in water	2021	R	Lancaster City Council	13	38	32	18.4%	G	**0.84**
Gradko	20% TEA in water	2021	R	Lancaster City Council	13	28	27	4.3%	G	**0.95**
Gradko	20% TEA in water	2021	R	Cheltenham Borough Council	12	29	25	13.4%	G	**0.88**
Gradko	20% TEA in water	2021	R	Preston City Council	12	24	21	12.2%	G	**0.89**
Gradko	20% TEA in water	2021		**Overall Factor[3] (34 studies)**				**Use**		**0.84**

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 can be estimated using the Diffusion Tube Data Processing Tool/NO_2 fall-off with distance calculator available on the LAQM Support website.

No diffusion tube NO_2 monitoring locations within Preston City Council required distance correction during 2021 as all sites not representative of exposure were below 36µg/m^3.

QA/QC of Automatic Monitoring

Bootle Street AURN – DEFRA, through the use of its designated contractors, carry out the QA/QC function for this air quality station. Preston City Council was the contracted Local Site Operative in 2021 and carried out calibrations on a monthly basis.

Meadow Street – Air Quality Data Management are contracted to carry out the QA/QC of the raw data and Enviro Technology Services maintain the air quality station. Preston City Council carries out calibrations of the monitor on a monthly basis.

Live and historic data are available at the http://www.ukairquality.net/ web site.

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

The type of PM_{10} and $PM_{2.5}$ monitors utilised within Preston City Council do not currently require the application of a correction factor.

Automatic Monitoring Annualisation

All automatic monitoring locations within Preston recorded data capture of at least 75% therefore annualisation was not required.

NO_2 Fall-off with Distance from the Road

No automatic NO_2 monitoring locations within Preston City Council required distance correction during 2021.

Table C.2 – Local Bias Adjustment Calculation

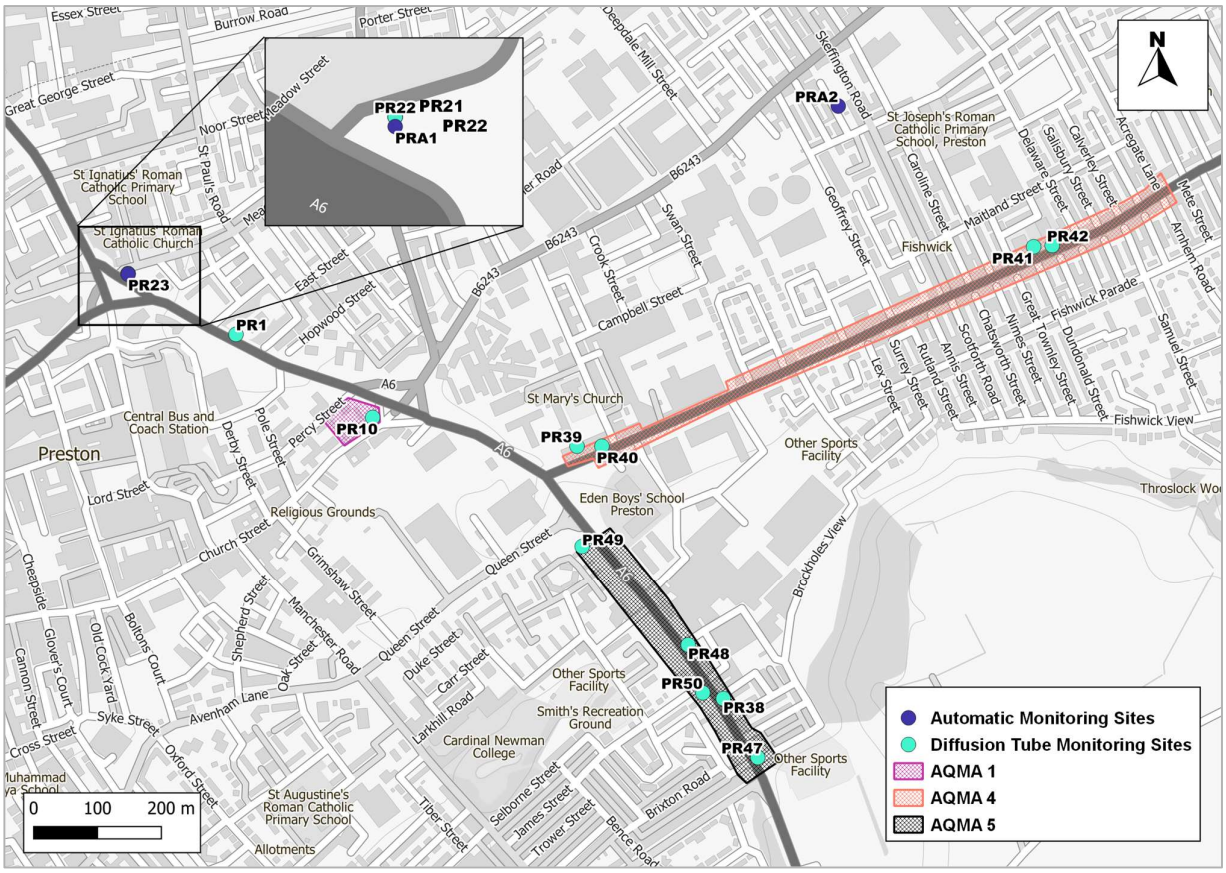
	Local Bias Adjustment Input 1
Periods used to calculate bias	12 periods
Bias Factor A	0.89 (0.84 – 0.94)
Bias Factor B	12% (6%-18%)
Diffusion Tube Mean (µg/m^3)	24
Mean CV (Precision)	4
Automatic Mean (µg/m^3)	21
Data Capture	100%
Adjusted Tube Mean (µg/m^3)	21 (20-22)

