BEDFORD
BOROUGH COUNCIL

2024 Air Quality Annual Status Report (ASR)

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

Date: August 2024

Information	Bedford Borough Council Details
Local Authority Officer	Callum Fletcher
Department	Regulatory Services
Address	Borough Hall Cauldwell Street, Bedford MK42 9AP
Telephone	01234 718099
E-mail	Callum.Fletcher@bedford.gov.uk
Report Reference Number	ASR 24 BBC
Date	August 2024

Executive Summary: Air Quality in Our Area

Air Quality in Bedford

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

Air pollution particularly affects the most vulnerable in society, children, the elderly, and those with existing heart and lung conditions. Additionally, people living in less affluent areas are most exposed to dangerous levels of air pollution[2].

Table ES 1 provides a brief explanation of the key pollutants relevant to Local Air Quality Management and the kind of activities they might arise from.

Table ES 1 - Description of Key Pollutants

Pollutant	Description
Nitrogen Dioxide (NO_2)	Nitrogen dioxide is a gas which is generally emitted from high-temperature combustion processes such as road transport or energy generation.
Sulphur Dioxide (SO_2)	Sulphur dioxide (SO_2) is a corrosive gas which is predominantly produced from the combustion of coal or crude oil.
Particulate Matter (PM_{10} and $PM_{2.5}$)	Particulate matter is everything in the air that is not a gas. Particles can come from natural sources such as pollen, as well as human made sources such as smoke from fires, emissions from industry and dust from tyres and brakes. PM_{10} refers to particles under 10 micrometres. Fine particulate matter or $PM_{2.5}$ are particles under 2.5 micrometres.

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

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

Air quality in Bedford Borough is mostly very good, however, there are locations where pollutants build up and are slow to disperse due to traffic volumes and road traffic routes with unfavourable layouts/local geography.

The main pollutant of concern in Bedford Borough is Nitrogen dioxide (NO_2), the primary source of which is road traffic emissions. Bedford has several strategic transport routes including the A1, A421 and A6 which carry high levels of traffic. Traffic routes are constrained in and around the town centre by river, road and rail bridges, and one-way traffic systems have evolved in response to pinch points created by these constraints. This combined with high levels of car ownership and use results in congestion hotspots.

In 2023 Bedford Borough Council were undertaking air quality monitoring for NO_2 at one automatic site and at 56 passive diffusion tube sites. The 2023 monitoring results have determined that there is one exceedance of the annual mean NO_2 objective at diffusion tube sites within the Borough

The 2023 Annual Status Report had to use the national bias adjustment factor, rather than the generally more conservative local bias adjustment factor which had been used for a number of consecutive years. For this year (2024) the approach has been to revert to the more conservative local bias adjustment as data capture for 2023 was good supporting its use.

Therefore, to assist comparison of data from 2023 with that of 2022, had the national bias adjustment been applied this year all diffusion tube monitoring locations would have seen a reduction from 2022 results.

The 2023 monitoring results, utilising the more conservative local bias adjustment factor, have determined that there was one exceedance of the annual mean NO_2 objective of 40 $\mu g/m^3$ at diffusion tube sites within the Borough (40.5 µg/m3). This is the same location as historically has been above the limit for a number of years, with one location within 10% (above 36 $\mu g/m^3$) the other values are all below 36 $\mu g/m^3$.

Two Earthsense Zephyr air quality monitors have been situated on Ampthill Rd since 2021 just outside the AQMA and four more have been installed in 2023. It is understood that results from such monitors should not be included within the formal reporting for this return however these can provide indicative data for particulate matter in the area. One of the zephyrs was located at the location of the NO_2 exceedance (Prebend Street) the others

located as part of the school streets project provide a good indication of the levels in the Borough.

Table ES 2 – Annual averages for PM2.5/PM10 & recorded PM10 exceedances at 5 locations within the Borough

Location	PM2.5 annual average (µg/m3)	PM 10 annual average (µg/m3)	No. of exceedances of PM10 over 50 µg/m (24 hr average)
Ampthill Rd - Morrisons	7.28	11.21	1
Ampthill Rd - Brittania Rd	7.63	11.58	1
Slade walk	10.58	11.69	0
Goldington Rd	11.27	12.51	2
Prebend St	11.79	13.09	1

The Air Quality Standards Regulations (2010) require that concentrations of PM in the UK must not exceed:

- An annual average of 40 µg/m^3 for PM10;
- A 24-hour average of 50 µg/m^3 more than 35 times in a single year for PM10;
- An annual average of 20 µg/m^3 for PM2.5.

Therefore, the indicative data does not suggest an exceedance of any of these objectives.

The Environment Act 2021 established a legally binding duty on Government to set an annual mean target on the level of fine particulate matter (PM2.5), in addition to a longer-term target. This resulted in the Environmental Targets (Fine Particulate Matter) (England) Regulations (2023) setting a requirement that in England by the end of 2040 the:

- Annual average of 10 µg/m3 for PM2.5 is not exceeded at any monitoring station (the Annual Mean Concentration Target or AMCT).

The Environmental Improvement Plan 2023 for England set interim targets that by January 2028:

- An annual average of 12 µg/m3 for PM2.5 is not exceeded at any monitoring station.

Although these are not reference standard accredited monitoring stations the levels indicated by the Zephyrs show levels below 12 µg/m3 for PM2.5. However, Bedford Borough Council are carrying out projects and work to highlight the impact of local sources on PM2.5 and educating residents in how to reduce these levels. Further details are provided within this report.

Bedford Borough Council has one AQMA - AQMA 5 Bedford Town Centre - AQMA Details - Defra, UK

The results from 2023 and the previous 5 years have been reviewed and provide some evidence to support considerations for reducing the size of the current AQMA. The only data within 10% of the annual mean objective for NO_2 has been in the centre of the AQMA and the areas to the East, North and South have not been within 10% for a number of years. Due to the impact of the Covid 19 pandemic on air quality data, during 2020 and 2021, it will be necessary to obtain robust data to support any decisions relating to the size of the current AQMA and therefore data will continue to be gathered during 2024 with a view to further considering options during 2025 as part of the ASR process.

In 2022 the Covanta Resource Recovery Facility located at Rookery Pit, Stewartby on the border of Bedford Borough and Central Bedfordshire became operational. This is an Environment Agency permitted activity with limits on emissions from the stack set as conditions within the permit for the site, and compliance regulated by the Environment Agency. The air quality with respect to NO_2 in this area is good with the site located approximately 10 Kilometres away from AQMA 5, with modelling accepted by the Environment Agency indicating no significant impact on levels within the AQMA. A diffusion tube previously located outside of the site entrance to the facility, to consider potential air quality impacts relating to vehicle movements, in 2021 showed the annual average NO_2 data remained significantly below the current government objective of 40 $\mu g/m^3$ at 13.6 $\mu g/m^3$, and 14.7 $\mu g/m^3$ in 2023. A diffusion tube measuring background levels in Stewartby was established at the same time which measured 11.2 $\mu g/m^3$ in 2023.

Bedford Borough Council has published an updated Air Quality Action Plan for the AQMA 5 Bedford Town Centre which was accepted by DEFRA in 2021. The Council is also working in partnership with Transport, Public Health, Planning and other council departments to continue to identify pollution hotspots and key sources of pollution across the Borough, and opportunities and actions to improve local air quality.

Several infrastructure projects are in the process of being developed/implemented including East West Rail (EWR) a nationally significant railway project which aims to deliver transport connections between Oxford and Cambridge, via Bedford. During 2023/2024 additional passive diffusion tube monitoring locations were established to gather information on current levels of NO^2.

Agreement for the construction of a new rail station at Wixams has also been reached providing additional infrastructure to current rail provision within the Borough.

These projects will continue to be considered and reviewed as they progress.

Actions to Improve Air Quality

Whilst air quality has improved significantly in recent decades, there are some areas where local action is needed to protect people and the environment from the effects of air pollution.

The Environmental Improvement Plan[3] sets out actions that will drive continued improvements to air quality and to meet the new national interim and long-term targets for fine particulate matter ($PM_{2.5}$), the pollutant of most harmful to human health. The Air Quality Strategy[4] provides more information on local authorities' responsibilities to work towards these new targets and reduce fine particulate matter in their areas.

The Road to Zero[5] details the Government's approach to reduce exhaust emissions from road transport through a number of mechanisms, in balance with the needs of the local community. This is extremely important given that cars are the most popular mode of personal travel, and the majority of Air Quality Management Areas (AQMAs) are designated due to elevated concentrations heavily influenced by transport emissions.

Data relating to the continuous monitor situated on Lurke Street was reviewed during 2022, and this identified results from the monitor as being well below 40 µg/m^3 (not above 30 µg/m^3 for the last 5 years) with no exceedances of the 1-hour objective. During 2022, following the reduction of the High Street to a single lane the annual average NO_2 concentration was 21 µg/m^3, therefore the decision was made to cease operation of the monitor in December 2022. Diffusion tubes remained in place at the location in order that NO_2 concentrations can continue to be monitored and considered.

The three diffusion tubes measured an average of 21.9 ug/m3 over 2023 which is still well below the exceedance limit. It is therefore recommended that the 3 diffusion tubes in this location are reduced to one single tube in 2024.

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

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

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

Bedford Borough Council has published an updated Air Quality Action Plan for the Town Centre AQMA 5 in 2021 covering the years 2021 to 2026, with the ultimate aim to achieve stable and compliant air quality concentrations across the Borough and allow for the consideration of reduction of the Town Centre AQMA 5 by 2026.

Bedford has seen an overall decrease in measured NO_2 levels over the past five years with just a single location exceeding the recommended level. Direct comparison using the national bias adjustment would show NO_2 levels decrease at all locations from 2022.

Bedford Borough Council applied for a DEFRA air quality grant in 2022 and was notified of the successful bid in early 2023. The objectives of this project were to support implementation of an air care journeys project aimed at educating pupils, parents and community groups from wards within and surrounding the AQMA around air quality impacts associated with travel choices. The objectives included the promotion of alternative travel options. In addition, funding was awarded to support a behavioural change project aimed at educating residents further around the domestic burning of solid fuels and impacts on PM2.5 with this work due to commence in 2024.

Bedford Borough Council is one of the first authorities in the country to be awarded funding from the UK government's Local Electric Vehicle Infrastructure (LEVI) Fund. This investment will increase the number of on-street charging points for electric vehicles across the whole Borough.

Following a successful application, the Borough will receive just over £1m for the installation and connection of new charge-points between 2025 and 2027, including locations outside the main urban area which currently have little or no provision.

The Council currently provides just over 100 charge-points, and with the new funding expects to install around twice as many again. This will provide a step-change in public charge-point facilities and open up the option of Electric Vehicle ownership to many residents who do not have off-street parking where they can charge at home.

Bedford Borough Council are developing plans for installing the new charge-points, using the feedback provided by respondents to a survey last autumn.

