Leicester City Council

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Bureau Veritas

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Leicester City Council

2022 Air Quality Annual Status Report (ASR)



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

Date: December 2022

Leicester City Council

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Executive Summary: Air Quality in Our Area

Air Quality in Leicester City Council

Air pollution is associated with a number of adverse health impacts. It is recognised as a contributing factor in the onset of heart disease and cancer. Additionally, air pollution particularly affects the most vulnerable in society: children, the elderly, and those with existing heart and lung conditions. There is also often a strong correlation with disparity 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].

Compared to 2020, in 2021 Leicester demonstrated an overall increase in NO_2 annual mean concentrations across the city. This is mainly due to the effects of government lockdowns due to COVID-19 significantly reducing air pollution levels during 2020 and associated reduction in traffic numbers Road traffic is understood to be the main source of pollution in the city, with passenger diesel vehicles contributing the most[5]. In 2021 it is understood that road traffic levels have increased by 12% when compared to 2020 and these are almost at pre-pandemic levels. This trend is easily identifiable when comparing 2019, 2020 and 2021 monitoring data. Between 2020 and 2021 there was on average a 7.7% increase in annual mean NO_2 concentrations at Leicester's automatic stations. This is most likely due to the 12% increase in road traffic levels compared to 2020 which are almost at pre-pandemic levels. When comparing 2021 data to 2019 (pre-pandemic) there is a 20% reduction in annual mean NO_2 concentrations. This is likely due to a combination

[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] Leicester City JAQU Local Plan, Air Quality Modelling Report (AQO) Undertaken by AECOM January 2021

of road traffic levels almost at pre-pandemic levels but also measures to improve air quality continually being implemented.

When analysing diffusion tube data, trends are slightly different. On average there is a 17% increase in annual mean NO_2 concentrations between 2020 and 2021, and a 9% decrease between 2019 and 2021. These are again due to an increase in road traffic numbers in 2021 compared to 2020 close to pre-pandemic levels and the implementation of various measures to improve air quality.

One monitoring location within Leicester City Council (LCC) exceeded the annual mean NO_2 Air Quality Objective (AQO). This was the automatic monitoring station labelled LC2 located on Glenhills Way, which monitored 42.1µg/m^3, however following distance correction monitored at 32.1µg/m^3. The diffusion tube LCC19 monitored 39.9µg/m^3 in 2021, however again following distance correction LCC19 monitored at 31.4µg/m^3.

No automatic monitoring locations exceeded the hourly NO_2 AQO in 2021. All diffusion tubes monitored concentrations below 60µg/m^3 and as such are unexpected to exceed the hourly NO_2 AQO based on TG16[6] guidance.

All PM_{10} concentrations continue to be below both the annual mean and 24-hour mean AQO.

Leicester is currently monitoring NO_2, PM_{10} and $PM_{2.5}$ concentrations across the city using low-cost sensors. These provide an additional indication of pollutant concentrations across the city, although these low-cost sensors are not equivalent to the Committee for Standardisation (CEN) Standard Method for PM analysers. Although these are not to the same standards, they do however provide a meaningful indication.

In 2021, Leicester consulted on an updated draft Transport Plan 4[7] and published a Climate Emergency Strategy[8]. Both documents provide added measures to help improve air quality across the city along with the current Air Quality Action Plan (AQAP).

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[6] https://laqm.defra.gov.uk/documents/LAQM-TG16-April-21-v1.pdf

[7]https://consultations.leicester.gov.uk/communications/ltp4/supporting_documents/Leicester%20Transport%20Plan.pdf

[8] https://www.leicester.gov.uk/media/kuuojdxw/leicester-climate-emergency-strategy-executive-summary-2020-2023.pdf

The current Leicester Air Quality Management Area (AQMA) was declared in 2000 for exceedances of the annual mean AQO for NO_2 The AQMA covers a large section of the city centre and along a number of radial roads and sections of the ring road[9]. In 2021, monitoring concentrations of NO_2 have increased when compared to 2020, however only one monitoring location exceeded the annual mean NO_2 objective (LC2) whereas in 2019 four monitoring sites exceeded the annual mean NO_2 objective. It is considered that the progression of the measures within the AQAP and further measures to be implemented following the adoption of the Climate Emergency Strategy and Leicester Local Transport Plan 4 will further improve NO_2, PM_{10} and $PM_{2.5}$ concentrations across the city. It is understood that Leicester City Council will review the monitoring strategy following 2022.

LCC are managing air quality across the city by working closely with both regional and local authorities, departments and partnerships that have an influence in improving air quality across the city. These include the transport department, bus, rail and power partnerships, Leicestershire County Council, Public Health Department, UK Health Security Agency and many more.

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[10] sets out the case for action, with goals to reduce exposure to harmful pollutants. The Road to Zero[11] 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.

Following the recently consulted upon draft Leicester Transport Plan, the published Leicester Climate Emergency Strategy, and the measures within the current AQAP

[9] https://uk-air.defra.gov.uk/aqma/details?aqma_ref=35

[10] Defra. Clean Air Strategy, 2019

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

Leicester has an array of measures to improve air quality. The key focus is concentrated on road traffic and uptake of more sustainable modes of transport.

Some of the key measures to improve air quality are:

- £100m+ Connecting Leicester public realm improvements including pedestrianisation and dedicated cycleways to encourage more walking and cycling.
- The Leicester Local Transport Plan 4 consultation concluded in Autumn 2021 and should be implemented in the coming years.
- 11 new electric buses were introduced in 2021 with further electric buses proposed in 2022.
- Roll out of UK's largest e-cycle only bikeshare scheme incorporating 500 cycles sponsored by Santander.
- Continuation of 20mph speed zones, with 75 schemes completed at the end of 2021 with the measures still ongoing.
- Near completion of the St Margaret's Bus Station which is planned to include new e-cycle hubs and is going to be a net zero building.
- 19 living roof bus shelters were installed with more proposed for 2022.

Image 1 – Pedestrianised Zones

Image 2 – New Electric Buses Introduced in 2021

Image 3 – Electric Bike Stations

Image 4 – Net Zero Improve St Margaret's Bus Station

Image 5 – Living Roof Bus Shelters

Monitoring within Leicester has helped understand pollutant concentrations, particularly of NO_2. Historically it was noted that Leicester would have required a Clean Air Zone (CAZ) to improve Air Quality Concentrations across the city. However, the Department for Environment, Food and Rural Affairs (Defra) have stated that due to the improvements in air quality across the city, a CAZ is no longer needed. This is mainly due to the wide range of measures implemented within the city in 2021 shown in Table 2.2 and other historic measures detailed in Appendix G.

Conclusions and Priorities

Overall air quality, particularly NO_2, PM_{10} and $PM_{2.5}$ annual mean concentrations, across Leicester has increased since 2020. However this is primarily because 2020 was affected by COVID-19 lockdowns with low overall road traffic levels. There has been an increase of 12% during 2021 with some months almost at 2019 (pre-pandemic) levels. One monitoring location exceeded the annual mean AQO for NO_2. Additionally there were no exceedances of the PM_{10} AQOs at any automatic station or low-cost sensors currently being used across the city. Overall monitoring concentrations for all pollutants has increased since 2020. However the trends, when comparing 2019, 2020 and 2021 data, show increases when compared to 2020, however concentrations of pollutants are still below pre-pandemic levels. This is also due to the continued implementation of measures to improve air quality.

LCC continues to implement a number of measures to improve air quality across the city with examples being the re-development of St Margret's Bus Station, implementation of the draft Leicester Transport Plan, an increase in sustainable travel infrastructure. The Climate Emergency Strategy will also provide additional measures to help improve air quality across the city.

Leicester is continuing to monitor through the current passive diffusion tubes at 43 monitoring locations in 2022.

Low-cost sensors have been deployed across the city to monitor NO_2, PM_{10} and $PM_{2.5}$ levels. Although not accredited to the same standards as the existing automatic monitoring within LCC, they provide a good indication of pollutant levels across the city and information on sources. In total 23 sensors were operational in 2021.

It is considered that as there are some monitoring locations within the council that are still exceeding the AQO for NO_2 and others that are above or within 10% of the AQO for NO_2

there are currently no plans to revoke the Leicester AQMA. There are no monitoring locations outside the AQMA which have exceeded the AQO for NO_2, PM_{10} and $PM_{2.5}$ and as such no changes to the AQMA boundary are required.

Local Engagement and How to get Involved

Our Councillors and Officers sit on many business-related boards and forums to discuss transport matters and give latest briefings. These include:

- The Leicester Business Improvement District
- Leicester & Leicestershire Local Enterprise Partnership
- GoTravel Solutions business forum on transport
- City Centre Business Group
- Chamber of Commerce

With regard to public engagement, air quality has a high public profile in Leicester with councillor ward meetings often having a slot in the agenda.

We work with many action groups such as Friends of the Earth, UK100, Healthier Air for Leicester Campaign and Extinction Rebellion. However, throughout 2021 we have seen a shift away from discussion on air quality, due to the improvements we have made through the Air Quality Action Plan and a stronger commitment to carbon savings.

The Council hosts a number of transport citizen groups such as Public Transport User Group and Bicycle User Group to help inform our future air quality and transport strategies.

We consult on all transport and air quality schemes giving citizens the chance to have their input.

The following websites provide information on various types of sustainable transport and also contain information about air quality:

Leicester‘s Air Quality Action Plan:

https://www.leicester.gov.uk/media/180653/air-quality-action-plan.pdf

Leicester City Public Health:

https://www.leicester.gov.uk/your-council/policies-plans-and-strategies/environment-and-waste/environmental-policy/

Planning sustainable travel journeys:

http://www.choosehowyoumove.co.uk/

Leicester Cycle City Action Plan:

https://www.leicester.gov.uk/media/179027/leicester-cycle-city-action-plan.pdf

Consultation Hub:

https://consultations.leicester.gov.uk/

Local Responsibilities and Commitment

This ASR was prepared by the Planning, Development & Transportation Department of Leicester City Council with the support and agreement of the following officers and departments:

Rob Howard – Public Health Leicester – Consultant – LCC

Joanne Russell – Housing – Head of Service – LCC

Matthew Mace – Group Manager – Transport Strategy – LCC

This ASR has been approved by:

Deputy City Mayor – Cllr Adam Clarke

Director of Planning Transport – Andrew L Smith

Director of Public Health. Leicester – Ivan Browne

If you have any comments on this ASR please send them to Jolanta Obszynska at:

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1 Local Air Quality Management

This report provides an overview of air quality in Leicester City Council 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 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 strategies employed by Leicester City Council to improve air quality and any progress that has been made.

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

2 Actions to Improve Air Quality

2.1 Air Quality Management Areas

AQMAs are declared when there is an exceedance or likely exceedance of an air quality objective. After declaration, the authority should prepare an 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 Leicester City Council can be found in Table 2.1. The table presents a description of the AQMA that is currently designated within Leicester City Council. Appendix D: Maps of Monitoring Locations and AQMAs provides a number of maps including the AQMA and also the air quality monitoring locations within Leicester. The air quality objectives pertinent to the current AQMA designation are as follows:

- NO_2 annual mean.

Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Date of Declaration	Pollutants and Air Quality Objectives	One Line Description	Is air quality in the AQMA influenced by roads controlled by National Highways?	Level of Exceedance: Declaration	Level of Exceedance: Current Year	Name and Date of AQAP Publication	Web Link to AQAP
AQMA Leicester City	Declared 2000 Amended 2007	NO_2, annual mean	Area encompassing large section of the City Centre and along a number of radial roads and sections of the ring road	NO	Glenhills Way 51.4 µg/m^3, St Matthews Way 52.1 µg/m^3	Glenhills Way 42 µg/m^3,	"Healthier Air for Leicester" Leicester's Air Quality Action Plan (2015-2026), 2015	http://www.leicester.gov.uk/media/180653/air-quality-action-plan.pdf

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

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

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

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

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

1. *The Council have provided a very detailed ASR that covers the ongoing hard work that is being completed in terms of measure implementation across the City to improve air quality conditions. The Council has also supplemented the ASR with the Air Quality Modelling report submitted for the Local Plan works.*
2. *The standard ASR template has been used, but Table B.1 should be checked for consistency across the other tables within the ASR; it was noted that there are some discrepancies with regards diffusion tube location coordinates. In addition, table formatting should be consistent throughout.*
3. *The methodology for driving a local bias factor and the QA/QC procedures for both automatic monitoring and passive monitoring have been included within the 2021 ASR. As a worst-case approach, as the majority of NO_2 diffusion tube monitoring locations are roadside, it may be more prudent to investigate the use a bias adjustment factor derived from only a roadside co-location study (Vaughan Way).*
4. *The maps provided within the ASR are clear with all monitoring sites labelled as referenced in the results tables. A map has been added to show the Zephyr locations and this is welcomed.*
5. *Annualisation has been completed for all diffusion tubes sites, as COVID-19 restrictions meant that these sites only achieved 50% data capture through the year. Distance correction should be completed for 361_CS as detailed within the LAQM.TG(16) guidance.*
6. *The extensive monitoring completed across the City in 2020 recorded very few exceedances of the annual mean NO_2 objective, therefore it is recommended that a review of the current AQMA designation be completed. It is acknowledged that the air quality modelling report for the local plan should assist with this, however it is unclear whether the Council intend to adjust the AQMA based upon the findings of the report.*
7. *Due to concentration increases at LCC46 and LCC49 in 2020 compared with 2019, it would be worthwhile investigating why these two sites did not follow the trend seen at all other sites of a reduction in concentration over this period. In addition, due to an elevated concentration recorded by the Zephyr monitor on Charles Street, it may be*

beneficial to install additional monitoring sites (e.g. diffusion tubes) in this area to check whether compliance is being achieved in this area."

Following a review of the appraisal for the 2021 ASR, Leicester City Council have ensured that:

1. All tables have been correctly formatted and diffusion tube locations and data checked.
2. A review of local bias adjustment factors using both colocation sites and just the one roadside colocation site have been undertaken.
3. Distance correction has been completed at all monitoring locations, including low-cost sensors.
4. Leicester City Council will continue to review the monitoring data following 2022 when the current passive monitoring network will be reviewed. Passive monitoring has only been undertaken in Leicester for the last two years, and due to the effects of COVID-19 on 2020 monitoring data more data is required to determine whether changes to the AQMA can occur.
5. Leicester City Council have reviewed all monitoring locations and provided justification for changes in concentration levels at certain monitoring locations and comparisons due to COVID-19 have been made. However, as mentioned previously, due to the effects of COVID-19 on 2020 monitoring data a review of the passive monitoring network is scheduled for the end of 2022.

Leicester City Council has taken forward a number of direct measures during the current reporting year of 2021 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2. 34 measures are included within Table 2.2, with the type of measure and the progress Leicester City Council have made during the reporting year of 2021 presented. Where there have been, or continue to be, barriers restricting the implementation of the measure, these are also presented within Table 2.2.

More detail on these measures can be found in their respective Action Plans including Leicester Air Quality Action Plan (2015 – 2026)[12], Leicester Transport Plan (2021 – 2036)[7] and Leicester Climate Emergency Strategy (2020 – 2023)[8]. Key completed or progressed measures are:

[12] https://www.leicester.gov.uk/media/180653/air-quality-action-plan.pdf

- £100m+ Connecting Leicester public realm improvements including pedestrianisation and dedicated cycleways to encourage more walking and cycling.
- Roll out of UK's largest e-cycle only bikeshare scheme incorporating 500 cycles sponsored by Santander.
- The Leicester Local Transport Plan 4 consultation concluded in Autumn 2021 and should be implemented in the coming years.
- Continuation of 20mph speed zones, with 75 schemes completed at the end of 2021 with the measures still ongoing.
- Near completion of the St Margaret's Bus Station a net zero building which is planned to include new cycle hubs.
- 11 new electric buses were introduced in 2021 with further electric buses proposed in 2022.
- 19 living roof bus shelters were installed with more proposed for 2022.

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

- Implementation of the Leicester Local Transport Plan 4 which will provide additional measures and schemes to reduce single occupancy vehicles and improve air quality.
- Workplace Parking Levy which plans to generate £450 million in the first 10 years to help deliver the measures in the Leicester Local Transport Plan 4.
- New Electric Vehicle strategy to be developed in 2022 to deliver up to 500 EV charging points.
- Personalised travel plans for households with the final report to be presented in 2022.

Leicester City Council's priorities for the coming year are to:

- Continue to develop ongoing and new measures to help improve air quality across the city, with a focus on sustainable modes of transport and reducing single occupancy vehicles.
- Implement the Leicester Local Transport Plan 4.
- Continue a co-ordinated approach led by the city council but supported by many key stakeholders including academia, other authorities, government departments, private companies and the general public to improve air quality in Leicester.

- Continue the Connecting Leicester programme and make our city more accessible to sustainable modes of transport such as walking and cycling.
- Learn from best practice and examples of schemes introduced successfully in other cities.

Image 6 – Planters Installed within Leicester Pedestrian Areas

Image 7 –Pedestrian Counter in Braunstone Park

Leicester City Council worked to implement these measures in partnership with the following stakeholders during 2021:

- Leicestershire County Council
- Leicester Car Club
- Developers
- Melton Borough Council
- Go Travel Solutions
- Joint Air Quality Unit
- Job Centre Plus and other employment agencies
- British Cycling
- Local Taxi and Bus operators

The principal challenges and barriers to implementation and slower than expected progress on measures for Leicester City Council are the post COVID-19 financial pressures on national and local government and the uncertainty generated by the COVID-19 pandemic in terms of transport recovery and new ways of working.

Whilst the measures stated above and in Table 2.2 will help to contribute towards compliance with the NO_2 annual mean AQO, LCC anticipates that further additional measures not yet prescribed will be required in subsequent years to achieve compliance and enable the revocation of the Leicester AQMA.

Within Appendix G are additional lists of measures, some of these measures are historic ongoing measures that LCC have previously implemented to help improve air quality, however, are not at the forefront of measures to improve NO_2. Additionally, within Appendix G are some of the measures that have been completed in previous ASR's. These provide a key indication of the types of measures that have been implemented and completed within LCC and our continued approach to improving Air Quality.

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	Local Transport Plan 4 (Leicester Transport Plan)	Policy Guidance and Development	Other policy	2022	2036	Leicester City Council	LCC and others to be identified	No	Partially Funded	<£1billion	Design	>25%	Approved plan	Consultation concluded autumn 2021	DfT are issuing new LTP guidance which needs to be met within the new plan.
2	Workplace Parking Levy	Demand management and funding initiative	Other policy	2023	>2036	Leicester City Council	LCC	No	Fully Funded	<£1 million	Design	>25%	Implemented scheme	Initial consultation completed autumn 2021. Full consultation launched in December 2021	Proposed scheme would generate £450m in first 10 years to deliver LTP4. Also demand management tool to deter car use.
3	AQAP- plan of measures between 2015-2026	Policy Guidance and Development	Low Emissions Strategy/Clean Air Zone	2015	2026	Leicester City Council	LCC funded	No	Partly Funded	>£100m	Ongoing	>20%	Implementation of the LES	AQAP adopted in 2015	Various schemes to be implemented to reduce pollution. The overall umbrella for many of the other measures in this table. Since 2015 NO_2 levels have dropped from 60ug/m^3 to under 40ug/m^3.
4	Leicester Direction for NO_2 Plan	Policy Guidance and Development	Low Emissions Strategy/ Clean Air Zone Feasibility Study	May 2018	2024	Leicester City Council	Joint Air Quality Unit	No	Fully Funded	>£3m	Ongoing	10%	Report delivered	OBC draft was delivered in October 2019 - interventions agreed and programmed for implementation between 2019 and 2023	A set of schemes to bring the NO_2 compliance in a shortest possible time, the impact of the schemes is assessed by using Traffic Model and Airviro Air Quality model
5	Connecting Leicester Public Realm Improvements	Transport Planning and Infrastructure	Public Realm	2011	Ongoing	Leicester City Council	LCC, TCF, Active Travel Fund, ERDF, Levelling Up	No	Partially Funded	>£100mill	Ongoing	> 1 %		Stand-alone routes not associated with a carriageway, 119.8km Cycle lanes located within the carriageway, either formed by road markings, signing or advisory routes 117km	On-going implementation subject to funding
6	Procurement of 110 ULEV vehicles to replace diesel vans	Promoting Low Emission Transport	Company Vehicle Procurement - Prioritising uptake of low emission vehicles	2015	2023	Leicester City Council	LCC funded	No	Partially Funded	>£1 million	Ongoing	< 0.1 %	35 vehicles already purchased	35 EV	Ongoing
7	500 EV charging points	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging	2015/2016	2020	Leicester City Council	OZEV , LCC, European Regional Development Fund	No	Partially Funded	>£1 million	Ongoing	< 0.1 %	KPI will be a % of the 500installed plugs	Implementation stage	50 charging points implemented, and £1.1 million funding secured so far. A new EV strategy is to be developed in 2022 setting a new set of KPI's and route map for delivering all EV Chargers.
8	TUSKER – ULEV salary sacrifice for city council employees	Promoting Low Emission Transport	Public Vehicle Procurement - Prioritising uptake of low emission vehicles	2016/2017	Ongoing	Leicester City Council	LCC	No	Partially Funded	<£1 million	Ongoing	< 0.1 %	60 vehicles and bikes purchased up to date	E-bikes delivered in 2021: 12 EV vehicles leased in 2021: 8	Salary sacrifice for employees for electric cars and for the e- bikes
9	Retrofitted buses	Public Transport		2015	Ongoing	Leicester City Council	Bus companies	No	Partially Funded	<£4,000,000	Ongoing	< 0.1 %	209 buses introduced in total	250 buses introduced	
10	20mph zones	Traffic Management	Reduction of speed limits, 20mph zones	1999	Ongoing	Leicester City Council	Transport Improvement Works Budget - LCC	No	Partially Funded	<£100,000.00	Ongoing	< 0.1 %	Continue to implement schemes where residents request them	75 schemes completed by end 2021	1385 streets and 292.7 km of highway

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
11	Local Plan	Policy Guidance and Development	Other policy	N/A	N/A	Leicester City Council	LCC funded	No	Fully Funded	N/A	Design	>1%	AQ imbedded in the plan	Final Draft ready	Pre-submission Leicester's Local Plan on Regulation 19 consultation Autumn 2022
12	Choose How You Move Sustainable Travel Website and Brand	Promoting Travel Alternatives	Intensive active travel campaign & infrastructure	2007	Ongoing	Leicester City Council and Leicestershire County Council	Access Fund	No	Partially funded	>£1million	Ongoing	<0.1%	250,816 -page views (Jan - Dec 2021)	95,905 new users to date., 18,493 returning users to date. 250,816 page views between Jan- Dec 2021. 180,000 itineraries for City and County users	
13	Car Clubs	Promoting Travel Alternatives	Car & lift sharing schemes	2015	Ongoing	Leicester City Council, Leicester Car Club, Developers	LCC funds, Car Club and Developers	No	Partial Funding	< £30k	Ongoing	<0.1%	Two Car Clubs	2 car clubs established although low numbers using them	Lack of access to electric charge points in some residential areas, currently being addressed by an electric vehicle charging point trial. Funding and value for money for the driver.
14	Choose How You Move - Journey Planner	Promoting Travel Alternatives	Web-based application	2012	Ongoing	Leicester City Council	Access Fund, JAQU	No	Partially Funded	<£100,000.00	Ongoing	< 0.1 %	Implement new Journey Planner	Ongoing	The Choose How You Move Journey Planner will be fully launched in March 2022 on web, iOS and Android. The work will include updates and refreshing of the site, along with continued and expanded promotion of the tool.
15	Personalised Travel Planning	Promoting Travel Alternatives	Personalised Travel Planning	2018	2022	Leicester City Council and Leicestershire County Council	ERDF	No	Partially Funded	<£100,000.00	Ongoing	< 0.1 %	To engage with household in Leicester	2600 households participated out of 10500. 23% reduction in single occupancy car journeys	Work completed in 2021 but final report presented in 2022
16	Wheels to work- fleet of electric bikes, which are available for loan by those who live and/or work in Leicester City and struggle to get to work, including apprentices and young people	Promoting Travel Alternatives	Personalised Travel Planning	2014	Ongoing	Leicester City Council	Capability Fund, E-Cycle Extension Fund	No	Partially Funded	<£100,000.00	Ongoing	< 0.1 %	40 e-bike users in Capability Fund during 2021/22 105 e-bike users in E- Cycle Extension Fund 2021/2	18 e-bike users in Capability Fund during 2021/22 124 e-bike users in E-Cycle Extension Fund 2021/2	In-house delivery since 2017. The scheme has grown to include Loan to Own and 4-week Loan To Business. E-Cycle Extension Funding has further grown the scheme with loans for schools' staff and hard to reach communities
17	Car share	Promoting Travel Alternatives	Personalised Travel Planning	2010	Ongoing	Leicester City Council, Melton Borough Council and Leicestershire County Council	Access Fund	No	Partially Funded	<£100,000.00	Ongoing	< 0.1 %	1000 new members per year		KPI has not been measured during the COVID Pandemic
18	Freight Quality Partnership	Freight and Delivery Management	Freight Partnerships for logistics improvements	2000	Ongoing	Leicester City Council	LTP/LCC funded	No	Funded	<£1k	Ongoing	< 0.1%	Leicester freight businesses engaged	Active forum, meetings	Comments were sought from the FQP on the Freight Study and possible design of the questionnaire. Comments received were used to help shape the design of the Freight Questionnaire. Raft of considerations for new freight plan and actions post covid to start in 2023.

