2018 Air Quality Annual Status Report (ASR)

In fulfilment of Part IV of the Environment Act 1995 Local Air Quality Management

November 2018

Local Authority Officer	Paul Burns
Department	Environmental Health
Address	Manor House, 40 Moat Lane, Birmingham, B5 5BD
Telephone	0121 303 9938
E-mail	pollution.team@birmingham.gov.uk
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Executive Summary: Air Quality in Our Area

Air Quality in Birmingham

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

The annual health cost to society of the impacts of particulate matter alone in the UK is estimated to be around £16 billion[3].

The main air quality issue in Birmingham is elevated levels of nitrogen dioxide (NO_2), particularly within the City Centre area as a result of road traffic emissions. Consequently a city wide air Quality Management Area (AQMA) was declared in 2005. Details can be found on the following webpage

https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=18.

In July 2017 DEFRA updated its Air Quality plans to demonstrate how the UK will achieve compliance with the EU limit values for NO2 (https://uk-air.defra.gov.uk/library/no2ten/). The document highlighted areas of non-compliance within Birmingham, principally within and around the City Centre. As a result Birmingham was required to implement a Clean Air Zone. A feasibility study is underway to determine the type and extent of the zone and any additional measures that may be required to achieve the required reduction in NO2 concentrations.

Work undertaken by Birmingham City Council has highlighted other areas where air pollution is above the legal limit, particularly in the vicinity of Moor Street Queensway; although at present there is considered to be no relevant exposure at this location.

Birmingham city centre is undergoing significant regeneration with several major projects either underway or planned for the near future including at Paradise Circus, Curzon Street (HS2), and Smithfield. As a result the city centre area is in a near

[1] Environmental equity, air quality, socioeconomic status and respiratory health, 2010
[2] Air quality and social deprivation in the UK: an environmental inequalities analysis, 2006
[3] Defra. Abatement cost guidance for valuing changes in air quality, May 2013

constant state of flux and as a result it is considered that the best way to address air quality issues is through the adoption of an area based strategy, and through working in collaboration with partner organisations such as DEFRA, the West Midlands Combined Authority, the Integrated Transport Authority, the West Midlands Low Emissions Towns & Cities Partnership, Highways England, and CENTRO.

The main focus within Birmingham has been on the city centre area due to the requirements of the Clean Air Zone and outputs from past monitoring and modelling exercises. There is a steady demand for data on concentrations outside the city centre, in other urban centres, however with reductions in resources and the focus from the CAZ it has not been possible to date to review the position with regards to the rest of the city area.

Actions to Improve Air Quality

A number of actions have been implemented under Birmingham City Council's Air Quality Action Plan with the aim of improving air quality, such as increasing the number of park and ride schemes, the provision of charging infrastructure to encourage the take up of electric vehicles, and, in partnership with CENTRO, improvements to the bus fleet under the Statutory Bus Quality Partnership (SBQP).

Several other projects have been undertaken with the aid of funding through DEFRA's Air Quality Grant Scheme;

2012-2013 Air Quality Grant - £150,000 to support implementation of ongoing work items commissioned through the West Midlands regional Low Emissions Towns and Cities Programme (LETCP). The automatic number plate recognition camera survey has been completed and reported upon. The information collected has been used to inform the Clean Air zone feasibility study.

2014-2015 Air Quality Grant - £32,443 for the Birmingham Region Updated Monitoring (BRUM) project. The new emissions database has been completed and uploaded into the air quality modelling software. However this project has now largely been superseded by the Clean Air zone feasibility study.

Other achievements include;

The setting up of an Air Quality Members Steering Group comprising the Chair of the Public Protection Committee and the Cabinet members for Transportation, Health and Wellbeing, and Clean Streets, Recycling and Environment.

An Air Quality Program Delivery Group has also been established, chaired by the Director of Public Health, and comprising senior officers from departments involved in the delivery of programs to improve air quality. This is known as the Brum Breathes programme. A key item for output by this group will be a Clean Air Strategy for the City of Birmingham and work on this document commenced this year.

The Environmental Health service has recently commenced a review of the 2011 Air Quality Action Plan to reinforce action within the city centre and determine pollutant concentrations in other areas, through a combination of modelling and monitoring. The first stage will involve an update to our city wide NO2 model, following which targeted monitoring can be undertaken at hotspot areas where there may be exposure. It is anticipated that the review of the Action Plan will be completed in early 2018.

Conclusions and Priorities

The City continues to have air quality breaches against the annual mean objective for NO2 with known exceedence areas being within the city centre. The primary source of air quality issues within Birmingham is road transport. However, in order to ensure that there is no risk of transferring exceedence areas during the implementation of compliance strategies the Council retains a city-wide air quality management area.

Birmingham, as a major UK city, is undergoing continual redevelopment of the urban landscape and resulting changes to the supporting transport network. This leads to challenges in balancing sustainable development of a 21st century city with providing for the health and well-being of citizens, business and visitors.

The primary focus to reduce air pollution, promote health and drive compliance in the coming year will be through development of the Clean Air Zone (CAZ) as directed by Government. It is anticipated that this study will provide the most up-to-date information on air quality within Birmingham, the strategy by which compliance can be delivered and the means for implementing that strategy.

The CAZ is part of a suite of measures being progressed by the City Council and to underpin these interventions air quality has been prioritised across all services and

championed by relevant politicians (Cabinet Members and Committee Chairs) and will be underpinned through the Brum Breathes programme and the emerging Clean Air Strategy. This updated and prioritised governance will be supported by underpinning policies, including a review of the Air Quality Action Plan.

Local Engagement and How to get Involved

Details of local consultation undertaken and how to help improve air quality can be viewed on the council's website here;

https://www.birmingham.gov.uk/info/20076/pollution.

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1 Local Air Quality Management

This report provides an overview of air quality in Birmingham during 2017. 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 exceedence is considered likely the local authority must declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives. This Annual Status Report (ASR) is an annual requirement showing the strategies employed by Birmingham City Council to improve air quality and any progress that has been made.

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

2 Actions to Improve Air Quality

2.1 Air Quality Management Areas

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

A summary of AQMAs declared by Birmingham City Council can be found in Table 2.1. Further information related to declared or revoked AQMAs, including maps of AQMA boundaries are available online at https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=18.

Alternatively, see Appendix D: Map(s) of Monitoring Locations and AQMAs, which provides for a map of air quality monitoring locations in relation to the AQMA(s).

Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Date of Declaration	Pollutants and Air Quality Objectives	City / Town	One Line Description	Is air quality in the AQMA influenced by roads controlled by Highways England?	Level of Exceedance (maximum monitored/modelled concentration at a location of relevant exposure)				Action Plan		
						At Declaration		Now		Name	Date of Publication	Link
Birmingham AQMA	05/05/2005	NO2 Annual Mean	Birmingham	Whole borough	NO	46	µg/m3	78	µg/m3	Air Quality Action Plan 2011	30/04/2011	https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=18

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

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

Defra's appraisal of last year's ASR stated that the conclusions reached were acceptable for all sources and pollutants, although it was recommended that in future reports if all monitoring locations can be identified on a map that highlights air pollution hotspots and includes the AQMA boundary. Guidance was also provided regarding the drafting of the revised Air Quality Action Plan.

Birmingham City Council has taken forward a number of direct measures during the current reporting year of 2017 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2. It is accepted that these measures are dated in that many have evolved into expanded or different work-streams. It is hoped that the refresh to the AQAP can capture the updated position of these measures whilst formally introducing new measures.

Birmingham City Council's priorities for the coming year (2018) are:

- We will progress all necessary actions pursuant to delivering the introduction of a Clean Air Zone as mandated by Defra. For 2018 this involves submitting a full business case to Government, complete with a preferred option which identifies the relevant interventions which can deliver compliance with the limit values as soon as possible.
- We will review and refresh our Air Quality Action Plan (AQAP), updating existing actions and building in new actions which are relevant to current challenges faced by the Council and better reflective of initiatives both proposed and underway which seek to address those challenges. This was a comment made in the ASR return for the year 2016. Unfortunately this has not been progressed as anticipated during 2017 due to staff absences and remaining resources being diverted to support the developing Clean Air Zone. Nevertheless the AQAP review will be progressed, commencing with the completion of an updated local model to complement the CAZ model and identify local hotspots that may need action outside of the CAZ work. The completion of the model will permit the review of the AQAP for which funding has been identified and a contractor is in place.

- Maintain the current internal governance (Air Quality Steering Groups at Officer and Member level), subject to update pending the all-out elections scheduled for May 2018.
- We will maintain our existing close working arrangements between Environmental Health and the Director of Public Health to ensure that we maximise benefits in delivering air quality improvements arising from key pollutants, namely nitrogen dioxide and fine particles.
- We will seek to work closer with the West Midlands Mayor and Combined Authority to ensure that air quality issues are considered at a regional level as well as at a local level.
- We will continue our representation on the project board of the Low Emissions Towns and Cities Programme (LETCP)[1], and will contribute to on-going, developing and proposed work streams in partnership with other members to seek air quality gains at a regional level.

[1] The LETCP comprises air quality specialists from the West Midlands Local Authorities, namely Birmingham City Council, Coventry City Council, Dudley Metropolitan Borough Council, Sandwell Metropolitan Borough Council, Solihull Metropolitan Borough Council, Walsall Council and Wolverhampton City Council.

Table 2.2 – Progress on Measures to Improve Air Quality

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
Action 2010/1	FS into a Low Emission Zone within the City Centre	Promoting Low Emission Transport	Low Emission Zone (LEZ)	BCC – TS	2011-2013	2013-2015	Completion of the FS	No target	FS Complete	Complete	Superseded by CAZ
Action 2010/2	Detailed study on introducing Biomass in Birmingham Schools	Policy Guidance and Development Control	Other policy	BCC – EH	NK	NK	Completion of the study	No target	Study complete	Complete	Led to introduction of a Biomass Emissions Policy by Council
Action 2010/3	Extend the Red Route network and assess effectiveness	Traffic Management	Other	BCC – TS	NK	NK	Improved journey times and less congestion in specific areas	No target	Red routes have been implemented on 6 major routes into and out of the city centre (Stratford Rd, Tyburn Rd, Walsall Rd. A4540 ring road, A38, A45)	Complete	Implementation and enforcement of the red route in the worst polluted area has shown a reduction in measured NO2 to below the objective in 2013.