Conclusions and Priorities

This Annual Status Report identifies that the annual mean objective for Nitrogen dioxide (NO_2) was exceeded at one location across the Borough during 2023. This exceedance was

on Prebend Street at 40.5 µg/m^3. There was one diffusion tube result within 10% of the 40 µg/m^3 limit situated in the AQMA which was on St Peters Street at 37.9 µg/m^3.

The local bias adjustment factor was used for 2023 data due to good data capture. This value is more conservative than the national bias adjustment factor. For context should the national factor have been used there would have been a minor change to these headline observations with no sites over 40 µg/m3, similar to 2022 when the national bias adjustment was used. Data using the national bias adjustment figure to compare 2023 results against those for 2022 show that all diffusion tube locations values would have decreased.

Current priorities include continuing actions within the AQAP, monitoring data to consider opportunities to reduce the size of the AQMA, and to also obtain an understanding of current levels in areas that may be impacted by future infrastructure projects such as EWR. Other priorities include the delivery of project work relating to DEFRA bids associated to education and behavioural change initiatives to increase awareness of sources of PM2.5 and education and promotional activities and 'Air Care Journeys' will continue in wards within and in close proximity to the AQMA over the course of 2024 and continuing to develop the infrastructure in support of electric vehicle use.

Local Engagement and How to get Involved

The air quality webpages have been updated on the Councils website and include historic Annual Status Reports and the Air Quality Action Plan, and members of the public are also able to report air quality issues via contact details provided on these pages.

Information relating to the 'Air Care Journeys' project has been made available on the council's webpages, providing details on what the council is currently doing to improve air quality and advice on what residents can do which includes:

- Drive less - for shorter trips try to walk or cycle.
- Stop car idling (an idling vehicle is one that has its engine running without moving anywhere).
    - Idling car fumes are more harmful inside than outside a car.
    - Idling vehicles create as much, or even more, carbon emissions and air polluting emissions than moving vehicles.
    - It is illegal leave a vehicle's engine running unnecessarily while that vehicle is stationary on a public road.

  - If you will be somewhere for more than 30 seconds – turn your engine off.
- At home, avoid using wood burning stoves and open fires. (If it is essential, only burn dry, well-seasoned or ‘Ready-to-Burn’ labelled wood, or smokeless fuel). Avoid burning household and garden waste: take it to the tip instead.
- Talk to your friends and family about air pollution, just because you can’t see it, doesn’t mean it’s not affecting us all.

Social media has been and will be used to support National Clean Air Day reiterating messaging around the domestic burning of solid fuels and promoting alternative transport choices.

DEFRA funded project work was also delivered during 2023, engaging with community groups and schools to educate and promote air quality matters including highlighting PM2.5 and how everyone can reduce the impact of particulate matter.

Local Responsibilities and Commitment

This ASR was prepared by the Regulatory Services department of Bedford Borough Council with the support and agreement of the following departments:

- Transport
- Highways
- Public Health
- Planning
- Transport Policy
- Planning Policy

This ASR has been signed off by: Vicky Head Director of Public Health on 16th August 2024.

If you have any comments on this ASR, please send them to: ehadmin@bedford.gov.uk at: Regulatory Services, Borough Hall. Cauldwell Street, Bedford, MK42 9AP - 01234 718099.

Table of Contents

Figures

Tables

1 Local Air Quality Management

This report provides an overview of air quality in Bedford during 2023. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995), as amended by the Environment Act (2021), and the relevant Policy and Technical Guidance 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 to achieve and maintain the objectives and the dates by which each measure will be carried out. This Annual Status Report (ASR) is an annual requirement showing the strategies employed by Bedford Borough Council to improve air quality and any progress that has been made.

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

2 Actions to Improve Air Quality

2.1 Air Quality Management Areas

Air Quality Management Areas (AQMAs) are declared when there is an exceedance or likely exceedance of an air quality objective. After declaration, the authority should prepare an Air Quality Action Plan (AQAP) within 18 months. The AQAP should specify how air quality targets will be achieved and maintained and provide dates by which measures will be carried out.

A summary of AQMAs declared by Bedford Borough Council can be found in Table 2.1. The table presents a description of the AQMA that is currently designated within Bedford. Appendix D: Map(s) of Monitoring Locations and AQMAs provides maps of the AQMA and the air quality monitoring locations in relation to the AQMA. The air quality objectives pertinent to the current AQMA designation are as follows:

- NO_2 annual mean

Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Date of Declaration	Pollutants and Air Quality Objectives	One Line Description	Is air quality in the AQMA influenced by roads controlled by Highways England?	Level of Exceedance: Declaration	Level of Exceedance: Current Year	Number of Years Compliant with Air Quality Objective	Name and Date of AQAP Publication	Web Link to AQAP
AQMA 5 Bedford Town Centre	06/11/2009	NO2 Annual Mean	An area encompassing the majority of properties within Bedford town centre, and incorporating the 2 previous AQMAs in the town centre	NO	Annual mean NO2 concentration 59µg/m3	Annual mean NO2 concentration 41 µg/m3	0	AQAP for AQMA 5 August 2021	Air Quality Action Plan 2021-2026 (bedford.gov.uk)

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

☒ **Bedford Borough Council confirm that all current AQAPs have been submitted to Defra**

2.2 Progress and Impact of Measures to address Air Quality in Bedford.

Defra's appraisal of last year's ASR was mostly positive but actions to consider were:

1. In Table B.1, the national bias factor selected for 2022 has not been included in the heading of the 17th Column. This should be added in future.

2. There are few minor formatting errors throughout the report. The phrase "Error! Bookmark not defined" appears in several places and there are a few places where a different font and colour has been used (see pages 11 and 29). The Council is encouraged to correct this in future reports.

These points have been addressed in this year's report.

Bedford Borough Council has taken forward a number of direct measures during the current reporting year of 2023 in pursuit of improving local air quality, including adding to the network of passive diffusion tube locations across the Borough. Details of all measures completed, in progress or planned are set out in Table 2.2. Eight measures are included within Table 2.2, with the type of measure and the progress Bedford Borough Council has made during the reporting year of 2023 presented. Where there have been, or continue to be, barriers restricting the implementation of the measure, these are also presented within Table 2.2.

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

Key completed measures are:

- Transporting Bedford 2030: Planning on the next phase of transporting Bedford which includes widening Greyfriars and encouraging cycling and walking.
- Installation of additional indicative PM monitors at various locations across the Borough.
- Ongoing 'Air Care Journeys' project work including education and air quality measurements using indicative monitors
- Successful DEFRA bids for air care journeys project and PM education and awareness project.
- Tree planting continuing throughout 2023

Bedford Borough Council expects the following measures to be completed over the course of the next reporting year:

- Implement DEFRA funded PM2.5 project
- Continuing DEFRA lot 1 project bid in relation to engaging with community groups and schools within 5 identified wards to educate on sources air pollution and measures to reduce exposure and impacts on local air quality.
- Review and assess monitoring locations and the potential for a new continuous monitor at another location within the Borough
- Continuing to promote air quality to raise awareness, promoting specific air quality topics and matters to encourage alternative transport choices such as reduced charges for local bus services, street tag - encouraging walking and physical activity etc.
- Implementing planned improvements to road infrastructure in and around the AQMA
  Preparation of contract documents for the installation of 256 charge points in the Borough with installation starting in 2025

Bedford Borough Council's priorities for the coming year are improving air quality, education of residents through project work, continuing to encourage and support electric and low emission vehicles use and highlighting areas of congestion.

To continue air quality monitoring to assess results over 2024 and consider potential for the reduction to the size of the current AQMA.

Bedford Borough Council worked to implement these measures in partnership with the following stakeholders during 2023:

- Public Health
- Transport Policy
- Sustainable Transport
- Planning Development
- Planning Strategy
- Highways

The principal challenges and barriers to implementation that Bedford Borough Council anticipates facing are:

- Possible funding changes

- Increase in demands associated with high priority service delivery.
- Maintaining Staffing resource

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

Implementation of the PM DEFRA funded project has been delayed due to staffing and the requirement to fill a post to manage this project.

Whilst the measures stated above and in Table 2.2 will help to contribute towards compliance, Bedford Borough Council anticipates that further additional measures not yet prescribed will be required in subsequent years to achieve compliance and enable the revocation of AQMA 5 although it is envisaged that a reduction to the size of the current AQMA may be feasible based on recent data, and this will be considered in 2025.

Table 2.2 – Progress on Measures to Improve Air Quality

Measure No.	Measure Title	Category	Classification	Year Measure Introduced in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
1	School streets project - (pedestrian and cycling zones)	Traffic Management	Anti-idling enforcement	2022	2024	Local Authority Environmental Health, Local Authority Transport Dept.	Defra and LA	YES	Fully funded	£100k - £500k	Implementation	not yet known	reduction of car journeys and anti-idling	Funding secured, implementation of school streets and monitors in use	
2	Transporting Bedford 2030	Promoting Travel Alternatives	Promotion of cycling	2023	2030	Local authority, Active travel, Transport		NO	Partially Funded	£1 million - £10 million	Planning	not yet known			
3	tree planting	Other	Other	2021	ongoing	Local authority		NO			Implementation	immeasurable	10 000 trees planted to date		
4	Transporting Bedford 2030	Promoting Travel Alternatives	Promotion of walking	2023	2030	Local authority, Active travel, Transport		NO	Partially Funded	£1 million - £10 million	Planning	not yet known			
5	St Pauls square	Traffic Management	UTC, Congestion management, traffic reduction					NO	Funded	£1 million - £10 million	Planning	not yet known			
6	Funding application for PM2.5 education project	Public Information	Other	2022	2024	DEFRA and Local Authority	Defra and LA	YES	Funded	£10k - 50k	Planning	PM 2.5	greater awareness of PM2.5 and behaviour changes for reduction	Funding received - employment of officer in place to begin in 2024	
7	EV charging strategy	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	2023	2024	Local authority	LA	NO	Funded	< £10k	Planning				
8	Electric car fleet for Bedford Borough Council	Promoting Low Emission Transport	Company Vehicle Procurement - Prioritising uptake of low emission vehicles	2022	2023	Local authority	LA	NO			Planning	reduction in car use may lead to a NO2 reduction	Pool cars used	Implementation due early 2023	

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

As detailed in Policy Guidance LAQM.PG22 (Chapter 8) and the Air Quality Strategy[6], local authorities are expected to work towards reducing emissions and/or concentrations of fine particulate matter ($PM_{2.5}$)). There is clear evidence that $PM_{2.5}$ (particulate matter smaller 2.5 micrometres) has a significant impact on human health, including premature mortality, allergic reactions, and cardiovascular diseases.

Bedford Borough Council is taking the following measures to address $PM_{2.5}$:

In Bedford in 2022 (most current data at the time of writing) the fraction of mortality attributable to particulate air pollution (new method) was 6.2% according to the public health outcomes framework. This value is the same as the East of England but higher than England (5.8%). The overall trend is an increase since 2021.