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
19	Air Quality Forum	Policy Guidance and Development	Regional Groups Co- ordinating programmes to develop Area wide Strategies to reduce emissions and improve air quality	N/A	N/A	Leicester City Council and Leicestershire Councils	Local Authority Funded	No	N/A	N/A	Ongoing	< 0.1 %	Exchange of knowledge across the districts in the Leicestershire, development and adoption of best practices	Forum meetings	AQ Forum to discuss issues of pollution across Leicestershire attended by districts, county and city representatives
20	Business Travel Plans	Promoting Travel Alternatives	Intensive active travel campaign & infrastructure	2012	Ongoing	Leicester City Council, but delivered through Go Travel Solutions (Local Social enterprise specialised in business engagement) and also grants from JAQU	Access fund, JAQU	No	N/A	N/A	Ongoing	< 0.1 %	Engaged with 60 + businesses	Engaged 553 businesses	Single occupancy car has dropped in the last year by 3% points from 85% to 82%
21	Statutory planning related Travel Plans secured through statutory planning conditions.	Promoting reducing single occupancy vehicle usage and generating a greater take-up of travel alternatives as required by the NPPF.	Promoting a decrease in single occupancy vehicle usage and promoting behaviour change across organisations in the city, as per statutory planning requirements	2002	Ongoing	Leicester City Council, but delivered through Go Travel Solutions (Local Social enterprise specialised in business engagement)	LCC, local businesses and developers	No	N/A	N/A	Ongoing	< 0.1 %	More than 521 businesses organisations engaged in Travel Plans and associated monitoring	More than 521 large/medium businesses actively engaged	On average, single occupancy vehicle usage has fallen by 14.2% over 5-year period under the
22	Bike It Schools Programme	Promoting Travel Alternatives	Promotion of cycling	2010	2017	Leicester City Council and Job Centre Plus and another employment agency	Access Fund	No	Partially Funded	<£100,000.00	Ongoing	< 0.1 %	29,000 pupils reached with messages	worked with 99 schools, 29 of which was intensive	One school car travel has dropped from 46% to 26%.
23	Bike Parks	Promoting Travel Alternatives	Promotion of cycling	2010	Ongoing	Leicester City Council and British Cycling	Access Fund/ TCF	No	Partially Funded	< 100,000.00	Ongoing	< 0.1 %	Ongoing	Town hall Bike Park currently caters for approximately 120+ cycles per day (365 days per year). 20+ mobile bike parks were provided at festivals and events in 2021'.	'Preparations are underway to provide new cycle hubs at St Margaret's Bus Station, on Humberstone Gate, Jarrom Street and at Park & Ride sites.
24	Bike Share Cycle hire	Promoting Travel Alternatives	Promotion of cycling	2016	Ongoing	Leicester City Council	TCF, LCC, Bike Share operator - Ride On	No	Partially Funded	< £1 million	Ongoing	< 0.1%	44 stations for electric bikes deployed around Leicester	350 e-bikes currently in use	
25	Walking programme	Promoting Travel Alternatives	Promotion of walking	2015	Ongoing	Leicester City Council	Access Fund / Capability Fund	No	Partially Funded	< 100,000.00	Ongoing	< 0.1 %	9 x walk programmes and 47 x walk events	Number of new walkers this period = 132 13 - new self-guided routes (PDFs on website) 63 - Led Group Walks delivered	Delivering walks with a smaller pool of volunteer Walk Leaders (13).
26	Walk to school programme	Promoting Travel Alternatives	Promotion of walking	2011	Funding until March 2020	Leicester City Council	Capability Fund	No	Partially Funded	< 100,000.00	Ongoing	< 0.1 %	Engage with 50 plus schools in Leicester	Delivered to 31 schools In addition target to deliver a Park and Stride initiative to 15 schools. Seven schools had a Park and Stride up and running with a further 9 in the planning stage.	According to Ward Councillors, Park and Stride have been well received within the community

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
27	Sustainable Travel Challenge	Promoting Travel Alternatives	Other	2018	Ongoing	Leicester City Council and Leicestershire County Council	Access fund / JAQU	No	Partially Funded	<£100,000.00	Ongoing	< 0.1 %	4,485 registered users.	BetterPoints 2021-2022: 507,236 active and sustainable activities recorded, avoiding a total of 178,783 Kg of CO_2.	For the financial year 2021/22 we partnered with Leicestershire County Council to produce a workplace challenge called 'Let's Go Leicestershire' to incentivise behaviour change, rewarding participants for travelling sustainably. Targeting 100 workplaces.
28	Clean Air Day	Public Information	Other	2018	Ongoing	Leicester City Council	DfT's Capability Fund. Road closure costs are from the JAQU fund/Leicester City Council	No	Partially Funded	<£100,000.00	Ongoing	< 0.1 %	Annual occurrence	Three schools took part in Leicester in 2021	Number affected by COVID in 2021
29	Leicester City Council social media	Public Information	Via the Internet	2015 - AQAP	Ongoing	Leicester City Council	LCC	No	Partially Funded	<£100,000.00	Ongoing	< 0.1 %	Active	Messages sent as and when required	Promotion of air quality issues, events and support available from the Council via Twitter and Facebook
30	Legible Leicester Wayfinding	Public Information	Other	2015-AQAP	Ongoing	Leicester City Council	LCC	No	Partially Funded	<£100,000.00	Ongoing	< 0.1 %	88 monolith type of signs deployed around Leicester	Available daily, updated as and when	
31	Bus routes, cycle routes, bus timetables	Public Transport	Via leaflets	Annual	January 2018	Leicester City Council	LCC, Bus Operators, County Council	No	Partially Funded	<£100,000.00	Ongoing	< 0.1 %	Annual publication		Bus Map published and available to general public
32	Electric buses	Public Transport		2021	Ongoing	Leicester City Council	TCF	No	Partially Funded	<£4,000,000	Ongoing	< 0.1 %	11 electric buses introduced	11 electric buses introduced	Further electric buses to be introduced in 2022 via ZEBRA funding
33	Living roof bus shelters	Public Transport		2021	Ongoing	Leicester City Council	TCF	No	Partially Funded	<£4,000,000	Ongoing	< 0.1 %	19 living roof shelters implemented	19 living roof shelters implemented	Further Living Roof Shelters to be deployed in 2022
34	Traffic sensitive streets	Traffic Management	Other	1991	Ongoing	Leicester City Council	LTP/LCC	No	Partially Funded	< 100,000.00	Ongoing	< 0.1 %	Quarterly Network Management Scorecard reports	Regulation in place	Any work carried out on the city highways has to be agreed as not to impede the traffic i.e. avoidance of rush hour. Permit scheme in place.

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.

PM_{10} is currently monitored at six of the automatic stations within the city, but $PM_{2.5}$ concentrations are only monitored at the Automatic Urban and Rural Site (AURN); University of Leicester. Additionally, a network of low-cost 'Zephyr' sensors monitor $PM_{2.5}$ across the city. Using a ratio calculated from PM_{10} and $PM_{2.5}$ concentrations at the University of Leicester AURN site, concentrations of $PM_{2.5}$ have been estimated from PM_{10} measurements at the remaining five monitoring sites.

The methodology detailed within Box 7.7 of LAQM.TG(16) has been followed to calculate a locally derived $PM_{2.5}$ / PM_{10} ratio of 0.69. Applied to the 2021 PM_{10} annual mean concentrations at the five automatic stations, A594 AURN, LC1, LC2, LC3 and LC6. Following this calculation, all automatic stations were below the annual mean AQO for $PM_{2.5}$.

Current Defra 2021 background maps (based on 2018 monitored concentrations) for Leicester City Council (2018 based) show that all background concentrations of $PM_{2.5}$ are far below the annual mean $PM_{2.5}$ stage II limit value of 20µg/m^3. The highest concentration is predicted to be 10.5µg/m^3 within the 1 x 1km grid square with the centroid grid reference of 460500, 305500. This is an area to the northeast of the city centre that contains commercial and industrial developments as well as a rail line. It is important to note that these estimations do not take into consideration any impacts as a result of the COVID-19 pandemic.

The Public Health Outcomes Framework data tool compiled by Public Health England quantifies the mortality burden of $PM_{2.5}$ within England on a county and local authority scale. The 2020 fraction of mortality attributable to $PM_{2.5}$ pollution across England is 5.6%, and in contrast the fraction within Leicester City Council is below the national average at 5.3%. The regional average for the East Midlands is below Leicester City Council at 5.2%. The 2020 data has been used as it is currently the latest available.

In conjunction with the current AQAP, Leicester City Council is taking the following measures and projects to address $PM_{2.5}$:

- A Smoke Control Area was declared for the whole of Leicester City on the 1st of June 2018.
- Secured an Air Quality Grant 2018/19 to study and model locally based fine particulate pollution ($PM_{2.5}$). An air quality grant has been awarded to monitor small particulates using portable air quality monitors – Zephyrs, to form a network of originally 10 units however this has now increased to 23 units deployed across the city. This is to help map and monitor PM_{10} and PM $_{2.5}$ using near real time data and make the public more aware of $PM_{2.5}$ by using smart device applications and leaflets and how it affects our city and our health.
- Applied 2019/20 Air Quality Grant for identifying transboundary sources of $PM_{2.5}$ in Leicester using state of the art modelling and satellite data.
- Applied and awarded 2020/21 Air Quality Grant to determine how much a traffic intervention will reduce pollution levels both for $PM_{2.5}$ and NO_2. It will address the issue of discrepancy between near real time modelling and in situ monitoring. It will allow to identify what works in order to create a model with the effect of reducing air pollution that can be applied elsewhere in the city.

Actions:

- Building on lessons from the COVID-19 pandemic including the promotion and facilitation of homeworking, cutting out the need for transport.
- To continue to bring electric vehicles and bikes into the city council's vehicle fleet.
- To continue the Connecting Leicester programme and make our city more accessible to sustainable modes of transport such as walking and cycling.
- To continue to deliver our programme of walking and cycling initiatives, including the Ride Leicester Festival, led rides, led walks, "Wheels to Work" scheme, and cycle training for children and adults.
- To learn from best practice and examples of schemes introduced successfully in other cities.
- To continue running Anti-Idling campaigns.
- To keep introducing bus priority schemes such as bus gate cameras.

- To continue to improve the city's traffic management system and address "pinch points" on the highway network.
- To continue to deliver our programme of introducing 20mph zones in residential areas and particularly around schools.

Collaborations:

- Working closely with Defra as part of Local Authorities advisory group.
- To continue to lobby and work with Government to introduce national measures to reduce polluting emissions from diesel vehicles, this includes work with UK100 and Local Government Association (LGA).
- To work with other local authorities and agencies, work closely with neighbouring boroughs of Blaby on transboundary sources of $PM_{2.5}$ through Defra Air Quality Grant project, Oadby& Wigston through Defra Air Quality Grant Project on monitoring of $PM_{2.5}$ with portable analysers, and other Leicestershire boroughs through Leicester and Leicestershire Air Quality Forum.
- To work with the Office for Zero Emission Vehicles (OZEV) to help introduce low emission taxis to Leicester.
- To form an effective partnership with bus operators – exploiting the full potential of the Bus Services Act 2017 to improve the quality and accessibility of bus services, promote modal shift and reduce harmful transport emissions.
- Smart cities – we will work with partners including universities to realise the full potential of smart systems and smart data within the planning and transport arena, delivering service improvements, efficiencies, and air quality benefits as a result.

Monitoring:

- To continue developing the monitoring network, enhancing it with additional pollution monitors such as diffusion tubes and portable air quality monitors.
- To ensure air quality considerations are embedded in Leicester's new Local Plan which is to be adopted in 2023.

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

This section sets out the monitoring undertaken within 2021 by Leicester 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 to allow monitoring trends to be identified and discussed.

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

Leicester City Council undertook automatic (continuous) monitoring at five sites as well as monitoring at two AURN sites during 2021. Table A.1 in *Appendix A* shows the details of the automatic monitoring sites. NB. Local authorities do not have to report annually on the following pollutants: 1,3 butadiene, benzene, carbon monoxide and lead, unless local circumstances indicate there is a problem. The Leicester City Council Air Quality Webpage presents the annual mean and hourly mean for NO_2 at the five automatic sites as well as PM_{10} annual and 24-hour mean for four of the automatic sites operated by LCC. The UK-Air webpage presents automatic monitoring results for the two AURN sites in Leicester City Council.

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.

Leicester City Council also currently undertake continuous monitoring across the city for NO_2, PM_{10} and $PM_{2.5}$ using low-cost Zephyr sensors. Monitoring results and figures for these sensors are presented in Appendix F.

3.1.2 Non-Automatic Monitoring Sites

Leicester City Council undertook non-automatic (i.e. passive) monitoring of NO_2 at 43 sites during 2021. 2021 was the third year of results following the installation of the diffusion tube network in 2019. Table A.2 in Appendix A presents the details of the non-automatic sites.

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

3.2 Individual Pollutants

The air quality monitoring results presented in this section are, where relevant, adjusted for bias, annualisation (where the annual mean data capture is below 75% and greater than 25%), and distance correction. Further details on adjustments are provided in Appendix C.

3.2.1 Nitrogen Dioxide (NO_2)

It should be noted that the diffusion tube survey and processing of diffusion tube monitoring data has been undertaken by a consultant and the report provided is included within Appendix H.

Table A.3 and Table A.4 in Appendix A compare the ratified and adjusted monitored NO_2 annual mean concentrations for the past five years with the air quality objective of 40µg/m^3. Note that the concentration data presented represents the concentration at the location of the monitoring site, following the application of bias adjustment and annualisation, as required (i.e. the values are exclusive of any consideration to fall-off with distance adjustment).

For diffusion tubes, the full 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.

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.

The passive monitoring network across Leicester recorded no exceedances of the annual mean AQO for NO_2 after diffusion tube data was annualised and time weighted averages were calculated. The maximum concentration within 2021 was recorded at site LCC19 located on Upperton Road, 39.9µg/m^3. This site did not exceed the AQO in 2020, however was close the AQO objective in 2019 (39.6µg/m^3). LCC19 is located within the Leicester AQMA. The monitoring location is located on a busy single carriageway road with

junctions on either side, 30m to the east and 100m to the west. It should be noted that following distance correction the NO_2 annual mean concentration predicted at the nearest receptor was 31.4µg/m^3.

There was one exceedance of the annual mean NO_2 objective at one of the seven automatic stations, LC2 on Glenhills Way (42.1µg/m^3), located within the Leicester AQMA. This site did not exceed the annual mean AQO in 2020, however monitored at 38.8µg/m^3 (within 10% of the AQO) but did exceed the AQO in 2019 and has exceeded the annual mean AQO for the five years prior to 2020. This site is located on the junction of Glenhills Way and Lutterworth road, which received around 40,000 and 15,000 Annual Average Daily Traffic (AADT)[13] flows.

One site, LC6 on Vaughan Way, monitored annual mean NO_2 concentrations of 37µg/m^3. This is within 10% of the annual mean objective. No further distance correction is required as the monitoring station is located at relevant exposure. It should be noted that LC6 did not exceed the AQO in 2020, however has previously consistently exceeded the AQO.

None of the automatic stations exceeded the hourly AQO of 200µg/m^3, not to be exceeded more than 18 times per year during 2021.

One Zephyr monitoring location, Z361 located at Haymarket Bus Station within the AQMA, exceeded the annual mean AQO for NO_2. This site also exceeded the AQO in 2020. The site is located adjacent to where buses would park, and potentially idle. Additionally, the section where the sensor is located on Charles Street is subject to a high number of buses. No Zephyr monitors exceeded the hourly air quality AQO during 2021. Full details of the Zephyr monitoring data are presented in Appendix F.

Across the city, the trend in NO_2 concentrations between 2019 and 2021 on average have fluctuated due to the effects of COVID-19 and associated local and national lockdowns. Between 2020 and 2021 on average at automatic stations there was a 7.7% increase in annual mean NO_2 concentrations. This is likely due to the 12% increase in road traffic levels compared to 2020 which is almost at pre-pandemic levels. When comparing 2021 data to 2019 (pre-pandemic) there is a 20% reduction in annual mean NO_2 concentrations. This is likely due to a combination of road traffic levels almost at pre-pandemic levels but also measures to improve air quality continually being implemented.

[13] https://roadtraffic.dft.gov.uk/#16/52.5944/-1.1601/basemap-countpoints

When looking at the diffusion tube data, trends are slightly different, where there is, on average, a 17% increase in annual mean NO_2 concentrations between 2021 and 2020 and a 9% decrease between 2019 and 2021. These are again due to the increase in road traffic numbers in 2021 compared to 2020 close to pre-pandemic levels and the implementation of various measures to improve air quality.

3.2.2 Particulate Matter (PM_{10})

Table A.6 in Appendix A 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} is currently monitored at six out of the seven automatic monitoring stations within the city, and at all but one Zephyr monitoring locations. Full details of Zephyr monitoring data are presented in Appendix F.

None of the automatic monitoring locations exceeded either the annual mean or 24-hour mean AQOs for PM_{10}. This follows the trends seen in previous years and it should be noted that the AQMA in Leicester has not been declared for exceedances of the AQO for PM_{10}. LCC will continue to monitor PM_{10} concentrations across the city.

3.2.3 Particulate Matter ($PM_{2.5}$)

Table A.8 in Appendix A presents the ratified and adjusted monitored $PM_{2.5}$ annual mean concentrations for the past five years.

$PM_{2.5}$ is currently monitored across Leicester through the low-cost Zephyr sensors but is also monitored at the University of Leicester AURN site. Although the Zephyr sensors are not rated as equivalent, the results do provide an indication of $PM_{2.5}$ concentrations across the city.

Overall monitoring through the AURN and Zephyrs did not indicate any exceedances of the 20µg/m^3 stage II annual mean limit value for $PM_{2.5}$. Full details of the Zephyr monitoring data are presented in Appendix F.

$PM_{2.5}$ results have also been estimated at those automatic sites that only monitor PM_{10} and not $PM_{2.5}$. This has been completed in accordance with guidance provided within TG16[6].

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)
AURN University Road	University Road	Urban background	459178	302808	NO_2, PM_{10}, $PM_{2.5}$, O_3	NO	Chemiluminescent, FIDAS,	N/A	30	4.00
AURN A594	AURN A594 St Matthews way	Roadside	459361	304908	NO_2, PM_{10}	YES	Chemiluminescent, BAM	0	3	2.25
AL (LC1)	Abbey Lane	Roadside	458574	306885	NO_2, PM_{10}	YES	Chemiluminescent, BAM	0	7	2.00
GW (LC2)	Glenhills Way	Roadside	457083	300156	NO_2, PM_{10}	YES	Chemiluminescent, BAM	14	3	2.00
MR (LC3)	Melton Road	Roadside	459528	306316	NO_2, PM_{10}	YES	Chemiluminescent, BAM	0	3	2.00
SM (LC4)	St Matthews Way	Roadside	459221	305036	NO_2	YES	Chemiluminescent	10	2	2.00
VW (LC6)	Vaughan Way	Roadside	458507	304904	NO_2, PM_{10}	YES	Chemiluminescent, BAM	0	3	2.00

Notes:

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

(2) N/A if not applicable.

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

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
LCC1	Lamppost on A563 Krefeld Way	Roadside	456672	307669	NO_2	NO	2	3	NO	2
LCC2	Lamppost on A563 Asquith Way	Roadside	459165	300271	NO_2	YES	0	3	NO	2
LCC3	Lamppost on A563 Red Hill Way	Roadside	458260	307900	NO_2	NO	0	3	NO	2
LCC4	Lamppost on A50 Groby Road	Roadside	457244	305572	NO_2	NO	0	3	NO	2
LCC5	Lamppost on A50 Groby Road	Roadside	455578	306395	NO_2	NO	0	3	NO	2
LCC6	Lamppost on A5630 Anstey Lane	Roadside	455825	307676	NO_2	NO	0	3	NO	2
LCC7	Lamppost on A563 New Parks Way	Roadside	455647	305825	NO_2	YES	0	3	NO	2
LCC8	Lamppost on Glenfield Road	Roadside	455917	304892	NO_2	YES	0	3	NO	2
LCC9	Lamppost on A563 New Parks Way	Roadside	455082	304761	NO_2	YES	0	3	NO	2
LCC11	Lamppost on A47 Hinckley Road	Roadside	456230	304273	NO_2	YES	0	3	NO	2
LCC12	Lamppost on A426 Aylestone Road	Roadside	457474	301061	NO_2	YES	0	3	NO	2
LCC14	Lamppost on Stretton Road	Roadside	457210	304276	NO_2	YES	0	3	NO	2
LCC16	Lamppost on A563 Palmerston Way	Roadside	461014	301043	NO_2	YES	0	3	NO	2
LCC17	Lamppost on Braunstone Lane	Roadside	456380	302193	NO_2	YES	0	3	NO	2
LCC18	Lamppost on A5460 Narborough Road	Roadside	456754	302259	NO_2	YES	0	3	NO	2
LCC19	Lamppost on Upperton Road.	Roadside	457667	303460	NO_2	YES	4.50	0.5	NO	2

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) [1]	Distance to kerb of nearest road (m) [2]	Tube Co-located with a Continuous Analyser?	Tube Height (m)
LCC20	Lamppost on A594 Waterloo Way	Roadside	459196	303882	NO_2	YES	0	3	NO	2
LCC21	Lamppost on A594 St Georges Way	Roadside	459431	304564	NO_2	YES	0	3	NO	2
LCC22	Lamppost on A563 Glenhills Way	Roadside	457869	300085	NO_2	YES	0	3	NO	2
LCC23	Lamppost on A5199 Welford Road	Roadside	459367	302117	NO_2	YES	0	3	NO	2
LCC24	Lamppost on B5366 Saffron Lane	Roadside	458542	302023	NO_2	YES	0	3	NO	2
LCC25	Lamppost on A5199 Welford Road	Roadside	459703	301072	NO_2	YES	0	3	NO	2
LCC26	Lamppost on A6 London Road	Roadside	461307	301478	NO_2	YES	0	3	NO	2
LCC27	Lamppost on A6 London Road	Roadside	460134	303093	NO_2	YES	0	3	NO	2
LCC28	Lamppost on A47 Uppingham Road	Roadside	463282	304552	NO_2	YES	0	3	NO	2
LCC29	Lamppost on A563 Colchester Road	Roadside	462891	305329	NO_2	YES	0	3	NO	2
LCC30	Lamppost on A47 Uppingham Road	Roadside	461806	305323	NO_2	YES	0	3	NO	2
LCC31	Lamppost on A6030 Coleman Road	Roadside	461596	304989	NO_2	NO	0	3	NO	2
LCC32	Lamppost on Forest Road	Roadside	460441	305322	NO_2	YES	0	3	NO	2
LCC33	Telegraph pole on A6 Abbey Lane	Roadside	458749	307184	NO_2	YES	0	3	NO	2
LCC34	Lamppost on A607 Melton Road	Roadside	460010	307324	NO_2	YES	0	3	NO	2
LCC35	Lamppost on A50 Frog Island	Roadside	458099	305184	NO_2	YES	0	3	NO	2

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
LCC37	Lamppost on St Nicholas Circle	Roadside	458182	304400	NO_2	YES	0	3	NO	2
LCC38	Lamppost on A6030 Victoria Road East	Roadside	461558	306508	NO_2	YES	0	3	NO	2
LCC40	Lamppost on A607 Melton Road	Roadside	460460	308234	NO_2	NO	0	3	NO	2
LCC41	Lamppost on A563 Troon Way	Roadside	460865	307949	NO_2	NO	0	3	NO	2
LCC43	Lamppost on Loughborough Road	Roadside	459304	307385	NO_2	YES	0	3	NO	2
LCC44abc	Co-location triplicate at Leicester University AURN, University Road	Urban Background	459185	302812	NO_2	NO	0	100	YES	2
LCC45	Lamppost on Leicester Road	Roadside	457596	310078	NO_2	YES	0	3	NO	2
LCC46	Lamppost on Scraptoft Lane	Roadside	464058	305532	NO_2	NO	0	3	NO	2
LCC47abc	Co-location triplicate Vaughan Way Automatic Monitoring Station	Roadside	458507	304904	NO_2	YES	0	3	YES	2
LCC49	Lamppost on Hogarth Road	Roadside	457472	310229	NO_2	YES	0	3	NO	2
LCC50	Lamppost on B5327 Anstey Lane	Roadside	456269	307062	NO_2	NO	0	3	NO	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.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
AURN University of Leicester	459178	302808	Urban Background	87	87	26.0	23.2	24.0	19.0	20.3
AURN A594	459361	304908	Roadside	94	94	**41.0**	36.0	38.0	28.0	29.0
AL (LC1)	458574	306885	Roadside	98	98	33.0	31.0	31.0	24.0	26.6
GW (LC2)	457083	300156	Roadside	98	98	**53.0**	**49.0**	**48.6**	38.8	**42.1**
MR (LC3)	459528	306316	Roadside	99	99	39.7	38.7	38.5	28.0	31.4
SM (LC4)	459221	305036	Roadside	98	98	**43.0**	**41.0**	**40.6**	31.0	34.9
VW (LC6)	458507	304904	Roadside	99	99	**53.0**	**45.0**	**45.7**	35.0	36.8

☒ **Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG16**

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

Notes:

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

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

All means have been "annualised" as per LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