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
Action 2010/4	Build New Roads and modify existing to promote effective traffic management	Traffic Management	Strategic highway improvements, Re-prioritising road space away from cars, including Access management, Selective vehicle priority, bus priority, high vehicle occupancy lane	BCC – TS	NK	NK	Improved journey times and less congestion in specific areas	No target	The Selly Oak New Road phase 1a is complete. Phase 1b is funded through Local Growth Fund.	Ongoing	Existing roads around the city centre will be amended to promote smoother flows for CAZ and HS2.
Action 2010/5	Policy on Air Quality & Planning	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	BCC - EH	2005-2007 / 2011-2012	2012 - 2014	Strategic, consistent and transparent approach to assessing planning applications on AQ grounds	No target	Extremely difficult to develop (commenced 2005-2007). Revisited within the LETCP. Best Practice Guide (BPG) issued by LETCP in 2014. Development of BDP and DM DPD both of which will have AQ links.	Ongoing	Development Management Development Plan Document (DMDPD) remains a work in progress. Air Quality Planning and Policy Guidance clearly referenced in current draft.
Action 2010/6	Control of Industry	Environmental Permits	Other measure through permit systems and economic instruments	BCC – EH	n/a	1995 to current	Annual Defra return	No target	All processes inspected annually in accord with direction from Defra	Ongoing - annual	Processes regulated to ensure emissions remain within specified limits
Action 2010/7	Control of Bonfires and other Unauthorised Fires			BCC – EH	n/a	Historic to current	Response to complaints about bonfires	No target	Complaints responded as and when generated	Ongoing	None

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
Action 2010/8	To increase the number and use of park & ride schemes in accord with the CENTRO Environment Strategy 2009-2014	Alternatives to private vehicle use	Rail based Park & Ride	BCC – TS	2008-2011	2018	Increase in park and ride usage	No target	New site proposed at Longbridge. Feasibility study on decking of car parks e.g. Four Oaks. Proposals related to Bus rapid Transit Routes.	2017	Longbridge site now operational. CENTRO has now published new Environment Strategy 2014-2019
Action 2010/9	All vehicles procured by Birmingham City Council will by 2015 be either electrically powered or run on LPG	Promoting Low Emission Transport	Company Vehicle Procurement - Prioritising uptake of low emission vehicles	BCC - S	2011	2012-2014	Replacement of council fleet vehicles through procurement strategy	No target	Green Fleet Review completed. Identified all vehicles, mileage, fuel costs, etc.	NK	Need to update action
Action 2010/10	Introduction of low carbon/ electric Vehicles	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging	BCC – S	2011	2012-2016	Infrastructure to encourage the use of electric and gas powered vehicles	No target	Green Fleet Review completed. Identified infrastructure requirements, gaps and barriers.	NK	Need to update action

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
Action 2010/11	Improvement of the Public Service Fleet - Birmingham City Council will support the programme for replacement buses as outlined by CENTRO's Environmental Strategy 2009 – 2014.	Promoting Low Emission Transport	Public Vehicle Procurement - Prioritising uptake of low emission vehicles	BCC - TS	2011	2012-2022	Replacement of the bus fleet with low emitting vehicles	No target	SBQP introduced and now under review	COMPLETE	Overtaken by CAZ proposals. All buses operating within city centre to be Euro VI by the time the CAZ becomes operational.
Action 2010/12	Birmingham City Council will seek to reduce the overall age of the taxi fleet and	Promoting Low Emission Transport	Public Vehicle Procurement - Prioritising uptake of low emission vehicles	BCC - L	2011-2015	2016-2020	Replacement of taxi fleet with vehicles with low emissions	No target	The City Council has a taxi age policy of hackney carriage not older than 14 years and private hire not older than 8 years and is developing a specific emissions related policy	Ongoing	Public consultation on Taxi Emissions Policy complete. Awaiting final approval. Taxis operating within city centre will have to meet CAZ requirements.

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

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

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

- The primary emission source for $PM_{2.5}$ within Birmingham is from the exhausts of road vehicles. Accordingly action taken to reduce vehicle usage and incentivise the uptake of cleaner vehicle technology will deliver reductions in $PM_{2.5}$. The actions will be set out in the revised AQAP (see section 2.2).
- The newly established Air Quality Steering Group will include the Director of Public Health to ensure that duties arising from the Public Health Outcomes Framework, including those relevant to $PM_{2.5}$ are captured at the highest level and built into future key policies.
- A working group comprising Environmental Health, Public Health and Transportation Policy has been established to produce information at a local level around pollution and health with a view to informing politicians about the health issues within their areas where they arise from traffic pollution. This work will seek to consider the impacts arising from key pollutants, namely NO_2 and $PM_{2.5}$.

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

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

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

Birmingham City Council undertook automatic (continuous) monitoring at 6 sites during 2017. Table A.1 in Appendix A shows the details of the sites. Work has begun to relocate the former Birmingham Tyburn monitoring station to a new site at Ladywood. It is anticipated that monitoring will commence during 2018.

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

Birmingham City Council undertook non- automatic (passive) monitoring of NO_2 at 77 sites during 2017. Table A.2 in Appendix A shows the details of the sites.

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

3.2 Individual Pollutants

The air quality monitoring results presented in this section are, where relevant, adjusted for bias, “annualisation” and distance correction. Further details on adjustments are provided in Appendix C.

3.2.1 Nitrogen Dioxide (NO_2)

Table A.3 in Appendix A compares the ratified and adjusted monitored NO_2 annual mean concentrations for the past 5 years with the air quality objective of 40µg/m^3.

For diffusion tubes, the full 2017 dataset of monthly mean values is provided in Appendix B.

The annual mean for NO2 was exceeded at the automatic monitoring site at Moor Street Queensway in the city centre. The concentrations at this location are higher than in 2016. However it is considered that there is no relevant exposure at this location. Concentrations at all of the other continuous monitoring sites were lower than the annual mean and generally show declining trends. The results are represented graphically in Figure A.1.

The annual mean was also exceeded at many of the non-automatic (diffusion tube) monitoring sites, notably in the city centre, and at Tyburn Road, Stratford Road, and Kings Heath High Street. In 2016 non-automatic monitoring sites were established at numerous sites around the Ring Road (A4540). 2017 is the first year for which a full years’ worth of data is available. Many of these sites have recorded concentrations in excess of the annual mean.

The annual mean was also exceeded at many of the non-automatic (diffusion tube) monitoring sites, notably in the city centre, and at Tyburn Road, Stratford Road, and Kings Heath High Street. In 2016 non-automatic monitoring sites were established at numerous sites around the Ring Road (A4540). 2017 is the first year for which a full years’ worth of data is available. Many of these sites have recorded concentrations in excess of the annual mean.

Table A.4 in Appendix A compares the ratified continuous monitored NO_2 hourly mean concentrations for the past 5 years with the air quality objective of 200µg/m^3, not to be exceeded more than 18 times per year.

There were no exceedances of the hourly mean air quality objective at any of the automatic monitoring sites. Annual means in excess of 60 μgm^{-3} were recorded at 13 of the non-automatic monitoring sites. These were located at Stratford Road, the Ring Road, and within the city centre on Moor Street and the A38. It is considered that that at these locations an individual is unlikey to be exposed for more than one hour. Further consideration of these locations is presented in Appendix C.

3.2.2 Particulate Matter (PM_{10})

Table A.5 in Appendix A compares the ratified and adjusted monitored PM_{10} annual mean concentrations for the past 5 years with the air quality objective of 40µg/m^3.

Table A.6 in Appendix A compares the ratified continuous monitored PM_{10} daily mean concentrations for the past 5 years with the air quality objective of 50µg/m^3, not to be exceeded more than 35 times per year.

The have been no exceedences of either air quality objective in 2017.

3.2.3 Particulate Matter ($PM_{2.5}$)

Table A.7 in Appendix A presents the ratified and adjusted monitored $PM_{2.5}$ annual mean concentrations for the past 5 years.

$PM_{2.5}$ concentrations continue to be low with annual means of 11 µg/m^3 measured at both the Acocks Green and A4540 monitoring sites.

Appendix A: Monitoring Results

Table A.1 – Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Inlet Height (m)
	New Hall	Urban Background	414574	296724	NO2	YES	Chemiluminescent	41	20	2
	Stratford Road	Roadside	408820	284591	NO2	YES	Chemiluminescent	5	5	2
	Bristol Road	Roadside	404545	283020	NO2	YES	Chemiluminescent	27	9	2
	Moor Street Queensway	Roadside	407435	286891	NO2	YES	Chemiluminescent	65	6	2
	Acocks Green	Urban Background	411649	282207	NO2; PM10; PM2.5; O3	YES	Chemiluminescent	43	65	2
	Birmingham A4540 Roadside	Roadside	408506	286470	NO2; PM10; PM2.5; O3	YES	Chemiluminescent; FDMS	14	7	2

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?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
BHM1	Fox Green Crescent	Urban Background	411211	282756	NO2	YES	0	10	NO	2
BHM2	Langleys Road	Urban Background	404082	282128	NO2	YES	0	9	NO	2
BHM3	28 High Street	Roadside	407386	282131	NO2	YES	5	2	NO	2
BHM4	75 High Street	Roadside	407401	282032	NO2	YES	13	1	NO	2
BHM5	448 Stratford Road	Roadside	409108	284158	NO2	YES	0	4	NO	2
BHM6	487 Stratford Road	Roadside	409144	284053	NO2	YES	0	4	NO	2
BHM7	Broad Street - Brasshouse	Roadside	406113	286633	NO2	YES	61	7	NO	2
BHM8	Broad Street - O'Neils	Roadside	406036	286489	NO2	YES	24	1	NO	2
BHM9	Shelley Drive	Roadside	408618	291351	NO2	YES	0	26	NO	2
BHM10	Stratford Road AQ station	Roadside	408818	284591	NO2	YES	21	3	NO	2
BHM11	Stratford Road AQ station	Roadside	408818	284591	NO2	YES	21	3	NO	2
BHM12	Stratford Road AQ station	Roadside	408818	284591	NO2	YES	21	3	NO	2
BHM13	Tyburn Road AQ station	Urban Background	411592	290438	NO2	YES	47	62	NO	2

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
BHM14	Tyburn Road AQ station	Urban Background	411592	290438	NO2	YES	47	62	NO	2
BHM15	Tyburn Road AQ station	Urban Background	411592	290438	NO2	YES	47	62	NO	2
BHM16	Childrens Hospital	Roadside	407321	287531	NO2	YES	0	6	NO	2
BHM17	Tyburn (39)	Roadside	410010	289995	NO2	YES	7	1	NO	2
BHM18	Tyburn (40)	Roadside	410072	289999	NO2	YES	7	1	NO	2
BHM19	Middleton Hall Road	Roadside	404739	279701	NO2	YES	8	2	NO	2
BHM20	641 Bristol Road	Roadside	404448	282890	NO2	YES	23	23	NO	2
BHM21	Lawley Middleway	Roadside	408197	287394	NO2	YES	1	1	NO	2
BHM23	Lower Severn Street	Roadside	406743	286541	NO2	YES	3	5	NO	2
BHM24	Great Charles Street (1)	Roadside	406621	287108	NO2	YES	26	4	NO	2
BHM25	Watery Lane Middleway	Roadside	408586	286455	NO2	YES	16	3	NO	2
BHM26	Nelson Jl	Urban Background	405648	287041	NO2	YES	98	2	NO	2
BHM27	Waterlinks	Roadside	407833	288046	NO2	YES	2	1	NO	2
BHM29	Sufflok Street Queensway	Roadside	406584	286723	NO2	YES	94	1	NO	2
BHM30	Curzon Street	Roadside	407967	287151	NO2	YES	33	1	NO	2

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
BHM31	Holiday Street	Roadside	406564	286688	NO2	YES	75	2	NO	2
BHM34	Superdrug	Urban Centre	407114	286906	NO2	YES	0	2	NO	2
BHM35	Café Nero	Urban Centre	407177	286996	NO2	YES	0	2	NO	2
BHM36	Corporation Street Sq Peg	Roadside	407205	287065	NO2	YES	20	2	NO	2
BHM37	Church Road	Roadside	405383	285315	NO2	YES	36	2	NO	2
BHM40	Priory Queensway (1)	Roadside	407407	287092	NO2	YES	46	1	NO	2
BHM42	MSQ - Masshouse	Roadside	407548	287107	NO2	YES	34	3	NO	2
BHM43	Masshouse Lane - Masshouse	Roadside	407611	287110	NO2	YES	14	3	NO	2
BHM44	Masshouse Lane - LP	Roadside	407628	287121	NO2	YES	24	3	NO	2
BHM45	Hotel La Tour - LP	Roadside	407582	287020	NO2	YES	30	2	NO	2
BHM46	Masshouse Lane Masshouse 2	Roadside	407547	287047	NO2	YES	2	2	NO	2
BHM48	Millenium Post MSQ	Roadside	407510	286963	NO2	YES	96	2	NO	2
BHM50	MSQ - No entry post	Roadside	407433	286922	NO2	YES	63	2	NO	2