Public Health Outcomes Framework - Data - OHID (phe.org.uk)

Bedford Borough Council does not currently monitor PM2.5 concentrations via reference standard monitoring equipment, however, two Zephyr air quality monitors have been in place on Ampthill Rd since 2021 and 4 more installed in 2023.

The results showed PM10 and PM2.5 levels below the limits required.

Modelled PM2.5 background data from DEFRA for 2023 (Background Mapping data for local authorities - 2018 - Defra, UK) shows the maximum background level of 10.7 µg/m^3 at Elstow Interchange, Elstow, Kempston at a roundabout on the A421, some distance from residential properties or pedestrians. The second highest is Abbey Fields, close to the A421 with a value of 10.1 µg/m^3. The averaged modelled background PM2.5 value for Bedford Borough in 2023 was 8.8 µg/m^3, a slight reduction from 2022 which was 8.9 µg/m^3.

Wood burning guidance has been published on the Bedford Borough Council website to advise and educate residents regarding appliances used to burn solid fuels such as wood. Corporate social media has also been used to promote best practice and raise awareness, sharing DEFRA guidance on best practice to limit the impacts of burning solid fuels.

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

Education and promotional activities alongside the actions detailed for tackling NO_2 are anticipated to support the management of local sources of PM2.5, within the limited fraction that can be impacted by actions within the Borough (traffic sources and wood burning etc.). Industrial sources will be controlled by the permitting process which limits emissions as required in the permitting legislation.

DEFRA grant funding was obtained in 2023/24 to undertake project work raising awareness of the domestic burning of solid fuels and review possible sales of fuels which are now restricted for use. Due to delays in recruiting an existing vacant air quality officer role, the recruitment of this project officer is due to take place in 2024. However, this will aim to reduce the impact residents can have on PM2.5 levels in the Borough in future years.

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

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

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

Bedford Borough Council undertook automatic (continuous) monitoring at 1 site during 2023. Table A.1 in Appendix A shows the details of the automatic monitoring sites. The Hertfordshire and Bedfordshire - Air Quality monitoring service (airqualityengland.co.uk) page presents automatic monitoring results for Bedford with automatic monitoring results also available through the UK-Air website .

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

3.1.2 Non-Automatic Monitoring Sites

Bedford Borough Council undertook non- automatic (i.e. passive) monitoring of NO_2 at 56 sites during 2023. Table A.2 in Appendix A presents the details of the non-automatic sites.

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

3.2 Individual Pollutants

The air quality monitoring results presented in this section are, where relevant, adjusted for bias, annualisation (where the annual mean data capture is below 75% and greater

than 25%), and distance correction. Further details on adjustments are provided in Appendix C.

3.2.1 Nitrogen Dioxide (NO_2)

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

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

In 2023 there was one exceedance of the annual mean NO_2 objective of 40µg/m^3 after bias adjustment and annualisation.

This was higher than the number of exceedances in 2022 which was zero, however as explained above, 2022 results used the national rather than local bias adjustment factor applied to 2023 data.

There was one diffusion tube result within 10% of the 40 µg/m^3 limit situated in the AQMA. This exceedance was on St Peters Street at 37.9 µg/m^3.

There were no exceedances of the hourly objective for the seventh year running. Breaches of the short-term hourly objective can relate to short term peaks in congestion/emissions where emissions of NO_2 can build up and be slow to disperse. Therefore, this demonstrates reductions in this area are being maintained and follow the trend seen in annual mean results of reductions to NO_2.

Justification for the use of the local bias adjustment factor is provided in Appendix C, however, for context should the national factor have been used there would have been a minor change to these headline observations with no sites over 40 µg/m^3 similar to 2022 when the national bias adjustment was used due to poor data capture.

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)
CM1	Prebend street	Roadside	504496	249625	NO2	YES AQMA 5	Chemiluminescent	1	4.2	1.5

Notes:

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

(2) N/A if not applicable

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

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
DT5	Bromham Road, Bedford	Roadside	503819	250060	NO2	No	15.0	3.1	No	2.5
DT7	4 Bunyan Road, Kempston	Roadside	503160	247751	NO2	No	1.8	1.4	No	2.5
DT10	1 Kirkstall Close, Bedford	Other	505425	247063	NO2	No	5.0	2.0	No	2.5
DT12	8 The Lane, Wyboston	Roadside	516345	256592	NO2	No	10.0	2.7	No	3.0
DT13	Gt Nth Road, Wyboston - A1 South	Other	516420	256552	NO2	No	8.0	2.6	No	3.0
DT14	Horne Lane, Bedford	Roadside	504857	249652	NO2	Yes - AQMA 5	2.6	2.7	No	2.4
DT16	Kempston Road ,Bedford	Roadside	504585	249003	NO2	Yes - AQMA 5	6.0	3.9	No	2.2
DT17	Ampthill Road , Bedford	Roadside	504783	248711	NO2	Yes - AQMA 5	4.0	4.4	No	2.5
DT19	Kimbolton Road ,Bedford	Roadside	505551	250584	NO2	Yes - AQMA 5	9.0	1.1	No	2.5
DT20	Prebend Street ,Bedford	Roadside	504486	249616	NO2	Yes - AQMA 5	0.1	2.0	No	2.5
DT25	London Road crossroad	Roadside	505389	248858	NO2	Yes - AQMA 5	2.9	2.4	No	3.0

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
DT28	Prebend St corner of commercial road	Roadside	504576	249501	NO2	Yes - AQMA 5	2.8	2.5	No	2.4
DT29	Goldington Road opp uni	Roadside	506630	250274	NO2	Yes - AQMA 5	4.0	2.5	No	2.0
DT30	High St Barovic jewellers	Urban Centre	505020	250044	NO2	Yes - AQMA 5	2.0	1.4	No	2.3
DT31	High St, Luddingtons	Urban Centre	505060	249766	NO2	Yes - AQMA 5	0.1	2.0	No	3.0
DT33	Shakespeare Road/Bromham Rd Junction	Roadside	504100	250142	NO2	Yes - AQMA 5	5.0	2.6	No	3.0
DT34	St Marys St kings' arms PH	Roadside	505102	249411	NO2	Yes - AQMA 5	0.5	2.4	No	3.0
DT35	Prebend St, crown quay	Roadside	504599	249432	NO2	Yes - AQMA 5	3.0	3.3	No	2.2
DT36	37 Ashburnham Road	Roadside	504289	249711	NO2	Yes - AQMA 5	2.0	2.0	No	3.0
DT40	YMCA, Tavistock St	Roadside	504808	250232	NO2	Yes - AQMA 5	6.0	2.1	No	2.5
DT42	28 St Johns St	Roadside	505143	249299	NO2	Yes - AQMA 5	9.0	3.3	No	2.5
DT43	45 Dame Alice St	Roadside	504913	250038	NO2	Yes - AQMA 5	0.6	2.3	No	3.0
DT44	Midland Road-outside No.137,139A	Roadside	504423	249647	NO2	Yes - AQMA 5	0.2	2.4	No	2.0

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
DT46	Midland Rd- outside Beegees opp Priory St	Urban Centre	504635	249724	NO2	Yes - AQMA 5	1.4	1.2	No	3.0
DT47	On corner Harpur St – opp 51A	Urban Background	504894	250049	NO2	Yes - AQMA 5	8.0	2.7	No	2.0
DT48	Outside Sound & Vision –Tavistock St	Urban Centre	504903	250199	NO2	Yes - AQMA 5	3.0	1.9	No	2.5
DT50	Outside John Bull – St Peters St	Urban Centre	505190	250075	NO2	Yes - AQMA 5	0.3	1.9	No	3.5
DT53	Outside Longstaff Gentle & Co – 59-61 Harpur St	Roadside	504907	250084	NO2	Yes - AQMA 5	1.9	2.5	No	2.5
DT54	Outside 63 – Union St	Roadside	504505	250361	NO2	Yes - AQMA 5	1.7	2.3	No	3.0
DT55	Opp urban & Rural on corner – Bromham Rd	Roadside	504475	250123	NO2	Yes - AQMA 5	4.0	2.4	No	2.5
DT57	Outside 110 - Newnham Av	Roadside	506626	250226	NO2	Yes - AQMA 5	2.4	1.2	No	2.2
DT61	Outside 185 Goldington Rd	Kerbside	506588	250254	NO2	Yes - AQMA 5	5.0	0.9	No	2.2
DT62	Outside 139 Goldington Rd	Kerbside	506390	250243	NO2	Yes - AQMA 5	6.0	1.0	No	2.2
DT65	Outside no.43 London Rd	Roadside	505438	248793	NO2	Yes - AQMA 5	3.0	1.5	No	2.5
DT66, DT67, DT68	Monitoring station	Roadside	504495	249622	NO2	Yes - AQMA 5	1.7	3.7	Yes	2.0

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
DT69	River Street, opposite chinese	Urban Centre	504734	249689	NO2	Yes - AQMA 5	0.3	3.8	No	3.0
DT70	Outside bus station	Urban Centre	504706	249860	NO2	Yes - AQMA 5	5.0	2.5	No	2.0
DT71	174 Ampthill Road ,Bedford	Roadside	504625	248169	NO2	No	3.0	4.4	No	2.5
DT72	150 Ampthill Road ,Bedford	Roadside	504648	248257	NO2	No	3.0	2.3	No	2.5
DT73	112 Ampthill Road ,Bedford	Kerbside	504684	248388	NO2	No	8.0	1.0	No	2.5
DT74, DT75, DT76	LS Monitor	Roadside	505044	249980	NO2	Yes - AQMA 5	2.0	5.0	No	1.5
DT77	Green lane, Stewartby	Roadside	501574	242181	NO2	No	250.0	2.3	No	3.0
DT78	Churchill close, Stewartby	Suburban	501878	242176	NO2	No	5.0	1.9	No	2.5
DT80	Shakespeare Rd/Clapham Rd junction	Roadside	503946	250765	NO2	No	5.0	1.8	No	2.5
DT81	Brooklands avenue - Wixams	Suburban	505273	245175	NO2	No	4.0	1.7	No	3.0
DT82	32 Fields Rd, Wootton	Roadside	500968	244911	NO2	No	5.0	1.6	No	2.5
DT83	37 Cemetery Road, off Branston way	Suburban	501595	247537	NO2	No	7.0	1.7	No	2.5

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
DT85	Rope Walk/Cardington Rd	Roadside	505493	249254	NO2	No	10.0	1.5	No	2.5
DT86	Outside 33 Goldington Rd	Roadside	505464	250142	NO2	Yes - AQMA 5	2.0	1.5	No	2.5
DT89	St Peters St/High St junction	Roadside	505046	250040	NO2	Yes - AQMA 5	2.0	1.9	No	2.5
DT91	High St Debenhams	Roadside	505034	249844	NO2	Yes - AQMA 5	15.0	2.0	No	3.5
DT92	Chesterton Mews (off Sidney Road)	Urban Background	503762	250386	NO2	No	10.0	1.0	No	2.0
DT93	Bell Farm Colesden Rd (outside Auto Sportivo	Rural	512728	255827	NO2	No	20.0	1.0	No	2.0
DT94	Chequers Hill - (opp No 25) Wilden	Rural	509935	256019	NO2	No	12.0	2.8	No	2.0
DT95	Chequers Hill - Wilden	Rural	510196	255468	NO2	No	24.0	2.0	No	2.0
DT96	Entrance to Rectory Farm - Wilden	Rural	509098	255515	NO2	No	150.0	1.5	No	2.0

Notes:

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

(2) N/A if not applicable.