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

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

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

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

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
LCC1	456672	307669	Roadside	82	82	-	-	32.6	23.3	29.9
LCC2	459165	300271	Roadside	100	100	-	-	24.9	20.3	24.4
LCC3	458260	307900	Roadside	91	91	-	-	34.1	25.0	31.7
LCC4	457244	305572	Roadside	55	55	-	-	32.2	N/A	32.2
LCC5	455578	306395	Roadside	100	100	-	-	36.0	25.4	35.2
LCC6	455825	307676	Roadside	100	100	-	-	35.3	24.6	33.5
LCC7	455647	305825	Roadside	100	100	-	-	31.5	24.7	28.0
LCC8	455917	304892	Roadside	82	82	-	-	21.6	17.7	17.8
LCC9	455082	304761	Roadside	91	91	-	-	30.1	21.4	24.3
LCC11	456230	304273	Roadside	100	100	-	-	28.2	21.0	26.6
LCC12	457474	301061	Roadside	91	91	-	-	28.9	19.8	24.7
LCC14	457210	304276	Roadside	100	100	-	-	23.6	17.3	21.9
LCC16	461014	301043	Roadside	100	100	-	-	32.0	22.3	34.7
LCC17	456380	302193	Roadside	100	100	-	-	25.6	20.1	24.4
LCC18	456754	302259	Roadside	91	91	-	-	31.4	22.1	27.6
LCC19	457667	303460	Roadside	73	73	-	-	39.6	30.8	39.9
LCC20	459196	303882	Roadside	100	100	-	-	27.1	21.8	24.1
LCC21	459431	304564	Roadside	55	55	-	-	30.3	24.7	27.1
LCC22	457869	300085	Roadside	100	100	-	-	27.8	21.8	27.9
LCC23	459367	302117	Roadside	100	100	-	-	35.6	28.5	32.4
LCC24	458542	302023	Roadside	100	100	-	-	25.3	21.5	25.0
LCC25	459703	301072	Roadside	100	100	-	-	21.9	16.9	20.6
LCC26	461307	301478	Roadside	100	100	-	-	27.5	20.5	25.7
LCC27	460134	303093	Roadside	100	100	-	-	34.1	25.6	31.8
LCC28	463282	304552	Roadside	100	100	-	-	19.6	15.8	18.8
LCC29	462891	305329	Roadside	100	100	-	-	24.7	21.1	22.7
LCC30	461806	305323	Roadside	55	55	-	-	35.2	27.1	35.2
LCC31	461596	304989	Roadside	91	91	-	-	27.6	21.3	25.8
LCC32	460441	305322	Roadside	100	100	-	-	35.0	28.5	33.4
LCC33	458749	307184	Roadside	45	45	-	-	32.5	25.5	27.5
LCC34	460010	307324	Roadside	100	100	-	-	25.6	18.5	23.3
LCC35	458099	305184	Roadside	82	82	-	-	33.7	25.1	27.2
LCC37	458182	304400	Roadside	100	100	-	-	38.0	25.0	31.9
LCC38	461558	306508	Roadside	91	91	-	-	24.6	15.0	21.9
LCC40	460460	308234	Roadside	100	100	-	-	30.8	23.5	27.9

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
LCC41	460865	307949	Roadside	91	91	-	-	31.2	24.4	27.8
LCC43	459304	307385	Roadside	100	100	-	-	30.5	18.6	28.8
LCC44abc	459185	302812	Urban Background	26	33	-	-	22.7	15.4	20.9
LCC45	457596	310078	Roadside	97	97	-	-	17.7	15.8	14.8
LCC46	464058	305532	Roadside	100	100	-	-	19.0	15.4	17.7
LCC47abc	458507	304904	Roadside	100	100	-	-	**42.8**	33.1	36.8
LCC49	457472	310229	Roadside	100	100	-	-	18.0	13.6	14.6
LCC50	456269	307062	Roadside	64	64	-	-	22.4	17.4	21.0

☒ **Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG16**

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

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

Notes:

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

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

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

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

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

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

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

Figure A.1 – Trends in Annual Mean NO_2 Concentrations Automatic Stations within AQMA

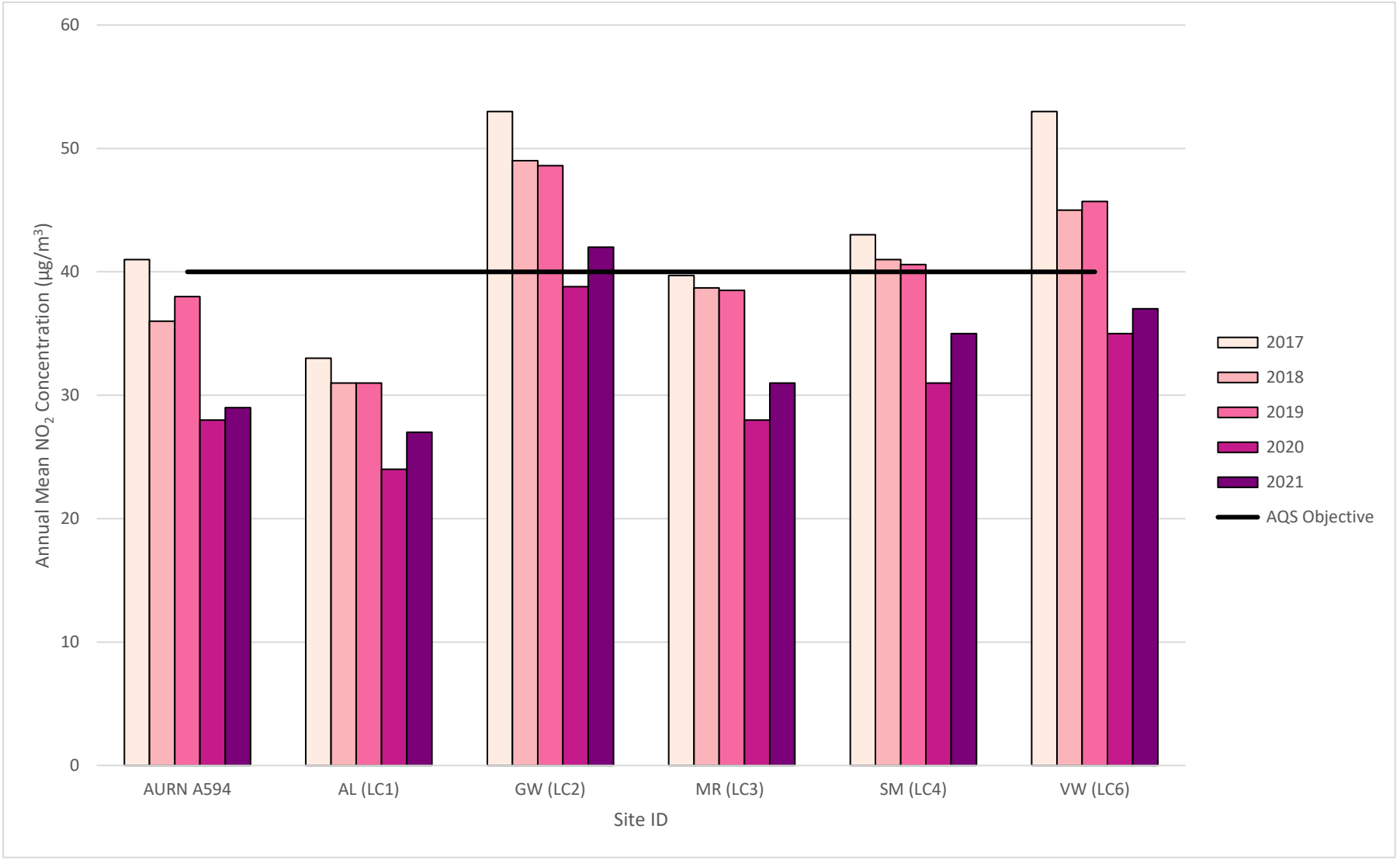


Figure A.2 – Trends in Annual Mean NO_2 Concentrations Diffusion Tube Sites within AQMA

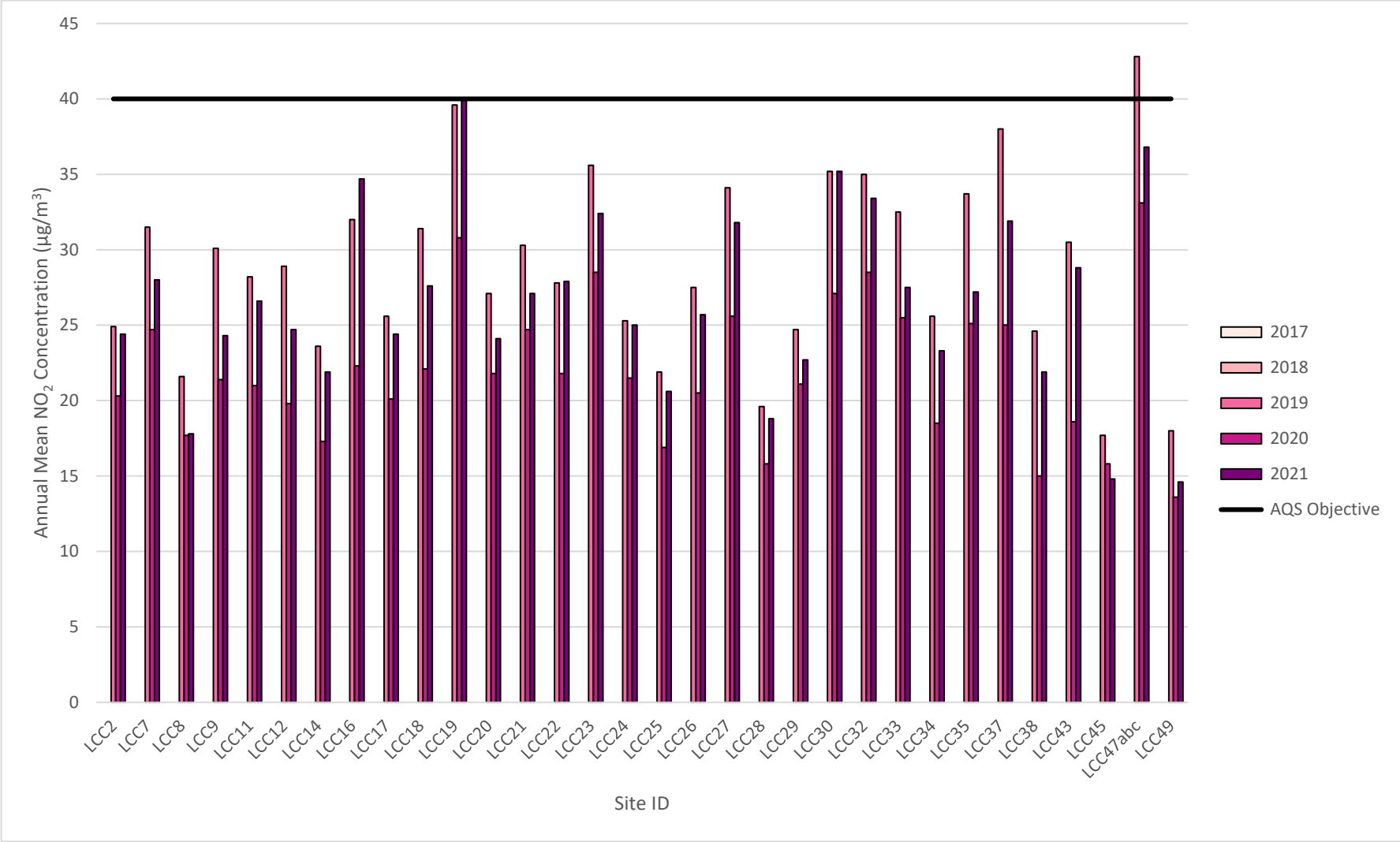


Figure A.3 – Trends in Annual Mean NO_2 Concentrations Outside of AQMA

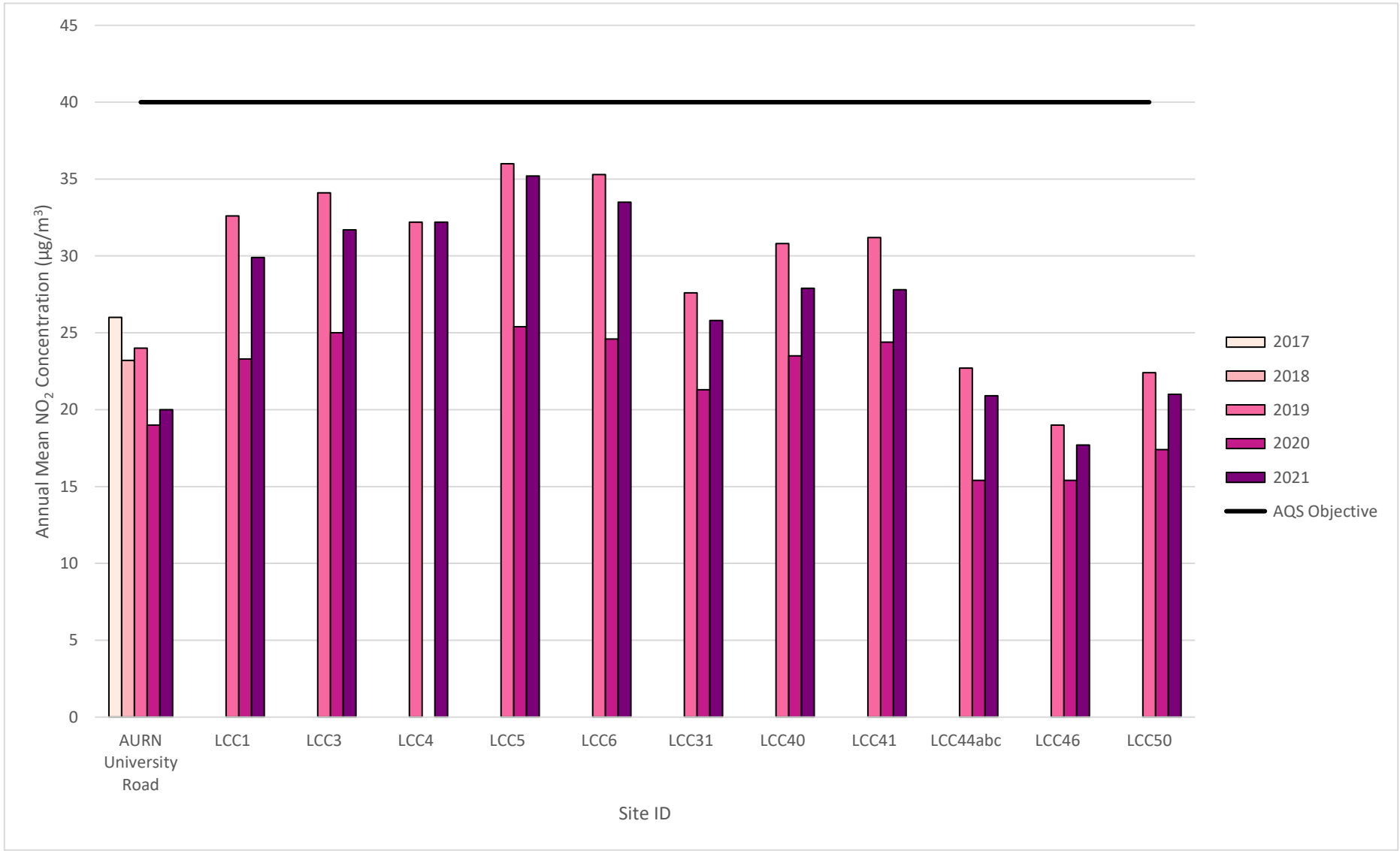


Table A.5 – 1-Hour Mean NO_2 Monitoring Results, Number of 1-Hour Means > 200µg/m^3

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
AURN University of Leicester	459178	302808	Urban Background	87	87	0	0	0	0	0
AURN A594	459361	304908	Roadside	94	94	0	0	0	0	0
AL (LC1)	458574	306885	Roadside	98	98	0	0	0	0	0
GW (LC2)	457083	300156	Roadside	98	98	1	0	0	0	0
MR (LC3)	459528	306316	Roadside	99	99	0	0	0	0	0
SM (LC4)	459221	305036	Roadside	98	98	0	0	0	0	0
VW (LC6)	458507	304904	Roadside	99	99	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 (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
AURN University of Leicester	459178	302808	Urban Background	99	99	-	-	-	13.0	12.2
AURN A594	459361	304908	Roadside	95	95	21.0	23.0	23.0	17.0	18.1
AL (LC1)	458574	306885	Roadside	99	99	20.0	19.0	18.0	19.0	18.8
GW (LC2)	457083	300156	Roadside	99	99	20.0	22.0	22.0	18.0	17.3
MR (LC3)	459528	306316	Roadside	99	99	19.0	21.0	21.0	16.0	13.8
VW (LC6)	458507	304904	Roadside	99	99	20.0	20.0	20.0	20.0	18.9

☒ **Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG16**

Notes:

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

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

All means have been "annualised" as per LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

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

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

Figure A.4 – Trends in Annual Mean PM_{10} Concentrations

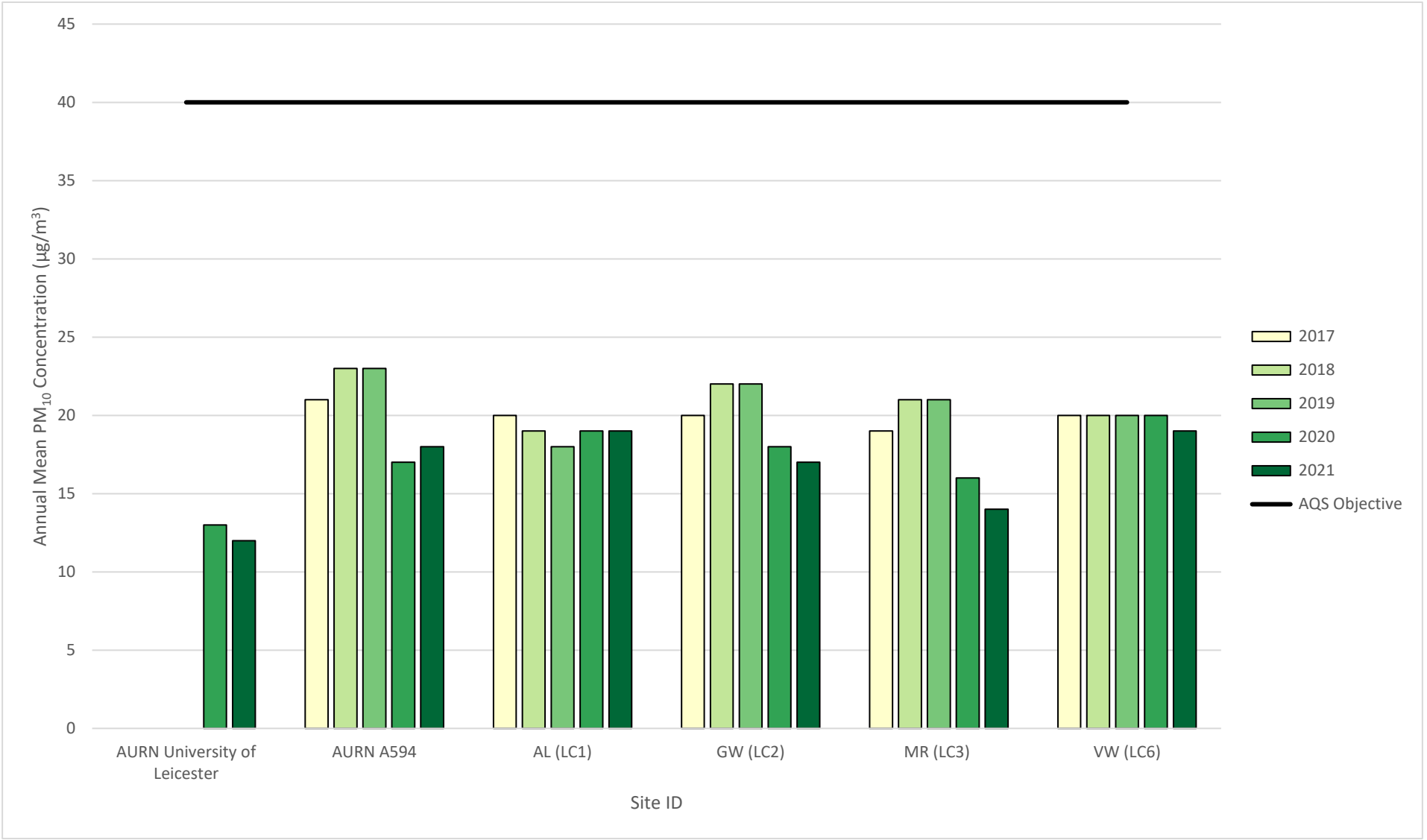


Table A.7 – 24-Hour Mean PM_{10} Monitoring Results, Number of PM_{10} 24-Hour Means > 50µg/m^3

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
AURN University of Leicester	459178	302808	Urban Background	99	99	-	-	-	0	0
AURN A594	459361	304908	Roadside	95	95	6	4	15	3	5
AL (LC1)	458574	306885	Roadside	99	99	2	10	5	0	0
GW (LC2)	457083	300156	Roadside	99	99	1	8	11	2	1
MR (LC3)	459528	306316	Roadside	99	99	5	8	10	0	2
VW (LC6)	458507	304904	Roadside	99	99	2	9	8	2	1

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%).

Figure A.5 – Trends in Number of 24-Hour Mean PM_{10} Results > 50µg/m^3

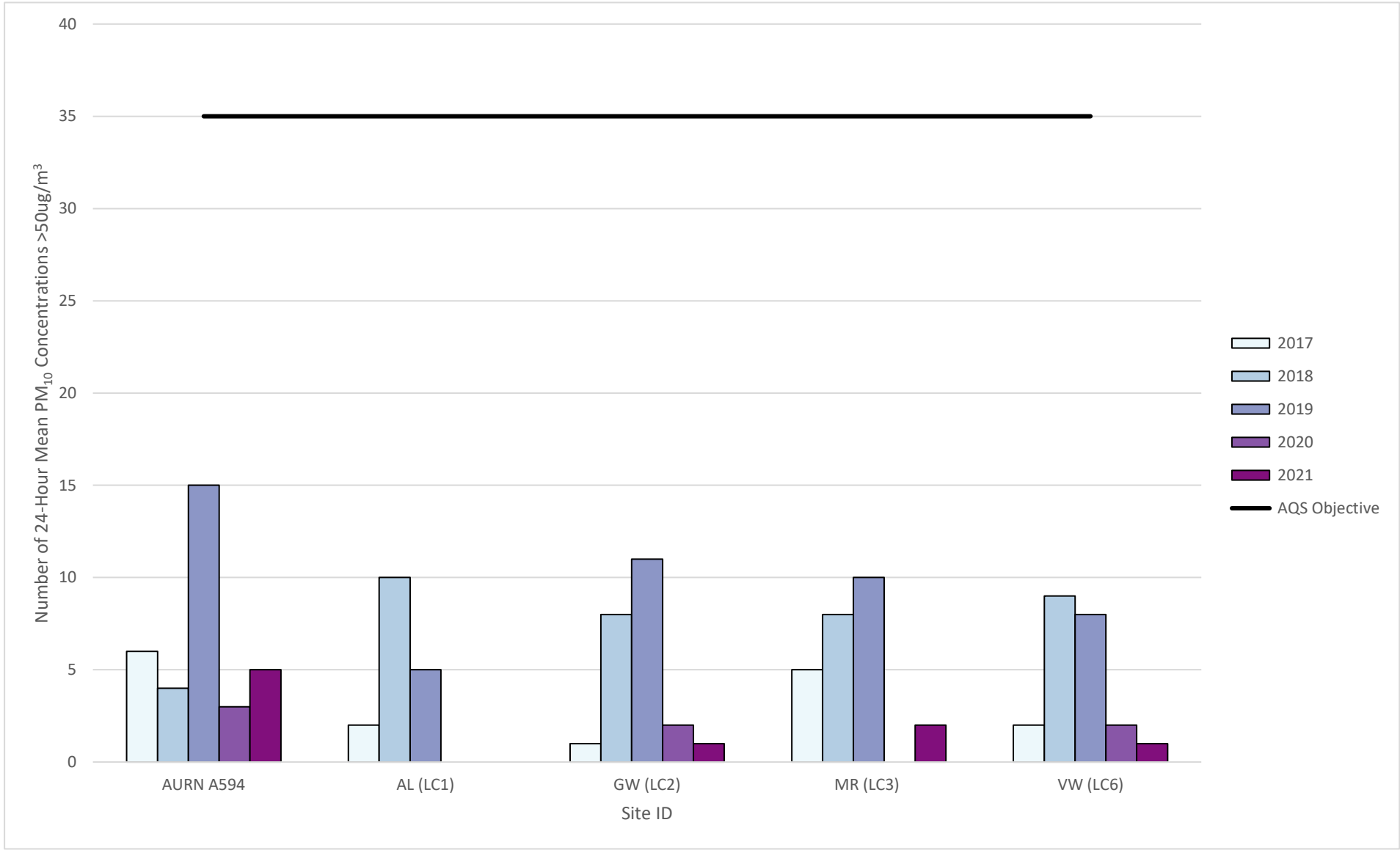


Table A.8 – Annual Mean $PM_{2.5}$ Monitoring Results (µg/m^3)

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
AURN University of Leicester	459178	302808	Urban Background	99	99	12.0	10.0	11.0	8.0	7.5

☒ **Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG16**

Notes:

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

All means have been "annualised" as per LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

