2024 Air Quality Annual Status Report (ASR)

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

Date: June, 2024

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Executive Summary: Air Quality in Our Area

Air Quality in Calderdale

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, s.

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

The key pollutants of concern in Calderdale are nitrogen dioxide (NO_2) and fine particulates ($PM_{2.5}$ and PM_{10}), with road traffic emissions being the principal local emission source. Commercial, industrial, and domestic sources also contribute to pollutant concentrations, with a greater proportional influence in more rural areas, away from roads.

Calderdale has a network of air pollution monitors across the borough, including three automatic (continuous) monitoring stations, monitoring NO_2, PM_{10} and $PM_{2.5}$, and 59 passive NO_2 diffusion tubes. Defra also has recently gained planning permission (reference: 23/00284/192) to install a new continuous $PM_{2.5}$ monitoring station on Parkinson Lane Halifax.

The 2023 monitoring results highlight that there are still several areas where the NO_2 annual mean objective is exceeded. Whilst there is a long-term downward trend in NO_2 concentrations in the borough, there are some locations in AQMAs where this trend is not evident, and measured NO_2 concentrations were higher at most sites in 2023, compared to 2022.

These recent monitoring measurements should be treated with some caution, with the reported increases in 2023 considered likely related to how the uncertainties in diffusion tube measurements were technically addressed. As presenting the lower-estimate of diffusion tube NO_2 measurements could have potential implications on Public Health (e.g. less investment in measures to improve air quality), the upper-limits have been presented in this report, and in the new Air Quality Action Plan. It is anticipated that the downward trend in NO_2 concentrations will return in future years, as the vehicle fleet in Calderdale improves, and the new Air Quality Action Plan is implemented.

Air quality is improving across much of the UK, where road traffic is the major source of emissions, due to the replacement of older, “dirtier” vehicles with those with “cleaner” engines, including electric vehicles. As such, the long-term trend in Calderdale is in line with national trends.

Measured concentrations of PM_{10} also show a decline over a 5-year period. The National Trend for PM_{10} and $PM_{2.5}$ is more complicated than the trend for NO_2, with decreases in

PM_{10} and $PM_{2.5}$ emissions from vehicle exhausts offset by reported increases in emissions from domestic sources[3].

Due to historic exceedances of the of the 40 µg/m^3 annual mean objective for NO_2 along major roads, Calderdale has eight Air Quality Management Areas (AQMAs) declared. The most recent AQMA (No.8 New Bank), which is found along the A58 at New Bank, was declared on 26th February 2020. Additional information, including further assessment reports, is available on Calderdale Metropolitan Borough Council's AQMA webpage.

AQMA No.4 at Luddendenfoot and AQMA No.5 at Stump Cross have been below the relevant AQS for five and six years, respectively, and Calderdale are taking the necessary steps to revoke these AQMA. The new AQAP, which is currently being prepared, does not consider these AQMAs.

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[4] 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 harm to human health. The Air Quality Strategy[5] 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[6] 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

[3] Defra. Emissions of air pollutants in the UK – Particulate matter (PM_{10} and $PM_{2.5}$), February 2023: https://www.gov.uk/government/statistics/emissions-of-air-pollutants/emissions-of-air-pollutants-in-the-uk-particulate-matter-pm10-and-pm25

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

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

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

personal travel and the majority of Air Quality Management Areas (AQMAs) are designated due to elevated concentrations heavily influenced by transport emissions.

Calderdale Council's 2019 Air Quality Action Plan (AQAP), and 2024 Draft Air Quality Action Plan outlines several key actions that are being undertaken to tackle sources of air pollution, primarily from road transport. The AQAPs focus on:

- Promoting the uptake and use of ultra-low emission vehicles (ULEVs).
- Facilitating the use of public transport by increasing the interconnectivity of the transport hub to control urban traffic congestion, prioritising public transport.
- Encouraging active travel by improving infrastructure (i.e. developing cycleways).
- Promoting the use of alternative fuels by providing electrical vehicle (EV) charging points and offering incentives such as discounted parking for EVs.
- Providing accessible information to the public to influence behaviour change.

Calderdale has also adopted the West Yorkshire Low Emission Strategy (WYLES) and continues to work with the group to improve air quality across the region.

There were several 'wins' for air quality in Calderdale in 2023. The WYLES Group won Defra funding for additional $PM_{2.5}$ monitoring, and Defra gained planning permission to install a new continuous $PM_{2.5}$ monitoring station on Parkinson Lane, Halifax.

In addition, funding was won for an engagement programme to increase awareness and encourage behaviour change around domestic burning and Halifax Bus Station partially re-opened to passengers. The redevelopment of the Bus Station included an 'electric bus station' that will facilitate the introduction of electric buses in Calderdale. As part of the White Forest Air Quality Action Plan, significant tree planting took place across Council-owned sites, with co-benefits for carbon sequestration and air quality.