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
BHM51	Bristol Street Monaco House	Roadside	406921	285937	NO2	YES	2	2	NO	2
BHM55	Moor Street corner of	Roadside	407348	286722	NO2	YES	139	3	NO	2
BHM56	New Meeting Street	Urban Centre	407377	286896	NO2	YES	12	23	NO	2
BHM57	Chantry Road	Roadside	407687	283370	NO2	YES	8	3	NO	2
BHM58	Carrs Lane High Street	Urban Centre	407255	286862	NO2	YES	13	5	NO	2
BHM61	St Phillips Church yard	Urban Centre	406919	287037	NO2	YES	91	19	NO	2
BHM62	Snow Hill	Urban Centre	407033	287196	NO2	YES	70	22	NO	2
BHM63	Chapel Lane	Roadside	407509	287226	NO2	YES	67	2	NO	2
BHM64	Stephenson Street	Roadside	406973	286751	NO2	YES	70	2	NO	2
BHM65	Digbeth	Roadside	407446	286478	NO2	YES	3	1	NO	2
BHM67	New John Street West (1)	Roadside	407056	288318	NO2	YES	15	3	NO	2
BHM68	Icknield Street (1)	Roadside	405781	288131	NO2	YES	12	4	NO	2
BHM69	Icknield Street (2)	Roadside	405806	288116	NO2	YES	38	2	NO	2
BHM70	Ledsam Street	Roadside	405221	287000	NO2	YES	129	2	NO	2
BHM71	Rann close	Roadside	405300	286430	NO2	YES	14	4	NO	2

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
BHM72	Leyburn Road	Roadside	405285	286395	NO2	YES	12	2	NO	2
BHM73	Islington Row (1)	Roadside	406038	285961	NO2	YES	45	2	NO	2
BHM74	Islington Row (2)	Roadside	406014	285936	NO2	YES	26	5	NO	2
BHM75	Lee Bank MW by School	Roadside	406355	285729	NO2	YES	21	2	NO	2
BHM76	Lee Bank MW opposite School	Roadside	406354	285676	NO2	YES	51	2	NO	2
BHM77	Lee Bank MW - St Lukes	Roadside	406936	285461	NO2	YES	59	2	NO	2
BHM78	Lee Bank MW - opposite St Lukes	Roadside	406912	285418	NO2	YES	11	2	NO	2
BHM79	Alexandra Road	Roadside	407373	285211	NO2	YES	25	4	NO	2
BHM80	Belgrave Middleway	Roadside	407385	285240	NO2	YES	21	4	NO	2
BHM81	Moseley Road	Roadside	408014	285305	NO2	YES	51	2	NO	2
BHM82	Highgate MW	Roadside	407981	285315	NO2	YES	15	3	NO	2
BHM83	Watery Lane (2)	Roadside	408558	286452	NO2	YES	0	2	NO	2

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
BHM84	Lawley Middleway (2)	Roadside	408171	287377	NO2	YES	3	2	NO	2
BHM85	Dartmouth MW (2)	Roadside	407802	288047	NO2	YES	39	2	NO	2
BHM86	Ronald McDonald House	Roadside	407163	287561	NO2	YES	8	2	NO	2
BHM87	St Chads (2)	Roadside	407162	287601	NO2	YES	15	2	NO	2
BHM88	Great Charles Street (3)	Roadside	406799	287314	NO2	YES	132	2	NO	2
BHM89	Great Charles Street (4)	Roadside	406594	287117	NO2	YES	5	2	NO	2
BHM90	Lionel Street	Roadside	406626	287304	NO2	YES	58	2	NO	2
BHM91	Adderley Street	Roadside	409496	287938	NO2	YES	34	5	NO	2
BHM93	New John Street (2)	Roadside	407052	288283	NO2	YES	47	2	NO	2

Notes:

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

(2) N/A if not applicable.

Table A.3 – Annual Mean NO_2 Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	NO_2 Annual Mean Concentration ($\mu g/m^3$) (3)				
					2013	2014	2015	2016	2017
Birmingham Tyburn Roadside	Roadside	Automatic	N/A	N/A	42	43	42	43	N/A
Birmingham Tyburn	Urban Background	Automatic	N/A	N/A	29	31	30	29	N/A
New Hall	Urban Background	Automatic		67	17	17	16	16	16
Stratford Road	Roadside	Automatic		73	31	36	33	37	34
Bristol Road	Roadside	Automatic		58	34	34	29	25	30
Moor Street Queensway	Roadside	Automatic		91	44	43	45	50	53
Acocks Green	Urban Background	Automatic		88	29	N/A	18	21	19
Birmingham A4540 Roadside	Roadside	Automatic		99	N/A	N/A	N/A	43	37
BHM1	Urban Background	Diffusion Tube		92%	19	17	17	15	18
BHM2	Urban Background	Diffusion Tube		92%	18	17	17	17	18
BHM3	Roadside	Diffusion Tube		83%	40	41	38	39	43
BHM4	Roadside	Diffusion Tube		75%	47	43	36	41	38
BHM5	Roadside	Diffusion Tube		100%	39	40	36	41	43
BHM6	Roadside	Diffusion Tube		75%	39	40	38	56	62

BHM7	Roadside	Diffusion Tube		75%	48	49	45	49	47
BHM8	Roadside	Diffusion Tube		75%	47	49	41	48	45
BHM9	Roadside	Diffusion Tube		92%	37	41	40	40	45
BHM10	Roadside	Diffusion Tube		100%	35	36	33	37	35
BHM11	Roadside	Diffusion Tube		83%	35	36	34	36	38
BHM12	Roadside	Diffusion Tube		83%	35	36	33	37	38
BHM13	Urban Background	Diffusion Tube		75%	29	30	31	29	30
BHM14	Urban Background	Diffusion Tube		75%	29	30	31	30	29
BHM15	Urban Background	Diffusion Tube		75%	30	31	31	29	30
BHM16	Roadside	Diffusion Tube		75%	52	55	55	54	61
BHM17	Roadside	Diffusion Tube		100%	41	42	43	48	50
BHM18	Roadside	Diffusion Tube		92%	45	47	44	47	49
BHM19	Roadside	Diffusion Tube		75%	N/A	N/A	N/A	48	52
BHM20	Roadside	Diffusion Tube		92%	N/A	37	35	39	36
BHM21	Roadside	Diffusion Tube		100%	N/A	N/A	N/A	62	68
BHM23	Roadside	Diffusion Tube		75%	N/A	N/A	N/A	52	55
BHM24	Roadside	Diffusion Tube		92%	N/A	N/A	N/A	49	50
BHM25	Roadside	Diffusion Tube		75%	N/A	N/A	N/A	49	47

BHM26	Urban Background	Diffusion Tube		92%	N/A	N/A	N/A	25	28
BHM27	Roadside	Diffusion Tube		92%	N/A	N/A	N/A	48	43
BHM29	Roadside	Diffusion Tube		83%	N/A	N/A	N/A	55	60
BHM30	Roadside	Diffusion Tube		100%	N/A	N/A	N/A	46	47
BHM31	Roadside	Diffusion Tube		75%	N/A	N/A	N/A	52	52
BHM34	Urban Centre	Diffusion Tube		100%	33	31	30	32	32
BHM35	Urban Centre	Diffusion Tube		100%	N/A	N/A	N/A	36	36
BHM36	Roadside	Diffusion Tube		100%	54	50	46	47	45
BHM37	Roadside	Diffusion Tube		75%	N/A	N/A	N/A	34	34
BHM40	Roadside	Diffusion Tube		100%	49	50	49	55	72
BHM42	Roadside	Diffusion Tube		75%	41	45	42	46	50
BHM43	Roadside	Diffusion Tube		75%	52	58	59	47	49
BHM44	Roadside	Diffusion Tube		83%	N/A	N/A	N/A	48	53
BHM45	Roadside	Diffusion Tube		100%	N/A	N/A	N/A	47	51
BHM46	Roadside	Diffusion Tube		92%	N/A	N/A	N/A	67	63
BHM48	Roadside	Diffusion Tube		100%	N/A	N/A	N/A	50	47
BHM50	Roadside	Diffusion Tube		100%	N/A	N/A	N/A	60	66
BHM51	Roadside	Diffusion Tube		100%	N/A	N/A	N/A	53	46

BHM55	Roadside	Diffusion Tube		83%	67	66	61	65	70
BHM56	Urban Centre	Diffusion Tube		83%	41	43	41	48	47
BHM57	Roadside	Diffusion Tube		83%	N/A	N/A	N/A	30	33
BHM58	Urban Centre	Diffusion Tube		100%	N/A	N/A	N/A	45	51
BHM61	Urban Centre	Diffusion Tube		92%	N/A	N/A	N/A	46	36
BHM62	Urban Centre	Diffusion Tube		100%	34	36	39	38	39
BHM63	Roadside	Diffusion Tube		83%	38	39	40	43	34
BHM64	Roadside	Diffusion Tube		83%	33	33	36	36	50
BHM65	Roadside	Diffusion Tube		92%	N/A	N/A	N/A	51	52
BHM67	Roadside	Diffusion Tube		100%	N/A	N/A	N/A	56	40
BHM68	Roadside	Diffusion Tube		100%	N/A	N/A	N/A	N/A	44
BHM69	Roadside	Diffusion Tube		100%	N/A	N/A	N/A	N/A	43
BHM70	Roadside	Diffusion Tube		83%	N/A	N/A	N/A	N/A	29
BHM71	Roadside	Diffusion Tube		100%	N/A	N/A	N/A	N/A	31
BHM72	Roadside	Diffusion Tube		92%	N/A	N/A	N/A	N/A	26
BHM73	Roadside	Diffusion Tube		100%	N/A	N/A	N/A	N/A	51
BHM74	Roadside	Diffusion Tube		92%	N/A	N/A	N/A	N/A	66
BHM75	Roadside	Diffusion Tube		100%	N/A	N/A	N/A	N/A	47

BHM76	Roadside	Diffusion Tube		92%	N/A	N/A	N/A	N/A	31
BHM77	Roadside	Diffusion Tube		100%	N/A	N/A	N/A	N/A	41
BHM78	Roadside	Diffusion Tube		75%	N/A	N/A	N/A	N/A	43
BHM79	Roadside	Diffusion Tube		100%	N/A	N/A	N/A	N/A	37
BHM80	Roadside	Diffusion Tube		100%	N/A	N/A	N/A	N/A	41
BHM81	Roadside	Diffusion Tube		83%	N/A	N/A	N/A	N/A	49
BHM82	Roadside	Diffusion Tube		83%	N/A	N/A	N/A	N/A	39
BHM83	Roadside	Diffusion Tube		92%	N/A	N/A	N/A	N/A	73
BHM84	Roadside	Diffusion Tube		92%	N/A	N/A	N/A	N/A	67
BHM85	Roadside	Diffusion Tube		92%	N/A	N/A	N/A	N/A	61
BHM86	Roadside	Diffusion Tube		100%	N/A	N/A	N/A	N/A	46
BHM87	Roadside	Diffusion Tube		92%	N/A	N/A	N/A	N/A	78
BHM88	Roadside	Diffusion Tube		83%	N/A	N/A	N/A	N/A	62
BHM89	Roadside	Diffusion Tube		83%	N/A	N/A	N/A	N/A	56
BHM90	Roadside	Diffusion Tube		75%	N/A	N/A	N/A	N/A	35
BHM91	Roadside	Diffusion Tube		92%	N/A	N/A	N/A	N/A	44
BHM93	Roadside	Diffusion Tube		83%	N/A	N/A	N/A	N/A	50