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

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2023 (%) (2)	2019	2020	2021	2022	2023
CM1	504496	249625	Roadside		92	32	26	32	34	29

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

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

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

Notes:

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

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

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

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

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

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

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

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2023 (%) (2)	2019	2020	2021	2022	2023
DT5	503819	250060	Roadside	100%	100.0	22.9	17.9	22.8	20.4	22.7
DT7	503160	247751	Roadside	100	82.7	25.7	23.2	24.6	22.5	24.6
DT10	505425	247063	Other	100	92.3	21.7	19.3	18.9	17.9	18.9
DT12	516345	256592	Roadside	100	75.0	18.2	14.6	16.1	14.1	15.7
DT13	516420	256552	Other	100	75.0	21.8	21.6	22.5	18.2	18.5
DT14	504857	249652	Roadside	100	90.4	32.6	22.0	25.5	24.2	28.5
DT16	504585	249003	Roadside	100	42.3	26.7	21.1	26.0	23.8	27.0
DT17	504783	248711	Roadside	100	73.1	31.0	23.8	27.7	25.4	28.7
DT19	505551	250584	Roadside	100	84.6	24.8	21.1	21.4	19.4	19.9
DT20	504486	249616	Roadside	100	92.3	**47.4**	**41.3**	**43.3**	39.4	**40.9**
DT25	505389	248858	Roadside	100	100.0	34.6	30.6	34.0	29.8	32.3
DT28	504576	249501	Roadside	100	92.3	32.4	27.3	31.5	28.9	31.9

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2023 (%) [2]	2019	2020	2021	2022	2023
DT29	506630	250274	Roadside	100	100.0	35.5	26.4	30.7	28.2	28.2
DT30	505020	250044	Urban Centre	100	100.0	38.8	31.4	27.8	31.9	33.7
DT31	505060	249766	Urban Centre	100	92.3	38.8	28.2	24.0	33.8	36.1
DT33	504100	250142	Roadside	100	82.7	36.3	27.5	34.1	30.2	34.9
DT34	505102	249411	Roadside	100	100.0	38.4	30.1	31.2	31.4	34.4
DT35	504599	249432	Roadside	100	100.0	36.3	29.1	32.0	28.3	32.1
DT36	504289	249711	Roadside	100	100.0	33.5	26.8	30.1	27.0	28.5
DT40	504808	250232	Roadside	100	100.0	25.1	20.6	21.2	21.4	24.5
DT42	505143	249299	Roadside	100	100.0	38.8	30.1	35.0	30.8	33.5
DT43	504913	250038	Roadside	100	100.0	31.5	22.9	28.5	25.6	28.9
DT44	504423	249647	Roadside	100	100.0	**40.2**	33.3	35.8	30.5	33.6
DT46	504635	249724	Urban Centre	100	100.0	36.6	32.1	33.8	29.2	31.5
DT47	504894	250049	Urban Background	100	100.0	32.5	21.2	24.1	23.7	26.1
DT48	504903	250199	Urban Centre	100	100.0	36.0	29.6	31.4	29.3	30.7

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2023 (%) [2]	2019	2020	2021	2022	2023
DT50	505190	250075	Urban Centre	100	100.0	**43.6**	36.1	38.1	35.8	39.0
DT53	504907	250084	Roadside	100	92.3	31.0	25.7	27.5	26.5	27.3
DT54	504505	250361	Roadside	100	100.0	30.0	24.2	27.1	24.4	27.5
DT55	504475	250123	Roadside	100	100.0	29.9	22.5	27.1	25.6	28.0
DT57	506626	250226	Roadside	100	100.0	31.5	25.2	27.3	26.6	28.9
DT61	506588	250254	Kerbside	100	100.0	33.3	27.9	29.3	25.6	27.8
DT62	506390	250243	Kerbside	100	92.3	26.6	21.7	23.2	23.1	25.0
DT65	505438	248793	Roadside	100	100.0	34.3	26.3	25.6	25.8	28.8
DT66, DT67, DT68	504495	249622	Roadside	100	100.0	33.8	28.0	30.9	27.4	30.0
DT69	504734	249689	Urban Centre	100	92.3	32.3	24.0	26.5	25.2	27.4
DT70	504706	249860	Urban Centre	100	100.0	33.6	24.6	28.0	27.0	28.5
DT71	504625	248169	Roadside	100	82.7	30.6	26.7	29.2	26.3	27.3
DT72	504648	248257	Roadside	100	90.4	32.2	28.6	31.0	27.0	29.9
DT73	504684	248388	Kerbside	100	92.3	33.9	27.3	29.7	26.9	29.7

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2023 (%) [2]	2019	2020	2021	2022	2023
DT74, DT75, DT76	505044	249980	Roadside	100	100.0	27.5	21.5	18.0	19.8	21.9
DT77	501574	242181	Roadside	100	82.7	18.5	12.6	13.6	13.5	14.7
DT78	501878	242176	Suburban	100	100.0	15.1	10.4	11.4	10.8	11.2
DT80	503946	250765	Roadside	100	92.3	33.9	27.1	29.9	27.3	30.4
DT81	505273	245175	Suburban	100	100.0	16.6	15.2	17.2	14.6	16.8
DT82	500968	244911	Roadside	100	100.0	17.8	14.6	15.4	14.9	14.5
DT83	501595	247537	Suburban	100	100.0	22.1	18.4	19.9	18.7	19.2
DT85	505493	249254	Roadside	100	100.0		23.7	26.2	24.7	27.9
DT86	505464	250142	Roadside	100	92.3		23.4	25.6	23.6	24.6
DT89	505046	250040	Roadside	100	80.8				36.6	**40.6**
DT91	505034	249844	Roadside	100	100.0				22.7	23.4
DT92	503762	250386	Urban Background	100	90.4					14.2
DT93	512728	255827	Rural	100	17.3					-
DT94	509935	256019	Rural	100	17.3					-

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2023 (%) (2)	2019	2020	2021	2022	2023
DT95	510196	255468	Rural	100	9.6					-
DT96	509098	255515	Rural	100	17.3					-

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

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

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

Notes:

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

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

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

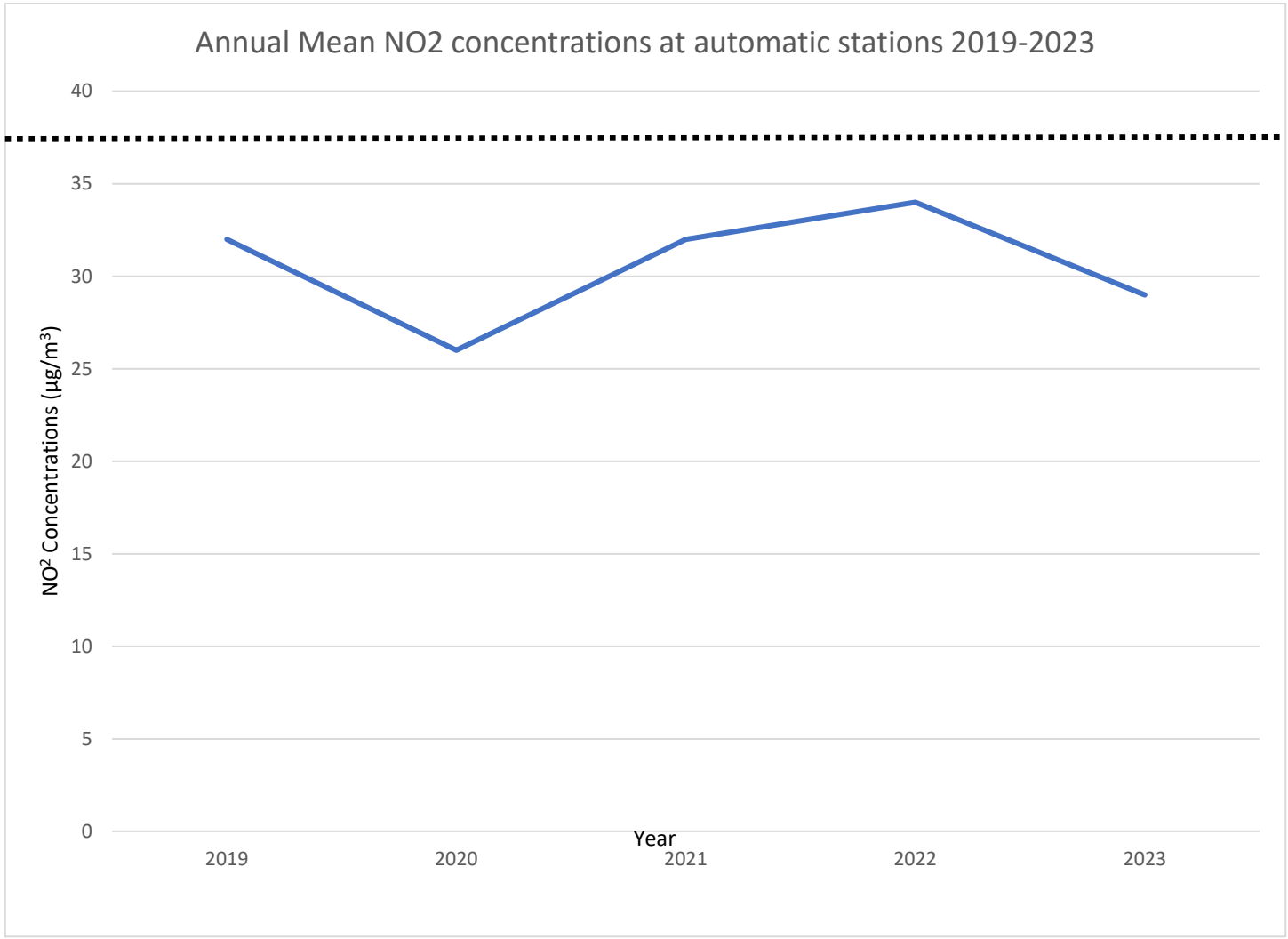
Means for diffusion tubes have been corrected for bias. All means have been “annualised” as per LAQM.TG22 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