Conclusions and Priorities

Compared to 2022, annual mean NO_2 concentrations in 2023 increased at 50 out of the 59 monitoring sites. Measured concentrations of NO_2 exceeded the annual mean air quality objective within all but three AQMAs (AQMA No. 4 Luddendenfoot, AQMA No.5 Stump Cross and AQMA No.7 Hipperholme) in 2023. The maximum annual mean concentration of NO_2, at a location of relevant exposure, was 44.6 $\mu g/m^3$ in AQMA No.1 (Salterhebble). AQMA No.4 and AQMA No.5 have been compliant with the annual mean Air Quality Standard for NO_2 for five and six years, respectively, and Calderdale Council are taking the necessary steps to revoke these AQMAs.

PM_{10} and $PM_{2.5}$ measurements continues to show compliance with the relevant air quality objectives and therefore, NO_2 continues to be the primary pollutant of concern.

We plan to submit our new AQAP (2024-2029) to Defra at the end of June 2024. The new AQAP details the measures Calderdale and its partners are taking, and will take, to minimise pollution concentrations in the AQMAs. The new AQAP focuses on minimising emissions from road traffic and raising awareness of the dangers of air pollution.

The following actions are key priorities for Calderdale Council in 2024:

- Adopt the new AQAP, which will be submitted to Defra for consultation.
- Continue to review the monitoring locations across the borough, particularly in the AQMAs and in vicinity of new development.
- To get funding to install EV charging.
- Continue collaborating with the WYLES group with monitoring and bids to Defra.
- Work with the Climate Action Group to promote the co-benefits of pollutant reduction and reaching net-zero.

Calderdale Council anticipate that these measures will contribute to achieving compliance with the NO_2 annual mean objective within the existing AQMAs, improving air quality across the borough and assisting in the Council's target to be net-zero.

Local Engagement and How to get Involved

Calderdale Council are committed to raising the awareness of the impacts of poor air quality. For example, improvements to public engagement are underway, ranging from web page improvements to making live monitoring data publicly available. As well as raising awareness, Calderdale Council intend to involve public engagement into policy decisions that impact upon travel. Indeed, Priority 4 in the 2019 AQAP, and draft AQAP, is to encourage public engagement and interest through improved communication and community involvement.

Road vehicles are the principal source of many pollutants in urban areas, including in Calderdale. As such, before using your car, ask yourself:

- Do I really need to make this journey?
- Could I walk or cycle instead of taking the car?
- Could I take a bus, or train or carpool?
- Are the levels of air pollution already too high today?

If you must drive:

- Drive smoothly. You'll save fuel (and money), and your engine will also pollute less.
- Don't rev your engine unnecessarily.
- Maintain your car. Keep the engine properly maintained and the tyres at the right pressure; and
- Turn off the engine when your car is stationary.

At home:

- Buy water-based or low-solvent paints, varnishes, glues and wood preservatives;
- Avoid burning solid fuels (wood, coal and charcoal), where possible;
- Avoid lighting bonfires;
- Only burn dry material and never burn household waste, especially plastic, rubber, foam or paint;
- Levels of pollution can be quite high on bonfire night and other events/festivals with bonfires, and sensitive people, including people with respiratory conditions, may notice some effects;
- However, exposure can be considerably reduced by remaining indoors and keeping windows closed;
- Be aware of internal sources of pollution (e.g. candles, cleaning products and gas stoves) and make sure that your home is sufficiently ventilated when using these products,

Further information on the health effects of air pollution can be found on the Government's website.

Local Responsibilities and Commitment

This ASR was prepared by Greenavon Ltd on behalf of Calderdale Council with the support and agreement of the following officers and departments;

- Kate Ryley (Senior Environmental Health Manager)
- Environmental Health & Community Protection Team

This ASR has been approved by:

- Andrew Pitts (Assistant Director, Neighbourhoods)

If you have any comments on this ASR please send them to Kate Ryley at:

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1 Local Air Quality Management

This report provides an overview of air quality in Calderdale 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 or not the air quality objectives are likely to be achieved. Where an exceedance is considered likely the local authority must declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in order to achieve and maintain the objectives and the dates by which each measure will be carried out. This Annual Status Report (ASR) is an annual requirement showing the strategies employed by Calderdale 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 Calderdale Council can be found in Table 2.1. The table presents a description of the 8 AQMAs that are currently designated within Calderdale Council. Appendix D: Map(s) of Monitoring Locations and AQMAs provides maps of AQMAs and also the air quality monitoring locations in relation to the AQMAs. The air quality objectives pertinent to the current AQMA designations are as follows:

- NO_2 annual mean

After five and six years of compliance in Luddendenfoot and Stump Cross, respectively, we propose to revoke AQMA No.4 and AQMA No.5. As these AQMAs are small, only impacting a few properties, Defra agreed that revocation could go ahead without a detailed assessment.