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

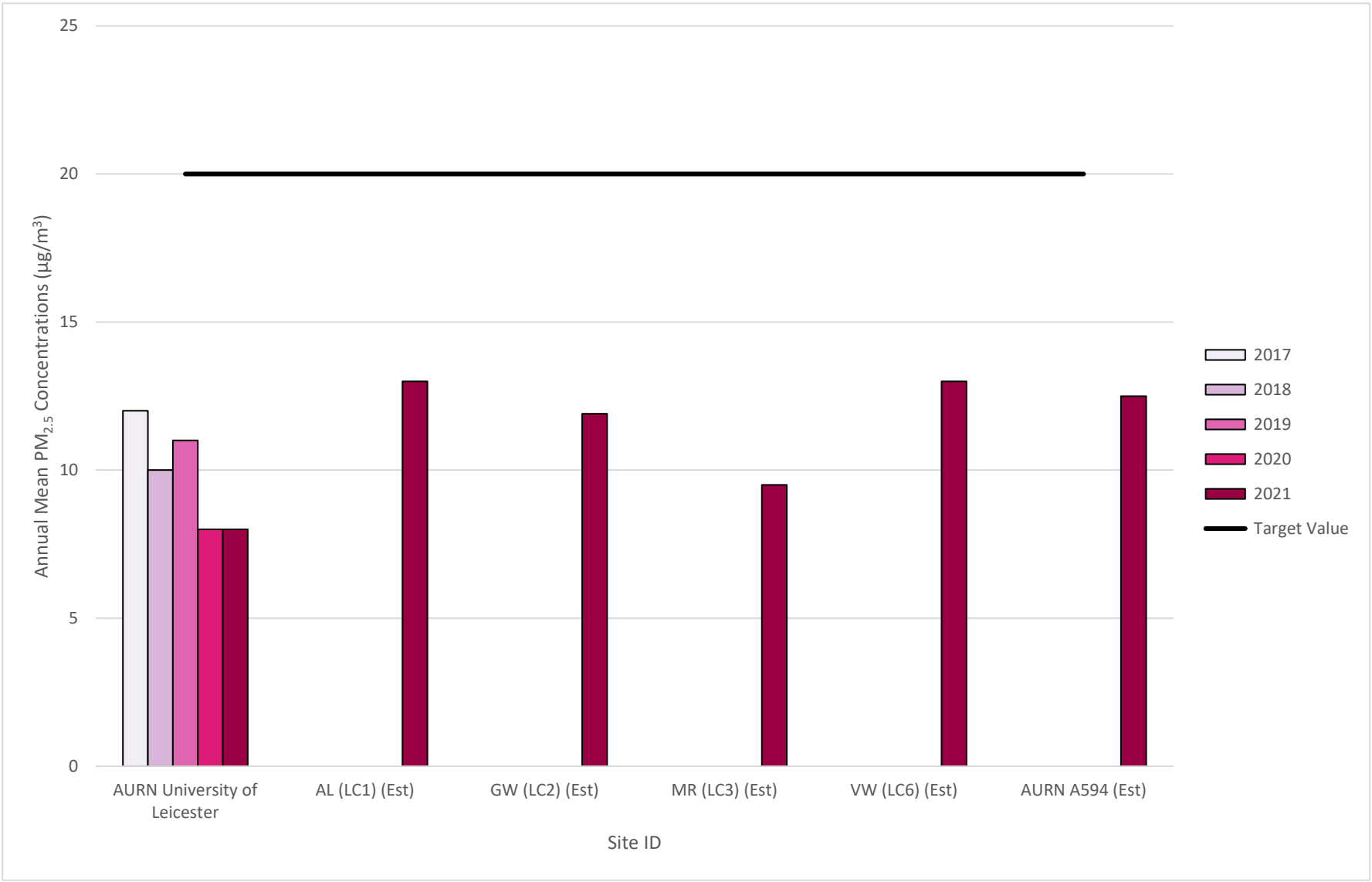
(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

For the five automatic monitoring sites that monitor PM_{10} but not $PM_{2.5}$, estimated annual mean $PM_{2.5}$ concentrations were calculated based on the ratio of $PM_{10}/PM_{2.5}$ concentrations at the University of Leicester AURN. The ratio calculated was 0.69. This value was then applied to the PM_{10} monitored results at the five automatic stations below.

Table A.9 – Estimated Annual Mean $PM_{2.5}$ Monitoring Results (µg/m^3)

Site ID	Site Type	$PM_{10}/PM_{2.5}$ Ratio	Monitored PM_{10}	Estimated $PM_{2.5}$
A594	Roadside	0.69	18.1	12.5
AL (LC1)	Roadside	0.69	18.8	13.0
GW (LC2)	Roadside	0.69	17.3	11.9
MR (LC3)	Roadside	0.69	13.8	9.5
VW (LC6)	Roadside	0.69	18.9	13.0

Figure A.6 – 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[1]	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted (0.83)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
LCC1	456672	307669	36.9	37.2	35.0	29.1	32.9	35.4	35.1	-	-	-	48.6	37.1	36.4	30.2		
LCC2	459165	300271	27.7	36.5	30.9	27.7	24.0	27.8	23.6	-	29.0	28.7	39.0	31.7	29.7	24.6		
LCC3	458260	307900	-	38.1	35.9	34.9	33.5	40.2	35.7	-	42.0	34.9	42.6	44.7	38.3	31.7		
LCC4	457244	305572	-	-	-	-	-	34.2	31.3	-	37.5	39.6	47.9	40.2	38.5	32.7		
LCC5	455578	306395	37.9	40.1	36.3	36.2	41.9	45.9	43.7	-	47.4	43.1	50.3	44.4	42.5	35.3		
LCC6	455825	307676	30.8	39.9	38.5	39.9	44.2	45.1	44.0	-	39.9	40.1	43.7	39.3	40.5	33.6		
LCC7	455647	305825	33.4	35.7	28.8	25.4	29.7	33.3	33.9	-	32.7	36.6	44.7	37.5	33.8	28.0		
LCC8	455917	304892	-	22.2	19.2	-	14.0	16.0	17.3	-	22.7	25.3	31.9	27.3	21.8	18.1		
LCC9	455082	304761	27.1	30.2	28.2	24.8	27.7	28.5	25.8	-	31.6	32.3	40.6	35.1	30.2	25.0		
LCC11	456230	304273	30.2	31.2	27.5	24.5	28.0	29.6	28.3	-	34.5	36.4	46.0	38.8	32.3	26.8		
LCC12	457474	301061	-	33.3	28.8	21.8	24.6	29.5	25.1	-	29.8	29.9	43.5	34.2	30.1	24.9		
LCC14	457210	304276	28.3	28.5	23.5	20.2	20.0	22.6	20.6	-	28.4	31.3	37.0	30.3	26.4	21.9		
LCC16	461014	301043	38.9	47.6	38.9	35.8	37.2	33.3	36.2	-	45.2	39.3	66.5	49.9	42.6	35.4		
LCC17	456380	302193	30.1	30.5	27.8	25.1	25.4	26.7	25.3	-	29.8	31.3	40.0	34.3	29.7	24.6		
LCC18	456754	302259	34.7	31.7	32.7	29.6	31.4	31.2	30.6	-	35.8	39.0	49.2	33.2	34.5	28.6		
LCC19	457667	303460	44.6	43.4	38.2	41.6	41.2	36.9	38.7	-	-	-	-	47.1	41.5	39.9	31.4	
LCC20	459196	303882	36.5	32.5	32.2	27.6	25.2	31.2	27.3	-	28.1	28.2	38	14.8	29.2	24.3		
LCC21	459431	304564	31.8	29.7	30.9	26.4	25.6	29.8	-	-	-	-	-	-	29.0	27.0		
LCC22	457869	300085	31.6	40.1	35.7	29.6	32.7	37.1	31.2	-	32.6	29.7	40.2	31.7	33.8	28.1		
LCC23	459367	302117	32.5	40.7	34.4	34.5	34.8	37.2	29.2	-	45.4	42.5	60.1	42.5	39.4	32.7		
LCC24	458542	302023	29.5	31.9	26.6	26.3	25.2	27.4	28.3	-	32.2	29.9	41.4	35.5	30.4	25.2		
LCC25	459703	301072	26.4	30.1	29.2	21.7	17.2	24.4	18.2	-	22.5	25.3	39.9	23.3	25.3	21.0		
LCC26	461307	301478	29.5	23.3	27.8	27.9	26.6	31.3	27.4	-	35.4	36.9	39.7	35.2	31.0	25.7		
LCC27	460134	303093	30.0	42.1	30.9	36.5	36.1	40.6	39.2	-	44.0	43.5	45.9	40.5	39.0	32.4		
LCC28	463282	304552	23.9	22.3	23.5	18.9	17.8	22.7	17.2	-	22.0	23.9	31.3	27.6	22.8	18.9		
LCC29	462891	305329	28.4	27.7	25.8	22.0	22.5	24.3	22.7	-	24.7	32.3	37.7	34.4	27.5	22.8		
LCC30	461806	305323	-	38.2	36.9	33.8	35.5	36.7	-	-	33.5	-	-	-	35.8	35.5		
LCC31	461596	304989	29.1	-	27.3	26.4	25.0	30.1	27.9	-	33.4	35.3	47.9	34.8	31.7	26.3		
LCC32	460441	305322	37.8	40.0	39.7	35.9	37.7	42.6	38.3	-	40.6	41.6	48.4	42.2	40.4	33.6		
LCC33	458749	307184	34.9	33.4	33.2	23.2	28.9	-	-	-	-	-	-	-	30.7	27.2		
LCC34	460010	307324	30.9	29.6	25.0	24.5	22.7	26.3	23.8	-	27.8	31.2	32.9	33.8	28.0	23.3		
LCC35	458099	305184	-	36.3	29.1	28.3	26.2	30.0	-	-	25.7	37.1	45.7	42.6	33.4	27.8		
LCC37	458182	304400	34.4	40.2	35.2	34.8	38.0	39.7	36.8	-	38.5	38.0	48.9	41.5	38.7	32.1		
LCC38	461558	306508	29.6	24.0	22.9	20.4	-	21.7	20.5	-	24.8	34.3	34.2	31.3	26.4	21.9		
LCC40	460460	308234	34.6	35.7	29.8	30.1	29.6	32.4	28.8	-	34.0	36.1	35.1	42.1	33.5	27.8		
LCC41	460865	307949	36.1	33.3	30.8	28.9	26.5	27.1	-	-	35.7	37.7	41.5	38.6	33.6	27.9		
LCC43	459304	307385	39.4	34.3	34.0	29.7	29.6	35.7	30.7	-	34.4	35.1	42.5	37.9	34.8	28.9		
LCC44a	459185	302812	27.9	27.9	-	17.0	18.6	-	-	-	-	-	-	-	-			
LCC44b	459185	302812	27.9	27.3	-	18.0		-	-	-	-	-	-	-	-			
LCC44c	459185	302812	27.8	24.9	-	17.8	17.2	-	-	-	-	-	-	-	22.5	20.5		
LCC45	457596	310078	22.5		17.3	13.3	12.6	13.1	14.0	-	14.8	25.0	25.0	21.2	17.9	14.8		
LCC46	464058	305532	20.0	24.3	19.3	16.0	17.0	18.1	17.2	-	21.6	22.6	34.1	27.6	21.6	17.9		
LCC47a	458507	304904	43.9	37.3	34.8	38.1	37.7	44.2	45.2	-	48.5	45.4	48.5	55.1				

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug[(1)]	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted (0.83)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
LCC47b	458507	304904	49.1	39.9	37.3	42.5	43.0	44.1	44.8	-	44.1	47.8	52.7	54.8				
LCC47c	458507	304904	45.3	38.2	33.2	33.4	40.4	45.2	44.4	-	45.8	48.1	54.0	54.6	44.3	36.8		
LCC49	457472	310229	22.3	18.7	17.2	13.5	11.2	13.8	13.8	-	17.0	20.8	23.3	22.1	17.6	14.6		
LCC50	456269	307062	25.2	25.7	27.9	20.8	20.6	23.2	-	-	-	-	-	23.0	23.8	20.9		

☒ **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.TG16**

☒ **Local bias adjustment factor used**

☐ **National bias adjustment factor used**

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

☒ **Leicester 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_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.

(1) Monitoring was undertaken for the full calendar year with changeover internals of 3-5 weeks. This resulted in some exposure periods covering more than one month (i.e. part of August was included within the July exposure period and part within September) resulting in 11 raw data sets instead of 12.

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

New or Changed Sources Identified Within Leicester City Council During 2021

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

Additional Air Quality Works Undertaken by Leicester City Council During 2021

Leicester have continued to monitor NO_2, PM_{10} and $PM_{2.5}$ concentrations across the city using the low-cost Zephyr sensors. Leicester have installed a total of 24 sensors, up from 11 compared to last year. The majority of these new Zephyr sensors are located around the Rushey Mead area.

QA/QC of Diffusion Tube Monitoring

An NO_2 diffusion tube survey has been undertaken over the course of 2021 as a continuation of the 2019 diffusion tube survey, where monitoring locations were selected in accordance with the methodology provided in 'Diffusion Tubes for Ambient NO_2 Monitoring: Practical Guidance' and approved by Department for Environment, Food & Rural Affairs (Defra) and Department for Transport (DfT) Joint Air Quality Unit (JAQU). It should be noted that diffusion tube locations for this study were selected in order to determine NO_2 concentrations across the city with the focus on covering major roads. Not all sites are representative of sensitive receptor locations and hence the AQS objectives are not applicable at all locations.

Monitoring has been undertaken at 43 locations across the city during 2021. At two of these locations triplicate tubes have been co-located with continuous NO_2 analysers (located on Vaughan Way and the Automatic Urban and Rural Network (AURN) site on University Road) to allow a bias adjustment factor to be calculated in accordance with the LAQM.TG(16).

All diffusion tubes used in the monitoring followed the preparation method of 20% Triethanolamine (TEA) in water and were provided and analysed by Staffordshire Highways Laboratory. The laboratory is accredited by the United Kingdom Accreditation Service (UKAS).

As the monitoring was originally undertaken for the purposed of a modelling assessment, diffusion tubes have not been deployed or collected in accordance with the Defra Diffusion Tube Calendar dates. The advice of the Defra Practical Guidance[14] has been followed however, which recommends an ideal two to four-week exposure periods but will allow an extension up to five weeks providing the diffusion tubes are not over saturated. The Defra Guidance in LAQM.TG(16) suggests that it may be necessary to do a time-weighted average (TWA) if the exposure periods are varied beyond the five-week recommendation. The following periods were used:

- Period 1 - 13/01/2021 - 19/02/2021 (Required TWA Correction)
- Period 2 - 18/02/2021 - 25/03/2021
- Period 3 - 24/03/2021 - 23/04/2021
- Period 4 - 22/04/2021 - 21/05/2021
- Period 5 - 20/05/2021 - 22/06/2021
- Period 6 - 22/06/2021 - 28/07/2021 (Required TWA Correction)
- Period 7 - 28/07/2021 - 01/09/2021
- Period 8 - 01/09/2021 - 07/10/2021 (Required TWA Correction)
- Period 9 - 07/10/2021 - 17/11/2021 (Required TWA Correction)
- Period 10 - 17/11/2021 - 10/12/2021 (Required TWA Correction)
- Period 11 - 09/12/2021 - 11/01/2022

Raw NO_2 results have been annualised and bias adjusted in accordance with LAQM.TG (16). It should be noted that LCC are looking to adhere to the Defra Diffusion Tube Calendar for future ASR's.

Diffusion Tube Annualisation

Seven monitoring sites required annualisation during 2021 due to having a data capture of less than 75% in 2021. This was due to a combination of unauthorised removal of

[14] https://laqm.defra.gov.uk/documents/0802141004_NO2_WG_PracticalGuidance_Issue1a.pdf

monitoring sites and missing diffusion tubes. The sites that required annualisation due to data capture being below 75% were:

- LCC4, LCC19, LCC21, LCC30, LCC33, LCC44abc and LCC50.

In total, seven annualisation factors were calculated based on the available exposure periods of each diffusion tube due to different deployment and collection dates as well as missing data. Three urban background AURN sites were used for annualisation, these were Coventry Allesley, Leamington Spa and Leicester University.

It should be noted that the December 2021 diffusion tube exposure period ended 11th January 2022 and therefore provisional continuous monitoring data from the first two weeks of 2022 were used during the annualisation process.

Details of the calculation method for annualisation for these monitoring sites are provided in Table C.2.

Diffusion Tube Bias Adjustment Factors

The diffusion tube data presented within the 2022 ASR has been corrected for bias using an adjustment factor. Bias represents the overall tendency of the diffusion tubes to under or over-read relative to the reference chemiluminescence analyser. LAQM.TG16 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.

Leicester City Council have applied a local bias adjustment factor of 0.83 to the 2021 monitoring data. A summary of bias adjustment factors used by Leicester City Council over the past five years is presented in Table C.1.

It should be noted that the Leicester University AURN triplicate tubes were not used for bias adjustment following review of the 2021 ASR Appraisal which advised to use Vaughan Way as this is more representative of the roadside locations of the diffusion tube network. It should also be noted that data capture for the triplicate monitoring at the Leicester University AURN was only 26% and would not have been suitable to calculate a local bias adjustment factor.

The Local Bias Adjustment factor has been used by LCC for the last three years, and the calculated factor in 2021 is similar to those calculated in previous years and is also similar

to the national bias adjustment factor of 0.85 for 2021 based on the June 2022 National Bias Adjustment Factor Sheet.

Table C.1 – Bias Adjustment Factor

Monitoring Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2021	Local		0.83
2020	Local	-	0.85
2019	Local	-	0.82
2018	-	-	-
2017	-	-	-

NO_2 Fall-off with Distance from the Road

Wherever possible, monitoring locations are representative of exposure. However, where this is not possible, the NO_2 concentration at the nearest location relevant for exposure has been estimated using the Diffusion Tube Data Processing Tool/NO_2 fall-off with distance calculator available on the LAQM Support website. Where appropriate, non-automatic annual mean NO_2 concentrations corrected for distance are presented in Table B.1.

The site that required fall off with distance calculations was LCC19 which monitored NO_2 annual mean concentrations of 39.9µg/m^3. It should be noted that following distance correction the annual mean NO_2 concentration at the receptor was 31.4µg/m^3.

QA/QC of Automatic Monitoring

The data management for automatic air quality stations presented in this report has been carried out by the Environmental Research Group at the Imperial College London. Data presented in the 2022 ASR has been ratified in accordance with LAQM.TG (16):

- erroneous data has been identified and deleted
- data was analysed for drifts
- scaling has been applied where required
- negative or out of range data have been identified
- results from other monitoring stations have been considered

- unusual weather patterns and unusual incidents such as lane closure have been considered
- all Local Site Operators (LSO) visits and services noted in the reports for each station
- loss of data due to equipment malfunction recorded
- LSO visits and services recorded

The ratified historical air quality data is available at the following website:

https://www.leicester.gov.uk/your-council/policies-plans-and-strategies/environment-and-sustainability/air-quality/

The LSO duties have been carried out by Enviro Technology Services Ltd (ET) on a monthly basis, they included calibrating the NO_x analysers and changing the BAM tapes when required to ensure continuous monitoring. After each LSO visit a written report is produced for the records, so all information is available for viewing if required.

Automatic air quality stations are serviced twice a year by ET and full reports are written after each service for record keeping.

The calibration procedures are as follows:

Teledyne API NOx Analyser Calibration Procedure

Zero Calibration

- Press the CALZ button to start the Zero calibration.
- Using the <TST TST> buttons, scroll to the NOX STB parameter and wait until the NO_X STB value drops below 1.0 PPB.
- Once stabilised, press ZERO followed by ENTER to confirm the new Zero offsets.
- Press EXIT to exit the Zero calibration mode.

Span Calibration

- For a span cylinder connected to the pressurised span port, press CALS, or for a cylinder connected to the sample inlet press CAL or CALM and open the valve to output 2 Bar on the regulator.
- Using the <TST TST> buttons, scroll to the NO_X STB parameter and wait until the NO_X STB value drops below 1.0 PPB.
- Once stabilised, press SPAN followed by ENTER to confirm the new Span slopes.
- Press EXIT to exit the Span calibration mode (and if using a cylinder on sample inlet, close the regulator).

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

Leicester City Council is using Smart Heated 1020 Beta Attenuation Monitors (BAMs) to monitor PM_{10} levels and a division of 1.035 based on TG(16) is used for the data. This corrects the measurements outputted from the instrument to reportable PM_{10} concentrations is applied to the data before it is published.

Automatic Monitoring Annualisation

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

NO_2 Fall-off with Distance from the Road

Wherever possible, monitoring locations are representative of exposure. However, where this is not possible, the NO_2 concentration at the nearest location relevant for exposure has been estimated using the NO_2 fall-off with distance calculator available on the LAQM Support website. Where appropriate, non-automatic annual mean NO_2 concentrations corrected for distance are presented in Table B.1.

The site that required fall off with distance calculations was LC2 which monitored NO_2 annual mean concentrations of 42.0µg/m^3. It should be noted that following distance correction the annual mean NO_2 concentration at the receptor was 31.2µg/m^3.

Table C.2 – Annualisation Summary (concentrations presented in µg/m^3)

Site ID	Annualisation Factor Coventry Allesley	Annualisation Factor Leamington Spa	Annualisation Factor Leicester University	Average Annualisation Factor	Raw Data Annual Mean	Annualised Annual Mean	Comments
LCC4	-	-	-	1.03	38.5	39.4	
LCC19	-	-	-	1.16	41.5	48.1	
LCC21	-	-	-	1.12	29.0	32.5	
LCC30	-	-	-	1.20	35.8	42.7	
LCC33	-	-	-	1.07	30.7	32.8	
LCC44 abc	-	-	-	1.10	22.5	24.7	
LCC50	-	-	-	1.06	23.8	25.2	

Table C.3 – Local Bias Adjustment Calculation: LC6

	Local Bias Adjustment Input 1	Local Bias Adjustment Input 2	Local Bias Adjustment Input 3	Local Bias Adjustment Input 4	Local Bias Adjustment Input 5
Periods used to calculate bias	11				
Bias Factor A	0.83 (0.75 – 0.94)				
Bias Factor B	20% (6% - 34%)				
Diffusion Tube Mean (µg/m^3)	44				
Mean CV (Precision)	5				
Automatic Mean (µg/m^3)	37				
Data Capture	99%				
Adjusted Tube Mean (µg/m^3)	37 (33 – 42)				

Notes:

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

Table C.4 – NO_2 Fall off With Distance Calculations (concentrations presented in µg/m^3)

Site ID	Distance (m): Monitoring Site to Kerb	Distance (m): Receptor to Kerb	Monitored Concentration (Annualised and Bias Adjusted	Background Concentration	Concentration Predicted at Receptor	Comments
LC2	3	14	42.0	14.9	31.2	
LCC19	0.5	4.5	39.9	17.9	31.4	

Appendix D: Maps of Monitoring Locations and AQMAs

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

Figure D.2 – Map of Non-Automatic Monitoring Sites (NW)

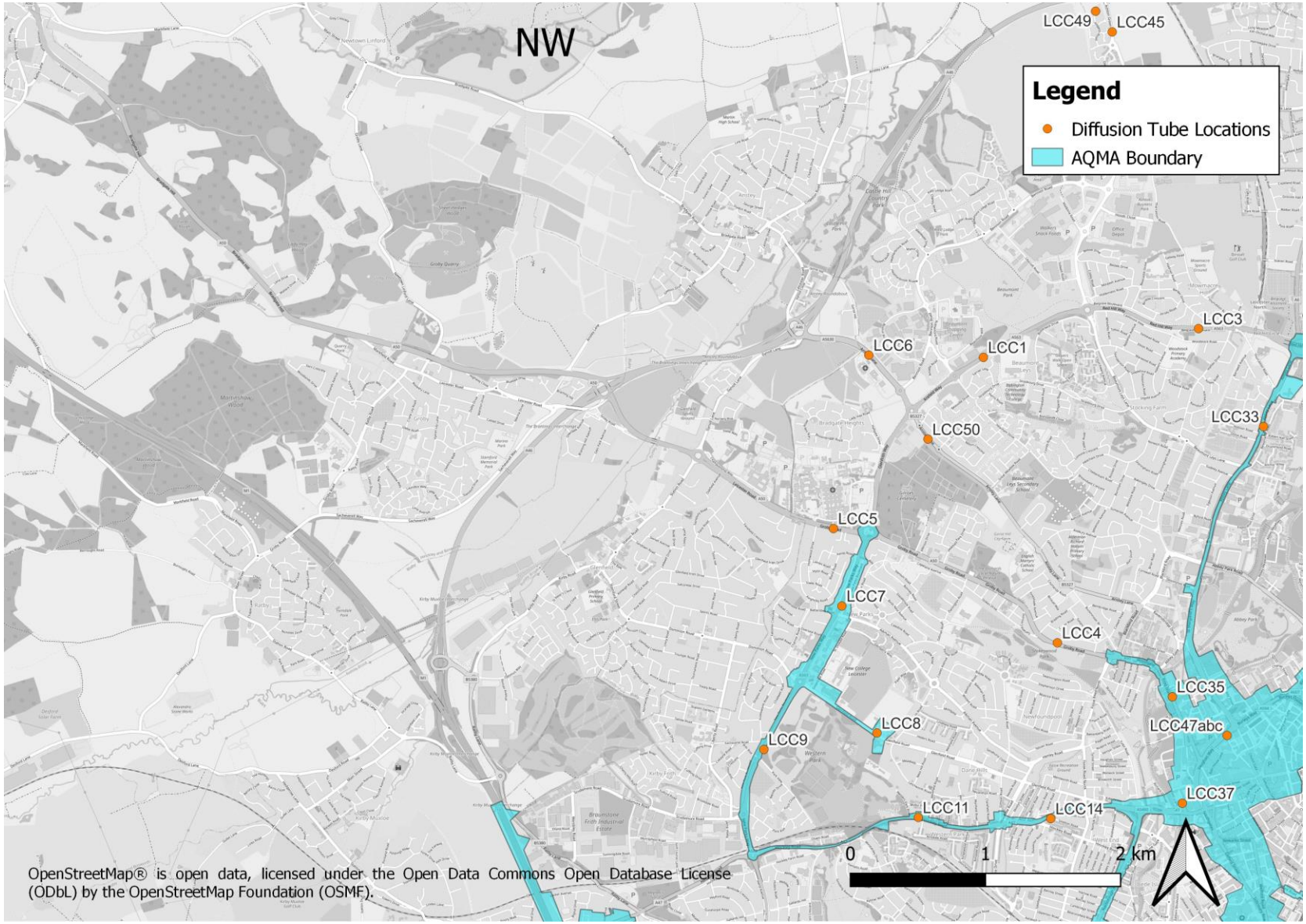


Figure D.3 – Map of Non-Automatic Monitoring Sites (NE)