☒ **Diffusion tube data has been bias corrected**

☒ **Annualisation has been conducted where data capture is <75%**

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.**

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

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

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

Figure A.1 – Trends in Annual Mean NO_2 Concentrations

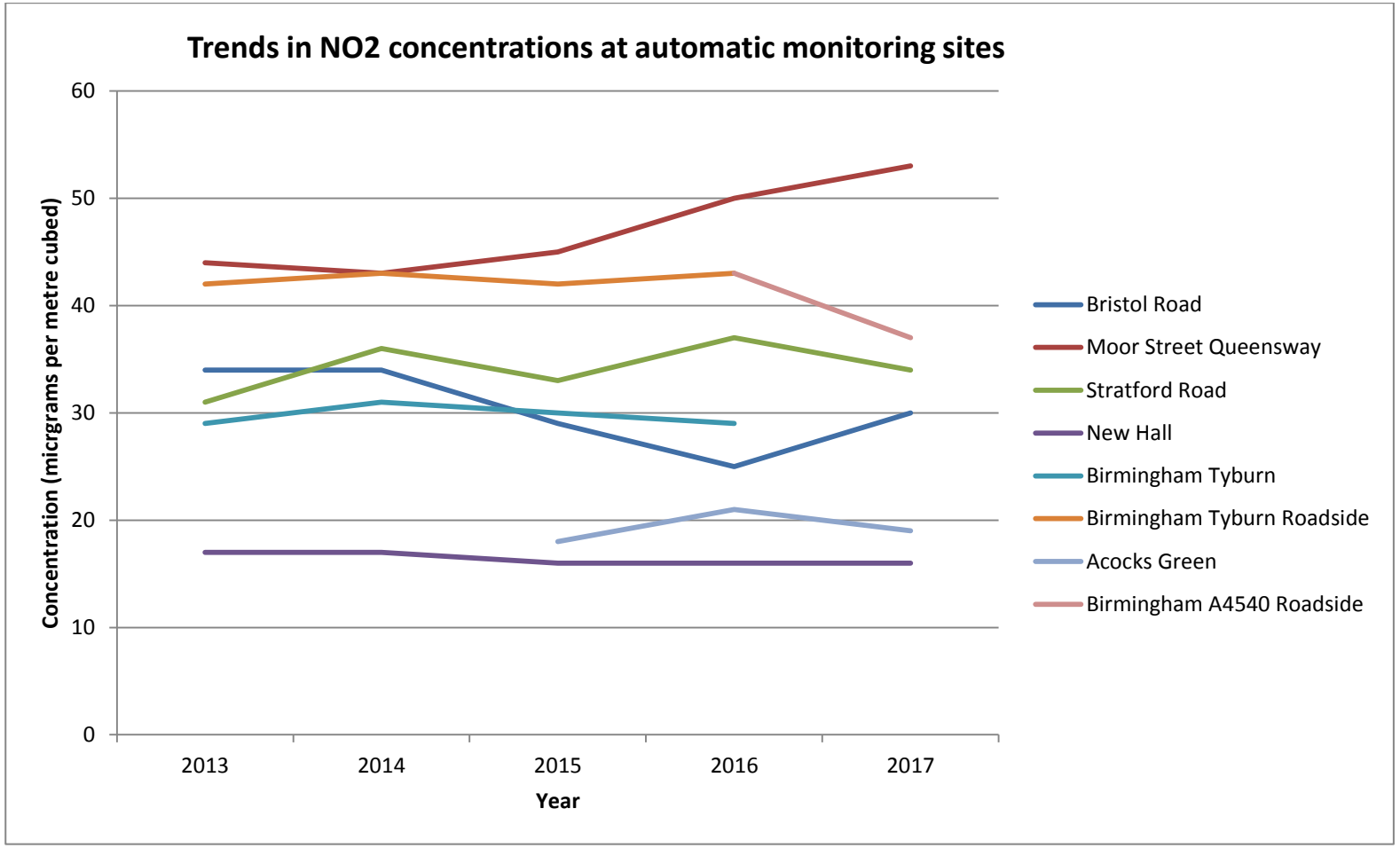


Table A.4 – 1-Hour Mean NO_2 Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	NO_2 1-Hour Means > 200µg/m^3 (3)				
					2013	2014	2015	2016	2017
Birmingham Tyburn Roadside	Roadside	Automatic		N/A	0	0	0	**0**	0
Birmingham Tyburn	Urban Background	Automatic		N/A	0	0	0	**0**	0
New Hall	Urban Background	Automatic		67	0	0	0	**0**	0
Stratford Road	Roadside	Automatic		73	0	0	0	**0**	0
Bristol Road	Roadside	Automatic		58	0	0	0	**0**	0
Moor Street Queensway	Roadside	Automatic		91	0	0	0	**0**	0
Acocks Green	Urban Background	Automatic		88	0	0	0	**0**	0
Birmingham A4540 Roadside	Roadside	Automatic		99	0	0	0	**0**	0

Notes:

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.**

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

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

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

Table A.5 – Annual Mean PM_{10} Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	PM_{10} Annual Mean Concentration ($\mu g/m^3$) (3)				
				2013	2014	2015	2016	2017
Birmingham Tyburn Roadside	Roadside		40	19	20	17	16	17
Birmingham Tyburn	Urban Background		N/A	18	19	19	14	N/A
Birmingham A4540 Roadside	Roadside		93	N/A	N/A	N/A	14	15

☒ **Annualisation has been conducted where data capture is <75%**

Notes:

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

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

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

(3) All means have been "annualised" as per Boxes 7.9 and 7.10 in LAQM.TG16, valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Table A.6 – 24-Hour Mean PM_{10} Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	PM_{10} 24-Hour Means > 50µg/m^3 (3)				
				2013	2014	2015	2016	2017
Birmingham Tyburn Roadside	Roadside		N/A	9	8	6	**6**	N/A
Birmingham Tyburn	Urban Background		N/A	7	6	3	**1**	N/A
Birmingham A4540 Roadside	Roadside		93	N/A	N/A	N/A	**0**	0

Notes:

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.**

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

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

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

Table A.7 – $PM_{2.5}$ Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	$PM_{2.5}$ Annual Mean Concentration (µg/m^3) (3)				
				2013	2014	2015	2016	2017
Birmingham Tyburn Roadside	Roadside		40	14	16	12	12	N/A
Birmingham Tyburn	Urban Background			14	13	13	11	N/A
Birmingham A4540 Roadside	Roadside		97	N/A	N/A	N/A	17	11
Acocks Green	Urban Background		89	13	12	12	10	11

☒ **Annualisation has been conducted where data capture is <75%**

Notes:

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

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

(3) All means have been "annualised" as per Boxes 7.9 and 7.10 in LAQM.TG16, valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Appendix B: Full Monthly Diffusion Tube Results for 2017

Table B.1 – NO_2 Monthly Diffusion Tube Results - 2017

Site ID	NO_2 Mean Concentrations ($\mu g/m^3$)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
													Raw Data	Bias Adjusted (0.89) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
BHM1	26.5	21.9	-	29.3	16.9	13.1	14.4	15.9	17.1	19.7	22.7	20.3	19.8	18	
BHM2	35.5	22.2	19.5	16.6	16.7	12.0	14.0	14.9	17.3	20.1	31.0	-	20.0	18	
BHM3	46.87	52.94	67.27	46.84	49.25	44.99	45.45		46.1	42.53	-	41.72	48.4	**43**	**43**
BHM4	69.09	49.09	-	39.96	-	41.56	40.52	48.47	23.48	41.94	-	34.78	43.2	38	
BHM5	61.05	49.09	42.42	56.51	62.85	44.2	47.86	39.83	52.06	40.01	38.26	40.56	47.9	**43**	**43**
BHM6	71.47	72.05	-	70.32	64	73.31	71.28	62.1	65.84	72.21	-	-	69.2	**62**	**62**
BHM7	59.09	65.06	-	-	52.43	53.89	45.95	39.98	57.64	47.88	-	52.01	52.7	**47**	**N/A**
BHM8	61.37	0.27	-	107.75	51.24	49.03	50.3		56.17	53.62	-	28.38	50.9	**45**	**N/A**
BHM9	68.2	61.69	54.41	44.91	40.99	48.74	43.1	39.43	57.18	47.12	-	48.6	50.4	**45**	**45**
BHM10	63.91	48.39	33	42.97	42.35	34.9	36.49	30.07	45.86	40.08	36.61	21.76	39.7	35	
BHM11	67.51	49.25	39.51	38.57	47.35	34.99	36.53	31.47	45.32	37.87	-	-	42.8	38	
BHM12	68.07		43.41	42.89	42.38	-	33.77	34.27	43.32	39.84	39.4	40.16	42.8	38	
BHM13	50.88	42.99	39.67	28.49	27.53	28.07	25.5	29.38	32.65	-	-	-	33.9	30	
BHM14	49.73	43.19	38.23	25.08	26.48	25.43	25.66	27.65	33.27	-	-	-	32.7	29	
BHM15	51.47	42.8	38.07	28.02	28.03	27.38	25.44	26.93	35.54	-	-	-	33.7	30	

Site ID	NO_2 Mean Concentrations (µg/m^3)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
													Raw Data	Bias Adjusted (0.89) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
BHM16	69.74	-	-	-	94.81	65.18	60.84	46.05	57.74	88.13	68.64	60.69	68.0	**61**	**61**
BHM17	71.65	70.66	80.3	53.28	50.85	47.12	43.9	42.1	55.43	50.38	62.27	48	56.3	**50**	**42**
BHM18	65.78	71.03	92.58	56.62	48.19	54.35	47.78	47.03	56.86	49.62	-	16.87	55.2	**49**	**41**
BHM19	73.51	62.26	-	69.53	58.16	54.48	53.17	25.1	60.23	72.73	-	-	58.8	**52**	**44**
BHM20	57.19	53.48	41.47	35.32	41.6	39.71	35.4	19.1	38.08	42.86	-	35.77	40.0	36	
BHM21	74.23	103.46	78.57	83.51	71.61	75.67	76.76	33.17	72.68	88.64	85.29	68.76	76.0	**68**	**65**
BHM23	79.41	80.34	-	-	66.65	60.18	60.1	26.7	64.1	56.21	-	59.09	61.4	**55**	**55**
BHM24	68.86	77.78	61.85	63.15	67.63	-	53.66	18.21	56.91	55.92	43.01	48.35	55.9	**50**	**N/A**
BHM25	64.63	75.14	-	-	-	54.71	60.26	19.88	58.74	49.11	57.93	32.68	52.6	**47**	38
BHM26	46.74	33.13	-	85.71	25.55	17.7	20.24	10.18	25.68	27.43	28.17	30.14	31.9	28	
BHM27	62.39	60.63	57.85	56.97	55.43	42.91	43.34	17.8	43.27	41.68	-	52.31	48.6	**43**	**41**
BHM29	125.41	74.76	-	97.25	77.69	57.23	56.21	21	63.16	49.96	-	48.17	67.1	**60**	**N/A**
BHM30	65.8	66.19	47.24	49.31	51.49	46.18	38.35	17.27	48.58	45.41	101.96	54.24	52.7	**47**	**N/A**
BHM31	-	74.03	-	70.24	77.43	51.63	48.77	39.74	59.79	52.23	-	53.71	58.6	**52**	**N/A**
BHM34	47.75	43.67	37.73	32.05	35.99	29.35	29.26	24.16	35.9	37.24	36.07	38.22	35.6	32	
BHM35	62.09	49.08	45.27	39	47.13	34.12	25.45	29.84	37.68	40.45	38.48	42.89	41.0	36	
BHM36	60.32	58.61	53.74	53.37	52.76	46.08	44.77	33.13	50.02	46.36	53.17	50.05	50.2	**45**	**N/A**
BHM37	57.94	43.81	-	47.51	40.55	27.43	28.3	25.34	30.58	38.52	-	-	37.8	34	
BHM40	76.11	81.56	79.73	87.77	78.22	91.42	77.19	68.25	89.08	77.72	78.94	83.34	80.8	**72**	**N/A**
BHM42	75.31	-	27.51	53.02	51.9	52.13	48.17	41.44	54.27	-	-	106.68	56.7	**50**	**45**