Notes:

A single local bias adjustment factor has been used to bias adjust the 2021 diffusion tube results.

Appendix D: Maps of Monitoring Locations and AQMAs

Figure D.1 – Maps of Automatic and Non-Automatic Monitoring Sites and AQMAs



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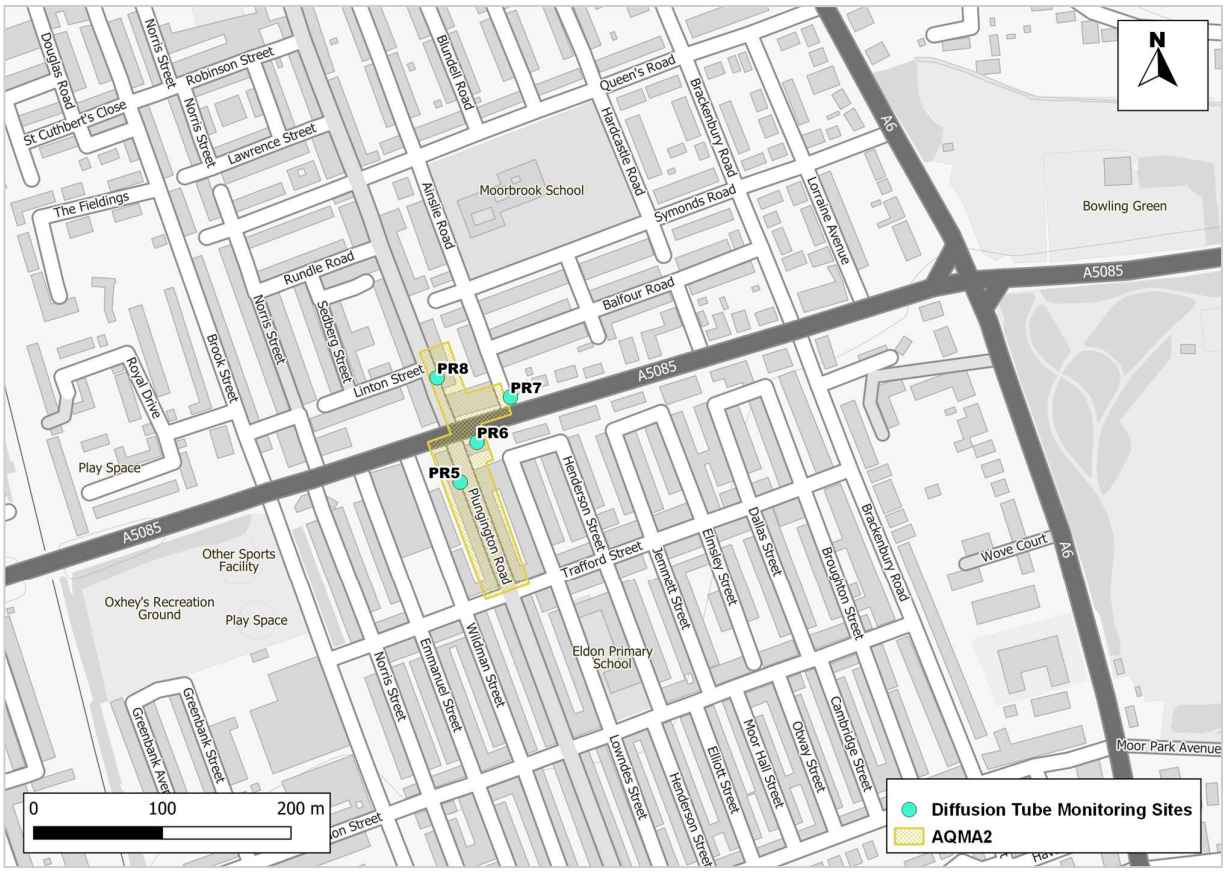