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
Calderdale No. 1 Salterhebble	Declared October 2005, amended April 2014	NO_2 Annual Mean	Stretch of the A629 south of Dryclough Lane	NO	46 µg/m^3	44 µg/m^3	0	AQAP 2019	https://new.calderdale.gov.uk/sites/default/files/2023-08/Air-Quality-Action-Plan-2019.pdf
Calderdale No.2 Sowerby Bridge	Declared July 2006	NO_2 Annual Mean	A58 through central Sowerby Bridge	NO	53 µg/m^3	41.8 µg/m^3	0	AQAP 2019	https://new.calderdale.gov.uk/sites/default/files/2023-08/Air-Quality-Action-Plan-2019.pdf
Calderdale No.3 Hebden Bridge	Declared August 2006	NO_2 Annual Mean	A646 through town centre	NO	48 µg/m^3	41.1µg/m^3	0	AQAP 2019	https://new.calderdale.gov.uk/sites/default/files/2023-08/Air-Quality-Action-Plan-2019.pdf

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
Calderdale No.4 Luddendenfoot	Declared July 2007, amended March 2014	NO_2 Annual Mean	A646 through town centre	NO	50 µg/m^3	34.6 µg/m^3	5	AQAP 2019	https://new.calderdale.gov.uk/sites/default/files/2023-08/Air-Quality-Action-Plan-2019.pdf
Calderdale No.5 Stump Cross	Declared July 2007	NO_2 Annual Mean	A58 at junction of Leeds Road and Bradford Road	NO	58 µg/m^3	34.0 µg/m^3	6	AQAP 2019	https://new.calderdale.gov.uk/sites/default/files/2023-08/Air-Quality-Action-Plan-2019.pdf
Calderdale No.6 Brighouse	Declared July 2007, amended March 2014	NO2 Annual Mean	Encircling town centre	NO	51 µg/m^3	41.9 µg/m^3	0	AQAP 2019	https://new.calderdale.gov.uk/sites/default/files/2023-08/Air-Quality-Action-Plan-2019.pdf
Calderdale No.7 Hipperholme	Declared March 2014	NO2 Annual Mean	A58 Leeds Road close to junction with Brighouse Road	NO	47 µg/m^3	39.2 µg/m^3	2	AQAP 2019	https://new.calderdale.gov.uk/sites/default/files/2023-08/Air-Quality-Action-Plan-2019.pdf

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
Calderdale No.8 New Bank	Declared February 2020	NO2 Annual Mean	A58 east of Halifax town centre	NO	42 µg/m3	40.6 µg/m3	0	AQAP 2019	https://new.calderdale.gov.uk/sites/default/files/2023-08/Air-Quality-Action-Plan-2019.pdf

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

☐ **Calderdale Council confirm that all current AQAPs have been submitted to Defra.**

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

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

- They supported a decision to revoke AQMA No.4 and AQMA No.5 as measured concentrations have remained below 10% of the annual mean objective for more than three consecutive years.
- Defra identified several formatting errors that have been updated in this report.

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

More detail on these measures can be found in the Calderdale Air Quality Action Plan 2019. The New AQAP (2024 -2029), which will be published for consultation during summer 2024, contains further details of measures that will be carried out to improve local air quality.

Key completed measures from 2023 are:

- We also increased our provision of EV charging infrastructure for fleet overnight charging.
- As part of the WYLES group, a bid for funding for $PM_{2.5}$ was granted.
- The Calderdale Local Plan, which included Air Quality Policy was adopted.

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

- A revised AQAP will be adopted.

Calderdale Council's priorities for the coming year are to continue working with the WYLES group on upcoming bids and to get our new AQAP adopted. Other stakeholders we worked with in 2023 included Leeds University, who carry out our air quality data management and analysis.

The principal challenges to improving air quality in Calderdale relate to resource and funding for projects. Calderdale Council anticipates that the measures stated above, in Table 2.2 and the new AQAP will achieve compliance in all AQMAs in the coming years.