Site ID	NO_2 Mean Concentrations (µg/m^3)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
													Raw Data	Bias Adjusted (0.89) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
BHM43	-	-	-	58.82	53.66	50.03	47.07	38.95	53.94	64.35	71.82	57.31	55.1	**49**	**48**
BHM44	-	82.59	68.1	58.69	54.18	47.23	-	45.26	57.99	56.44	72.34	57.09	60.0	**53**	**N/A**
BHM45	73.7	64.75	64.57	57.73	48.39	51.92	51.25	41.58	56.1	51.07	63.16	60.86	57.1	**51**	**N/A**
BHM46		78.62	75	87.49	66.87	65.33	64.45	59.82	77.66	66.46	76.82	58.01	70.6	**63**	**53**
BHM48	68.62	67.4	57.33	28.9	50.82	43.79	45.34	41.44	53.28	53.51	64.37	64.39	53.3	**47**	**N/A**
BHM50	84.11	90.17	81.84	35.87	79.1	76.42	66.9	58.56	67.67	87.28	76.86	79.67	73.7	**66**	**N/A**
BHM51	63.58	63.4	53.72	83.56	31.37	46.68	45.28	36.39	52.92	51.97	43.14	47.76	51.6	**46**	**43**
BHM55	79.39	94.54	71.33	86.78	80.75	88.45	77.15	-	48.65	86.63	73.82	-	78.7	**70**	**N/A**
BHM56	58.6	-	62	54.91	64.53	44.41	43.47	30.13	67.54	44.33	-	55.93	52.6	**47**	**N/A**
BHM57	56.45	40.1	-	-	57.46	26.74	27.73	23.42	38.79	33.15	29.83	37.1	37.1	33	
BHM58	69.35	54.85	55.87	53.59	68.73	53.09	47.34	34.35	74.99	44.94	72.06	64.84	57.8	**51**	**N/A**
BHM61	57.583	52.41	-	42.76	40.93	31.62	32.92	35.85	29.59	41.33	41.67	41.19	40.7	36	
BHM62	50.14	58.23	53.23	51.92	47.08	39.56	42.67	14.54	46.76	42.05	24.19	52.3	43.6	39	
BHM63	49.98	-	32.33	33.21	37.37	36.99	33.62	17.2	43.39	46.22	-	46.93	37.7	34	
BHM64	65.36	72.38	-	-	56.86	60.87	47.27	44.9	54.34	57.3	47.72	56.24	56.3	**50**	**N/A**
BHM65	59.23	64.37	55.57	72.93	60.36	-	48.72	42.38	59.22	57.27	61.57	67.15	59.0	**52**	**44**
BHM67	53.22	63.92	40.58	42.27	48.57	40.15	35.39	32.16	41.72	41.79	39.82	58.8	44.9	40	38
BHM68	48.11	66.61	61.87	58.81	65.66	40.5	37.38	38.14	39.05	42.25	45.05	48.12	49.3	**44**	38
BHM69	48.76	55.5	53.39	40.69	48.23	45.68	50.79	41.12	43.27	54.48	48.75	53.83	48.7	**43**	**N/A**
BHM70	38.73	40.39	32.12	-	33.59	-	25.06	24.83	29.6	34.25	36.28	36.61	33.1	29	

Site ID	NO_2 Mean Concentrations (µg/m^3)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
													Raw Data	Bias Adjusted (0.89) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
BHM71	66.4	43.98	42.54	32.33	32.8	27.62	28.33	0.94	33.23	34.25	38.76	41.2	35.2	31	
BHM72	36.27	35.92	-	36.04	27.35	19.45	22.89	22.62	26.78	27.26	33.86	35.41	29.4	26	
BHM73	48.05	68.83	59.04	54.07	89.97	49.42	47.77	39.13	47.86	54.48	62.25	61.95	56.9	**51**	**48**
BHM74	76.58	-	91.11	95.96	49.13	81.98	79.19	63.64	71.85	38.53	82.29	85.49	74.2	**66**	**N/A**
BHM75	52.34	65.41	50.02	58.58	47.9	44.64	42.63	43.47	46	44.96	68.89	62.23	52.3	**47**	36
BHM76	40.59	38.69	37.41	35.59	36.55	27.75	30.25	28.73	28.58	-	36.31	38.56	34.5	31	
BHM77	47.17	57.27	46.04	47.07	42.32	43.74	42.85	39.84	41.02	41.29	55.39	50.69	46.2	**41**	**N/A**
BHM78	48.26	62.95	46.9	50.96	51.33	-	-	42.76	39.89	-	49.18	44.12	48.5	**43**	37
BHM79	42.34	42.96	39.5	46.87	43.78	24.47	33.13	28.38	45.43	56.39	51.46	41.69	41.4	37	
BHM80	49.91	71.01	58.75	53.29	55.46	47.34	43.85	41.8	29.31	32.58	38.28	33.13	46.2	**41**	35
BHM81	-	-	43.52	37.22	42.47	56.19	58.11	47.98	51.72	48.96	74.63	87.37	54.8	**49**	**N/A**
BHM82	-	-	55.63	59.21	65.14	33.59	33.48	31.83	36.53	36.49	43.6	39.3	43.5	39	36
BHM83	75.66	-	74.95	99.4	89.22	91.38	87.17	75.82	82.62	74.35	83.42	68.24	82.0	**73**	
BHM84	75.97	-	80.02	83.81	80.85	83.08	74.93	57.24	65.94	81.61	75.58	66.74	75.1	**67**	**58**
BHM85	67.67	99.02	79.13	-	72.92	69.02	67.46	59.32	61.76	54.61	61.32	62.89	68.6	**61**	**51**
BHM86	58.64	62.72	57.66	47.43	55.87	53.9	48.06	39.77	50.71	45.72	49.16	49.42	51.6	**46**	**N/A**
BHM87	91.22	-	104.21	102.21	92	102.21	102.43	58.94	76.03	98.05	67.58	67.48	87.5	**78**	**61**
BHM88	-	-	57.74	82.88	79.49	72.34	69.91	53.24	72.85	94.24	52	60.23	69.5	**62**	**N/A**
BHM89	-	82.68	74.99	73.08	60.21	57.52	64.05	43.22	53.87	58.41	59.42	-	62.7	**56**	**52**
BHM90	58.51	-	34.42	17.61		65.63	30.21	28.54	33.13	58.38	-	31.07	39.7	35	

Site ID	NO_2 Mean Concentrations ($\mu g/m^3$)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
													Raw Data	Bias Adjusted (0.89) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
BHM91	58.51	48.99	55.21	97.72	67.63	33.39	34.61	37.9	34.34	38.96	-	36.43	49.4	**44**	38
BHM93	63.17	72.85	63.17	-	57.34	51.71	47.34	54.94		56.72	53.69	41.94	56.3	**50**	**N/A**

☐ **Local bias adjustment factor used**

☒ **National bias adjustment factor used**

☒ **Annualisation has been conducted where data capture is <75%**

☒ **Where applicable, data has been distance corrected for relevant exposure**

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.**

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

(2) Distance corrected to nearest relevant public exposure.

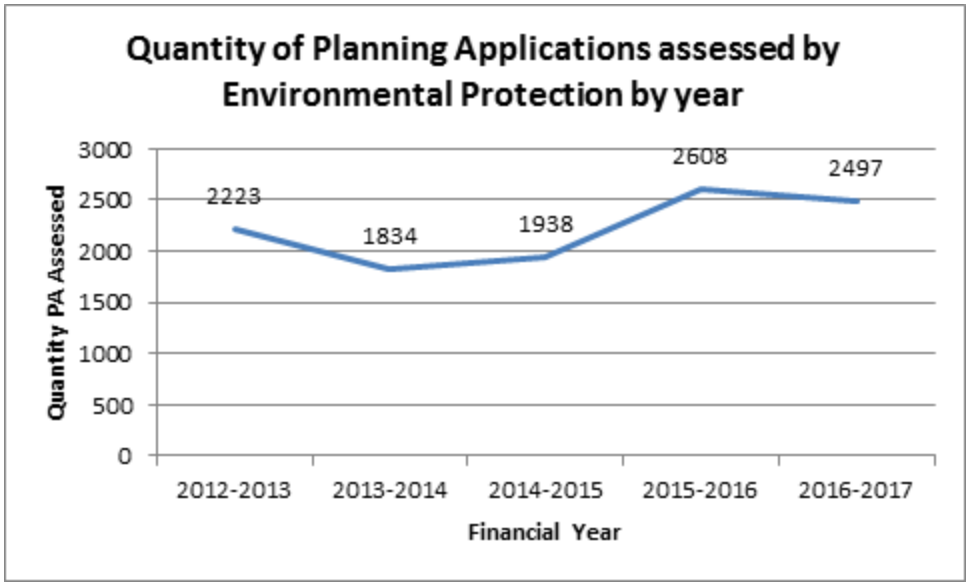
Appendix C: Supporting Technical Information / Air Quality Monitoring Data QA/QC

Review and Assessment

It is considered that there have been no significant changes to sources in the reporting year. Road traffic remains the dominant source of emissions. No dispersion modelling has been undertaken to support the LAQM process during the reporting year. It is proposed that an updated air quality model will be developed to support the development of the revised AQAP. It is anticipated that this will help identify local hotspots and assist in developing actions to reduce emissions. The scope of the council's monitoring strategy will be reviewed as necessary once this process is complete.

Officers from Environmental Protection act as a non-statutory consultee to the Planning Service by providing input on the environmental merits of planning applications lodged with the City Council. These range from minor schemes through to major developments. Officers consider emissions to almost all environmental media e.g. land, air, as noise and whilst not all of these applications involved air quality considerations, a significant number will have done so, especially given the focus on increasing residential development within the city centre area. Officers now make use of the Good Practice Air Quality Planning Guidance published by the Low Emissions Towns and Cities Partnership (May 2014) when making their response.

The following graph shows the quantity of planning applications commented upon by EP officers over the last five years.



Diffusion Tube information

All diffusion tubes are prepared, supplied and analysed by:

Gradko International Limited
St. Martins House,
77 Wales Street
Winchester,
Hampshire
SO23 0RH
England

Tubes supplied with 20% TEA in water (see the appended technical data sheet). The Gradko laboratory is UKAS accredited, which ensures conformance with the requirements of ISO/IEC 17025 and participates in several national quality schemes such as WASP, LEAP and Field Intercomparison. Results of the WASP scheme (obtained from https://laqm.defra.gov.uk/diffusion-tubes/qa-qc-framework.html) are appended.

Technical Data Sheet: TDS 1

DIF 100 RTU - NITROGEN DIOXIDE (NO_2)

This tube is designed for passively monitoring gaseous airborne Nitrogen dioxide.

Description: Acrylic tube fitted with coloured and white thermoplastic rubber caps. The coloured cap contains the absorbent.

The concentrations of Nitrite ions and hence NO_2 chemically adsorbed are quantitatively determined by UV/ Visible Spectrophotometry with reference to a calibration curve derived from the analysis of standard nitrite solutions (UKAS Accredited Methods).

Suitable for carrying out spatial or localized assessments for NO_2 in ambient air or workplace monitoring. It can be used for co-location projects alongside an automatic analyzer to obtain bias correction factors.

Clips and straps are not included and must be ordered separately.

Tube Dimensions: 71.0mm length x 11.0mm internal diameter.

Absorbent: Two preparations of Triethanolamine (TEA) absorbent are available:

20% Triethanolamine / De-ionised Water - *GREY CAP
50% Triethanolamine / Acetone – *RED CAP

Recommended Exposure Periods: 2 -4 weeks.