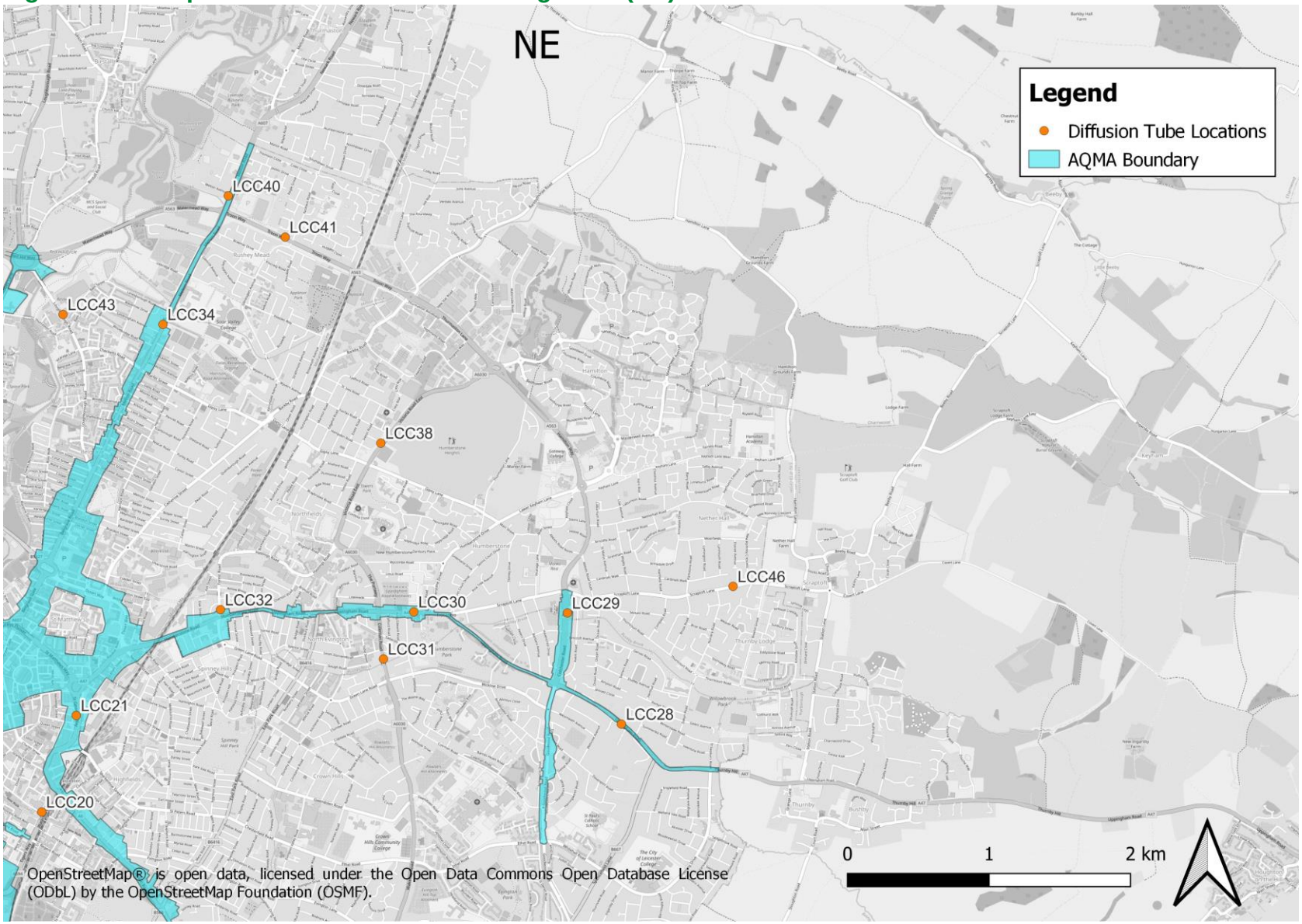


Figure D.4 – Map of Non-Automatic Monitoring Sites (SW)

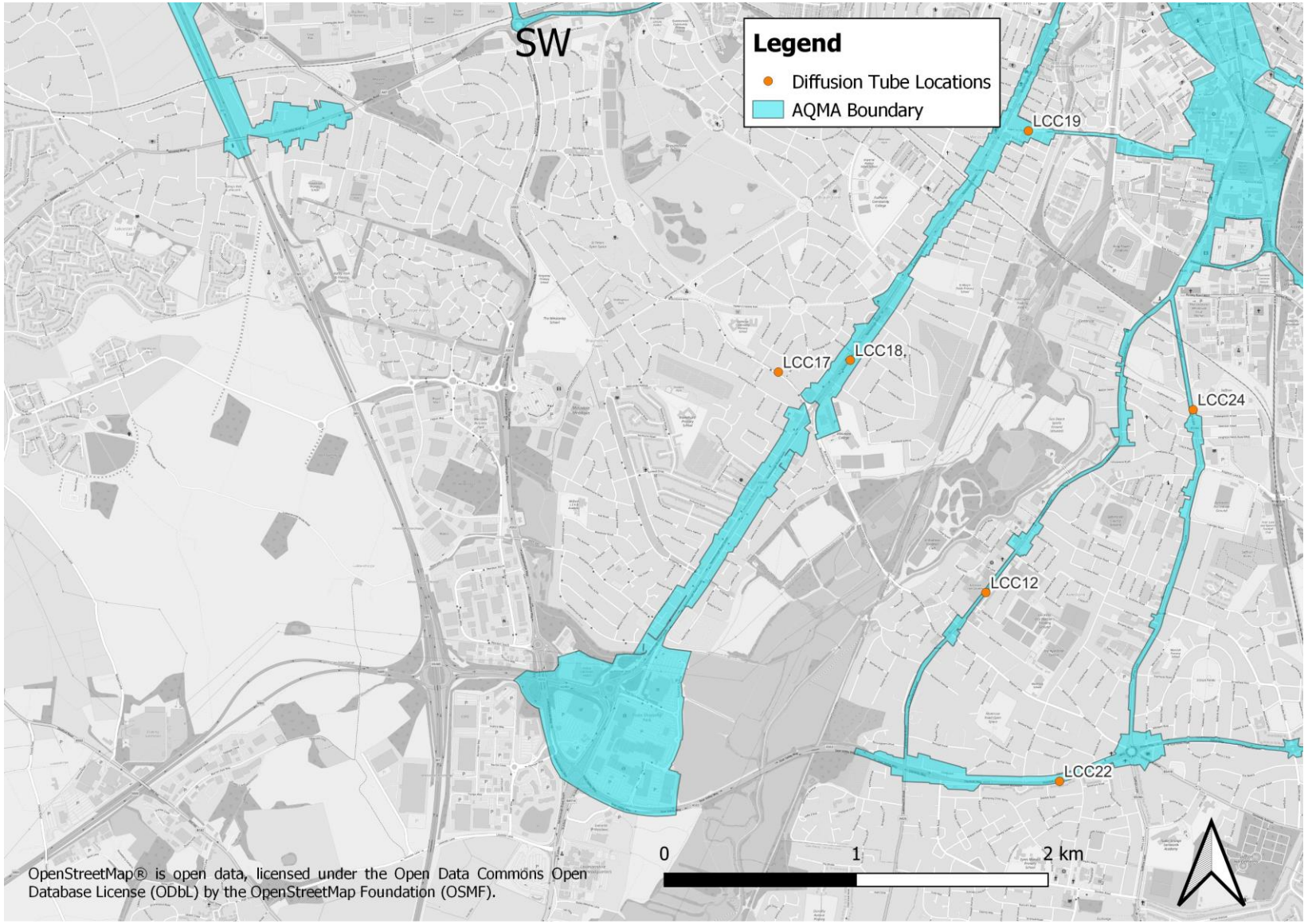


Figure D.5 – Map of Non-Automatic Monitoring Sites (SE)

Figure D.6 – Map of Automatic Monitoring Sites

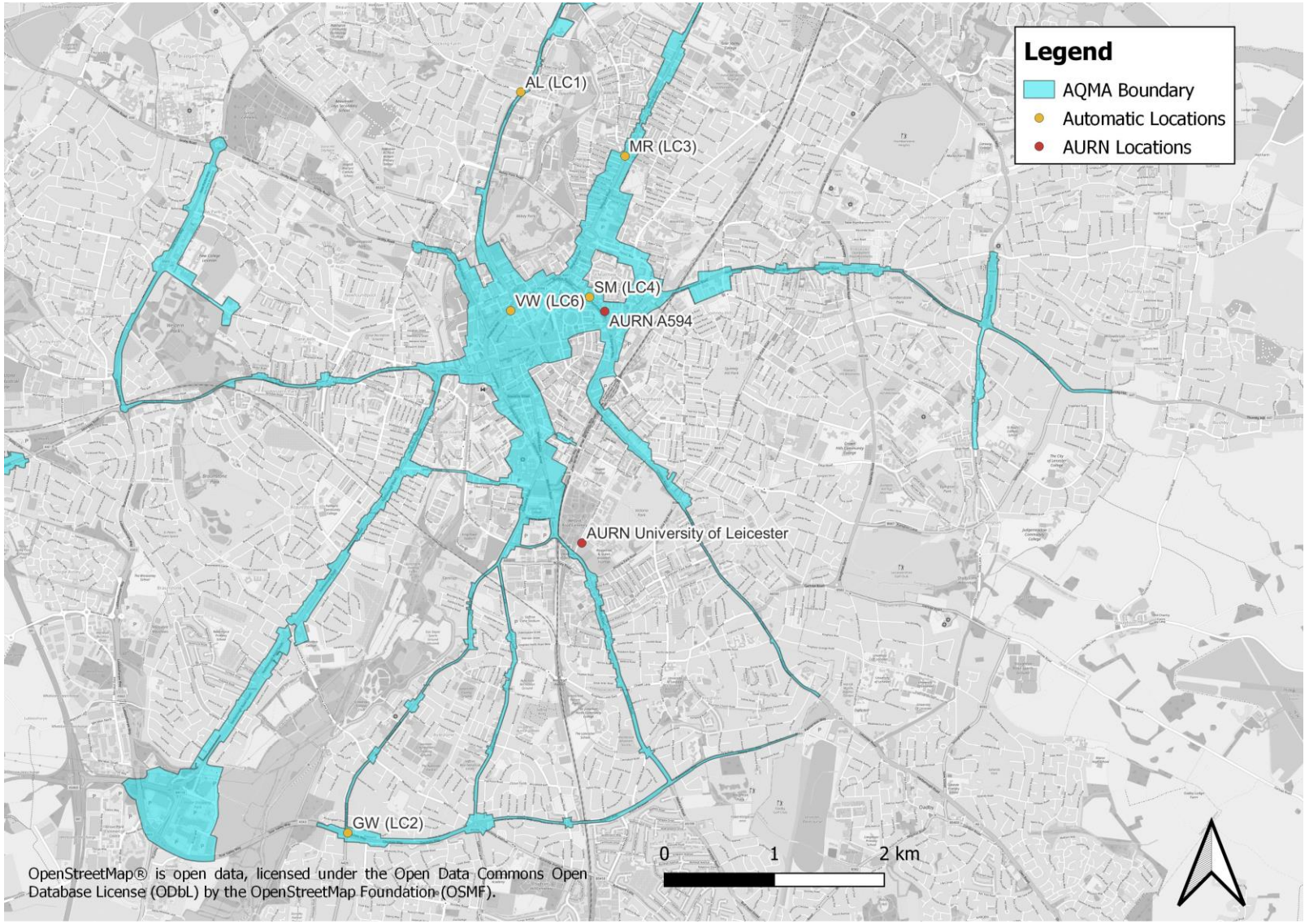
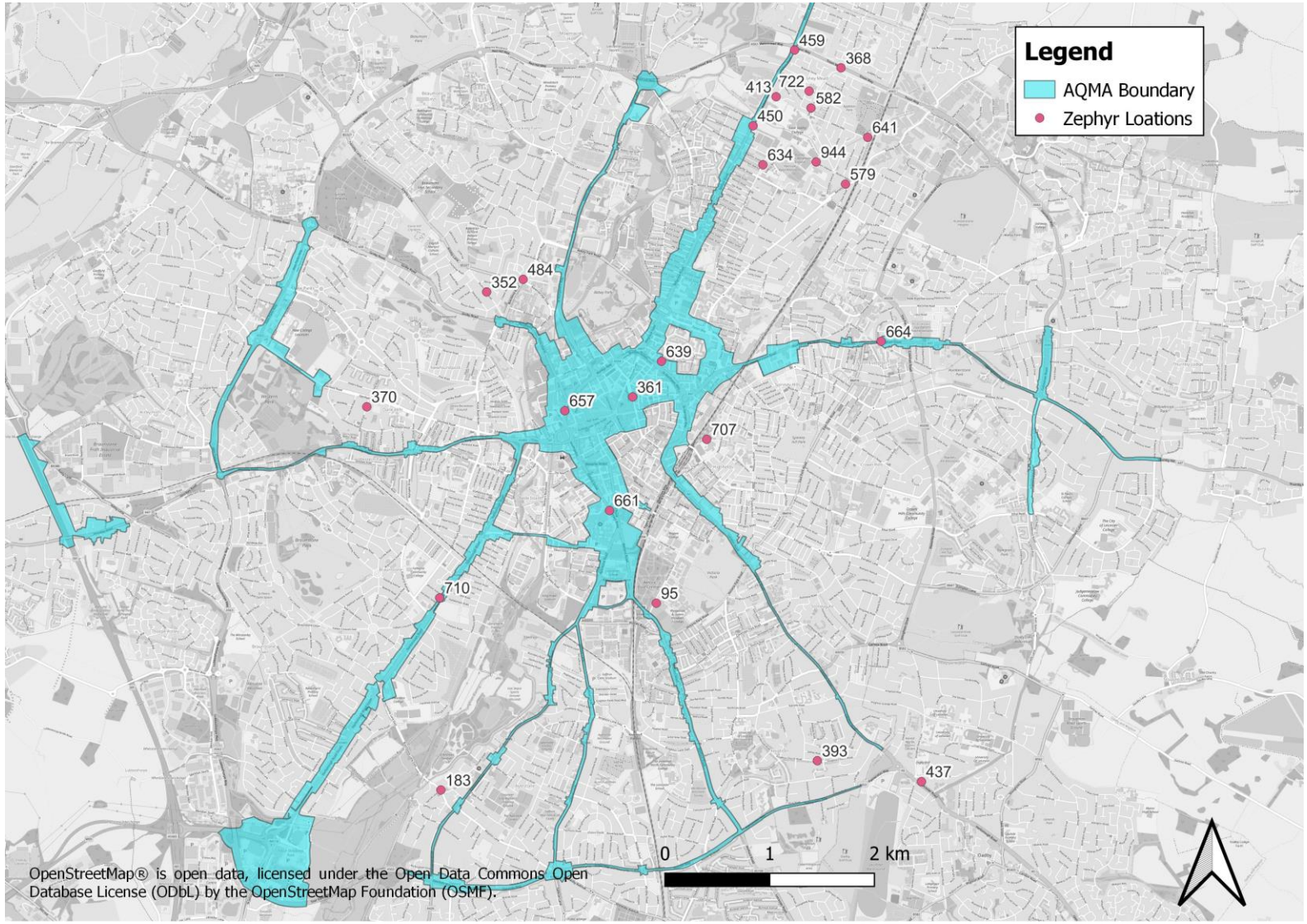


Figure D.7 – Map of Zephyr Sensors



Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England[15]

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

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

Appendix F: Summary of Zephyr Monitoring

As mentioned above and throughout the 2022 ASR, Leicester City Council currently undertake NO_2, PM_{10} and $PM_{2.5}$ monitoring using the low-cost Zephyr sensors across the city. Leicester City Council began using these sensors in 2020 with 10 sensors installed across the city, both within and outside of the AQMA. In 2021, Leicester City Council have installed an additional 13 sensors.

Table F.1 below illustrates the details of the Zephyr monitoring sites, with Table F.2 - Table F.6 presenting the annual mean and short term means for NO_2, PM_{10} and $PM_{2.5}$. Figure F.1 to Figure F.5 also present the trends in monitoring data at the Zephyr sensors.

Table F.1 – Details of Zephyr Monitoring Sensors

Site ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Inlet Height (m)
95	Wyggeston & Queen Elizabeth I College	Roadside	459179	302812	NO	0	1	2.5
183	Middleton Street, Aylestone	Roadside	457144	301010	NO	0	1	2.5
352	Buckminster Road, Newfoundpool,	Roadside	457525	305752	NO	0	1	2.5
361	Wilko, Charles Street, St Matthew	Roadside	458930	304771	YES	0	1	2.5
368	Troon Way, Rushey Mead	Roadside	460878	307923	NO	0	1	2.5
370	Shiloh Pentecostal Fellowship Church, 57, Westfield Road,	Roadside	456395	304647	NO	0	1	2.5
393	122, Knighton Church Road, Knighton	Roadside	460734	301332	NO	0	1	2.5
413	Rushey Mead School	Roadside	460263	307641	NO	0	1	2.5
437	Stoughton Drive South, Leicester Road, Oadby	Roadside	461731	301145	NO	0	1	2.5
450	Rushey Mead, Leicester,	Roadside	460046	307362	YES	0	1	2.5
459	Melton Road, Rushey Mead	Roadside	460434	308087	YES	0	1	2.5

Site ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Inlet Height (m)
484	Blackbird Road, Stocking Farm	Roadside	457872	305876	NO	0	1	2.5
579	Barkby super store, Barkby Road, Northfields,	Roadside	460935	306819	NO	0	1	2.5
582	Gleneagles Avenue, Rushey Mead,	Roadside	460597	307538	NO	0	1	2.5
634	Harrison Road, Latimer,	Roadside	460145	306993	NO	0	1	2.5
639	107, Wharf Street North, St Matthew	Roadside	459201	305113	YES	0	1	2.5
641	Roseneath Avenue, Northfields	Roadside	461141	307266	NO	0	1	2.5
657	Southgates Underpass, Bede Island	Roadside	458285	304632	YES	0	1	2.5
661	Leicester Royal Infirmary	Roadside	458722	303688	YES	0	1	2.5
664	East Leicester Medical Practice,	Roadside	461294	305329	YES	0	1	2.5
707	Hutchinson Walk, Highfields	Roadside	459641	304376	NO	0	1	2.5
710	Narborough Road, Westcotes	Roadside	457111	302838	YES	0	1	2.5
722	Herrick Primary School, Dalkeith Road, Rushey Mead,	Roadside	460577	307698	NO	0	1	2.5
944	Wyvern Primary School, Wyvern Avenue, Rushey Mead	Roadside	460652	307026	NO	0	1	2.5

Table F.2 – Annual Mean NO_2 Concentrations at Zephyr Sensors

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
95	459179	302812	96	96				19.2	25.8
183	457144	301010	93	93				21.5	17.8
361	458930	304771	99	99				43.6	53.7
368	460878	307923	44	44					29.4
370	456395	304647	85	85				6.2	11.3
393	460734	301332	87	87				18.0	16.4
413	460263	307641	37	37					18.7
437	461731	301145	99	99					24.5
450	460046	307362	51	51					23.7
459	460434	308087	89	89					37.3
484	457872	305876	100	100					35.7
579	460935	306819	89	35					33.8
582	460597	307538	96	96					19.7
634	460145	306993	89	89					21.5
639	459201	305113	84	56					22.2
641	461141	307266	83	83					14.3
657	458285	304632	83	78					33.8
661	458722	303688	90	90					32.8
664	461294	305329	75	73					23.4
707	459641	304376	100	100					22.6
710	457111	302838	95	95					21.4
722	460577	307698	94	94					15.1
944	460652	307026	16	3					41.9

Table F.3 – Hourly Mean NO_2 Concentrations at Zephyr Sensors

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
95	459179	302812	96	96				0	0
183	457144	301010	93	93				1	0
361	458930	304771	99	99				1	3
368	460878	307923	44	44					1 (163.9)
370	456395	304647	85	85				0	9
393	460734	301332	87	87				1	0

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
413	460263	307641	37	37					0 (60.0)
437	461731	301145	99	99					2
450	460046	307362	51	51					7 (166.5)
459	460434	308087	89	89					**22**
484	457872	305876	100	100					0
579	460935	306819	89	35					0 (115.8)
582	460597	307538	96	96					0
634	460145	306993	89	89					0
639	459201	305113	84	56					**18 (215.4)**
641	461141	307266	83	83					0 (57.3)
657	458285	304632	83	78					0 (107.7)
661	458722	303688	90	90					2
664	461294	305329	75	73					0 (71.8)
707	459641	304376	100	100					0
710	457111	302838	95	95					6
722	460577	307698	94	94					0
944	460652	307026	16	3					N/A

Table F.4 – Annual Mean PM_{10} Concentrations at Zephyr Sensors

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
95	459179	302812	96	96				15.6	12.0
183	457144	301010	95	95				12.2	13.2
361	458930	304771	99	99				11.2	12.0
368	460878	307923	73	73					14.8
370	456395	304647	97	97				13.2	13.4
393	460734	301332	87	87				13.8	12.0
413	460263	307641	38	38					11.7
437	461731	301145	100	100					14.0
450	460046	307362	51	51					13.1
459	460434	308087	90	90					12.8
579	460935	306819	91	36					11.5
582	460597	307538	97	97					12.0

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
634	460145	306993	90	90					12.5
639	459201	305113	78	78					14.6
641	461141	307266	85	85					11.3
657	458285	304632	83	78					17.8
661	458722	303688	91	91					16.6
664	461294	305329	75	73					17.2
707	459641	304376	100	100					13.4
710	457111	302838	95	95					12.4
722	460577	307698	96	96					11.5
944	460652	307026	16	3					6.6

Table F.5 – 24-Hour Mean PM_{10} Concentrations at Zephyr Sensors

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
95	459179	302812	96	96				3	0
183	457144	301010	95	95				1	0
361	458930	304771	99	99					0
368	460878	307923	73	73					0 (46.1)
370	456395	304647	97	97				0	0
393	460734	301332	87	87				0	0
413	460263	307641	38	38					0 (42.1)
437	461731	301145	100	100					0
450	460046	307362	51	51					0 (47.5)
459	460434	308087	90	90					0
579	460935	306819	91	36					0 (36.5)
582	460597	307538	97	97					0
634	460145	306993	90	90					0
639	459201	305113	78	78					0 (48.5)
641	461141	307266	85	85					0 (38.1)
657	458285	304632	83	78					0 (48.4)
661	458722	303688	91	91					0
664	461294	305329	75	73					0 (44.8)
707	459641	304376	100	100					0
710	457111	302838	95	95					0

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
722	460577	307698	96	96					0
944	460652	307026	16	3					N/A

Table F.6 – Annual Mean $PM_{2.5}$ Concentrations at Zephyr Sensors

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
95	459179	302812	96	96				8.9	8.6
183	457144	301010	95	95				10.9	8.9
361	458930	304771	99	99				8.5	8.7
368	460878	307923	73	73					9.9
370	456395	304647	97	97				9.4	9.3
393	460734	301332	87	87				11.5	8.4
413	460263	307641	38	38					7.6
437	461731	301145	100	100					11.3
450	460046	307362	51	51					9.7
459	460434	308087	90	90					8.7
579	460935	306819	91	36					7.4
582	460597	307538	97	97					8.2
634	460145	306993	90	90					8.7
639	459201	305113	78	78					8.4
641	461141	307266	85	85					7.9
657	458285	304632	83	78					15.2
661	458722	303688	91	91					14.3
664	461294	305329	75	73					14.5
707	459641	304376	100	100					9.4
710	457111	302838	95	95					8.7
722	460577	307698	96	96					8.4
944	460652	307026	16	3					4.6

Figure F.1 – Trends in Annual Mean NO_2 Concentration at Zephyr Sensors within AQMA