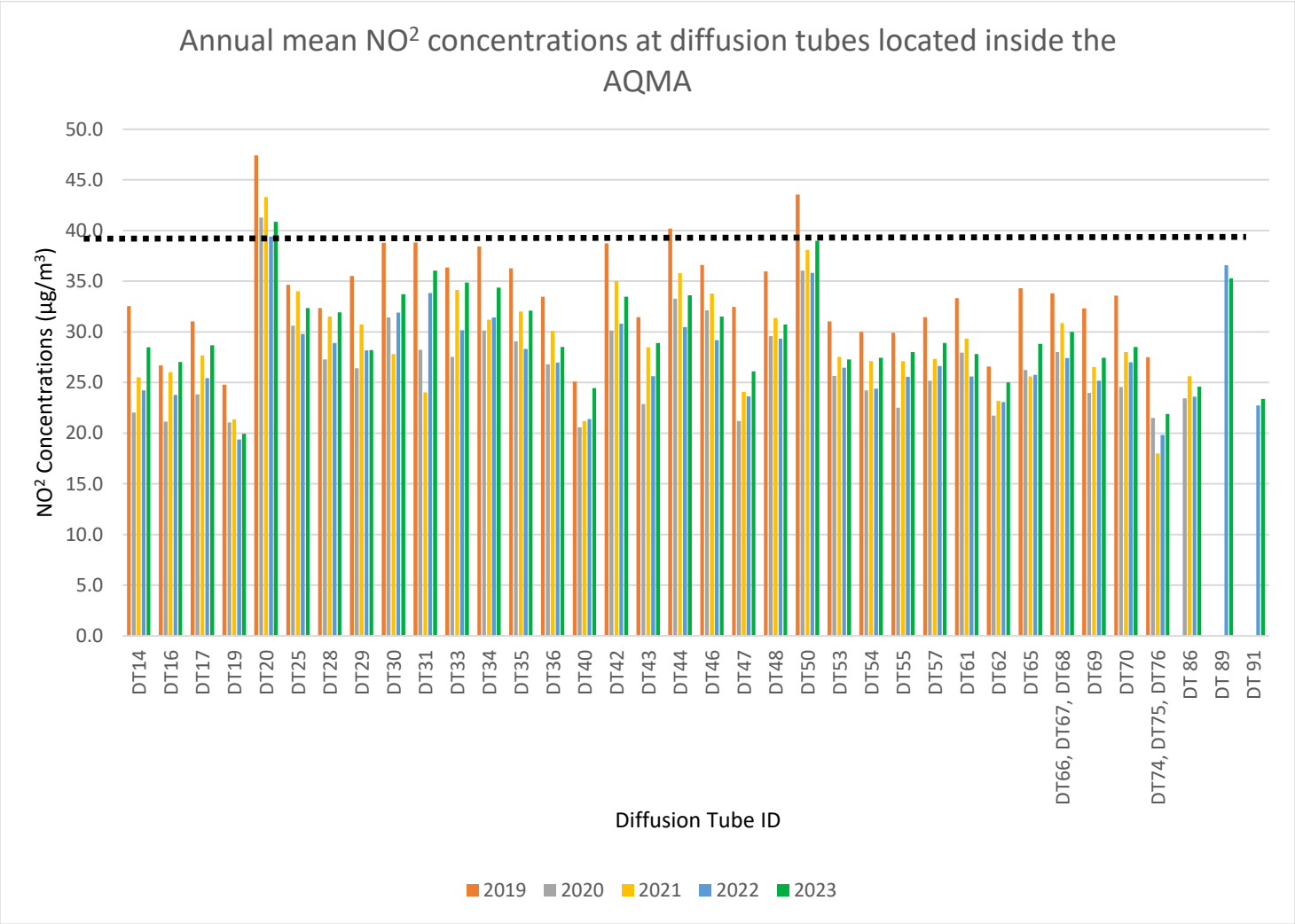
Concentrations are those at the location of monitoring and not those following any fall-off with distance adjustment.

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

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

Figure A.1 – Trends in Annual Mean NO_2 Concentrations




Annual mean NO2 concentrations at diffusion tubes located inside the AQMA
NO2 Concentrations (µg/m3)
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
DT14
DT16
DT17
DT19
DT20
DT25
DT28
DT29
DT30
DT31
DT33
DT34
DT35
DT36
DT40
DT42
DT43
DT44
DT46
DT47
DT48
DT50
DT53
DT54
DT55
DT57
DT61
DT62
DT65
DT66, DT67, DT68
DT69
DT70
DT74, DT75, DT76
DT 86
DT 89
DT 91
Diffusion Tube ID
2019
2020
2021
2022
2023

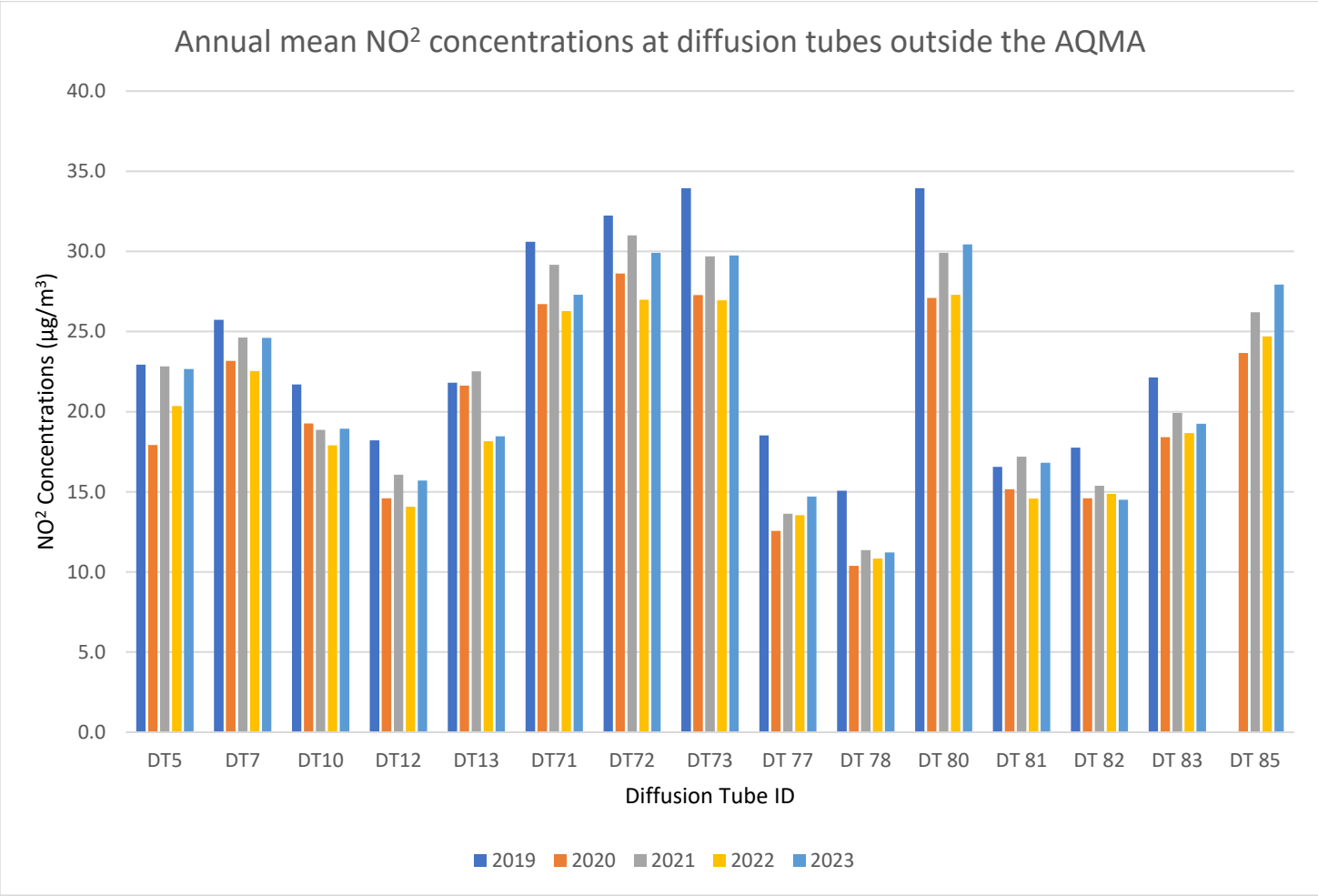

Annual mean NO2 concentrations at diffusion tubes outside the AQMA
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
NO2 Concentrations (µg/m3)
DT5
DT7
DT10
DT12
DT13
DT71
DT72
DT73
DT 77
DT 78
DT 80
DT 81
DT 82
DT 83
DT 85
Diffusion Tube ID
2019
2020
2021
2022
2023

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 2023 (%) (2)	2019	2020	2021	2022	2023
CM1	504496	249625	Roadside		92	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%).

Appendix B: Full Monthly Diffusion Tube Results for 2023

Table B.1 – NO_2 2023 Diffusion Tube Results ($\mu g/m^3$)

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted (0.98)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
DT5	503819	250060	27.2	27.5	22.8	21.3	17.9	17.5	18.0	18.3	26.0	26.7	27.4	27.0	23.1	22.7	-	
DT7	503160	247751	31.0	31.8	27.4	25.0	23.7		18.9	19.8	26.7		24.0	22.8	25.1	24.6	-	
DT10	505425	247063	25.3	25.8	21.3	18.8	13.4	14.6	12.9	15.5	19.8		25.5	19.6	19.3	18.9	-	
DT12	516345	256592	17.2	19.5	24.4	13.2	11.8	11.6				17.4	17.8	11.4	16.0	15.7	-	
DT13	516420	256552	29.0	25.9	15.4	15.0	13.0	13.6			14.3		24.7	18.7	18.8	18.5	-	
DT14	504857	249652	34.0	34.2	29.0	28.6	25.7		24.0	23.0	31.8	32.8	33.5	23.2	29.1	28.5	-	
DT16	504585	249003							25.1	25.3		29.7	35.4	26.9	28.5	27.0	-	
DT17	504783	248711	33.7	38.6		31.4		24.1	20.5		27.6	31.7	32.8	23.1	29.3	28.7	-	
DT19	505551	250584			22.7	18.1	15.1	16.3	17.8	16.9	24.0	25.1	23.8	23.7	20.4	19.9	-	
DT20	504486	249616		49.5	41.8	43.5	34.8	33.7	40.5	38.6	46.7	45.8	50.0	33.8	41.7	**40.9**	**40.5**	
DT25	505389	248858	32.5	46.6	39.5	23.8	30.6	21.3	34.0	22.8	39.9	26.5	45.5	33.0	33.0	32.3	-	
DT28	504576	249501	34.5	39.8	34.1		38.2	32.7	21.9	26.2	35.2	35.2	36.9	23.7	32.6	31.9	-	
DT29	506630	250274	38.6	34.9	31.1	23.9	29.3	25.8	19.6	14.6	31.0	32.3	35.6	28.7	28.8	28.2	-	
DT30	505020	250044	40.5	43.3	41.6	33.8	26.3	27.1	32.9	29.6	37.4	37.1	40.0	23.4	34.4	33.7	-	
DT31	505060	249766	37.8	43.0	40.6		35.5	35.2	31.2	32.6	40.4	39.1	38.5	30.9	36.8	36.1	35.7	
DT33	504100	250142	37.4	41.3		39.4		33.0	32.0	27.8	40.1	35.5	32.8	36.5	35.6	34.9	-	
DT34	505102	249411	37.2	42.5	41.9	38.5	37.3	32.2	25.8	28.3	36.0	37.0	37.3	26.7	35.1	34.4	-	
DT35	504599	249432	39.0	41.9	34.4	30.6	26.4	25.1	28.1	27.1	34.5	36.7	39.8	29.5	32.8	32.1	-	