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
AQAP1 (1)	Achieve better understanding of local air quality, including monitoring and source apportionment, queue length and congestion studies	Transport Planning and Infrastructure	Other	2009-2014	ongoing	Calderdale MBC, neighbouring authorities, tools from Defra, WYCA	Calderdale MBC, neighbouring authorities, tools from Defra, WYCA	No	Partially funded	< £10k	Implementation	Neutral	% data collection	funding in place until 2019, including contribution from WYCA	funding ends 2019
AQAP1 (2)	Traffic flow and network improvements,	Traffic Management	UTC, Congestion management, traffic reduction	current	ongoing	CMBC, Highways England, neighbouring Las, WYCA	CMBC, Highways England, neighbouring Las, WYCA	No	Partially funded	< £10k	Implementation	Neutral	data collection	Implementation on-going	Funding; Ongoing programme of renewals and upgrades including installation of intelligent TM systems
AQAP1 (3)	Urban Traffic Control (UTC) improvements	Traffic Management	UTC, Congestion management, traffic reduction	current	To be included in major projects and Corridor Improvement Plans	Calderdale MBC, neighbouring authorities	Calderdale MBC, neighbouring authorities	No	Not funded	< £10k	Implementation	Some reduction due to improved flows of traffic	Decreased congestion on routes with air quality exceedances	Implementation on-going	Modified since original action plan
AQAP1 (4)	Handling emissions data (Emissions Factor Toolkit)	Transport Planning and Infrastructure	Other	NA	Ongoing	Calderdale MBC, tools from Defra	Calderdale MBC, tools from Defra	No	Not funded	< £10k	Implementation	Neutral	effectiveness of predictions	Informs annual status report	None identified
AQAP2 (1)	Air Quality web pages - improve, e.g. include live data	Public Information	Via the Internet	ongoing	September 2019	Calderdale MBC	Calderdale MBC	No	Not funded	< £10k	Completed	indirect, may influence behaviour	web traffic, customer satisfaction	web pages updated, work progressing on live data	Technical matters
AQAP2 (2)	Clean air campaign	Public information	Via internet/social media/other	April 2019	ongoing	Calderdale MBC	Calderdale MBC	No	Not funded	< £10k	Implementation	Moderate impact behaviour change	Social media analytics	Agreed launch 20th June 2019	N/A
AQAP2 (3)	Investigate freight partnership	Freight and Delivery Management	Freight Partnerships for city centre deliveries	current	2021	Kirklees MBC, Calderdale MBC, Highways England	Kirklees MBC, Calderdale MBC, Highways England	No	Partially funded	< £10k	Planning	significant improvements in longer term	number of partners signed up	Preliminary work with operators	Resources to engage with potential partners
AQAP3 (1)	Promote high occupancy travel	Transport Planning and Infrastructure	Strategic highway improvements, re-prioritising	ongoing	ongoing	Calderdale MBC, Neighbouring Authorities	Calderdale MBC, Neighbouring Authorities	No	Not funded	< £10k	Planning	modest reduction in road emissions	To be determined	Campaign 2018	Resources and partner commitments
AQAP3 (2)	Cycling infrastructure improvements and facilities	Promoting Travel Alternatives	Promotion of cycling	current	Ongoing	Calderdale MBC	Calderdale MBC	No	Not funded	< £10k	Implementation	significant improvements in longer term	kilometres of new cycle paths	Various schemes underway, some stalled	Funding and staffing resources and land ownership
AQAP3 (3)	Active Calderdale campaign	Promoting Travel Alternatives	Intensive active travel campaign & infrastructure	current	2022	Calderdale MBC	Calderdale MBC	No	Not funded	< £10k	Implementation	low impact on emissions but reduced exposure	most active Borough in the North by 2024	Work with design council/Sport England to support local schemes	Commitment from communities
AQAP3 (4)	Metro travel card pool scheme	Alternatives to private vehicle use	Other	current	ongoing	Calderdale MBC, Metro	Calderdale MBC, Metro	No	Pfunded artially	< £10k	Implementation	Low initial impact	Number of staff car journeys replaced	take-up increasing	further cards purchased 2018