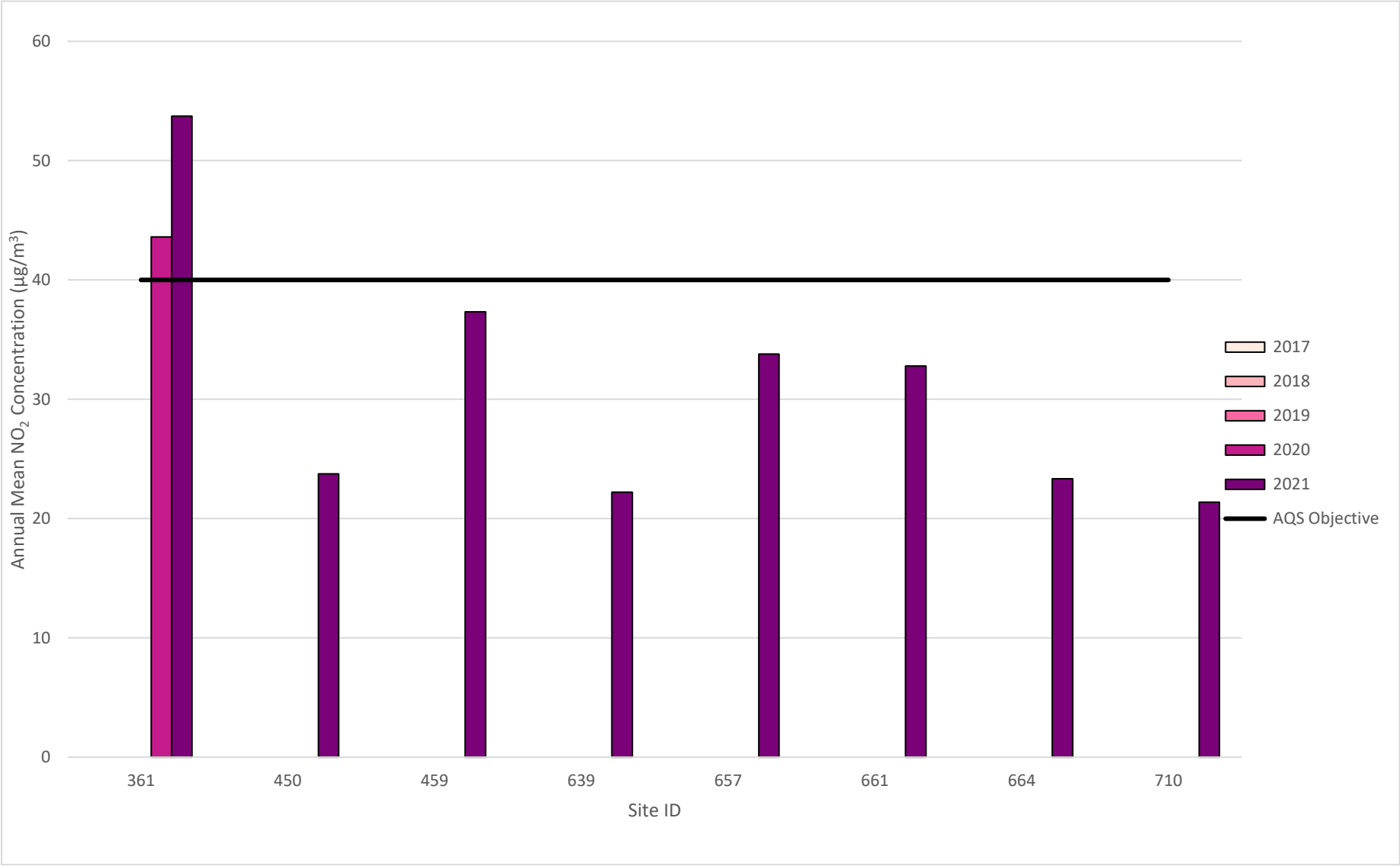


Figure F.2 – Trends in Annual Mean NO_2 Concentration at Zephyr Sensors Outside of AQMA

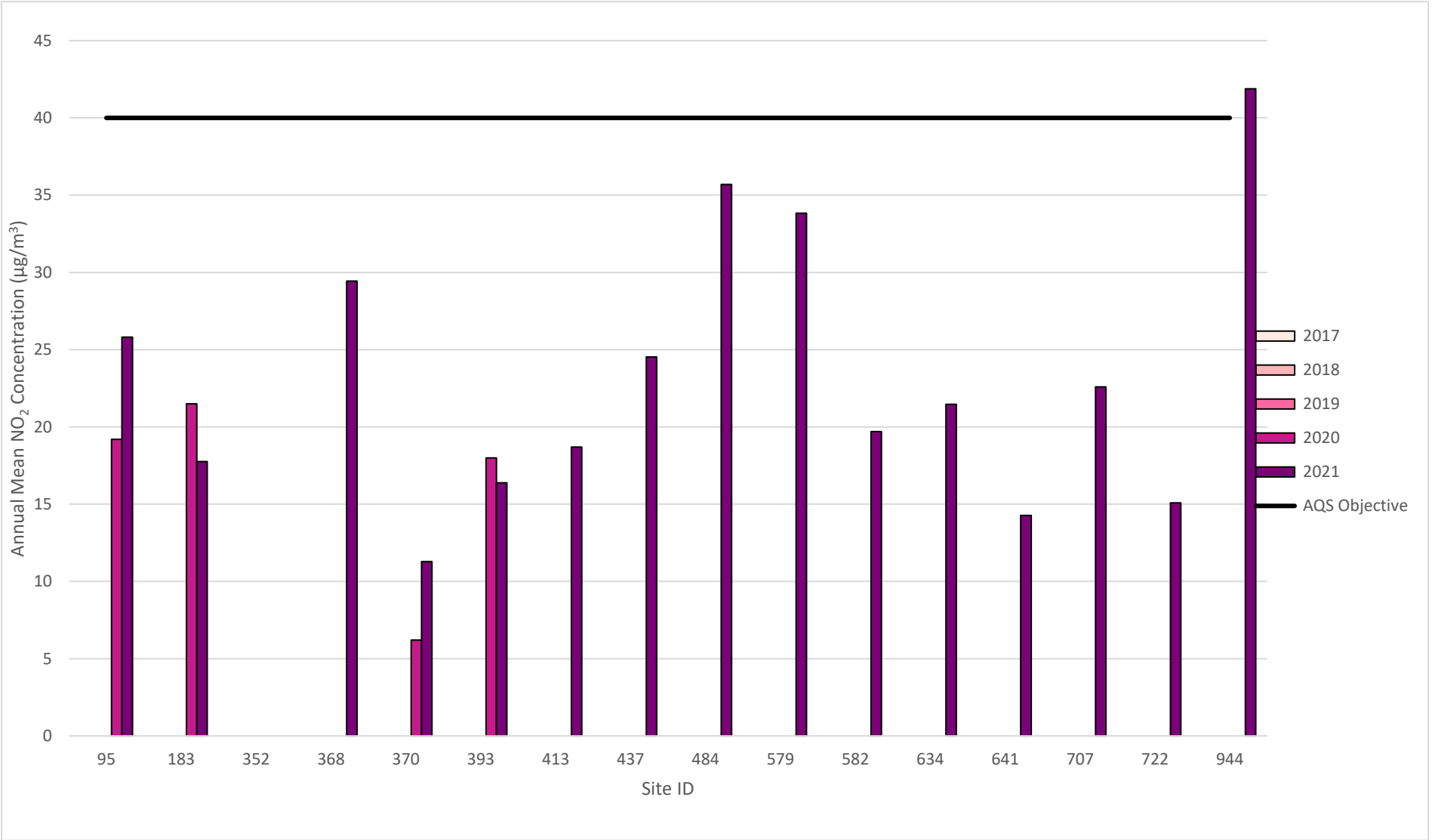


Figure F.3 – Trends in Hourly Mean NO_2 Concentration at Zephyr Sensors

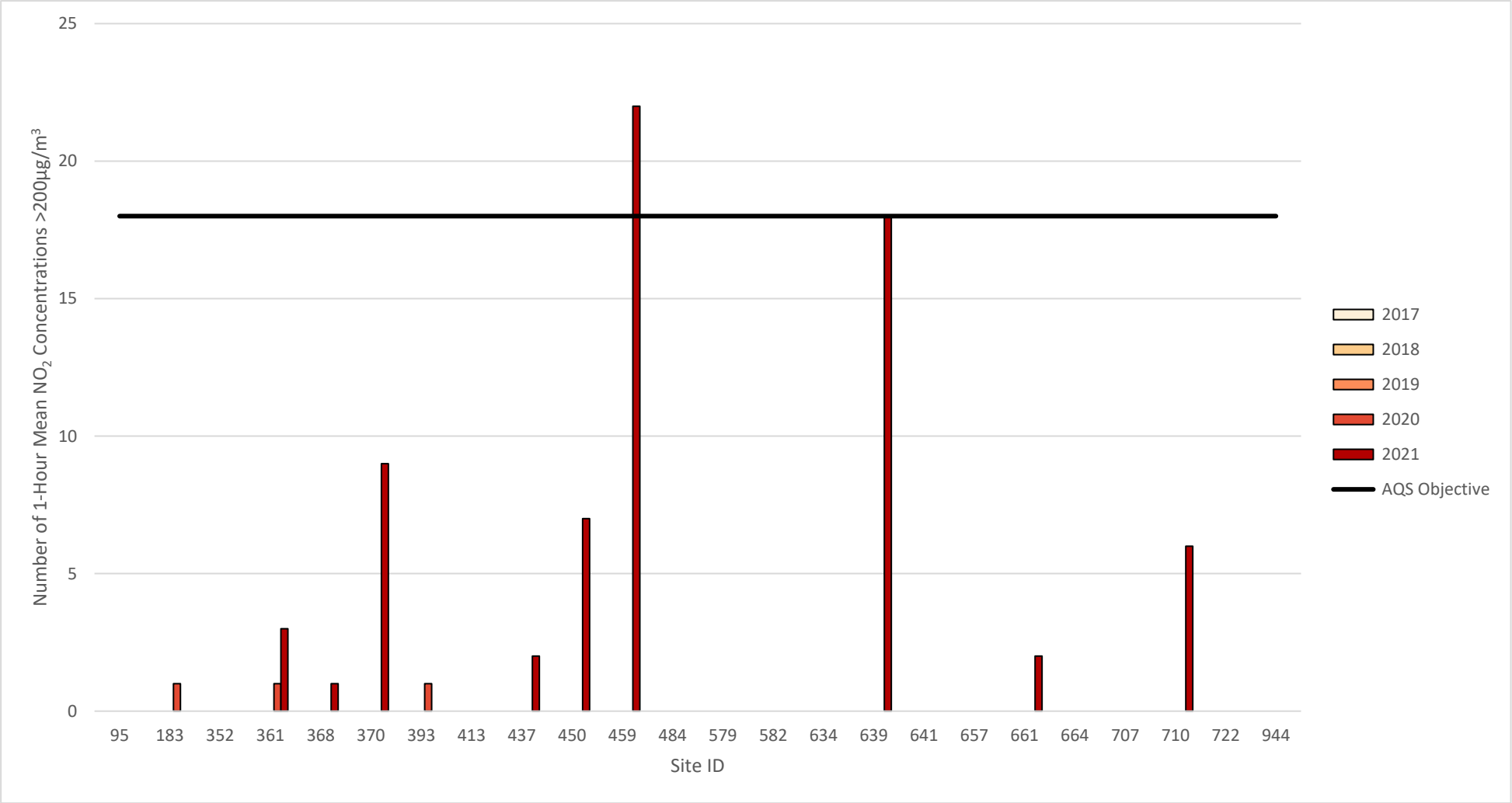


Figure F.4 – Trends in Annual Mean PM_{10} Concentration at Zephyr Sensors

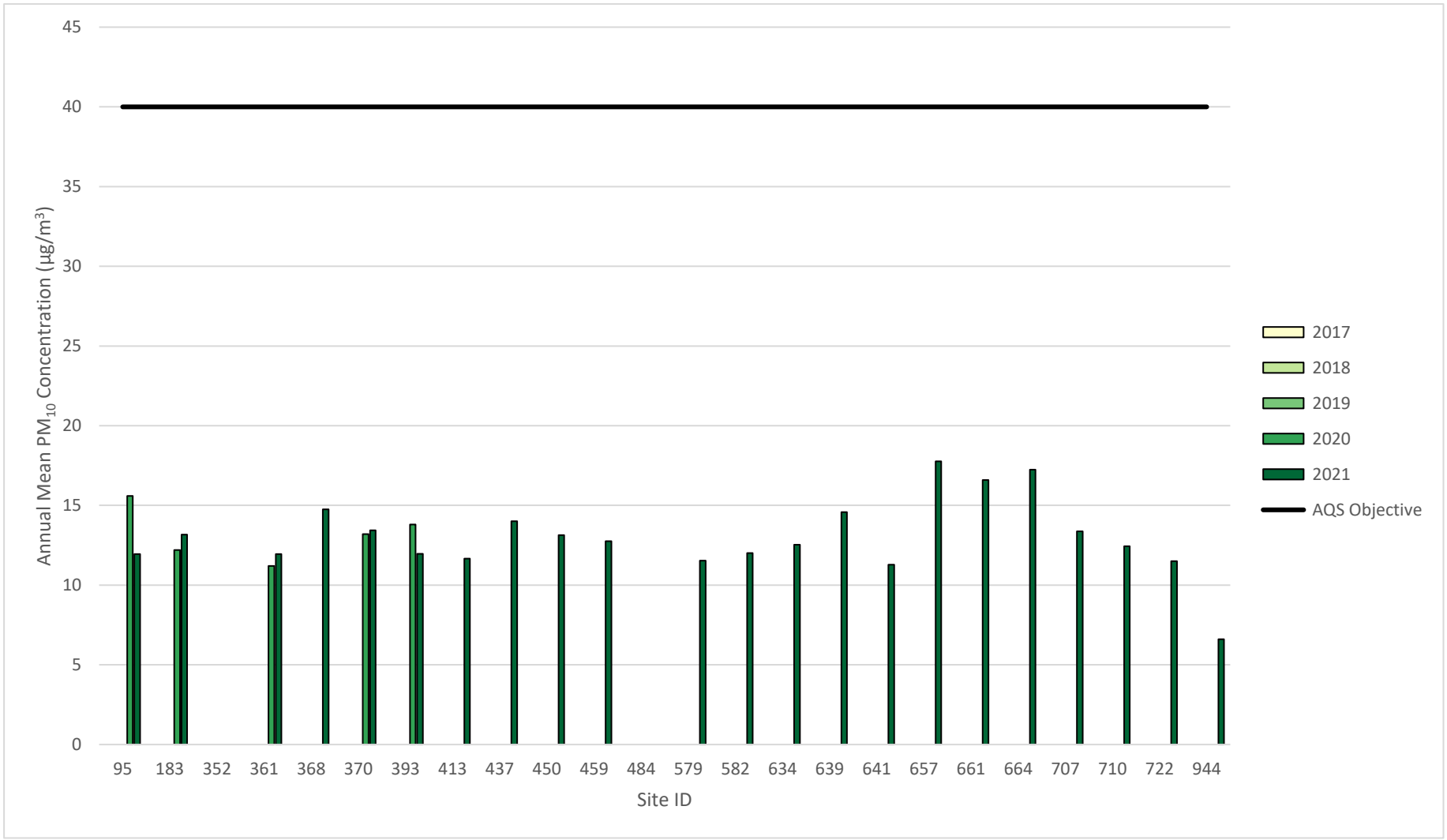
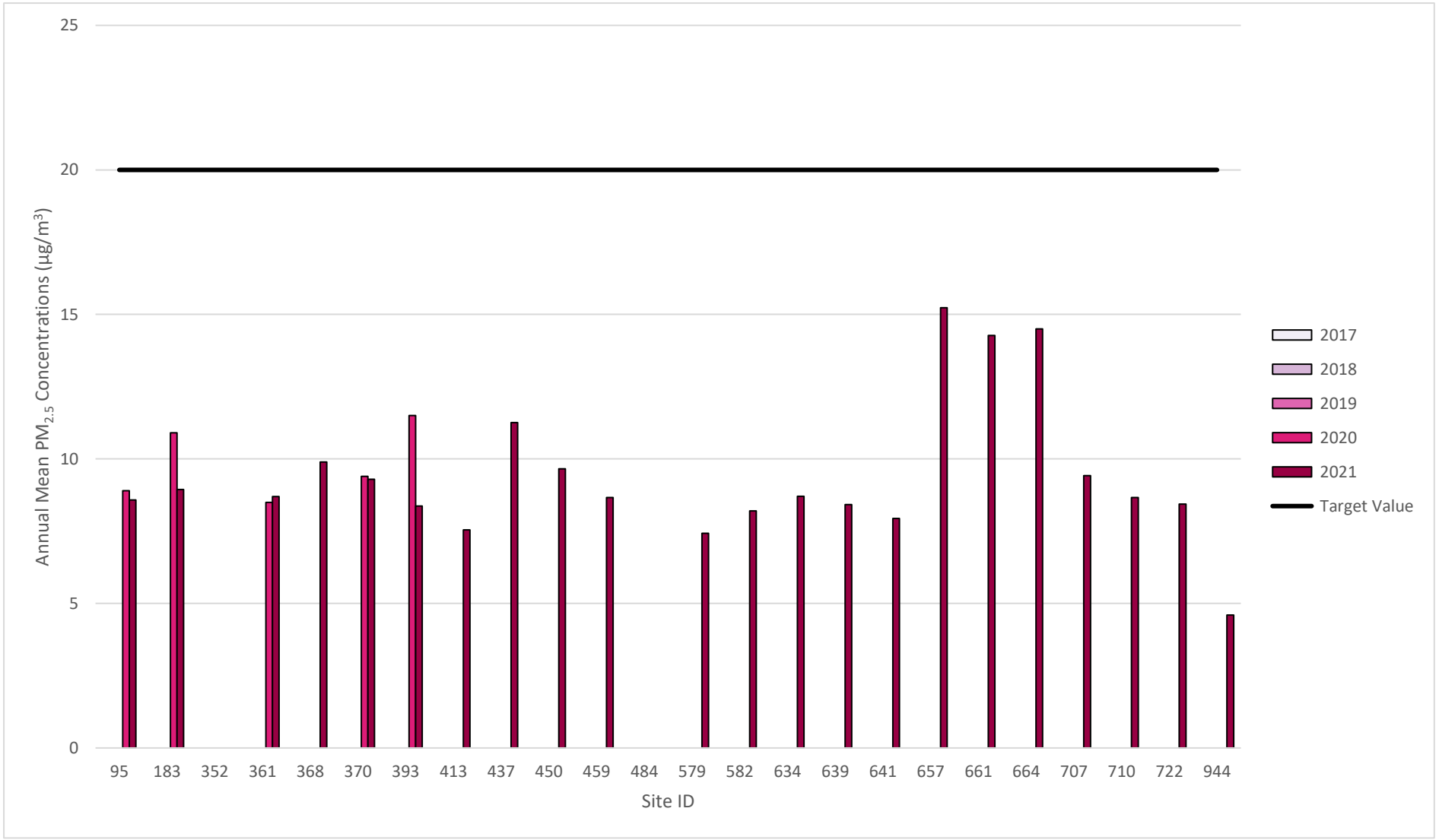


Figure F.5 – Trends in Annual Mean $PM_{2.5}$ Concentration at Zephyr Sensors



Appendix G: Historic Completed and Ongoing Measures to Improve Air Quality

Figure G.1 – Historic Ongoing Measures to improve Air Quality in Leicester City Council

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
	East Midlands Air Quality network	Policy Guidance and Development	Regional Groups Co-ordinating programmes to develop Area wide Strategies to reduce emissions and improve air quality	2015	Ongoing	Authorities in East Midlands, Public Health England	LTP / Public Health	No	N/A	N/A	Ongoing	< 0.1 %	Delivery of joint strategies for East Midlands	Initial drafts of guidance documents	A network of air quality specialists and public health officials
	Spot check operations on taxis which include emission tests	Promoting Low Emission Transport	Other	2000	Ongoing	Leicester City Council	LCC	No	N/A	N/A	Ongoing	< 0.1%	10 operations per year involving around 30 vehicles	Ongoing operations	Spot-checks have resumed in 2021 with slight change, testing the emissions has stopped due to the length of time this take. Also the risk of causing damage to the engine when revving it.

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
	Two vehicle tests per year which include an emission test	Promoting Low Emission Transport	Other	2000	Ongoing	Leicester City Council	LCC	No	N/A	N/A	Ongoing	< 0.1 %	All taxies to have 2 tests per year	2011 vehicle testing brought in house to ensure consistent application of standards	
	Business Grants	Promoting Travel Alternatives	Intensive active travel campaign & infrastructure	2011	Ongoing	Leicester City Council	Access fund	No	N/A	<£1,000.000.00	Ongoing	< 0.1 %	5 grants approved and 2 paid out	50 grants issued up to date	
	Led Rides and Festival Programme	Promoting Travel Alternatives	Promotion of cycling	2010	Ongoing	Leicester City Council, delivered through Sustrans	Access Fund	No	Partially Funded	< 100,000.00	Ongoing	< 0.1 %	15 000 attendees at Ride Leicester Festival and 3000 plus participants on led rides per annum	'Ride Leicester Festival resumed in 2021 as primarily an online administered event. It attracted around 2,000 active participants'.	'Ride Leicester Festival resumes in 2022 as part of the post-covid recovery'.
	Bike Maintenance training	Promoting Travel Alternatives	Promotion of cycling	2011	Ongoing	Leicester City Council	Access y Fund	No	Partially Funded	< 100,000.00	Ongoing	< 0.1 %	Ongoing	Cycle maintenance training is currently being reviewed as part of considerations for Cycle City Action Plan II'	'Future Cycles training relocated to Linwood Centre and is no longer directly supported by the City Council. Cycle

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
															Maintenance training and ad hoc classes is provided by a variety of bike projects including Northside Bikes, Community Cycles, B-Buddies and others'.
	Employment adviser training	Promoting Travel Alternatives	Personalised Travel Planning	2012	Ongoing	Leicester City Council	Capability Fund	No	Partially Funded	<£100,000.00	Ongoing	< 0.1 %	Ensure ongoing training of 200 plus Work Coaches	Continuous training with 200 plus employment advisors, information passed on to approximately 150 people a day	The training includes advice on smart ticketing and sustainable travel, so it can be passed to people who come to Job Centre Plus, training agencies and employment agencies for work advice
	FACE–internal newsletter	Public Information	Via other mechanisms	Weekly		Leicester City Council Get moving this summer	LCC	No	Partially Funded	<£100,000.00	Ongoing	< 0.1 %	Delivered to all of employees	Delivered weekly	

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
	Bus lanes	Public Transport	Strategic highway improvements, Re-prioritising road space away from cars, including Access management, Selective vehicle priority, bus priority, high vehicle occupancy lane	First bus lane was introduced in 1973, since then many bus lanes were implemented, and the work is ongoing	Ongoing	Leicester City Council	Transport Improvement Works Programme, S106, S278, National Productivity Investment Fund, TCF	No	Partially Funded		Ongoing	< 0.1 %	Continue to implement bus lanes where there is a need	75 bus lanes implemented	
	SCOOT sites	Traffic Management	UTC, Congestion management, traffic reduction	1970	Ongoing	Leicester City Council	LTP, Connecting Leicester, LCC	No	Partially Funded	< 100,000.00	Ongoing	< 0.1 %	189 sites	268 sites	268 sites active
	Mova UTC System	Traffic Management	UTC, Congestion management, traffic reduction	1980	Ongoing	Leicester City Council	LTP Connecting Leicester, LCC	No	Partially Funded	< 100,000.00	Ongoing	< 0.1 %	70 sites	113 Mova sites	36 sites are dual, both SCOOT and Mova
	Coordination of street work	Traffic Management	Other	1991	Ongoing	Leicester City Council	LTP/LCC/Permit schemes for utility works	No	Partially Funded	< 100,000.00	Ongoing	<0.1 %	Regulations in place	Regulation in place	Introduction of the Permit scheme allowed to reduce time of works from 3.5 days to 2.8 days on average

Figure G.2 – Historic Completed Measures to improve Air Quality in Leicester City Council

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	Meynell's Gorse Park and Ride	Alternatives to private vehicle use	Bus based Park & Ride	1995	1997	Leicester City Council and Leicestershire County Council	LCC County Council and Department for Transport	NO	Partially funded	>£1 million	Operational	<0.1%	57,804	Implemented, Electric Buses introduced	Passenger Journeys, big decrease due to lockdown
2	Enderby Park and Ride	Alternatives to private vehicle use	Bus based Park & Ride	2005	2009	Leicester City Council and Leicestershire County Council	LTP (Local Transport Plan), direct funding from LCC and County Council	No	Partially funded	> £1million	Operational	<0.1%	75,677	Implemented, Electric Buses introduced	Passenger Journeys, big decrease due to pandemic and lockdown
3	Birstall Park and Ride	Alternatives to private vehicle use	Bus based Park & Ride	2009	2011	Leicester City Council and Leicestershire County Council	LTP, direct funding from LCC and County Council	No	Partially funded	>£1million	Operational	<0.1%	43,680.4	Implemented, Electric Buses introduced	Passenger Journeys, big decrease due to lockdown
6	A2 installations	Environmental Permits	Introduction/increase of environment charges through permit systems and economic instruments	2019	2021	Leicester City Council and Leicestershire County Council	N/A	NO	N/A	N/A	Ongoing	<0.1%	2 permits	£3056.00 fees	2020/21
7	Options and pilot schemes to improve the efficiency in the city	Freight and Delivery Management	Delivery and Service plans	2016	2017	Leicester City Council	Joint Air Quality Unit	NO	Fully funded	£30,000.00	Terminated	<0.1%	Delivery of the successful scheme	Included in AQAP as action to be delivered by 2017	Contractual issues related to insurance risk prevented the project going ahead.