Air Velocity: Influence of Wind Speed < 10% between 1.0 and 4.5 $msec^{-1}$ (* based on original data).

Storage: Store in a dark, cool environment preferably between 5-10°C.

Shelf Life: 12 weeks from preparation date.

Desorption Efficiency: d = 0.98 (determined using N.I.S.T. Standard Analytes).

Limit of detection:

- 20%TEA/Water – less than 1.5 ugm^{-3} over a 4-week exposure period. Specific values available upon request.
- 50%TEA/Acetone – less than 2 ugm^{-3} over a 4-week exposure period. Specific values available upon request.

Analytical Expanded Measurement Uncertainty: available upon request.

Relevant Standards: BS EN 13528 Parts 1-3: 2002/3

Reference document: ED48673043 Issue-1A Feb 2008 – AEA Energy and Environment

Special Factors: Potential interference from Nitrous Acid , Peroxy Acetyl Nitrate, which could increase levels of nitrate.

Summary of Laboratory Performance in AIR NO_2 Proficiency Testing Scheme (September 2016 – August 2018).

Reports are prepared by LGC for BV/NPL on behalf of Defra and the Devolved Administrations.

Background

AIR is an independent analytical proficiency-testing (PT) scheme, operated by LGC Standards and supported by the Health and Safety Laboratory (HSL). AIR PT is a new scheme, started in April 2014, which combined two long running PT schemes: LGC Standards STACKS PT scheme and HSL WASP PT scheme.

AIR offers a number of test samples designed to test the proficiency of laboratories undertaking analysis of chemical pollutants in ambient indoor, stack and workplace air. One such sample is the AIR NO_2 test sample type that is distributed to participants in a quarterly basis.

AIR NO_2 PT forms an integral part of the UK NO_2 Network's QA/QC, and is a useful tool in assessing the analytical performance of those laboratories supplying diffusion tubes to Local Authorities for use in the context of Local Air Quality Management (LAQM). With consent from the participating laboratories, LGC Standards provides summary proficiency testing data to the LAQM Helpdesk for hosting on the web-pages at http://laqm.defra.gov.uk/diffusion-tubes/qa-qc-framework.html. This information will be updated on a quarterly basis following completion of each AIR PT round.

Defra and the Devolved Administrations advise that diffusion tubes used for Local Air Quality Management should be obtained from laboratories that have demonstrated satisfactory performance in the AIR PT scheme. Laboratory performance in AIR PT is also assessed, by the National Physical Laboratory (NPL), alongside laboratory data from the monthly NPL Field Intercomparison Exercise carried out at Marylebone Road, central London.

The information is used to help the laboratories to identify if they have problems and may assist devising measures to improve their performance and forms part of work for Defra and the Devolved Administrations under the Local Air Quality Management Services Contract.

AIR NO_2 PT Scheme overview

Purpose of scheme

The AIR PT scheme uses laboratory spiked Palmes type diffusion tubes to test each participating laboratory's analytical performance on a quarterly basis and continues the format used in the preceding WASP PT scheme. Such tubes are not designed to test other parts of the measurement system e.g. sampling. Every quarter, roughly January, April, July and October each year, each laboratory receives four diffusion tubes doped with an amount of nitrite, known to LGC Standards, but not the participants. At least two of the tubes are usually duplicates, which enables precision, as well as accuracy, to be assessed. The masses of nitrite on the spiked tubes are different each quarter, and reflect the typical analytical range encountered in actual NO_2 ambient monitoring in the UK.

Preparation of test samples

Diffusion tubes are spiked using a working nitrite solution prepared from a stock solution. The concentration of this stock solution is initially assayed using a titrimetric procedure. All steps in the subsequent test sample production process, involving gravimetric and volumetric considerations, are undertaken using calibrated instruments employing traceable standards. As an additional cross check, 12 spiked Palmes tubes are picked at random from each spike loading level and submitted to a third party laboratory which is accredited to ISO 17025 to undertake this analysis using an ion chromatographic procedure.

In summary, the tube spiking precision is calculated to be better than 0.5 %, expressed as a standard deviation, and this is derived from repeat gravimetric checking of the pipette device used to spike the test samples. The calculated spike values, derived from titrimetric, gravimetric and volumetric considerations, are found to be typically within ± 3 % of results obtained by the third party laboratory using an ion chromatographic analytical procedure.

Scheme operation

The participants analyse the test samples and report the results to LGC Standards via their on-line PORTAL data management system. LGC Standards assign a performance score to each laboratory's result, based on how far their results deviate from the assigned values for each test samples. The assigned values are best estimates of the levels of nitrite doped onto the test sample tubes and are calculated from the median of participant results, after the removal of test results that are inappropriate for statistical evaluation, e.g. miscalculations, transpositions and other gross errors. At the completion of the round, laboratories receive a report detailing how they have performed and how their results relate to those of their peers.

Performance scoring

The z-score system is used by LGC to assess the performance of laboratories participating in the AIR PT NO_2 scheme.

The Z_{score}, may be defined as:

$$Z_{score} = \frac{\left(x_{lab} - \bar{x}_{assigned}\right)}{\sigma_{SDPA}}$$

Where:

x_{lab} = participant result from a laboratory

$\bar{x}_{assigned}$ = assigned value

σ_{SDPA} = standard deviation for performance assessment (currently set at 7.5 % of $\bar{x}_{assigned}$)

Performance score interpretation

A Z_{score} is interpreted as described below:

$|Z_{score}| \leq 2$ indicates satisfactory laboratory performance

$2.0 < |Z_{score}| < 3$ indicates questionable (warning) laboratory performance

$|Z_{score}| \geq 3$ indicates unsatisfactory (action) laboratory performance

As a general rule of thumb, provided that a laboratory does not have systematic sources of bias in their laboratory measurement system, then on average, 19 out of every 20 z-scores should be $\leq \pm 2$. In this scheme each laboratory receives 4 test samples per round and therefore submits 4 z-scores per round. Hence over 5 rounds laboratories would receive 20 test samples and report 20 z-scores.

Assessing the performance of a laboratory

End users that avail of analytical services from laboratories should satisfy themselves that such laboratories meet their requirements. A number of factors ideally need to be considered including

- Expertise and skills of staff within the laboratory?
- Does the laboratory follow accepted measurement standards, guidance?
- Does the laboratory operate a robust internal quality control system?
- Is the laboratory third party accredited to relevant standards such as ISO 17025?
- Does the laboratory successfully participate in relevant external proficiency testing schemes?
- How good is their customer care (communication, turnaround times, pricing etc)?

Participation therefore, in an external proficiency-testing scheme such as AIR PT, represents but one factor in such considerations.

Participation in a single round of an external proficiency-testing scheme represents a “snap-shot” in time of a laboratory’s analytical quality. It is more informative therefore to consider performance over a number of rounds.

Following on from above, therefore over a rolling five round AIR PT window, one would expect that 95 % of laboratory results should be $\leq \pm 2$. If this percentage is substantially lower than 95 % for a particular laboratory, within this five round window, then one can conclude that the laboratory in question has significant sources of error within their analytical procedure.

A summary of the performance, for each laboratory participating in the AIR PT scheme, is provided in Table 1. This table shows the percentage of results where the absolute z-score, for each laboratory, was less than or equal to 2, i.e. those results which have been assessed as satisfactory.

Contacts

Further **specific** information on the LGC AIR NO_2 PT scheme is available from LGC proficiency testing on 0161 7622500 or by email at customerservices@lgcgroup.com.

For **general** questions about the scheme within the context of wider LAQM activities please contact Nick Martin at NPL on 0208 943 7088 or nick.martin@npl.co.uk.

Table 1: Laboratory summary performance for AIR NO_2 PT rounds AR0016, 18, 19, 21, 22, 24, 25 and 27

The following table lists those UK laboratories undertaking LAQM activities that have participated in recent AIR NO_2 PT rounds and the percentage (%) of results submitted which were subsequently determined to be **satisfactory** based upon a z-score of $\leq \pm 2$ as defined above.

AIR PT Round	AIR PT AR016	AIR PT AR018	AIR PT AR019	AIR PT AR021	AIR PT AR022	AIR PT AR024	AIR PT AR025	AIR PT AR027
Round conducted in the period	September – October 2016	January – February 2017	April – May 2017	July – August 2017	September – October 2017	January – February 2018	April – May 2018	July – August 2018
Aberdeen Scientific Services	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
Cardiff Scientific Services	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]
Edinburgh Scientific Services	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
Environmental Services Group, Didcot	100 % [1]	100 % [1]	100 % [1]	100 % [1]	100 % [1]	100 % [1]	100 % [1]	100 % [1]
Exova (formerly Clyde Analytical)	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]
Glasgow Scientific Services	100 %	100 %	50 %	0 %	100 %	100 %	100 %	50 %
Gradko International [1]	100 % [1]	100 % [1]	100 % [1]	100 % [1]	100 % [1]	100 % [1]	100 %	100 %
Kent Scientific Services	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]
Kirklees MBC	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]
Lambeth Scientific Services	75 %	100 %	NR [2]	NR [2]	100 %	NR [2]	NR [2]	NR [2]
Milton Keynes Council	75 %	100 %	75 %	0 %	75 %	100 %	75 %	100 %
Northampton Borough Council	75 %	0 %	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]
Somerset Scientific Services	100 %	100 %	100 %	100 %	75 %	100 %	100 %	100 %
South Yorkshire Air Quality Samplers	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
Staffordshire County Council	NR [2]	100 %	100 %	100 %	100 %	50 %	100 %	100 %
Tayside Scientific Services (formerly Dundee CC)	NR [2]	100 %	NR [2]	100 %	NR [2]	100 %	NR [2]	100 %
West Yorkshire Analytical Services	50 %	100 %	100 %	100 %	100 %	50 %	75 %	100 %

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

Bias adjustment

Diffusion tube results have been bias adjusted using the national bias adjustment factor obtained from here; https://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html.

The national factor has been used in the absence of a co-location study being undertaken in the reporting year.

Distance correction

Where appropriate diffusion tube results have been distance corrected to account for public exposure at the façade of a building where relevant exposure needs to be considered. However due to the relationship between the diffusion tube location, the carriage way, and the nearest building where exposure is relevant, it is not always possible to undertake the distance correction calculation. Further consideration of those monitoring locations where exceedences have been measured and the application of distance correction is appended. The distance correction has been calculated using the latest version of the tool available here; https://laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html.

Enter data into the pink cells

Site Name/ID	Distance (m)		NO_2 Annual Mean Concentration ($\mu g/m^3$)			Comment
	Monitoring Site to Kerb	Receptor to Kerb	Background	Monitored at Site	Predicted at Receptor	
BHM17	1.0	11.5	33.2	50.0	**41.7**	Predicted concentration at Receptor above AQS objective.
BHM18	1.0	11.3	33.2	49.0	**41.3**	Predicted concentration at Receptor above AQS objective.
BHM19	2.5	9.2	28.3	52.0	**44.4**	Predicted concentration at Receptor above AQS objective.
BHM21	4.8	6.5	32.3	68.0	**64.8**	Predicted concentration at Receptor above AQS objective.
BHM25	2.5	19.6	30.1	47.0	*38.4*	Predicted concentration at Receptor within 10% the AQS objective.
BHM27	1.6	4.3	35.4	43.0	**41.3**	Predicted concentration at Receptor above AQS objective.