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted (0.98)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
DT36	504289	249711	33.8	37.1	29.6	31.2	28.7	25.9	20.5	21.1	30.5	33.0	33.3	24.4	29.1	28.5	-	
DT40	504808	250232	29.1	31.4	24.2	21.7	18.5	14.6	16.0	16.8	36.7	24.1	35.8	30.5	25.0	24.5	-	
DT42	505143	249299	37.8	40.2	27.4	36.1	41.7	37.4	27.3	31.6	36.6	30.3	38.4	25.1	34.2	33.5	-	
DT43	504913	250038	31.5	38.9	30.6	32.3	29.2	27.0	21.0	24.1	30.1	31.5	33.6	24.3	29.5	28.9	-	
DT44	504423	249647	40.0	41.0	34.5	35.0	36.2	33.1	25.0	27.3	36.8	36.1	38.7	27.8	34.3	33.6	-	
DT46	504635	249724	39.0	39.8	32.8	33.0	26.4	22.6	23.9	26.4	36.3	35.7	39.2	30.6	32.1	31.5	-	
DT47	504894	250049	29.7	30.4	30.6	31.5	22.1	28.1	17.1	24.0	25.1	28.9	29.8	22.4	26.6	26.1	-	
DT48	504903	250199	36.0	41.8	35.5	36.3	34.3	31.7	25.8	25.2	22.8	36.3	27.9	22.8	31.4	30.7	-	
DT50	505190	250075	43.0	48.0	42.4	39.9	35.4	34.1	38.1	31.9	42.9	44.9	43.5	33.5	39.8	39.0	37.9	
DT53	504907	250084	30.5	34.5	26.5	26.0	31.1	19.7		20.1	31.9	32.8	30.6	22.4	27.8	27.3	-	
DT54	504505	250361	29.5	33.8	27.3	28.1	25.7	25.4	22.8	24.3	33.5	32.6	30.5	22.8	28.0	27.5	-	
DT55	504475	250123	33.4	37.4	28.3	28.3	27.2	27.7	23.4	25.6	31.9	25.8	32.5	21.6	28.6	28.0	-	
DT57	506626	250226	34.3	40.0	32.1	27.2	23.9	22.2	25.9	19.4	33.6	32.7	31.0	31.7	29.5	28.9	-	
DT61	506588	250254	33.8	36.6	33.4	29.8	19.0	25.7	20.7	17.6	33.7	33.2	30.5	26.5	28.4	27.8	-	
DT62	506390	250243	32.0	32.6	25.6	31.7	26.8	17.5	15.5	21.5	25.2		28.8	23.7	25.5	25.0	-	
DT65	505438	248793	44.6	33.0	26.4	34.0	22.7	30.9	19.5	29.4	24.7	38.5	28.6	20.6	29.4	28.8	-	
DT66	504495	249622	35.5	38.8	31.8	31.3	28.6	25.1	25.9	25.1	31.7	32.6	33.2	26.2	-	-	-	Triplicate Site with DT66, DT67 and DT68 - Annual data provided for DT68 only
DT67	504495	249622	36.0	40.3	31.9	33.1	28.7	24.8	24.7	25.8	32.6	31.5	34.3	23.6	-	-	-	Triplicate Site with DT66, DT67 and DT68 - Annual data provided for DT68 only
DT68	504495	249622	36.0	38.8	33.3	33.2	28.0	25.1	25.0	25.9	32.5	32.9	35.7	23.7	30.6	30.0	-	Triplicate Site with DT66, DT67 and DT68 - Annual data provided for DT68 only
DT69	504734	249689	31.6	34.1	25.2		26.0	24.3	24.2	24.7	31.2	31.5	33.0	22.3	28.0	27.4	-	
DT70	504706	249860	33.8	36.4	30.1	27.8	23.5	23.2	25.3	24.4	31.3	32.4	34.3	26.5	29.1	28.5	-	

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted (0.98)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
DT71	504625	248169	35.8	35.6	30.2		28.0		18.0	21.9	27.9	30.3	31.5	19.3	27.9	27.3	-	
DT72	504648	248257	32.0	38.6		35.0	24.4	29.3	20.4	24.4	34.2	37.3	34.9	25.3	30.5	29.9	-	
DT73	504684	248388	33.7	40.4	35.0		29.6	22.1	27.9	27.6	30.2	29.7	35.0	22.6	30.3	29.7	-	
DT74	505044	249980	28.3	29.3	23.5	21.8	17.6	16.6	18.4	17.8	22.8	25.1	27.5	21.1	-	-	-	Triplicate Site with DT74, DT75 and DT76 - Annual data provided for DT76 only
DT75	505044	249980	27.6	27.3	23.5	21.0	17.5	16.8	17.8	17.8	23.0	25.1	27.6	20.4	-	-	-	Triplicate Site with DT74, DT75 and DT76 - Annual data provided for DT76 only
DT76	505044	249980	28.4	29.5	23.2	22.0	17.8	16.7	17.4	17.5	22.5	27.9	26.1	20.5	22.4	21.9	-	Triplicate Site with DT74, DT75 and DT76 - Annual data provided for DT76 only
DT77	501574	242181	23.0	19.6	13.6	12.1	10.6	9.6	11.1		14.2	17.3	18.9		15.0	14.7	-	
DT78	501878	242176	17.0	17.4	11.6	9.6	8.4	6.8	6.7	7.8	10.0	12.6	16.9	12.5	11.4	11.2	-	
DT80	503946	250765	33.0	39.8	32.3	31.9		28.0	22.2	22.8	33.1	33.8	39.0	25.7	31.1	30.4	-	
DT81	505273	245175	24.0	24.6	16.5	14.9	13.5	12.8	11.6	13.1	15.9	18.5	23.9	16.6	17.2	16.8	-	
DT82	500968	244911	19.0	21.1	15.6	14.0	11.5	10.0	9.2	12.0	14.1	17.0	20.2	13.9	14.8	14.5	-	
DT83	501595	247537	24.0	25.5	20.2	19.4	16.1	15.6	14.0	16.7	20.9	21.6	24.0	17.7	19.6	19.2	-	
DT85	505493	249254	30.0	34.1	35.0	28.5	26.7	25.0	19.1	22.5	31.2	37.0	31.2	21.6	28.5	27.9	-	
DT86	505464	250142	32.4	35.9	27.3	25.1	19.8	18.9	21.1	18.7	28.1		23.7	25.1	25.1	24.6	-	
DT89	505046	250040	44.0	47.2	36.1	42.1	39.5	42.3	36.4		45.9	44.9		35.9	41.4	**40.6**	35.3	
DT91	505034	249844	29.0	31.8	26.2	25.3	19.3	19.6	15.8	18.2	24.7	25.3	30.1	20.9	23.9	23.4	-	
DT92	503762	250386	17.8	23.5	17.0	15.0	11.4	9.9	11.3	12.1	17.8	6.1		17.2	14.5	14.2	-	
DT93	512728	255827											11.1	8.2	-	-	-	
DT94	509935	256019											14.0	9.4	-	-	-	
DT95	510196	255468											13.3		-	-	-	
DT96	509098	255515											11.1	9.0	-	-	-	

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

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

☒ **Local bias adjustment factor used**

☐ **National bias adjustment factor used**

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

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

Notes:

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

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

See Appendix C for details on bias adjustment and annualisation.

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

New or Changed Sources Identified Within Bedford During 2023

Bedford Borough Council has not identified any new sources relating to air quality within the reporting year of 2023. Additional Monitoring locations have been established in relation to EWR, and in relation to a section of road bypassing the main town between Bromham Road, Clapham.

Additional Air Quality Works Undertaken by Bedford During 2023.

Bedford Borough Council has not completed any additional works within the reporting year of 2023.

QA/QC of Diffusion Tube Monitoring

The diffusion tubes used by Bedford Borough Council were analysed by Gradko International ltd using a preparation method of 20% TEA in water. The laboratory is UKAS accredited, ensuring conformance with the requirements of ISO/IEC 17025.

The monitoring was undertaken in adherence to the 2023 diffusion tube monitoring calendar.

Diffusion Tube Annualisation

Annualisation was required for two diffusion tubes, these were DT 16 and DT 17. Annualisation was carried out as detailed in TG22 using continuous monitoring data from the two sources available in the Borough. The Annual Mean/Period Mean ratios are calculated (Am/Pm) and averaged to provide an annualisation factor for each site requiring annualisation. These and the final annualised average NO2 concentrations for each of the diffusion tube sites are presented in table C2 below. Annualisation figures were obtained using data from Prebend Street and the other site was Northampton, which is a national monitor, measuring background data and within 50 miles.

Table C.1 – Annualisation Summary (concentrations presented in µg/m³)

Site ID	Annualisation Factor <Site 1 Name>	Annualisation Factor <Site 2 Name>	Annualisation Factor <Site 3 Name>	Annualisation Factor <Site 4 Name>	Average Annualisation Factor	Raw Data Annual Mean	Annualised Annual Mean
DT16	0.9816	0.9559			0.9688	28.5	27.6
DT17	0.9718	0.9284			0.9501	29.3	-

Diffusion Tube Bias Adjustment Factors

The diffusion tube data presented within the 2023 ASR have been corrected for bias using an adjustment factor. Bias represents the overall tendency of the diffusion tubes to under or over-read relative to the reference chemiluminescence analyser. LAQM.TG22 provides guidance regarding 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.

Bedford Borough Council have applied a local bias adjustment factor of 0.98 to the 2023 monitoring data. A summary of bias adjustment factors used by Bedford Borough Council over the past five years is presented in Table C.2.

The data was obtained from the co-location studies at Prebend Street in Bedford and following the guidance in TG22. The data has good overall precision and good data capture.

Table C.2 – Bias Adjustment Factor

Monitoring Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2023	Local	-	0.98
2022	National	03/23	0.83
2021	Local	-	0.91
2020	Local	-	0.86
2019	National	03/20	0.93

Table C.3 – Local Bias Adjustment Calculation

	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	10				
Bias Factor A	0.98 (0.89 - 1.08)				
Bias Factor B	-2% (-7% - 12%)				
Diffusion Tube Mean (µg/m^3)	29.3				
Mean CV (Precision)	2.6%				
Automatic Mean (µg/m^3)	28.6				
Data Capture	100%				
Adjusted Tube Mean (µg/m^3)	29 (26 - 32)				

Notes:

A single local bias adjustment factor has been used to bias adjust the 2023 diffusion tube results.

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. Four sites were calculated for distance correction DT20, DT31, DT 50 and DT89.