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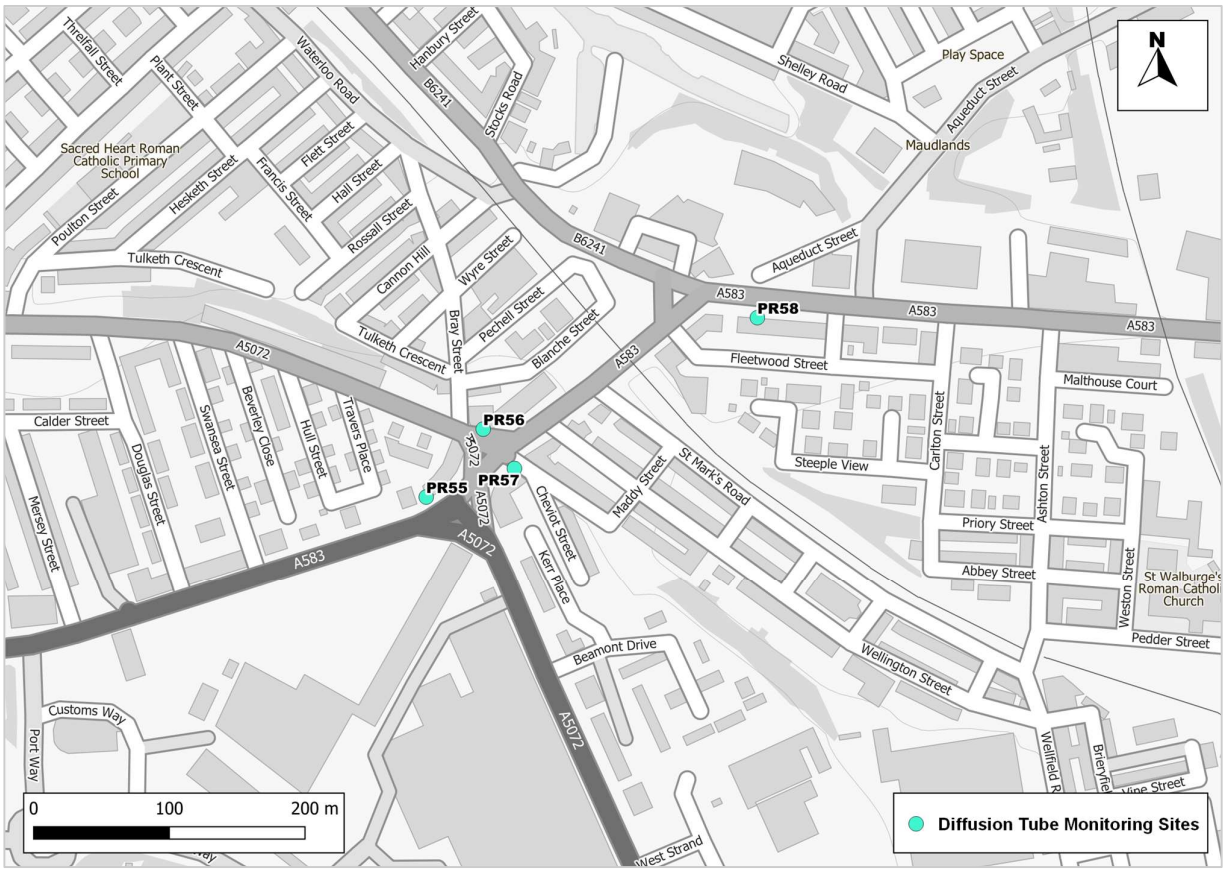