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
															JAQU funding source was briefed and funding re-allocated
8	Questionnaire	Freight and Delivery Management	Freight Consolidation Centre	2016	2017	Leicester City Council	LCC funds	NO	Fully funded	N/A	Delivered	<0.01%	High response	Preparation of questions	The Freight Study (2017) looked at the potential role of a Freight Consolidation Centre for Leicester. It was recommended that Leicester City Council do not contribute financially. The proposal would be suitable for the private sector to take forward
9	Questionnaire	Freight and Delivery Management	Freight Partnerships for city centre deliveries	2016	2018	Leicester City Council	LCC funded	NO	Fully funded	N/A	Terminated	<0.01%	High response	Preparation of questions	A questionnaire has been drafted and we are currently awaiting the cost for the delivery of a questionnaire for the freight industry. Comments

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
															have been noted and used to revise the draft. This was circulated to the FQP for comment. The work was planned to be included as part of an EcoStars scheme. The EcoStars scheme will now not be progressed due to contractual issues.
11	Pedestrian Preference zone	Freight and Delivery Management	Quiet & out of hours delivery	2006	2007	Leicester City Council	LTP	NO	Partial Funding	>£1 million	Delivered	<0.1%	Scheme fully delivered	Scheme completed	All deliveries in this zone have to be done before 11, successful scheme
12	Cleige-route map for lorries	Freight and Delivery Management	Route Management Plans/ Strategic routing strategy for HGV's	2012	2013	Leicester City Council	Connecting Leicester	NO	Fully Funded	<£30,000.00	Delivered	< 0.1%	Map delivered	Map used by drivers	Completed, map used by drivers
13	AQ considerations will be imbedded in the new Local Plan and Land	Policy Guidance and Development	Air Quality Planning and Policy Guidance	2016	2020	Leicester City Council	Horizon 2020	NO	N/A	N/A	Delivered	<0.1 %	AQ imbedded in the documents	Preliminary work carried out	Currently ongoing

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
	use planning														
21	Procurement strategy	Policy Guidance and Development	Sustainable Procurement Guidance, Social Value Charter	2014	2018	Public Health England East Midlands	LCC funded	NO	N/A	N/A	Delivered	<0.1%	AQ included in the procurement strategy	New policy for procurement developed	Leicester City Council
22	Sustainable Procurement Guide	Promoting Low Emission Plant	Low Emission Fuels for stationary and mobile sources in Public Procurement	2016	Published 2018	Leicester City Council	LCC funded	NO	N/A	N/A	Delivered	< 0.1 %	Lowes emission plants	Implementation ongoing	Guidance prepared
23	Sustainable Procurement Guide	Promoting Low Emission Plant	Other Policy	2010	Published 2010	Leicester City Council	LCC funded	NO	N/A	N/A	Delivered	< 0.1 %	Adherence to the policy	Implementation ongoing	Ongoing
27	Plugged In places - Midlands	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging	2012	2017	Leicester City Council	DfT	NO	Partially Funded	<£1 million	Delivered	< 0.1 %	24 plugs installed	All installed	Scheme completed
53	Bus routes, cycle routes, bu timetables	Public Information	Via leaflets	Annual	January 2018	Leicester City Council	LCC, Bus Operators, County Council	NO	Partially Funded	< 100,000.00	Ongoing	< 0.1 %	Annual publication		Bus Map published and available to general public
54	Leaflets promoting walking	Public Information	Via leaflets	2015	2015/2016	Leicester City Council	LCC	NO	Partially Funded	< 100,000.00	Ongoing	< 0.1 %	7,500 leaflets distributed	Completed	

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
55	Leaflets promoting walking and cycling	Public Information	Via leaflets	2016	2019	The Ramblers Walks	ERDF	NO	Partially Funded	< 100,000.00	Ongoing	< 0.1%	2000	?	
71	A46 better bus scheme to improve bus lane	Transport Planning and Infrastructure	Bus route improvements	2012	Completed	Leicester City Council	LCC					< 0.1 %	Scheme implemented., bus journey time significantly reduced	Scheme successful, reported 15% increase in bus patronage	
74	New Haymarket Bus station	Transport Planning and Infrastructure	Public transport improvements-interchanges stations and services	2015	Completed	Leicester City Council	LCC, LLEP	NO	Partially Funded	< 1,000,000.00	Ongoing	< 5%	Opened	Implemented	
75	Leicester North-West major transport project	Transport Planning and Infrastructure	Other	2014	Stage 2 in designed, scheme to be completed in 2019	Leicester City Council, government grant, LEP	LCC, LLEP	NO	Partially Funded	< 10,000,000.00	Completed	< 0.1 %	Scheme being implemented in stages, stage 1 completed in June 2016	Stage 1 completed in June 2016, all completed	Scheme delivered
76	Bus pinch points project	Transport Planning and Infrastructure	Other	2015	2019	Local Growth Fund (LGF), administered by the LLEP	Local Growth Fund (LGF), administered by the LLEP, National	NO	Partially Funded	< 10,000,000.00	Completed	< 0.1 %	Reduced delays to buses at junctions and other nodes	Planning and initial design work carried out	Won National Productivity Investment Fund and LEP funding for 6
30	A discount on the licence fee of 40% for Euro 5 vehicles	Promoting Low Emission Transport	Taxi emission incentives	2013		Leicester City Council	LCC funded	NO	Partially Funded	< 1 million	Ongoing	< 0.1 %		Discount of 40% is discontinued as Euro 5 from 1	Discount no longer available

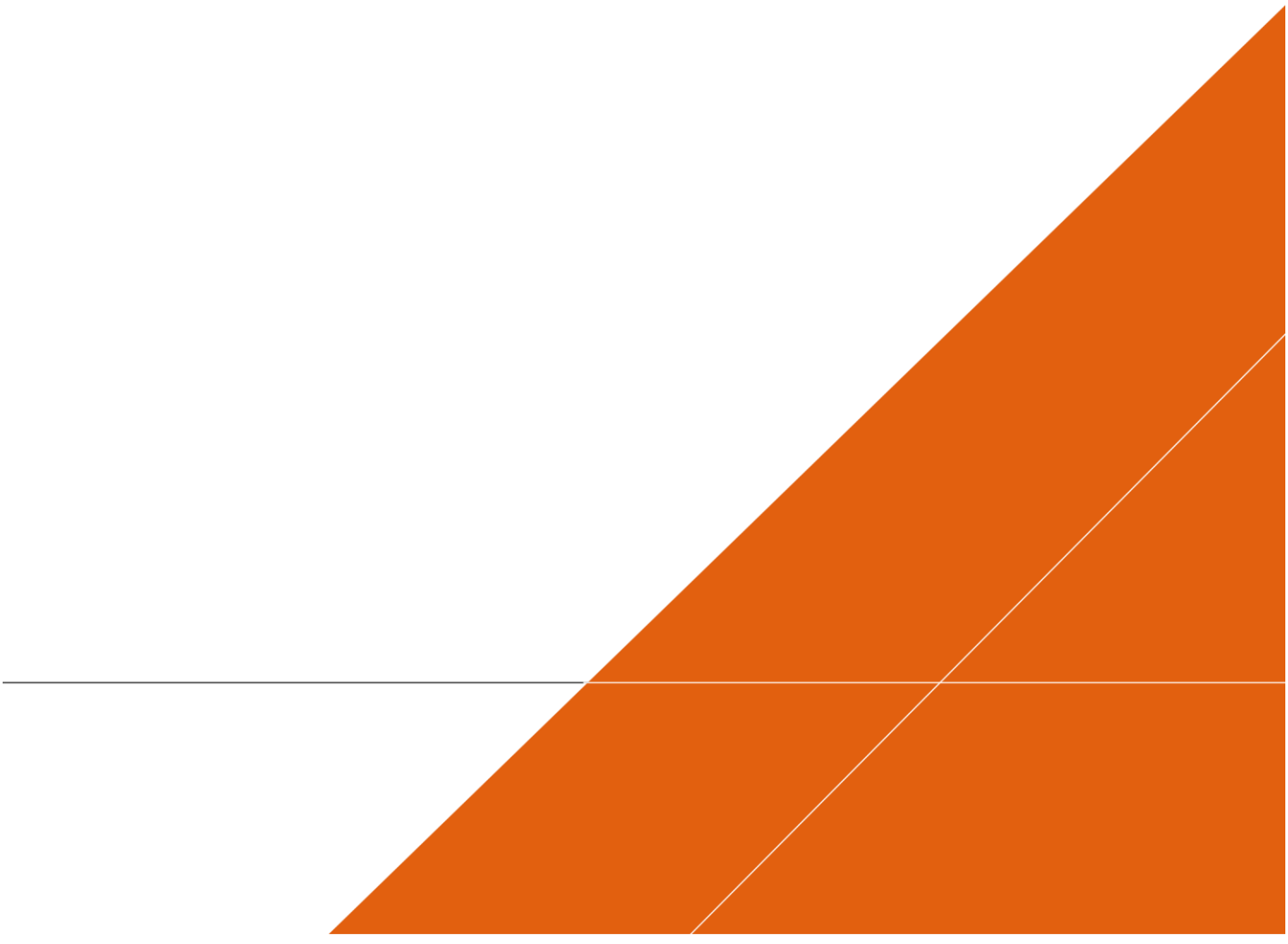
Appendix H: Diffusion Tube Monitoring Report for LCC (2021)

ARCADIS Design & Consultancy for natural and built assets

LEICESTER AIR QUALITY MONITORING REPORT

2021 Annual Diffusion Tube Results

JULY 2022



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VERSION CONTROL

Version	Date	Author	Checker	Approver	Changes
V01	23/06/2022	I.Ward	E.Hassall	S.Naylor	Draft
V02	06/07/2022	I.Ward	E.Hassall	S.Pyatt	Final
V03	22/07/2022	I.Ward	E.Hassall	S.Pyatt	Amendments to annualisation

CONTENTS

TABLES

APPENDICES

1 Introduction

1.1 Background

Arcadis (UK) Limited has been commissioned by Leicester City Council to undertake an Air Quality Monitoring Assessment to determine nitrogen dioxide (NO_2) concentrations at various locations across the city using passive diffusion tubes.

1.2 UK Legislation

Part IV of the Environment Act (1995) requires UK Government to produce a national Air Quality Strategy (AQS) which contains standards, objectives and measures for improving ambient air quality. The most recent AQS was published in July 2007[1]. The AQS sets out AQS objectives that are maximum ambient pollutant concentrations not to be exceeded either without exception or with a permitted number of exceedances over a specified timescale.

The regulations referred to in the AQS have been supplemented by the Air Quality Regulations (2010), which came into force on 11th June 2010 and transposed the European Union (EU) Air Quality Directive (2008/50/EC) into UK law. Air Quality Limit Values (AQLVs) were published in these regulations for seven pollutants, in addition to Target Values for an additional five pollutants. These are generally in line with the AQS objectives, although the requirements for the determination of compliance vary.

Pursuant to the European Union (Withdrawal) Act 2018[2], law derived from the EU has been converted into domestic law following the UK's withdrawal from the EU. The Air Quality (Amendment of Domestic Regulations) (EU Exit) Regulations 2019[3] made amendments to the Air Quality Standards Regulations 2010 to transpose provisions of the EU Ambient Air Quality Directive (2008/50/EC).

Table 1 presents the AQS objectives for pollutants considered within this assessment.

Table 1 - AQS Objectives

Pollutant	Air Quality Strategy Objective	
	Concentration (µg/m^3)	Averaging Period
NO_2	40	Annual mean
	200	1-hour mean; not to be exceeded more than 18 times a year

Table 2 summarises the advice provided in Local Air Quality Management Technical Guidance 2016 (LAQM.TG(16))[4] on where the AQS objectives for pollutants considered within this report apply.

Table 2 - Examples of Where the AQS Objectives Apply

Averaging Period	Objectives Should Apply At	Objectives Should Not Apply At
Annual Mean	All locations where members of the public might be regularly exposed	Building façades of offices or other places of work where members of the public do not have regular access

[1] Defra (2007), The Air Quality Strategy for England, Scotland, Wales and Northern Ireland
[2] Her Majesty's Stationary Office (2018) European Union (Withdrawal) Act 2018
[3] Her Majesty's Stationary Office (2019) Air Quality (Amendment of Domestic Regulations) (EU Exit) Regulations 2019
[4] Defra (2021), Local Air Quality Management Technical Guidance (TG16)

Averaging Period	Objectives Should Apply At	Objectives Should Not Apply At
	Building façades of residential properties, schools, hospitals, care homes etc.	Hotels, unless people live there as their permanent residence Gardens of residential properties Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term
1-hour Mean	All locations where the annual mean and 24-hour mean objectives apply, in addition to: Kerbside sites (for example, pavements of busy shopping streets) Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where the public might reasonably be expected to spend one hour or more Any outdoor locations where members of the public might reasonably be expected to spend one hour or longer	Kerbside sites where the public would not be expected to have regular access

It is a requirement of the Environment Act (1995) that Local Authorities (LAs) review current and future air quality within their area of jurisdiction under the system of Local Air Quality Management (LAQM). Any areas of relevant exposure where the AQS objectives are not, or unlikely to be, achieved should be identified.

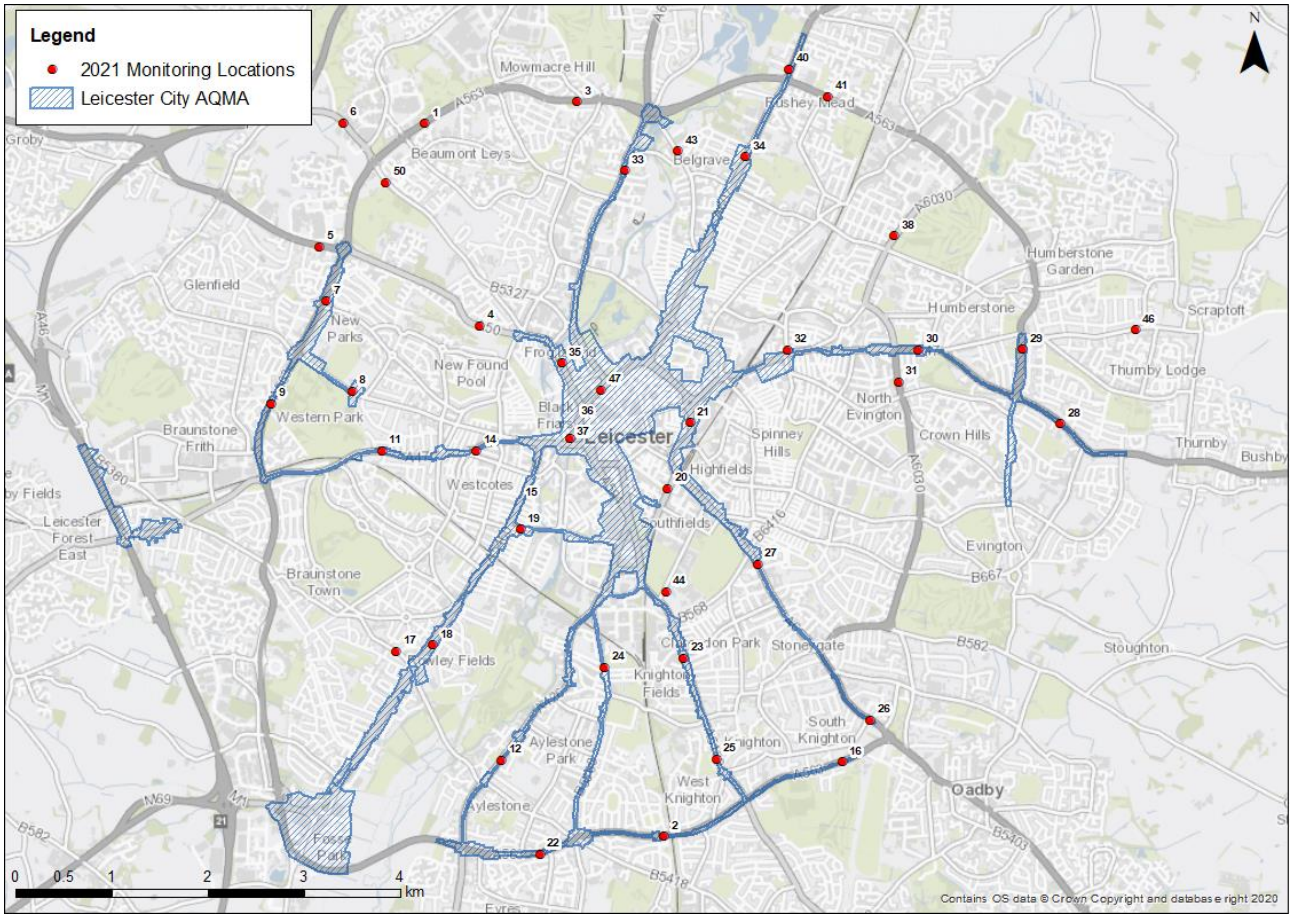
Where it is anticipated that an AQS objective will not be met, it is a requirement that an Air Quality Management Area (AQMA) be declared. Where an AQMA is declared, the LA is obliged to produce an Action Plan in pursuit of the achievement of the AQS objectives.

Leicester City Council have declared an AQMA (declared in 2000 and amended in 2007) for exceedances of the annual mean NO_2 objectives. The AQMA covers a large section of the City Centre and along a number of radial roads and sections of the ring road.

2 Methodology

An NO_2 diffusion tube survey has been undertaken in agreement with Leicester City Council over the course of 2021 as a continuation of the 2020 diffusion tube survey[5], where monitoring locations were selected in accordance with the methodology provided in 'Diffusion Tubes for Ambient NO_2 Monitoring: Practical Guidance'[6] and approved by Department for Environment, Food & Rural Affairs (Defra) and Department for Transport (DfT) Joint Air Quality Unit (JAQU). It should be noted that diffusion tube locations for this study were selected in order to determine NO_2 concentrations across the city with the focus on covering major roads. Not all sites are representative of sensitive receptor locations and hence the AQS objectives are not applicable at all locations.

Monitoring has been undertaken at 43 locations across the city during 2021. At two of these locations triplicate tubes have been co-located with continuous NO_2 analysers (located on Vaughan Way and the Automatic Urban and Rural Network (AURN) site on University Road) to allow a bias adjustment factor to be calculated in accordance with the LAQM.TG(16)[4]. Insert 1 presents a map of the diffusion tube monitoring locations across the city alongside the current declared AQMA. Details of the site locations are provided in Appendix A.



Insert 1 - Diffusion Tube Monitoring Locations

All diffusion tubes used for the purposes of this monitoring survey used the preparation method of 20% TEA in water and were provided and analysed by Staffordshire Highways Laboratory. Raw NO_2 results have been annualised and bias adjusted in accordance with LAQM.TG(16)[4] as detailed in the following section.

[5] Arcadis (2021) Leicester Air Quality Monitoring Report 2020 Annual Diffusion Tube Survey
[6] AEA Technology (2008), Diffusion Tubes for Ambient NO_2 Monitoring: Practical Guidance

3 Results

3.1 Raw Monitoring Results

The raw monitoring results for each monthly exposure period are presented in Table 3. It should be noted that these results have not been bias adjusted or annualised so do not reflect an annual average concentration comparable to the AQS objective.

Table 3 - Raw Nitrogen Dioxide Diffusion Tube Results

Diffusion Tube ID	Raw Measured NO_2 Concentration (µg/m^3)												Average raw measured NO_2 concentration (µg/m^3)	Data Capture for Monitoring Period (%)
	Jan 2021	Feb 2021	March 2021	April 2021	May 2021	June 2021	July 2021	Aug 2021[1]	Sept 2021	Oct 2021	Nov 2021	Dec 2021		
LCC1	36.9	37.2	35.0	29.1	32.9	35.4	35.1	-	-	-	48.6	37.1	36.4	82
LCC2	27.7	36.5	30.9	27.7	24.0	27.8	23.6	-	29.0	28.7	39.0	31.7	29.7	100
LCC3	-	38.1	35.9	34.9	33.5	40.2	35.7	-	42.0	34.9	42.6	44.7	38.3	91
LCC4	-	-	-	-	-	34.2	31.3	-	37.5	39.6	47.9	40.2	38.5	55
LCC5	37.9	40.1	36.3	36.2	41.9	45.9	43.7	-	47.4	43.1	50.3	44.4	42.5	100
LCC6	30.8	39.9	38.5	39.9	44.2	45.1	44.0	-	39.9	40.1	43.7	39.3	40.5	100
LCC7	33.4	35.7	28.8	25.4	29.7	33.3	33.9	-	32.7	36.6	44.7	37.5	33.8	100
LCC8	-	22.2	19.2	-	14.0	16.0	17.3	-	22.7	25.3	31.9	27.3	21.8	82
LCC9	27.1	30.2	28.2	24.8	27.7	28.5	25.8	-	31.6	32.3	40.6	35.1	30.2	91
LCC11	30.2	31.2	27.5	24.5	28.0	29.6	28.3	-	34.5	36.4	46.0	38.8	32.3	100
LCC12	-	33.3	28.8	21.8	24.6	29.5	25.1	-	29.8	29.9	43.5	34.2	30.1	91
LCC14	28.3	28.5	23.5	20.2	20.0	22.6	20.6	-	28.4	31.3	37.0	30.3	26.4	100
LCC16	38.9	47.6	38.9	35.8	37.2	33.3	36.2	-	45.2	39.3	66.5	49.9	42.6	100
LCC17	30.1	30.5	27.8	25.1	25.4	26.7	25.3	-	29.8	31.3	40.0	34.3	29.7	100
LCC18	34.7	31.7	32.7	29.6	31.4	31.2	30.6	-	35.8	39.0	49.2	33.2	34.5	91
LCC19	44.6	43.4	38.2	41.6	41.2	36.9	38.7	-	-	-	-	47.1	41.5	73

Diffusion Tube ID	Raw Measured NO_2 Concentration (µg/m³)												Average raw measured NO_2 concentration (µg/m³)	Data Capture for Monitoring Period (%)
	Jan 2021	Feb 2021	March 2021	April 2021	May 2021	June 2021	July 2021	Aug 2021[1]	Sept 2021	Oct 2021	Nov 2021	Dec 2021		
LCC20	36.5	32.5	32.2	27.6	25.2	31.2	27.3	-	28.1	28.2	38.0	14.8	29.2	100
LCC21	31.8	29.7	30.9	26.4	25.6	29.8	-	-	-	-	-	-	29.0	55
LCC22	31.6	40.1	35.7	29.6	32.7	37.1	31.2	-	32.6	29.7	40.2	31.7	33.8	100
LCC23	32.5	40.7	34.4	34.5	34.8	37.2	29.2	-	45.4	42.5	60.1	42.5	39.4	100
LCC24	29.5	31.9	26.6	26.3	25.2	27.4	28.3	-	32.2	29.9	41.4	35.5	30.4	100
LCC25	26.4	30.1	29.2	21.7	17.2	24.4	18.2	-	22.5	25.3	39.9	23.3	25.3	100
LCC26	29.5	23.3	27.8	27.9	26.6	31.3	27.4	-	35.4	36.9	39.7	35.2	31.0	100
LCC27	30.0	42.1	30.9	36.5	36.1	40.6	39.2	-	44.0	43.5	45.9	40.5	39.0	100
LCC28	23.9	22.3	23.5	18.9	17.8	22.7	17.2	-	22.0	23.9	31.3	27.6	22.8	100
LCC29	28.4	27.7	25.8	22.0	22.5	24.3	22.7	-	24.7	32.3	37.7	34.4	27.5	100
LCC30	-	38.2	36.9	33.8	35.5	36.7	-	-	33.5	-	-	-	35.8	55
LCC31	29.1	-	27.3	26.4	25.0	30.1	27.9	-	33.4	35.3	47.9	34.8	31.7	91
LCC32	37.8	40.0	39.7	35.9	37.7	42.6	38.3	-	40.6	41.6	48.4	42.2	40.4	100
LCC33	34.9	33.4	33.2	23.2	28.9	-	-	-	-	-	-	-	30.7	45
LCC34	30.9	29.6	25.0	24.5	22.7	26.3	23.8	-	27.8	31.2	32.9	33.8	28.0	100
LCC35	-	36.3	29.1	28.3	26.2	30.0	-	-	25.7	37.1	45.7	42.6	33.4	82
LCC37	34.4	40.2	35.2	34.8	38.0	39.7	36.8	-	38.5	38.0	48.9	41.5	38.7	100

Diffusion Tube ID	Raw Measured NO_2 Concentration (µg/m³)												Average raw measured NO_2 concentration (µg/m³)	Data Capture for Monitoring Period (%)
	Jan 2021	Feb 2021	March 2021	April 2021	May 2021	June 2021	July 2021	Aug 2021[1]	Sept 2021	Oct 2021	Nov 2021	Dec 2021		
LCC38	29.6	24.0	22.9	20.4	-	21.7	20.5	-	24.8	34.3	34.2	31.3	26.4	91
LCC40	34.6	35.7	29.8	30.1	29.6	32.4	28.8	-	34.0	36.1	35.1	42.1	33.5	100
LCC41	36.1	33.3	30.8	28.9	26.5	27.1	-	-	35.7	37.7	41.5	38.6	33.6	91
LCC43	39.4	34.3	34.0	29.7	29.6	35.7	30.7	-	34.4	35.1	42.5	37.9	34.8	100
LCC44a	27.9	27.9	-	17.0	18.6	-	-	-	-	-	-	-	N/A[2]	36
LCC44b	27.9	27.3	-	18.0	-	-	-	-	-	-	-	-	N/A[2]	27
LCC44c	27.8	24.9	-	17.8	17.2	-	-	-	-	-	-	-	N/A[2]	36
LCC45	22.5	-	17.3	13.3	12.6	13.1	14.0	-	14.8	25.0	25.0	21.2	17.9	91
LCC46	20.0	24.3	19.3	16.0	17.0	18.1	17.2	-	21.6	22.6	34.1	27.6	21.6	100
LCC47a	43.9	37.3	34.8	38.1	37.7	44.2	45.2	-	48.5	45.4	48.5	55.1	N/A*	100
LCC47b	49.1	39.9	37.3	42.5	43.0	44.1	44.8	-	44.1	47.8	52.7	54.8	N/A*	100
LCC47c	45.3	38.2	33.2	33.4	40.4	45.2	44.4	-	45.8	48.1	54.0	54.6	N/A*	100
LCC49	22.3	18.7	17.2	13.5	11.2	13.8	13.8	-	17.0	20.8	23.3	22.1	17.6	100
LCC50	25.2	25.7	27.9	20.8	20.6	23.2	-	-	-	-	-	23.0	23.8	64

[1] Monitoring was conducted for the full calendar year with changeover intervals of 3-5 weeks. This resulted in some exposure periods covering more than one month (i.e. part of August was included within the July exposure period and part within September), resulting in 11 raw data sets instead of 12. Details of exposure period dates are provided in Table B 1 of Appendix B.