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

Site ID	Distance (m): Monitoring Site to Kerb	Distance (m): Receptor to Kerb	Monitored Concentration (Annualised and Bias Adjusted	Background Concentration	Concentration Predicted at Receptor	Comments
DT20	2.0	2.1	40.9	13.2	**40.5**	*Predicted concentration at Receptor above AQS objective.*

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
DT31	2.0	2.1	36.1	6.4	35.7	
DT50	1.9	2.2	39.0	7.6	*37.9*	*Predicted concentration at Receptor within 10% the AQS objective.*
DT89	1.9	3.9	40.6	8.7	35.3	

QA/QC of Automatic Monitoring

In 2023 Bedford Borough Council have a service and maintenance contract for both monitoring stations with ESU1, which includes 2 scheduled on-site services per annum. There is also have a 48hour call out for any problems that may occur.

Monthly calibrations are carried out by the local authority and results sent to Ricardo

Air quality measurements from automatic instruments were validated and ratified to the standards described in the Local Air Quality Management – Technical Guidance LAQM TG (16) by Ricardo. Current readings and historic data are available at: https://www.airqualityengland.co.uk/local-authority/?la_id=408

Automatic Monitoring Annualisation

All automatic monitoring locations within Bedford recorded data capture of greater than 75% therefore it was not required to annualise any monitoring data. In addition, any sites with a data capture below 25% do not require annualisation.

NO_2 Fall-off with Distance from the Road

Wherever possible, monitoring locations are representative of exposure. However, where this is not possible, the NO_2 concentration at the nearest location relevant for exposure has been estimated using the NO_2 fall-off with distance calculator available on the LAQM

Support website. Where appropriate, automatic annual mean NO_2 concentrations corrected for distance are presented in Table A.3.

No automatic NO2 monitoring locations within Bedford required distance correction during 2023.

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

Figure D.1 – Map of Non-Automatic Monitoring Site Showing Bedford Borough boundary and diffusion tube locations indicated

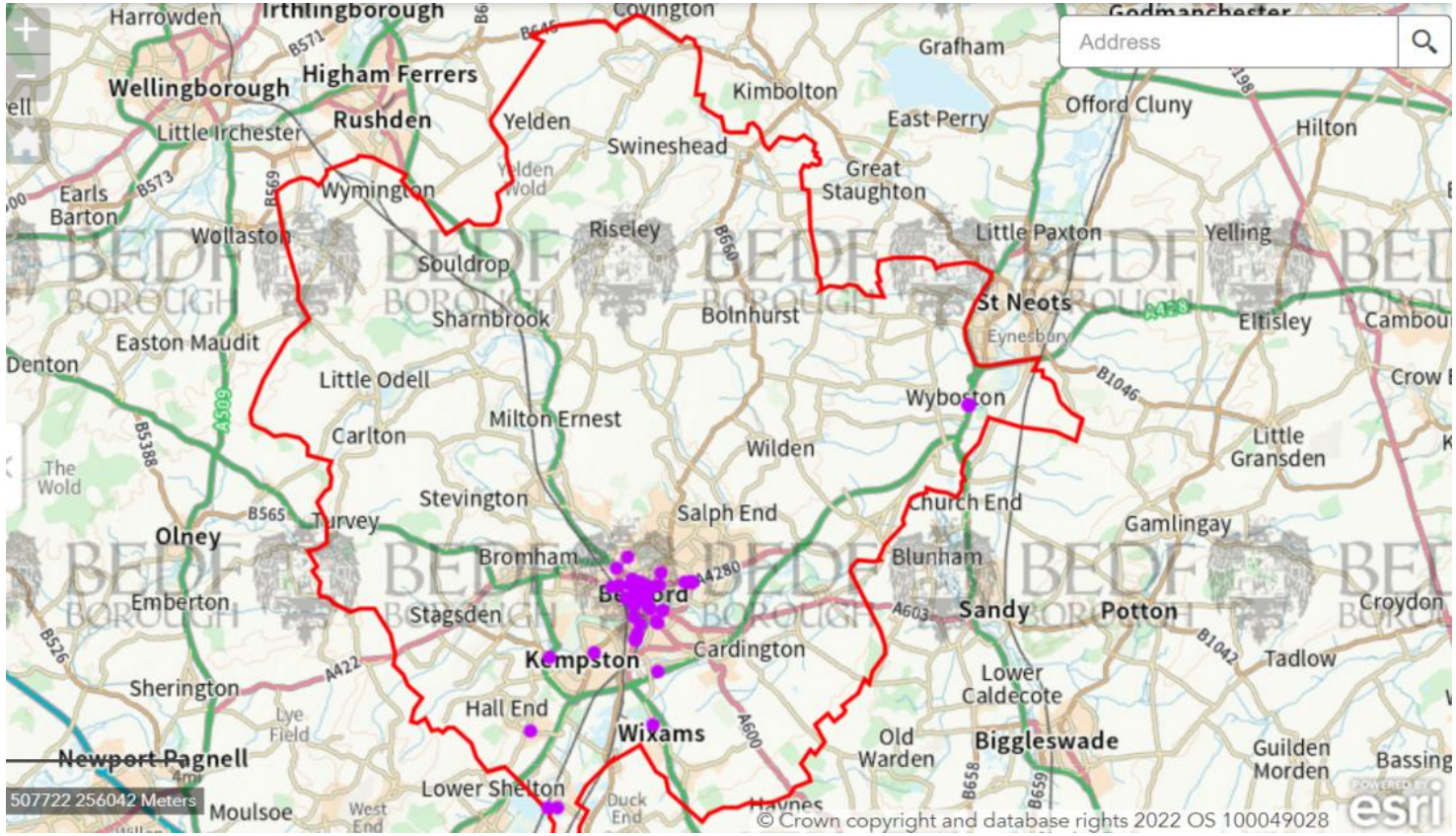


Figure D.2 – Map indicating diffusion tubes south of Bedford Town Centre

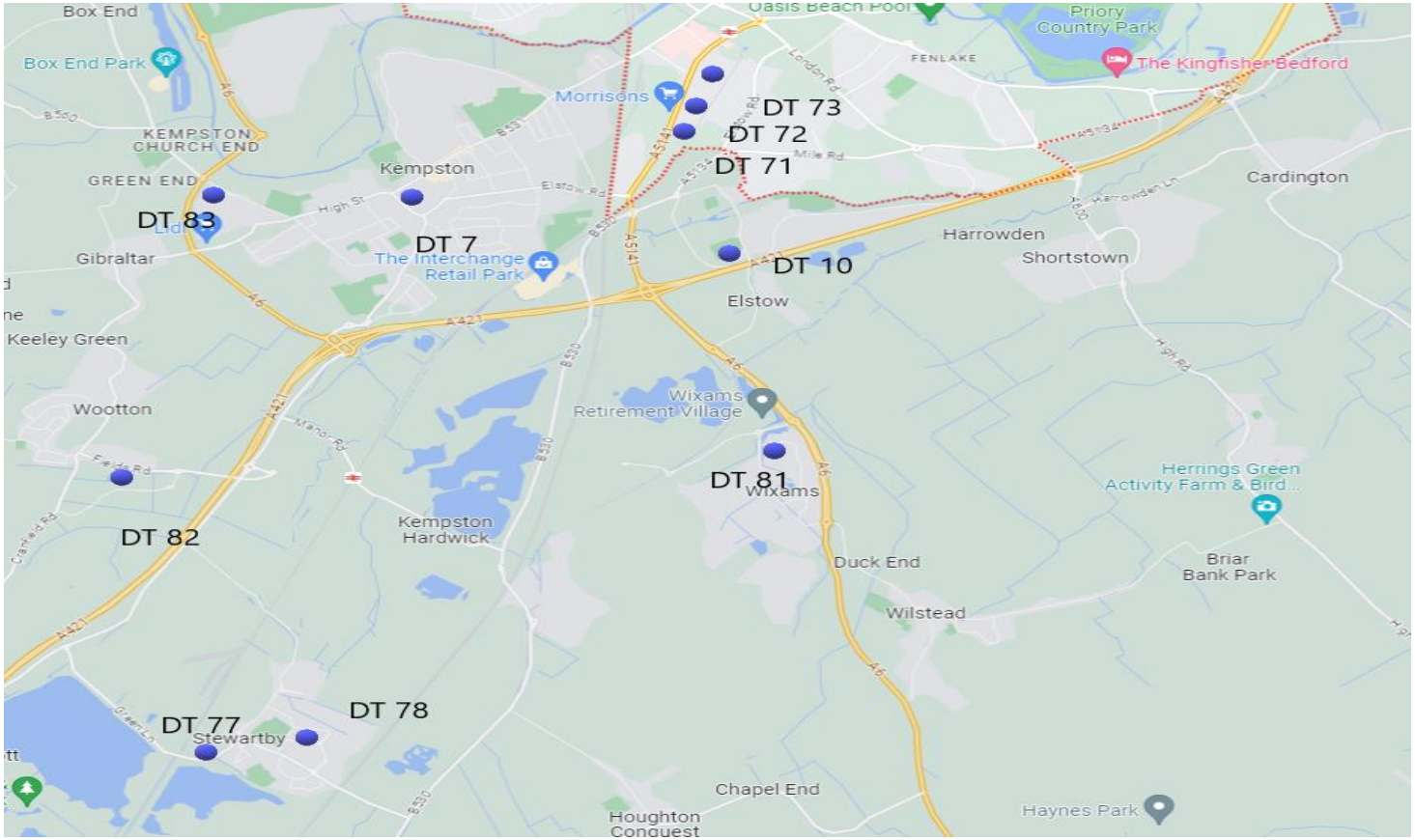


Figure D.2(a) – Additional map indicating diffusion tubes south of Bedford Town Centre