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
AQAP3 (5)	20mph areas	Traffic Management	Reduction of speed limits, 20mph areas	Complete	completed 2017	Calderdale MBC	Calderdale MBC	No	Not funded	< £10k	Completed	Possible small reduction in road traffic emissions	Number of 20mph zones	zones completed	Requirement to retrofit traffic calming in specific loaction within 20mph area due to excess traffic speeds
AQAP3 (6)	Car sharing promotion	Alternatives to private vehicle use	Car & lift sharing schemes	2009-2014	ongoing	Calderdale MBC	Calderdale MBC	No	Not funded	< £10k	Implementation	small reduction, behavioural change	number of car sharing partners	car sharing scheme up and running - featured in Clean Air day 2018	interest appears to be growing
AQAP4 (1)	ULEV procurement	Promoting Low Emission Transport	Company Vehicle Procurement - Prioritising uptake of low emission vehicles	2018-2023	after 2023	Calderdale MBC	Calderdale MBC	No	Not funded	< £10k	Implementation	Reduction in emissions around schools	% low emission/ ULEV vehicles in fleet	KPI achieved. Council fleet to be 17% ULEV compliant by March 25	Funding availability
AQAP4 (2)	EV recharging provision	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging	current	Date	Calderdale MBC supported by OLEV etc.	Calderdale MBC supported by OLEV etc.	No	Partially funded	< £10k	Implementation	Reduced vehicle emissions	Number of EV charging points	Implementation on-going	Funding; EV charging infrastucture for Council fleet is installed at multiple locations across the borough. This will grow as more EV's are introduced onto the fleet.
AQAP4 (3)	Retrofit school bus fleet	Promoting Low Emission Transport	Public Vehicle Procurement - Prioritising uptake of low emission vehicles	2015	Date	Calderdale MBC, neighbouring authorities	Calderdale MBC, neighbouring authorities	No	Not funded	< £10k	Implementation	Reduced vehicle emissions	Proportion of fleet retrofitted	Implementation on-going	This was a WYCA-led project
AQAP5 (1)	Travel plans	Promoting Travel Alternatives	Workplace Travel Planning	NA	Ongoing	Calderdale MBC, neighbouring authorities	Calderdale MBC, neighbouring authorities	No	Not funded	< £10k	Implementation	Potential moderate in long term	Number of workplaces with travel plans	With WYLES guidance	Need for section 106 agreement
AQAP5 (2)	School travel plans	Promoting Travel Alternatives	School Travel Plans	Review in 2020	2020	Calderdale MBC, neighbouring authorities	Calderdale MBC, neighbouring authorities	No	Not funded	< £10k	Implementation	Mainly behavioural influence	schools with travel plans	Plan completed pre 2019	Many schools not with Local Authority
AQAP5 (3)	Local Plan Air Quality Policies	Policy Guidance and Development Management	Air Quality Planning and Policy Guidance	Local Plan adopted March 2023	ongoing	Calderdale MBC	Calderdale MBC	No	Not funded	< £10k	Implementation	significant improvements in longer term	Policies applied to all developments	Local Plan adopted and used	See policy EN2 of the Local Plan
AQAP5 (4)	Promote uptake of electric vehicles e.g. taxis	Promoting Low Emission Transport	Taxi emission incentives	Begun 2017	Ongoing	Calderdale MBC	Calderdale MBC	No	Not funded	< £10k	Implementation	moderate, especially in town centres	number of ULEV taxis	1 operating further promotion in place. In April 2024 the council has started to record the emissions classification of all vehicles licensed by the council as they renewed. Robust data on the breakdown of vehicle emission types will be available from 2025.	Engagement of license trade
AQAP5 (5)	Promote and support use of public transport and improved infrastructure	Promoting Low Emission Transport	Public Vehicle Procurement - Prioritising uptake of low emission vehicles	Begun 2018	2019	Calderdale MBC, WYCA	Calderdale MBC, WYCA	No	Partially funded	< £10k	Implementation Completed /	Potentially moderate in the longer term	Passenger journeys on public transport	Clean Bus Technology grants awarded and fleet being upgraded	Funding
AQAP5 (6)	Promote good practice in domestic burning	Policy guidance and development control	Other	Current	ongoing	Calderdale MBC and DEFRA	Calderdale MBC and DEFRA	No	Partially funded	< £10k	Implementation	Significant local impact	Number of complaints about smoke from chimneys	Published on website	Enforcement
AQAP6 (1)	Community renewable energy scheme	Promoting Low Emission Plant	Public Procurement of stationary combustion sources	current	ongoing	Calderdale MBC	Calderdale MBC	No	Not funded	< £10k	Implementation	significant improvements in longer term	number of schemes approved	Feasibility Modelling done	Funding
AQAP6 (2)	Promote locally grown food, goods and services	Freight and Delivery Management	Other	current		CMBC, local partners including 'Incredible Edible'	CMBC, local partners including 'Incredible Edible'	No	Partially funded	< £10k	Implementation	significant improvements in longer term	Policies applied to all developments	Council policy agreed & land use for growing promoted	Ongoing Community take up