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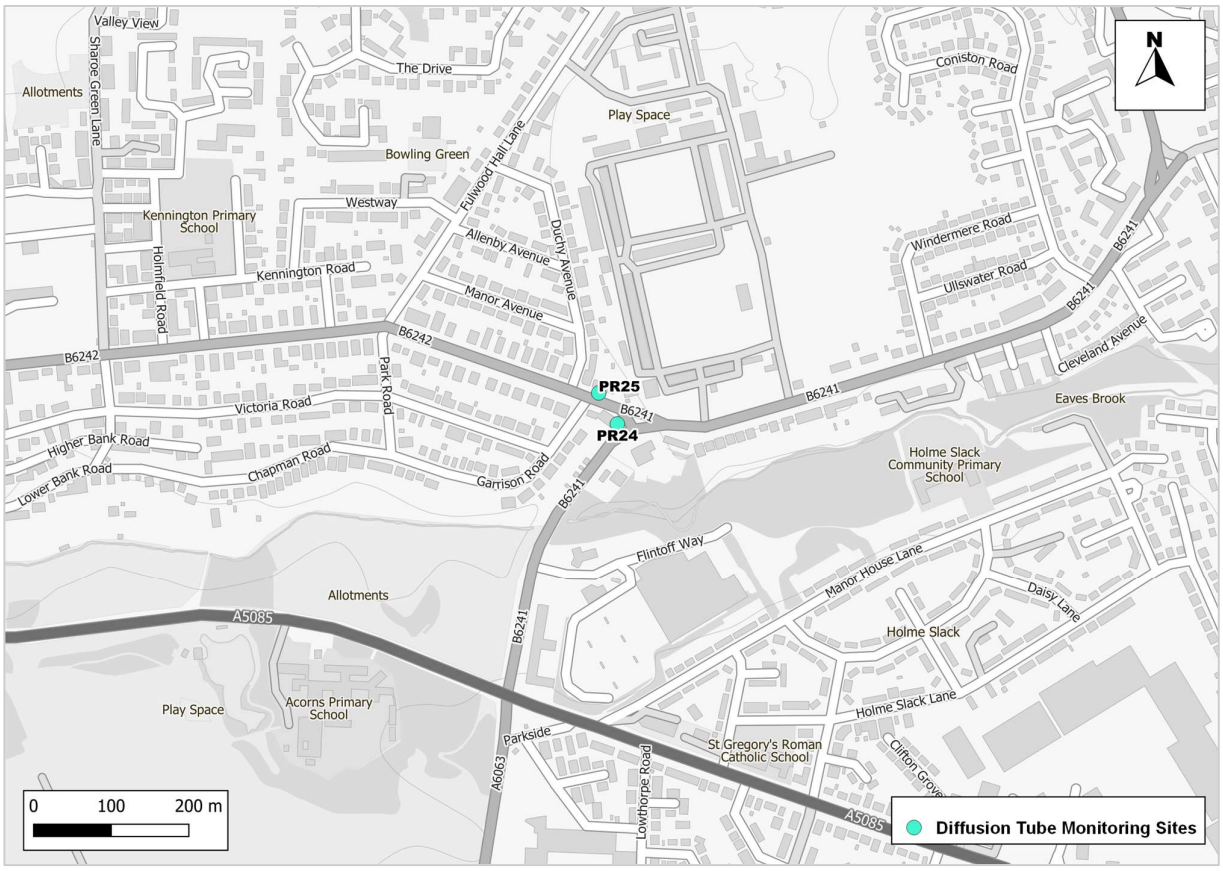

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Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England[11]

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

[11] 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
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by National Highways
DT	Diffusion Tube
EU	European Union
EV	Electric Vehicle
FDMS	Filter Dynamics Measurement System
LCC	Lancashire County Council
LAQM	Local Air Quality Management
LCC	Lancashire County Council
LCWIPs	Local Cycling and Walking Infrastructure Plans
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
PCC	Preston City Council
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

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