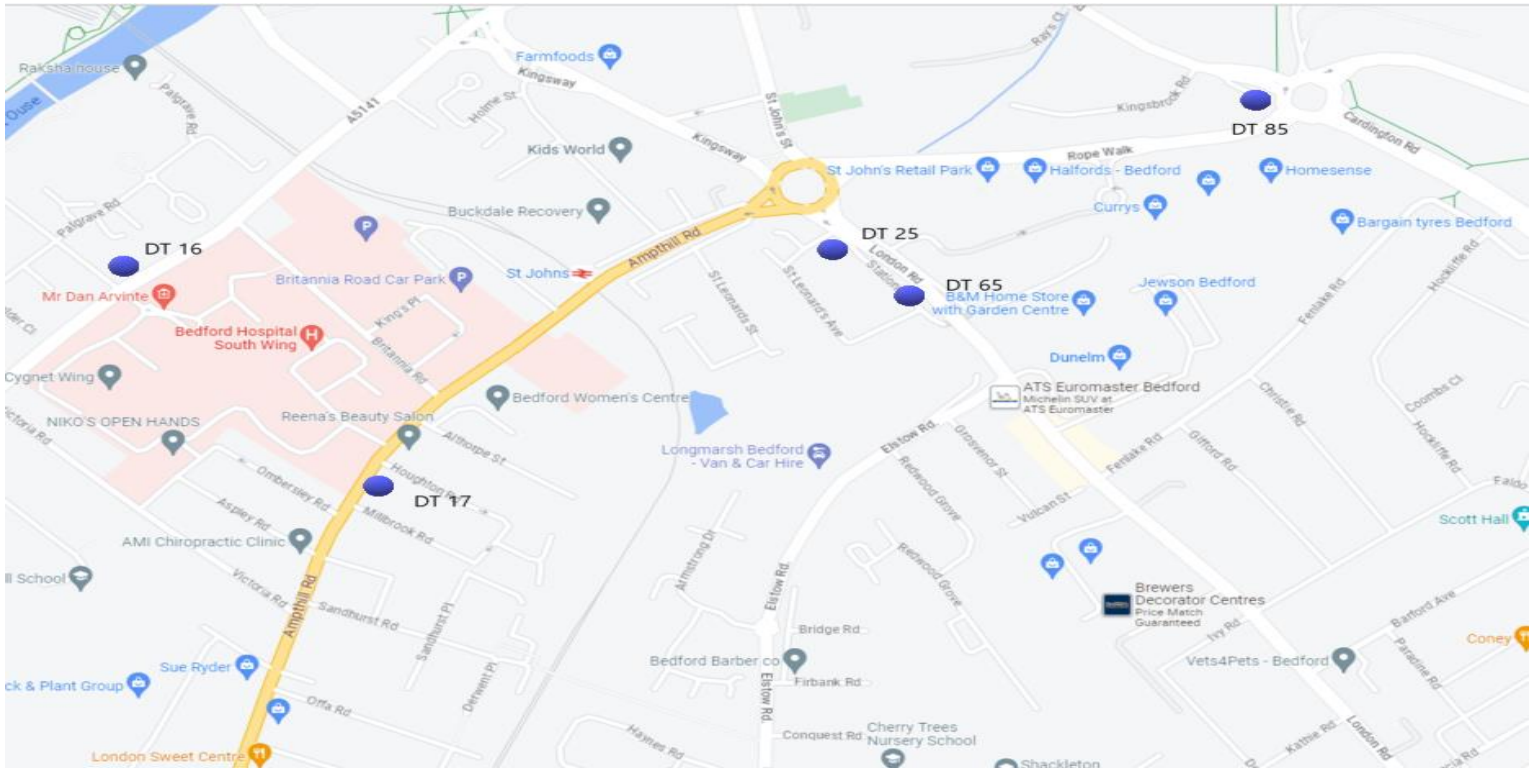


Figure D.3 – Map of diffusion tube locations Bedford Town Centre

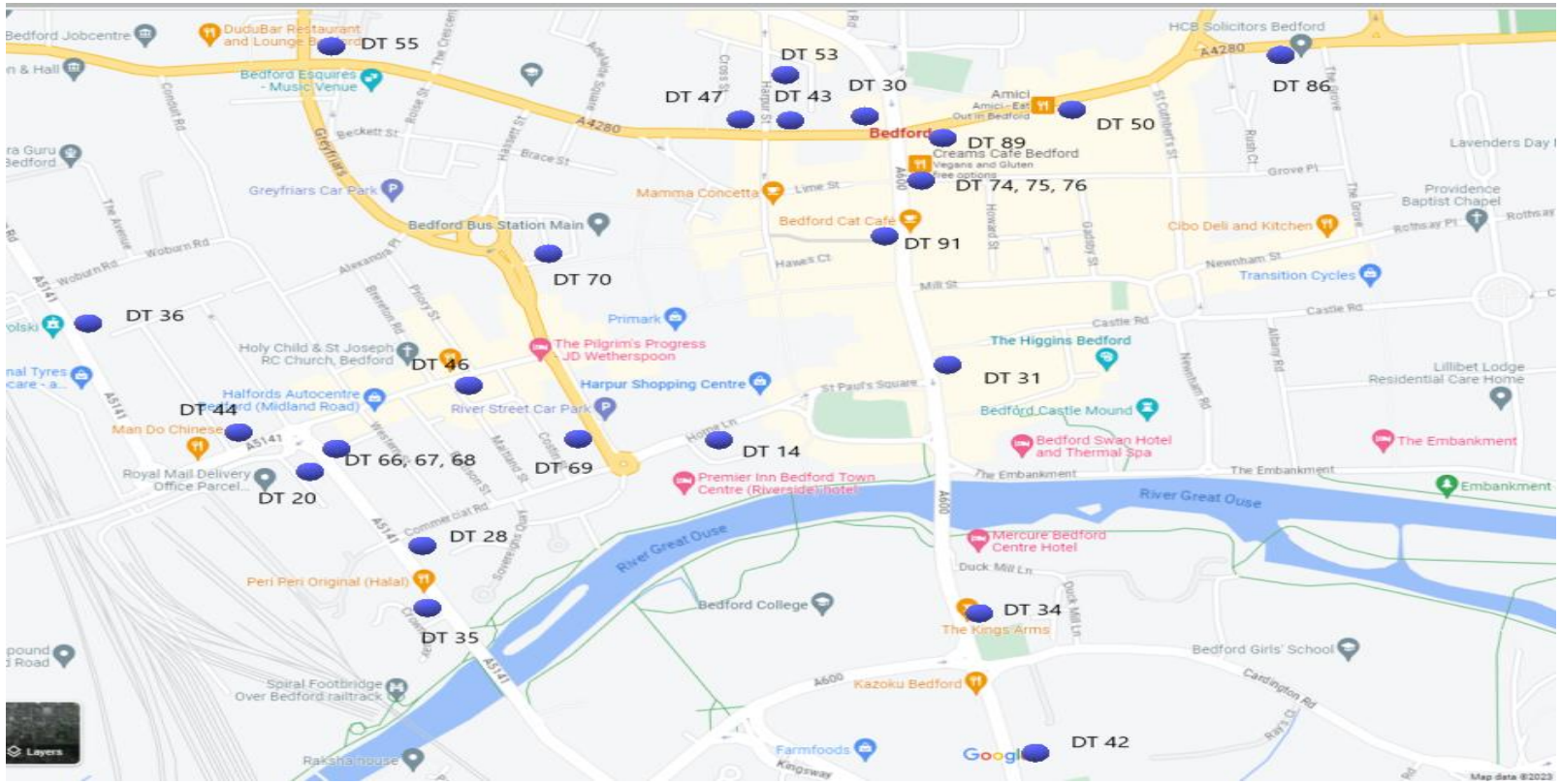


Figure D.4 – Map of diffusion tube locations North of Bedford Town Centre

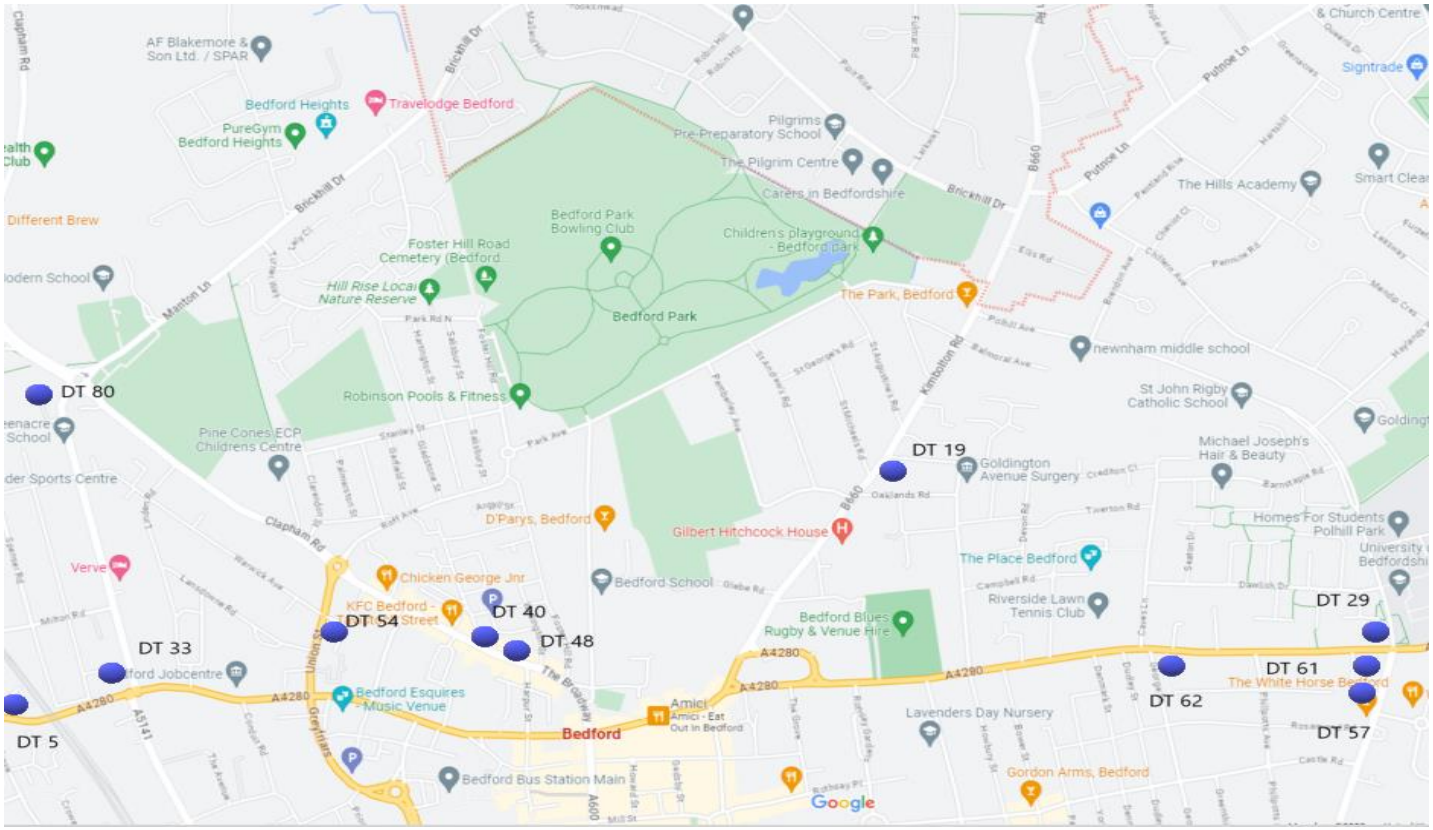


Figure D.5 – Map of new diffusion tube rural locations

Appendix E: Summary of Air Quality Objectives in England

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

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

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

Glossary of Terms

Abbreviation	Description
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

References

- Local Air Quality Management Technical Guidance LAQM.TG22. August 2022. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.
- Local Air Quality Management Policy Guidance LAQM.PG22. August 2022. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.
- Chemical hazards and poisons report: Issue 28. June 2022. Published by UK Health Security Agency
- Air Quality Strategy – Framework for Local Authority Delivery. August 2023. Published by Defra.