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
AQAP6 (3)	Improved energy efficiency	Other	Other			Calderdale MBC	Calderdale MBC	No	funded Not		< £10k		Number of developments incorporating energy efficiency measures		
AQAP6 (4)	Compliance checks for environmental permit	Promoting Low Emission Plant	Environmental permits	current	ongoing	CMBC / Environment Agency	CMBC / Environment Agency	No	Partially funded	< £10k	Implementation	Significant impact locally	Level of compliance with permit conditions	Part A1, A2, B and Schedule 9 and 13 permits in place	N/A
AQAP6 (5)	Introduction of green screens	Transport/planning/infrastructure	Other	Planning phase March2019	Ongoing	Calderdale MBC	Calderdale MBC	No	Not funded	< £10k	Implementation	Moderate local impact	NO2 monitoring	First installation May 2019	Finance
AQAP6 (6)	Pilot school road closure	Transport/planning/infrastructure	Other	June 2019	Ongoing	Calderdale MBC/Schools	Calderdale MBC/Schools	No	Not funded	< £10k	Implementation Completed/	Significant local impact	Air quality monitored	Plans in place	Community support
AQAP6 (7)	Tackle idling vehicles	Traffic management	Congestion management/traffic reduction	Planning phase current	Ongoing	Calderdale MBC	Calderdale MBC	No	Not funded	< £10k	Implementation Completed/	Moderate local impact	Number of idling vehicles In key destinations	Tickets have been issued for idling however work needs doing to identify key locations where there are air quality issues and targeted enforcement can take place	Compliance and resource; Ongoing refresher training for CSWs and initial training for new recruits.

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[7], 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.

The highest $PM_{2.5}$ annual mean concentration of $PM_{2.5}$ in Calderdale, in 2023, was 11.1µg/m^3. This is well below the annual mean Air Quality Objective of 20 µg/m^3 and marginally above the 2040 Air Quality Target of 10 µg/m^3.

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 latest available data shows that the 2022 fraction of mortality attributable to $PM_{2.5}$ pollution in Calderdale is 5.3% which is slightly above Yorkshire and the Humber's fraction (5.1%) and below the England average of 5.8%.

Calderdale Council's website includes an excellent resource on Smoke Pollution, considering what it is, how it is generated, as well as the legal responsibilities to prevent smoke nuisance for businesses and members of the public. The webpage allows you to report a nuisance bonfire, or report other forms of air pollution.

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

- **Biomass Combustion (including domestic wood burning**)
    - Guidance is provided on the appropriate selection of fuels on Calderdale Council's web pages, and support is provided to the information campaign by Defra surrounding domestic emissions. The latest announcement to phase out coal burning and other fuels has also been made available.
    - A green waste collection service is also in operation to discourage the burning of garden waste. As large parts of Calderdale (especially urban areas) are covered by Smoke Control Areas, households are advised on

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

how to comply with these measures and where additional information can be obtained from.

- **Industrial Sources**
  - Calderdale Council are engaging with local operators who hold environmental permits for combustion plant to ensure that emissions are within limits and, where possible, reduced even further. A number of premises burning waste below the permitted threshold have been identified, and advice is being provided on obtaining a U4 exemption and, more importantly, reducing the smoke emissions from their appliances. Calderdale Council is also working with the Environment Agency to identify and regularise waste burning in the borough. Industrial chimneys are required to ensure that their chimneys are high enough to allow the emissions to disperse.
- **Public Information**
  - The public are informed by Calderdale Council on less polluting ways of travel, in particular avoiding private vehicle use where possible. Encouraging the use of alternative modes of transport (i.e. walking and cycling) is hoped to assist in reducing fine particles from brake and tyre wear. In addition, information is provided on how garden waste can be correctly disposed of, without causing unnecessary smoke pollution.
- **Smoke Control Area**
  - Calderdale Council has two large smoke control areas, within which it is an offence to emit smoke from a domestic chimney. The exceptions are:
    - Where the fuel being burned is shown to be an authorised fuel (wood is not an authorised fuel);
    - or when fuel is burned on a fireplace that has been exempt. This is known as an 'exempted fireplace' or 'exempt appliance'.

A Climate Change Operational Group has been formed within Calderdale Council, alongside the Air Quality Operational Group to develop ideas that can be implemented to reduce emissions of greenhouse gases across the borough. This will help minimise emissions of $PM_{2.5}$ from combustion. Details of Calderdale Council's Climate Action Plan can be found online. The measures which will have significant co-benefits to minimising $PM_{2.5}$ levels in the borough include:

- The White Rose Forest Action Plan (significant tree planting in Calderdale);

- Retrofitting buildings and increasing energy efficiency, and thus decreasing domestic emissions from boilers, woodburning stoves and other sources of combustion; and
- The restoration of peatlands, which will help reduce fire risk on the moors.

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

This section sets out the monitoring undertaken within 2023 by Calderdale 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

Calderdale Council undertook automatic (continuous) monitoring at 3 sites during 2023. Table A.1 in Appendix A shows the details of the automatic monitoring sites. The Dataworks page presents automatic monitoring results for Calderdale Council , 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

Calderdale Council undertook non- automatic (i.e. passive) monitoring of NO_2 at 57 sites during 2023. One site is however a triplicate, resulting in 59 diffusion tubes being deployed each month. 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.