BHM85	1.4	9.3	35.4	61.0	**50.5**	Predicted concentration at Receptor above AQS objective.
BHM42	2.8	10.3	34.8	50.0	**45.0**	Predicted concentration at Receptor above AQS objective.
BHM43	3.5	4.2	34.8	49.0	**48.3**	Predicted concentration at Receptor above AQS objective.
BHM46	0.9	5.5	34.8	63.0	**52.9**	Predicted concentration at Receptor above AQS objective.
BHM51	2.0	4.2	27.5	46.0	**42.8**	Predicted concentration at Receptor above AQS objective.
BHM65	0.9	5.6	30.9	52.0	**44.4**	Predicted concentration at Receptor above AQS objective.
BHM67	4.1	18.6	35.4	40.0	*38.0*	Predicted concentration at Receptor within 10% the AQS objective.
BHM68	2.2	9.9	27.0	44.0	*37.9*	Predicted concentration at Receptor within 10% the AQS objective.

BHM73	9.5	13.2	27.5	51.0	**48.1**	Predicted concentration at Receptor above AQS objective.
BHM75	1.8	23.4	27.5	47.0	35.6	Warning: your receptor is more than 20m further from the kerb than your monitor - treat result with caution.
BHM78	3.1	12.6	27.5	43.0	*37.3*	Predicted concentration at Receptor within 10% the AQS objective.
BHM80	1.5	14.5	28.7	41.0	34.9	
BHM82	5.7	17.0	28.9	39.0	35.6	
BHM84	0.9	3.6	32.4	67.0	**57.5**	Predicted concentration at Receptor above AQS objective.
BHM87	3.5	14.8	34.8	78.0	**61.2**	Predicted concentration at Receptor above AQS objective.
BHM91	12.5	33.0	27.9	44.0	*37.6*	Predicted concentration at Receptor within 10% the AQS objective. Warning: your receptor is more than 20m further from the kerb than your monitor - treat result with caution. Warning: your monitor is more than 10m further from the kerb than your receptor - treat result with caution.

BHM89	7.0	12.0	33.0	56.0	**51.9**	Predicted concentration at Receptor above AQS objective.

PM Monitoring Adjustment

All monitoring in Birmingham for particulate matter (PM) is contained within the AURN network. The data from this monitoring is collected and where necessary adjusted by Bureau Veritas. The data from the monitoring sites is considered to be representative of the Birmingham area and includes both background and roadside locations.

QA/QC of automatic monitoring

QA/QC for the Birmingham A4540 Roadside and Acocks Green AURN sites is completed by Bureau Veritas.

The remaining Birmingham monitoring stations have QA/QC procedures completed in-house. All data from the sites is collected remotely onto the SMHI Airviro system. The data is reviewed daily to check for obvious errors or analyser faults. Gas calibrations are completed automatically every third night and this data is also checked for consistency and analyser drift. Manual calibrations and filter checks are completed regularly. All calibration gases are of traceable standard, and the servicing and maintenance is provided by Horiba.

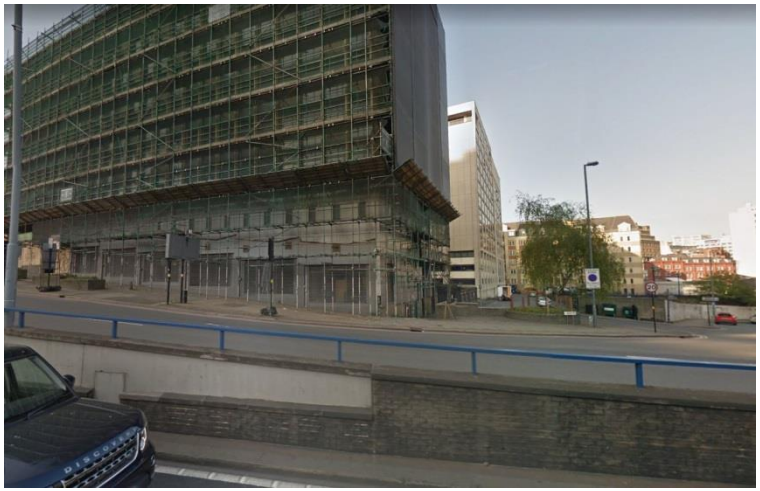
Commentary on diffusion tube sites where distance correction not applied

Reference	Location	Comment	Reason monitoring undertaken
BHM3	28 High Street	Not relevant. On building façade. Table B.1. amended	
BHM 7	Broad Street - Brasshouse	No relevant exposure considering relationship of the tube to the carriageway and building façade.	
BHM 8	Broad Street - O'Neils	No relevant exposure considering relationship of the tube to the carriageway and building façade.	
BHM 23	Lower Severn Street	Not relevant. On building façade. Table B.1. amended	
BHM 29	Suffolk Street Queensway	No relevant exposure considering relationship of the tube to the carriageway and building façade.	Monitoring undertaken to support CAZ development
BHM 30	Curzon Street	No relevant exposure considering relationship of the tube to the carriageway and building façade.	Monitoring undertaken to support CAZ development
BHM 31	Holiday Street	No relevant exposure considering relationship of the tube to the carriageway and building façade.	Monitoring undertaken to support CAZ development
BHM 36	Corporation Street Sq Peg	No relevant exposure considering relationship of the tube to the carriageway and building façade.	Monitoring undertaken to support CAZ development
BHM 40	Priory Queensway (1)	No relevant exposure considering relationship of the tube to the carriageway and building façade.	Monitoring undertaken to assess effect of changes to bus routes
BHM 44	Masshouse Lane - LP	No relevant exposure considering relationship of the tube to the carriageway and building façade.	Monitoring undertaken to assess effect of changes to bus routes
BHM 45	Hotel La Tour - LP	No relevant exposure considering relationship of the tube to the carriageway and building façade.	Monitoring undertaken to assess effect of changes to bus routes
BHM 48	Millennium Post MSQ	No relevant exposure considering relationship of the tube to the carriageway and building façade.	Monitoring undertaken to assess effect of changes to bus routes
BHM 50	MSQ - No entry post	No relevant exposure	Monitoring undertaken to assess effect of changes to bus routes
BHM 55	Moor Street corner of	No relevant exposure	Monitoring undertaken to assess effect of changes to bus routes
BHM 56	New Meeting Street	No relevant exposure considering relationship of the tube to the carriageway and building façade.	Monitoring undertaken to assess effect of changes to bus routes
BHM 58	Carrs Lane High Street	No relevant exposure	Monitoring undertaken to assess effect of changes to bus routes

BHM 64	Stephenson Street	No relevant exposure	High concentrations may be due to fugitive emissions from New Street Station
BHM 69	Icknield Street (2)	No relevant exposure considering relationship of the tube to the carriageway and building façade.	Monitoring undertaken to support CAZ development
BHM 74	Islington Row (2)	No relevant exposure considering relationship of the tube to the carriageway and building façade.	Monitoring undertaken to support CAZ development
BHM 77	Lee Bank MW - St Lukes	No relevant exposure	Adjoining site has planning permission for residential development. Air quality assessment undertaken.
BHM 81	Moseley Road	No relevant exposure	Monitoring undertaken to support CAZ development
BHM 86	Ronald McDonald House	No relevant exposure	Building used as temporary accommodation for parents of in-patients at Children's Hospital.
BHM 88	Great Charles Street (3)	No relevant exposure considering relationship of the tube to the carriageway and building façade.	Monitoring undertaken to support CAZ development
BHM 89	Great Charles Street (4)	Drop of with distance now undertaken. Table B.1. amended	Previously no relevant exposure but building now converted to residential through new permitted development rights. LPA cannot consider air quality impacts for this type of development
BHM 93	New John Street (2)	No relevant exposure	Monitoring undertaken to support CAZ development

Commentary on diffusion tube sites where annual mean exceeds 60 µgm^{-3} limit

Reference	Location	Photo	Comments
BHM6	487 Stratford Road		Located on the footpath on a busy arterial route. It is considered unlikely that an individual will be exposed for an hour at this location. The nearby continuous monitor shows no exceedences of the hourly objective, with the maximum recorded hourly mean 157 µgm^{-3}.
BHM16	Children's Hospital		Located adjacent to the footpath next to the Children's Hospital and in the shadow of the A38 flyover. It is considered unlikely that an individual will be exposed for an hour at this location. A continuous monitor has recently been installed nearby and Birmingham City Council will further assess concentrations at this location when data is available.

BHM21	Lawley Middleway		Located on the footpath on the A4540 ring road, near to the Wisdom Academy Primary School. The school building is currently unoccupied. It is considered unlikely that an individual will be exposed for an hour at this location.
BHM29	Suffolk Street Queensway		Located on the footpath adjacent to the A4400. It is considered unlikely that an individual will be exposed for an hour at this location. A continuous monitor has recently been installed nearby and Birmingham City Council will further assess concentrations at this location when data is available.

BHM40	Priory Queensway (1)		Located on the footpath adjacent to Priory Queensway. It is considered unlikely that an individual will be exposed for an hour at this location. The nearby continuous monitor on Moor Street Queensway shows no exceedences of the hourly objective, with the maximum recorded hourly mean 150 µgm^{-3}.
BHM46	Masshouse Lane Masshouse 2		Located on the footpath adjacent to Masshouse Lane in a street canyon. It is considered unlikely that an individual will be exposed for an hour at this location. The nearby continuous monitor on Moor Street Queensway shows no exceedences of the hourly objective, with the maximum recorded hourly mean 150 µgm^{-3}.

BHM50	MSQ - No entry post		Located on the central reservation on Moor Street Queensway. It is considered unlikely that an individual will be exposed for an hour at this location. The nearby continuous monitor on shows no exceedences of the hourly objective, with the maximum recorded hourly mean 150 µgm^{-3}.
BHM55	Moor Street corner of		Located on a building façade at the junction with Moor Street and Moor Street Queensway. It is considered unlikely that an individual will be exposed for an hour at this location. The nearby continuous monitor on shows no exceedences of the hourly objective, with the maximum recorded hourly mean 150 µgm^{-3}.