[2] N/A - triplicate tubes at co-location site require monthly averaging.

3.2 Annualisation

Annualisation is the process of estimating annual mean NO_2 concentrations when data capture for the year is below 75%. Seven sites had data capture below 75% in 2021 and therefore required annualisation. These sites were LCC4, LCC19, LCC21, LCC30, LCC33, LCC44 (triplicate) and LCC50.

The results from these sites have been annualised to represent a full annual data capture based upon the methodology contained within LAQM.TG(16)[4]. The approach is based on the principle that patterns in pollutant concentrations are usually consistent across broad regions and therefore considers the relationship between period means and annual means at monitoring stations in the same region as the site of interest. The period mean is the period that the diffusion tube data is available for. The average of the ratios of the continuous monitor data annual mean to the period mean (Am/Pm) provides the annualisation factor. This annualisation factor is then applied to the diffusion tube period mean to provide an estimated annual average representative of a full calendar year.

LAQM.TG(16)[4] stipulates that background sites should be used to avoid any local effects that may occur at roadside sites, and should, wherever possible lie within a radius of about 50 miles. Table 4 presents three Defra AURN background monitoring locations, which are within 50 miles of the site, and the 2021 annual mean NO_2 concentrations and data captures. Urban background monitoring sites are characterised as urban locations distanced from sources and broadly representative of city-wide background concentrations. Data from these sites is considered by LAQM.TG(16)[4] to be suitable for the adjustment of short-term diffusion tube monitoring survey results to annual mean concentrations.

Table 4 - Continuous Monitoring Sites used for Annualisation

Automatic Site	X	Y	Site Type	2021 Annual Mean NO_2 (µg/m^3)	Data Capture (%)
Coventry Allesley	430011	279376	Urban Background	15.6	96
Leamington Spa	431943	265733	Urban Background	15.0	94
Leicester University	459178	302808	Urban Background	20.3	87

It should be noted that the December 2021 diffusion tube exposure period ended 11th January 2022 and therefore provisional continuous monitoring data from the first two weeks of 2022 were used during the annualisation process. All 2021 continuous monitoring data from the three automatic sites had been fully ratified at the time of this assessment. Data captures from all three continuous monitors were above the 85% required for annualisation to be completed as stipulated in LAQM.TG(16)[4]. LAQM.TG(16)[4] stipulates that there must be at least three months of available monitoring data in order to be annualised. All sites met this data capture criteria therefore an annual mean could be estimated for all sites.

Table 5 shows the annualisation factors that were applied to each diffusion tube and the 2021 annualised NO_2 concentrations. Further detail on how the individual annualisation factors were derived is presented in Appendix B.

Table 5 - Annualised 2021 Diffusion Tube Results

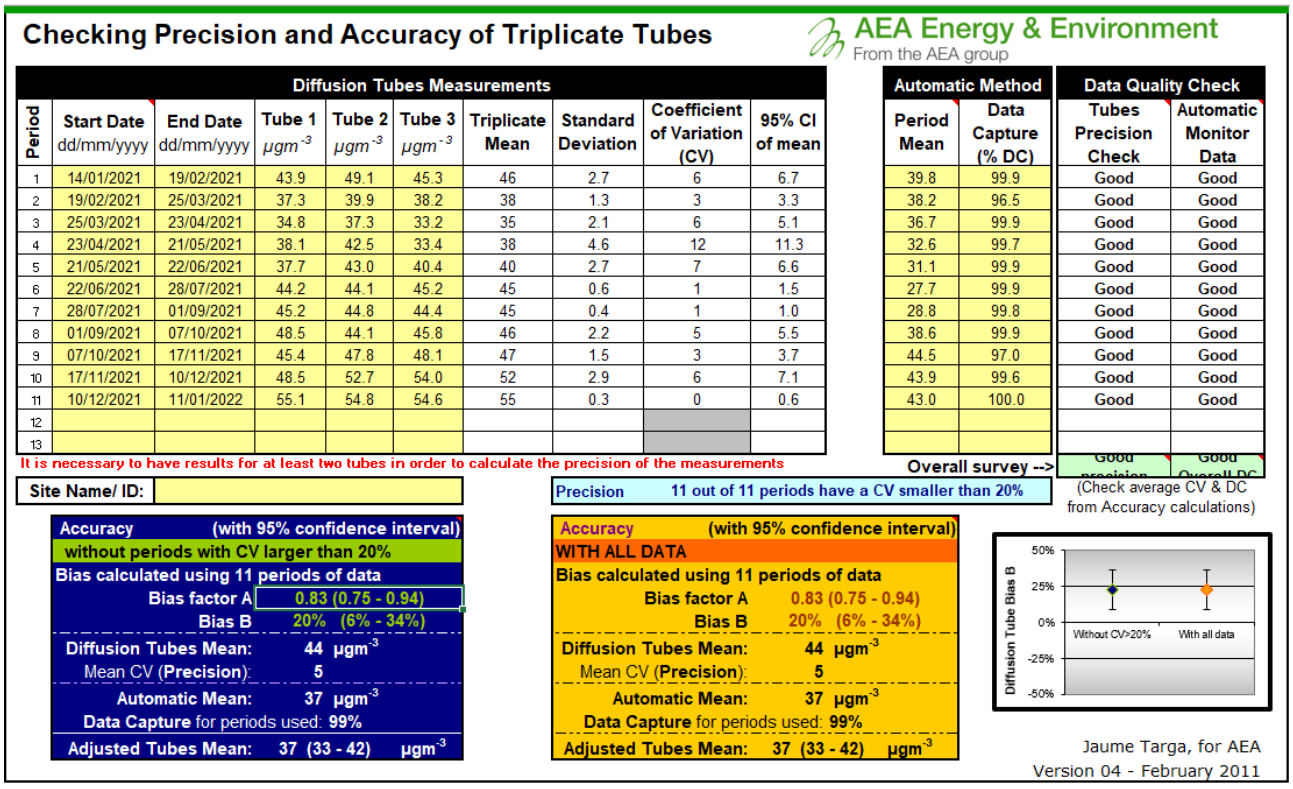
Diffusion Tube ID	Raw Period Mean NO_2 Concentration (µg/m^3)	Data Capture (%)	Annualisation Factor	2021 Annualised Mean NO_2 Concentration (µg/m^3)
LCC4	38.5	55	1.03	39.4
LCC19	41.5	73	1.16	48.1

Diffusion Tube ID	Raw Period Mean NO_2 Concentration ($\mu g/m^3$)	Data Capture (%)	Annualisation Factor	2021 Annualised Mean NO_2 Concentration ($\mu g/m^3$)
LCC21	29.0	55	1.12	32.5
LCC30	35.8	55	1.20	42.7
LCC33	30.7	45	1.07	32.8
LCC44abc	22.5	36	1.10	24.7
LCC50	23.8	64	1.06	25.2

3.3 Bias Adjustment

Due to the inherent bias associated with passive NO_2 diffusion tubes, it is necessary to utilise an adjustment factor which can be applied to the monitoring dataset in order to calculate the concentration from the tube. Bias adjustment is the process of accounting for the variable accuracy of annual mean NO_2 concentrations as measured by diffusion tubes relative to the chemiluminescent reference method from continuous automatic analysers. The Local Bias Adjustment Factor Tool[7], designed by AEA Technology on behalf of DEFRA, was used with monitoring data from the co-location site (Vaughan Way), as displayed in Insert 2, to generate a local bias adjustment factor of 0.83 which was then utilised for bias correction, in accordance with LAQM.TG(16)[4]. It should be noted that the Leicester University AURN triplicate tubes were not used for bias adjustment following advise from DEFRA to use Vaughan Way as this is more representative of the roadside locations of the diffusion tube network.

[7] AEA Technology, on behalf of Defra (2011), Local Bias Adjustment Factor Tool. Available online from: https://laqm.defra.gov.uk/bias-adjustment-factors/local-bias.html



Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements

Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 µgm^{-3}	Tube 2 µgm^{-3}	Tube 3 µgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean	Automatic Method: Period Mean	Automatic Method: Data Capture (% DC)	Data Quality Check: Tubes Precision Check	Data Quality Check: Automatic Monitor Data
1	14/01/2021	19/02/2021	43.9	49.1	45.3	46	2.7	6	6.7	39.8	99.9	Good	Good
2	19/02/2021	25/03/2021	37.3	39.9	38.2	38	1.3	3	3.3	38.2	96.5	Good	Good
3	25/03/2021	23/04/2021	34.8	37.3	33.2	35	2.1	6	5.1	36.7	99.9	Good	Good
4	23/04/2021	21/05/2021	38.1	42.5	33.4	38	4.6	12	11.3	32.6	99.7	Good	Good
5	21/05/2021	22/06/2021	37.7	43.0	40.4	40	2.7	7	6.6	31.1	99.9	Good	Good
6	22/06/2021	28/07/2021	44.2	44.1	45.2	45	0.6	1	1.5	27.7	99.9	Good	Good
7	28/07/2021	01/09/2021	45.2	44.8	44.4	45	0.4	1	1.0	28.8	99.8	Good	Good
8	01/09/2021	07/10/2021	48.5	44.1	45.8	46	2.2	5	5.5	38.6	99.9	Good	Good
9	07/10/2021	17/11/2021	45.4	47.8	48.1	47	1.5	3	3.7	44.5	97.0	Good	Good
10	17/11/2021	10/12/2021	48.5	52.7	54.0	52	2.9	6	7.1	43.9	99.6	Good	Good
11	10/12/2021	11/01/2022	55.1	54.8	54.6	55	0.3	0	0.6	43.0	100.0	Good	Good
12													
13													

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

Overall survey --> Good Good

Site Name/ ID:

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

(Check average CV & DC from Accuracy calculations)

Accuracy (with 95% confidence interval) without periods with CV larger than 20%
Bias calculated using 11 periods of data
Bias factor A: 0.83 (0.75 - 0.94)
Bias B: 20% (6% - 34%)
Diffusion Tubes Mean: 44 µgm^{-3}
Mean CV (Precision): 5
Automatic Mean: 37 µgm^{-3}
Data Capture for periods used: 99%
Adjusted Tubes Mean: 37 (33 - 42) µgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA
Bias calculated using 11 periods of data
Bias factor A: 0.83 (0.75 - 0.94)
Bias B: 20% (6% - 34%)
Diffusion Tubes Mean: 44 µgm^{-3}
Mean CV (Precision): 5
Automatic Mean: 37 µgm^{-3}
Data Capture for periods used: 99%
Adjusted Tubes Mean: 37 (33 - 42) µgm^{-3}

Jaume Targa, for AEA
Version 04 - February 2011

Insert 2 - Co-location at Vaughan Way Local Bias Adjustment Factor Tool

The calculated annualisation and bias adjustment factors have been applied to the raw diffusion tube mean NO_2 concentrations. The annualised and bias adjusted annual mean 2021 monitoring results from the diffusion tube survey are displayed in Table 6.

Table 6 - Bias Adjusted and Annualised 2021 Diffusion Tube Results

Diffusion Tube ID	Raw Monitored Mean NO_2 Concentration (µg/m^3)	Monitoring Period Data Capture (%)	Bias Adjusted Annualised 2021 Mean NO_2 Concentration (µg/m^3)
LCC1	36.4	82	30.2
LCC2	29.7	100	24.6
LCC3	38.3	91	31.7
LCC4	38.5	55	32.7
LCC5	42.5	100	35.3
LCC6	40.5	100	33.6
LCC7	33.8	100	28.0
LCC8	21.8	82	18.1
LCC9	30.2	91	25.0

Diffusion Tube ID	Raw Monitored Mean NO_2 Concentration ($\mu g/m^3$)	Monitoring Period Data Capture (%)	Bias Adjusted Annualised 2021 Mean NO_2 Concentration ($\mu g/m^3$)
LCC11	32.3	100	26.8
LCC12	30.1	91	24.9
LCC14	26.4	100	21.9
LCC16	42.6	100	35.4
LCC17	29.7	100	24.6
LCC18	34.5	91	28.6
LCC19	41.5	73	39.9
LCC20	29.2	100	24.3
LCC21	29.0	55	27.0
LCC22	33.8	100	28.1
LCC23	39.4	100	32.7
LCC24	30.4	100	25.2
LCC25	25.3	100	21.0
LCC26	31.0	100	25.7
LCC27	39.0	100	32.4
LCC28	22.8	100	18.9
LCC29	27.5	100	22.8
LCC30	35.8	55	35.5
LCC31	31.7	91	26.3
LCC32	40.4	100	33.6
LCC33	30.7	45	27.2
LCC34	28.0	100	23.3
LCC35	33.4	82	27.8
LCC37	38.7	100	32.1
LCC38	26.4	91	21.9
LCC40	33.5	100	27.8

Diffusion Tube ID	Raw Monitored Mean NO_2 Concentration ($\mu g/m^3$)	Monitoring Period Data Capture (%)	Bias Adjusted Annualised 2021 Mean NO_2 Concentration ($\mu g/m^3$)
LCC41	33.6	91	27.9
LCC43	34.8	100	28.9
LCC44abc	22.5	36	20.5
LCC45	17.9	91	14.8
LCC46	21.6	100	17.9
LCC47abc	44.3	100	36.8
LCC49	17.6	100	14.6
LCC50	23.8	64	20.9

3.4 NO_2 Fall-off with Distance from the Road

Following annualisation and bias adjustment, one diffusion tube site, LCC19, was close to exceeding the AQS objective for 2021 (i.e. the annual average NO_2 concentration was greater than 40µg/m³). LCC19 is located on Upperton Road where sensitive receptors are present. The diffusion tube was located closer to the road than the receptors so to account for the fall-off in concentration further from the road, the concentration measured at LCC19 was distance corrected to estimate the concentration at sensitive receptors near Upperton Road using the NO_2 Fall-Off with Distance Calculator (Version 4.2)[8].

Table 7 presents the inputs for the distance correction calculation and the distance corrected concentration for the monitoring location LCC19.

Table 7 - Distance Corrected Result for LCC19

Site ID	Distance (m): Monitoring Site to Kerb	Distance (m): Receptor to Kerb	Monitored Concentration (Annualised and Bias Adjusted) ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)	Concentration Predicted at Receptor ($\mu g/m^3$)
LCC19	0.5	4.5	39.9	17.9	31.4

[8] Bureau Veritas, on behalf of Defra (2018), NO_2 Fall-Off with Distance Calculator (Version 4.2). Available online from: https://laqm.defra.gov.uk/air-quality/air-quality-assessment/no2-falloff/

4 Summary

The results of the monitoring have identified that one of the diffusion tube sites was close to exceeding the AQS objective for 2021 (i.e. the annual average NO_2 concentration was within 10% of 40µg/m^3). The monitoring location LCC19 is located on Upperton Road which is a busy road close to the centre of the City and the tube is located where traffic is likely to queue for traffic lights. It should be noted that sensitive receptors adjacent to Upperton Road are set further back from the road than the diffusion tube and when the measurement is adjusted to account for the decrease in concentration with distance from road (using the NO_2 Fall-Off with Distance Calculator (Version 4.2))[8], the estimated NO_2 concentration at sensitive receptors on Upperton Road is 31.4µg/m^3, below the AQS objective. All other monitoring locations are well below the AQS objective.

APPENDIX A

Monitoring Locations

Table A1 - British National Grid Coordinates of the Diffusion Tube Monitoring Sites.

Diffusion Tube ID	X	Y	Description
LCC1	456672	307669	Lamppost on A563 Krefeld Way
LCC2	459165	300271	Lamppost on A563 Asquith Way
LCC3	458260	307900	Lamppost on A563 Red Hill Way
LCC4	457244	305572	Lamppost on A50 Groby Road
LCC5	455578	306395	Lamppost on A50 Groby Road
LCC6	455825	307676	Lamppost on A5630 Anstey Lane
LCC7	455647	305825	Lamppost on A563 New Parks Way
LCC8	455917	304892	Lamppost on Glenfield Road
LCC9	455082	304761	Lamppost on A563 New Parks Way
LCC11	456230	304273	Lamppost on A47 Hinckley Road
LCC12	457474	301061	Lamppost on A426 Aylestone Road
LCC14	457210	304276	Lamppost on Stretton Road
LCC16	461014	301043	Lamppost on A563 Palmerston Way
LCC17	456380	302193	Lamppost on Braunstone Lane
LCC18	456754	302259	Lamppost on A5460 Narborough Road
LCC19	457667	303460	Lamppost on Upperton Road.
LCC20	459196	303882	Lamppost on A594 Waterloo Way
LCC21	459431	304564	Lamppost on A594 St Georges Way
LCC22	457869	300085	Lamppost on A563 Glenhills Way
LCC23	459367	302117	Lamppost on A5199 Welford Road
LCC24	458542	302023	Lamppost on B5366 Saffron Lane
LCC25	459703	301072	Lamppost on A5199 Welford Road
LCC26	461307	301478	Lamppost on A6 London Road
LCC27	460134	303093	Lamppost on A6 London Road

Diffusion Tube ID	X	Y	Description
LCC28	463282	304552	Lamppost on A47 Uppingham Road
LCC29	462891	305329	Lamppost on A563 Colchester Road
LCC30	461806	305323	Lamppost on A47 Uppingham Road
LCC31	461596	304989	Lamppost on A6030 Coleman Road
LCC32	460441	305322	Lamppost on Forest Road
LCC33	458749	307184	Telegraph pole on A6 Abbey Lane
LCC34	460010	307324	Lamppost on A607 Melton Road
LCC35	458099	305184	Lamppost on A50 Frog Island
LCC37	458182	304400	Lamppost on St Nicholas Circle
LCC38	461558	306508	Lamppost on A6030 Victoria Road East
LCC40	460460	308234	Lamppost on A607 Melton Road
LCC41	460865	307949	Lamppost on A563 Troon Way
LCC43	459304	307385	Lamppost on Loughborough Road
LCC44abc	459185	302812	Co-location triplicate at Leicester University AURN, University Road
LCC45	457596	310078	Lamppost on Leicester Road
LCC46	464058	305532	Lamppost on Scraptoft Lane
LCC47abc	458507	304904	Co-location triplicate Vaughan Way Automatic Monitoring Station
LCC49	457472	310229	Lamppost on Hogarth Road
LCC50	456269	307062	Lamppost on B5327 Anstey Lane

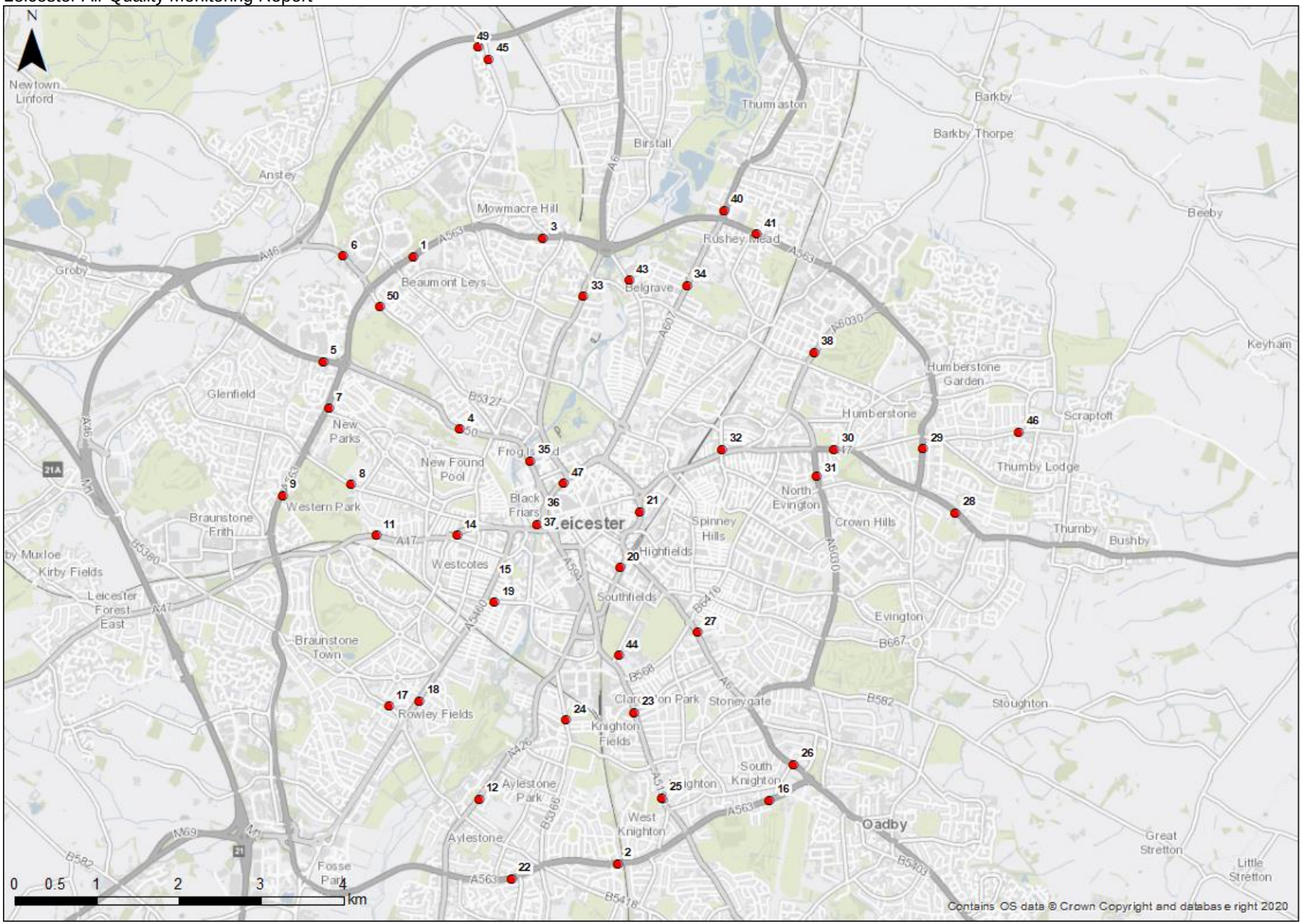


Figure 1 - Diffusion Tube Monitoring Locations

APPENDIX B

Annualisation Factors

Seven annualisation factors were calculated based on the available exposure periods of each diffusion tube due to different on/off days and missing data. Table B 1 shows the exposure periods that were used to calculate the period mean for each annualisation factor for the diffusion tube sites with a data capture less than 75%.

Table B 1- Exposure periods and available data periods used to determine period means for annualisation factors

Month	Start Date	End Date	LCC4	LCC19	LCC21	LCC30	LCC33	LCC44	LCC50
Jan	13/01/2021	18/02/2021					✓		✓
	14/01/2021	19/02/2021		✓	✓			✓	
Feb	18/02/2021	24/03/2021				✓	✓		✓
	19/02/2021	25/03/2021		✓	✓			✓	
Mar	24/03/2021	22/04/2021				✓	✓		✓
	25/03/2021	23/04/2021		✓	✓				
Apr	22/04/2021	20/05/2021				✓	✓		✓
	23/04/2021	21/05/2021		✓	✓			✓	
May	20/05/2021	22/06/2021				✓	✓		✓
	21/05/2021	22/06/2021		✓	✓			✓	
Jun	22/06/2021	28/07/2021	✓	✓	✓	✓			✓
Jul	28/07/2021	01/09/2021	✓	✓					
	28/07/2021	07/10/2021				✓			
Sep	01/09/2021	07/10/2021	✓						
Oct	07/10/2021	17/11/2021	✓						
Nov	17/11/2021	10/12/2021	✓						
Dec	09/12/2021	11/01/2022							✓
	10/12/2021	11/01/2022	✓	✓					
	Annualisation Factor:		1.03	1.16	1.12	1.20	1.20	1.10	1.06

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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
EU	European Union
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
PM_{10}	Airborne particulate matter with an aerodynamic diameter of 10µm or less
$PM_{2.5}$	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO_2	Sulphur Dioxide
LCC	Leicester City Council
LTP	Leicester Transport Plan
CAZ	Clean Air Zone
DfT	Department for Transport
LES	Low Emission Strategy
TFC	Transforming City Funds
OZEV	Office for Low Zero Vehicles
ULEV	Ultra-Low Emission Vehicle
JAQU	Joint Air Quality Unit

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