3.2.1.1 AQMA No.1 (Salterhebble)

Of the four monitors in AQMA No.1, two were in exceedance of the annual mean air quality objective, in 2023. The highest concentration at a location of relevant exposure was recorded at site AQ21 (44.6µg/m^3). Tube CRH1 also recorded a concentration over 40.0µg/m^3 for the second year in a row. As such, Calderdale will not consider revoking or amending this AQMA at this time.

3.2.1.2 AQMA No.2 (Sowerby Bridge)

Of the seven monitors in AQMA No.2, one was in exceedance of the annual mean air quality objective, in 2023. The highest concentration at a location of relevant exposure was recorded at site SB1 (41.8µg/m^3). Two sites in AQMA No.2 were within 10% of the objective in 2023. Two of the other monitors in AQMA No.2 have recorded annual mean concentrations less than 10% of the objective for at least three years, suggesting the AQMA could be amended to cover a smaller area. However, concentrations increased at all diffusion tubes in the AQMA relative to 2022 and as such, Calderdale will not consider revoking or amending this AQMA at this time.

3.2.1.3 AQMA No.3 (Hebden Bridge)

Of the five monitors in AQMA No.3, one was in exceedance of the annual mean air quality objective, in 2023. The highest concentration at a location of relevant exposure was recorded at site HQ1 (41.1µg/m^3). All other concentrations were more than 10% below the annual mean objective. As such, Calderdale will not consider revoking or amending this AQMA at this time.

3.2.1.4 AQMA No.4 (Luddendenfoot)

Of the two monitors in AQMA No.4, there have been no exceedances of the objective in five years, nor has any tube been greater than 10% below the objective since 2018. There was a minor increase in measured concentrations at both sites, in 2023. However, measured concentrations remained more than 10% below the annual mean objective. As such, Calderdale will now revoke this AQMA.

3.2.1.5 AQMA No.5 (Stump Cross)

There is one monitor in AQMA No.5 (SC5). There have been no recorded exceedances of the objective in 6 years and concentrations have been less than 10% below the objective since 2019. As such,

3.2.1.6 AQMA No.6 (Brighouse)

Of the six monitors in AQMA No.6, only one was in exceedance of the annual mean AQS in 2023. The highest concentration at a location of relevant exposure was recorded at site HXR1 (41.9µg/m^3). As such, Calderdale will not consider revoking or amending this AQMA.

3.2.1.7 AQMA No.7 (Hipperholme)

Of the three monitors in AQMA No.7, there have been no exceedances of the objective in two years. The highest concentration at a location of relevant exposure was recorded at site HH-LT (39.2µg/m^3), which is marginally lower than the objective. As three years of compliance, at levels more than 10% below the objective are required to consider revocation, Calderdale will not revoke this AQMA.

3.2.1.8 AQMA No.8 (New Bank)

Of the five monitors in AQMA No 5, one was in exceedance of the annual mean air quality objective, in 2023, when distance corrected to a location of relevant exposure. The highest

concentration at a location of relevant exposure was recorded at site NB-GR (40.6µg/m^3). As such, Calderdale will not consider revoking or amending this AQMA.

3.2.1.9 Outside of AQMAs

Of the 27 monitors outside of AQMAs, none were in exceedance, or within 10% of the annual mean air quality objective, in 2023 (when distance corrected to a location of relevant exposure). 19 out of the 27 monitors recorded an increase in 2023 compared to 2022 levels. As discussed elsewhere in this report, the increase in reported concentrations at diffusion tubes is likely due to the use of a local bias adjustment factor, instead of the national factor.

3.2.2 Particulate Matter (PM_{10})

Table A.6 in Appendix A: Monitoring Results compares the ratified and adjusted monitored PM_{10} annual mean concentrations for the past five years with the air quality objective of 40µg/m^3.

Table A.7 in Appendix A compares the ratified continuous monitored PM_{10} daily mean concentrations for the past five years with the air quality objective of 50µg/m^3, not to be exceeded more than 35 times per year.

PM_{10} is measured at one location in the district (AQS4, in Sowerby Bridge) and measured concentrations have been well below the relevant annual mean and daily mean air quality standards between 2019 and 2023. Prior to 2023 concentrations recorded at AQS4 showed no significant trend with respect to annual concentrations of the 24-hour air quality standard. However, both annual mean concentrations of PM_{10}, as well as the number of daily exceedances of the 24-hour standard, dropped significantly, in 2023.

3.2.3 Particulate Matter ($PM_{2.5}$)

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

$PM_{2.5}$ is measured at two locations in the district (AQS2 and AQS3) and annual mean concentrations recorded at these sites show a downward trend over 5 years. Furthermore, measured concentrations in 2023 were well below the relevant annual mean standard (20µg.m^{-3}) at both sites; however, at AQS3 measured concentrations marginally exceeded the 2040 target of 10µg.m^{-3}.