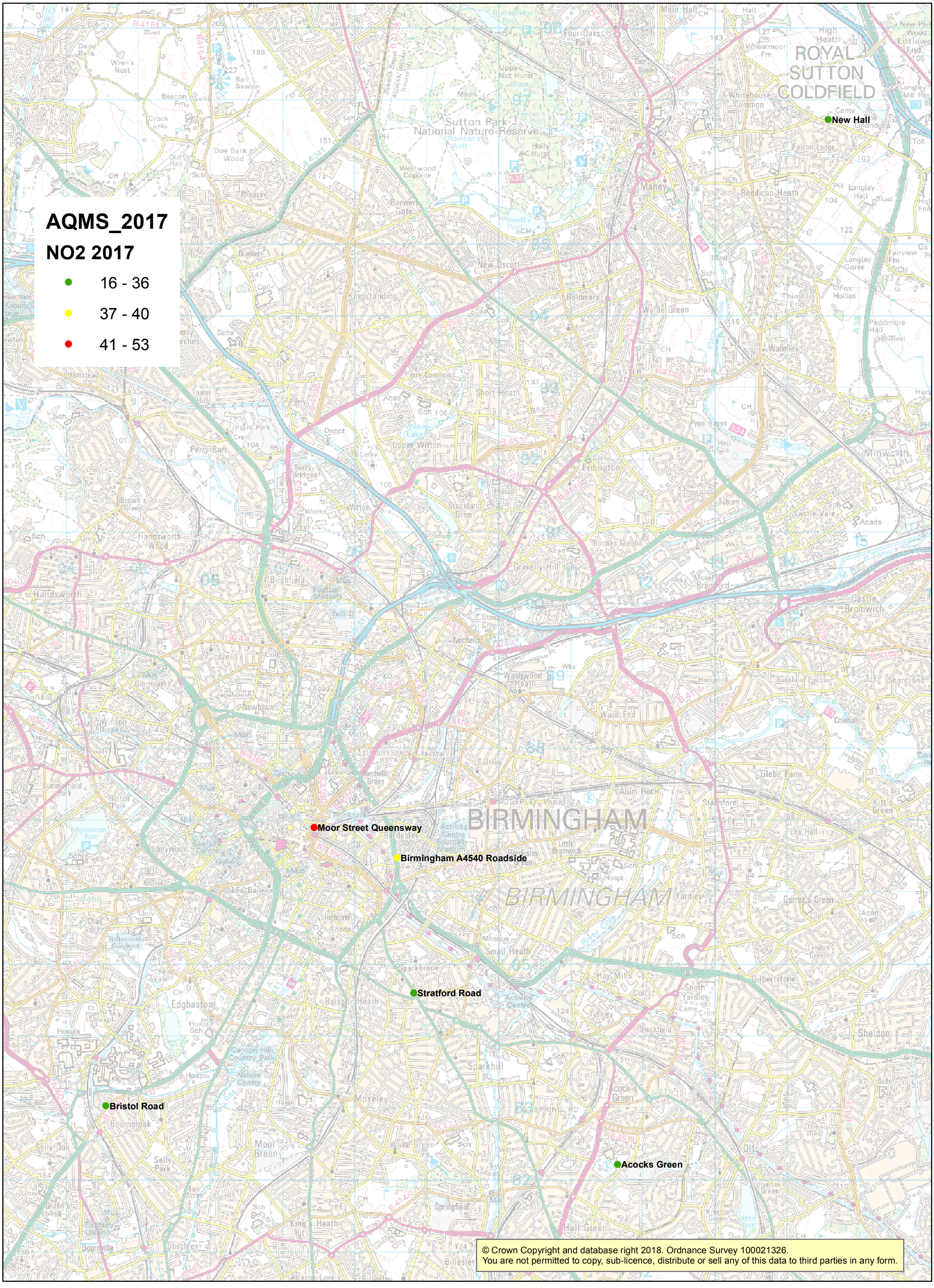
BHM74	Islington Row (2)		Located on the footpath on the A4540 ring road, near to Five Ways Railway Station. It is considered unlikely that an individual will be exposed for an hour at this location.
BHM83	Watery Lane (2)		Located on the façade of Archway Academy, adjacent to the A4540 Ring Road. The school has no outdoor space for pupils. It is considered unlikely that an individual will be exposed for an hour at this location. The nearby continuous monitor on A4540 shows no exceedences of the hourly objective.

BHM84	Lawley Middleway (2)		Located on the footpath adjacent to the A4540 Ring Road. It is considered unlikely that an individual will be exposed for an hour at this location.
BHM85	Dartmouth MW (2)		Located on the footpath adjacent to the A4540 Ring Road. It is considered unlikely that an individual will be exposed for an hour at this location.

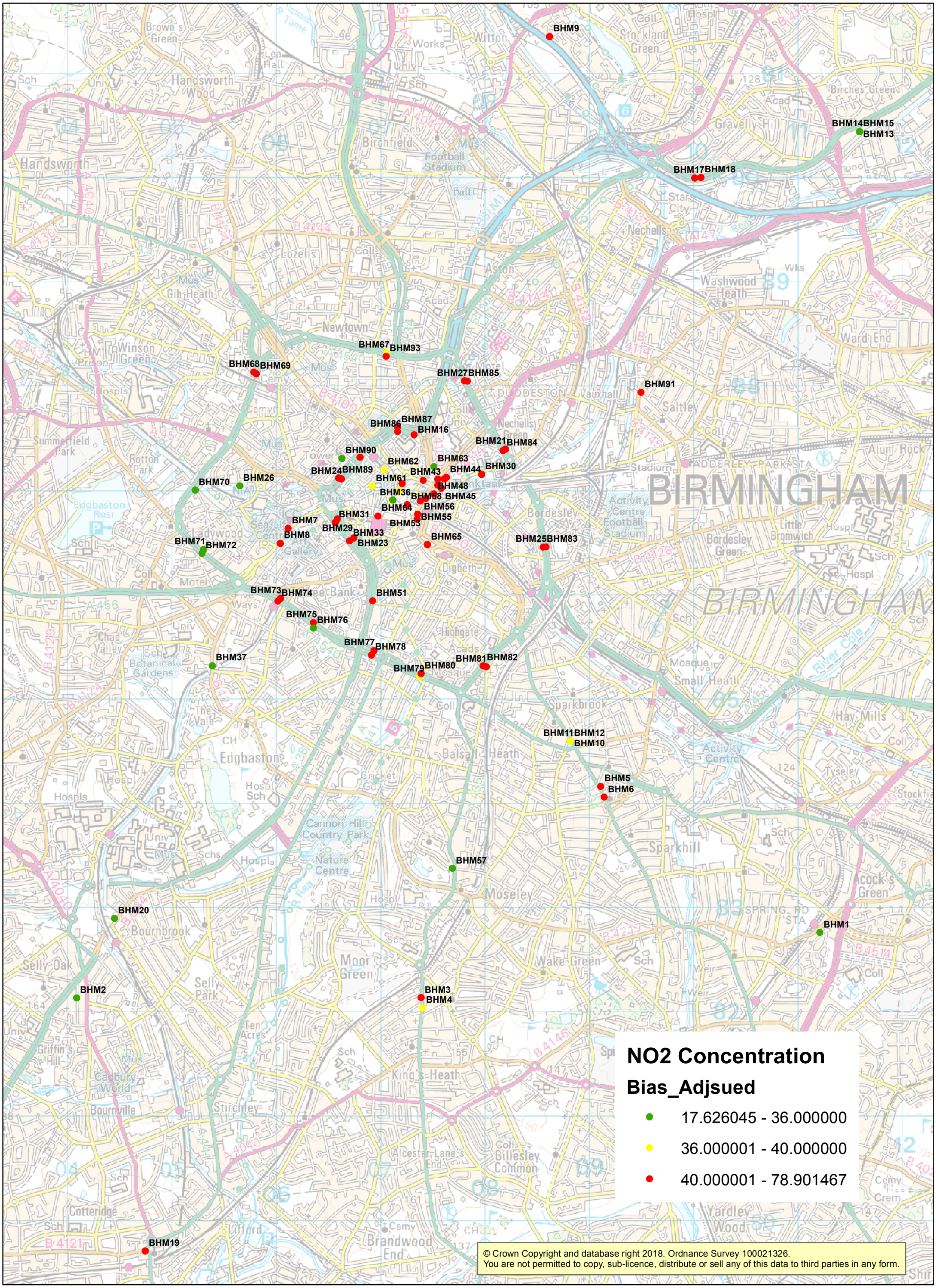
BHM87	St Chads (2)		Located on the footpath adjacent to the A38. It is considered unlikely that an individual will be exposed for an hour at this location. A continuous monitor has recently been installed nearby and Birmingham City Council will further assess concentrations at this location when data is available.
BHM88	Great Charles Street (3)		Located on the footpath adjacent to the A38. It is considered unlikely that an individual will be exposed for an hour at this location.

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

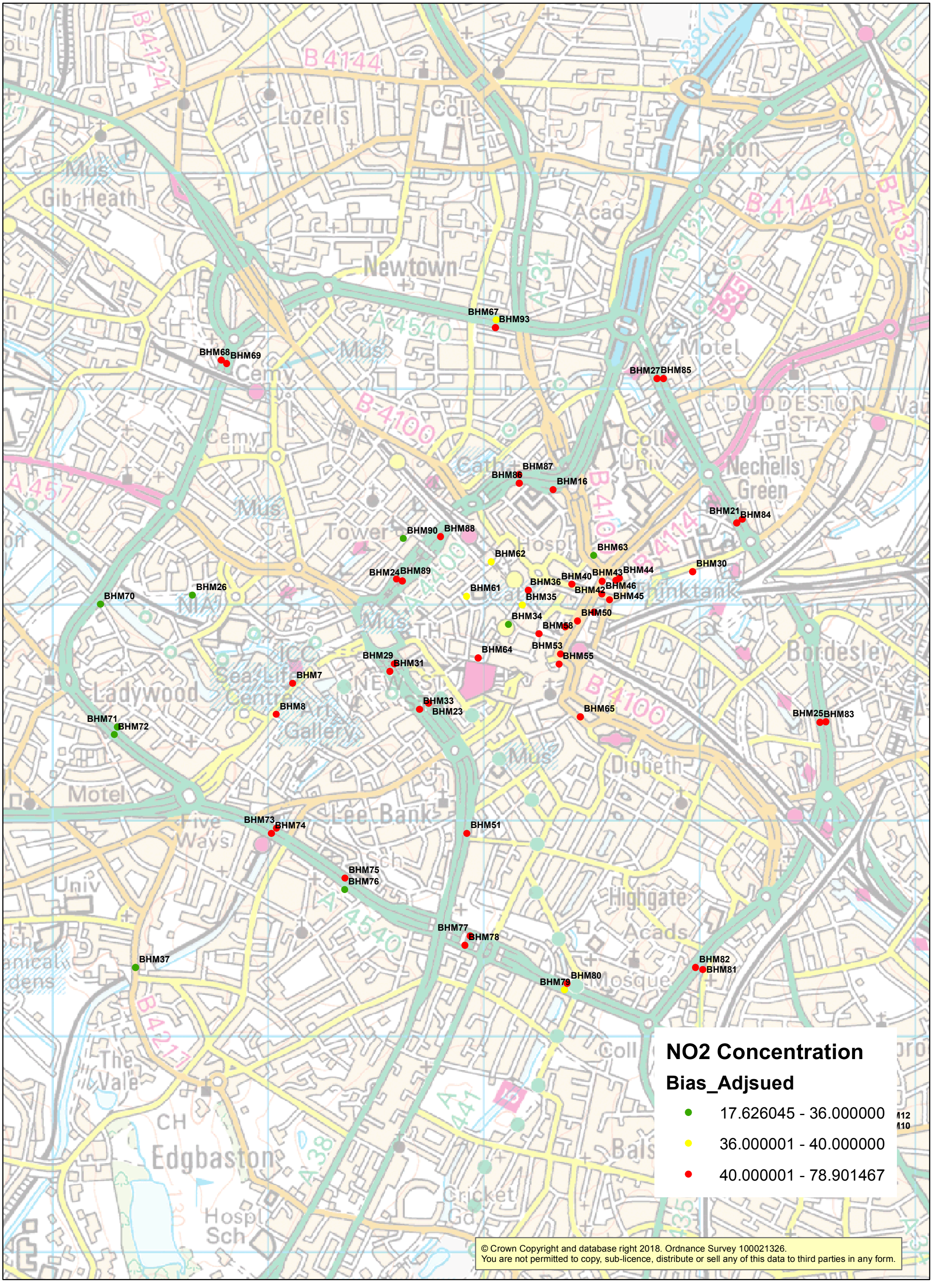
Location of Continuous Air Quality Monitoring Sites



Location of Diffusion Tube Monitoring Sites



Location of City Centre Diffusion Tube Monitoring Sites



Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective[2]	
	Concentration	Measured as
Nitrogen Dioxide (NO_2)	200 µg/m^3 not to be exceeded more than 18 times a year	1-hour mean
	40 µg/m^3	Annual mean
Particulate Matter (PM_{10})	50 µg/m^3, not to be exceeded more than 35 times a year	24-hour mean
	40 µg/m^3	Annual mean
Sulphur Dioxide (SO_2)	350 µg/m^3, not to be exceeded more than 24 times a year	1-hour mean
	125 µg/m^3, not to be exceeded more than 3 times a year	24-hour mean
	266 µg/m^3, not to be exceeded more than 35 times a year	15-minute mean

[2] 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	Air quality Annual Status Report
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England
EU	European Union
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
PM_{10}	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less
$PM_{2.5}$	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO_2	Sulphur Dioxide
CAZ	Clean Air Zone