Appendix A: Monitoring Results

Table A.1 – Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Inlet Height (m)
AQS2	Huddersfield Road	Roadside	409485	423430	NO2, PM2.5	YES; AQMA No.1 (Salterhebble)	Chemiluminescent; BAM	N/A	3	1.5
AQS3	Hebden Bridge	Roadside	398990	427210	NO2, PM2.5	YES; AQMA No.3 (Hebden Bridge)	Chemiluminescent; BAM	N/A	3	1.5
AQS4	Sowerby Bridge	Roadside	406075	423615	NO2, PM10	YES; AQMA No.2 (Sowerby Bridge)	Chemiluminescent; BAM	N/A	3	1.5

Notes:

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

(2) N/A if not applicable

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

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
AQ20	AQ20	Roadside	409483	423337	NO2	No	0.0	5.0	No	2.0
AT-BR	ATBR	Suburban	411514	419548	NO2	No	6.0	1.0	No	2.0
AT-MR	ATMR	Roadside	411581	419373	NO2	No	10.0	0.5	No	2.0
CL1	CL1	Roadside	413261	420686	NO2	No	0.0	2.0	No	2.5
HTAH	HTAH	Suburban	411494	419594	NO2	No	0.0	2.0	No	2.5
LV-62E	LV62E	Roadside	416717	422113	NO2	No	25.0	4.0	No	2.0
LV-62W	LV62W	Roadside	416172	422282	NO2	No	6.0	3.0	No	2.5
LV-AT	LVAT	Roadside	411533	419358	NO2	No	14.0	4.0	No	2.5
LV-EWB	LVEWB	Roadside	410104	421516	NO2	No	250.0	1.0	No	2.5
LV-LEE	LVLEE	Roadside	417698	420709	NO2	No	200.0	3.0	No	2.5
LV-SAA	LVSAA	Roadside	411201	419429	NO2	No	11.0	0.0	No	2.0
LV-SCA	LVSCA	Roadside	405911	416597	NO2	No	150.0	10.0	No	2.5

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) [1]	Distance to kerb of nearest road (m) [2]	Tube Co-located with a Continuous Analyser?	Tube Height (m)
MY01	MY01	Roadside	401431	425995	NO2	No	0.0	1.0	No	1.0
MY02	MY02	Urban Background	401275	426046	NO2	No	20.0	10.0	No	2.5
MY03	MY03	Roadside	401204	426041	NO2	No	0.0	2.0	No	2.5
MY-04	MY04	Roadside	401059	426179	NO2	No	12.0	2.0	No	2.5
MY-05	MY05	Roadside	401040	426186	NO2	No	19.0	2.0	No	2.5
NB-GL	NBGL	Roadside	410367	425975	NO2	No	17.0	2.0	No	2.5
SB23	SB23	Roadside	405701	423223	NO2	No	3.0	1.5	No	2.5
SB40	SB40	Roadside	405814	422611	NO2	No	35.0	0.5	No	2.5
SB41	SB41	Roadside	405727	422878	NO2	No	5.0	0.0	No	2.0
SB42	SB42	Roadside	404938	422699	NO2	No	10.0	2.0	No	2.0
SB43	SB43	Roadside	405082	422999	NO2	No	8.0	1.5	No	2.0
SB44	SB44	Roadside	405234	423022	NO2	No	30.0	0.0	No	2.0
SB45	SB45	Roadside	405780	423349	NO2	No	20.0	1.5	No	2.0

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) [1]	Distance to kerb of nearest road (m) [2]	Tube Co-located with a Continuous Analyser?	Tube Height (m)
WV-SR1	WVSR1	Roadside	409598	421167	NO2	No	0.0	2.0	No	2.5
WV-SR2	WVSR2	Roadside	409608	421160	NO2	No	3.0	2.0	No	2.5
AQ21	AQ21	Roadside	409822	423167	NO2	Yes: AQMA No.1 (Salterhebble)	2.0	2.0	No	2.5
AQC1, AQC2, AQC3	AQC3	Roadside	409485	423431	NO2	Yes: AQMA No.1 (Salterhebble)	2.0	2.0	Yes	1.5
CRH1	CRH1	Roadside	409767	423011	NO2	Yes: AQMA No.1 (Salterhebble)	0.0	2.0	No	2.5
SB1	SB1	Roadside	406135	423639	NO2	Yes: AQMA No.2 (Sowerby Bridge)	0.0	2.0	No	2.5
SB15	SB15	Roadside	406707	423824	NO2	Yes: AQMA No.2 (Sowerby Bridge)	1.0	2.0	No	2.0
SB16	SB16	Roadside	406638	423836	NO2	Yes: AQMA No.2 (Sowerby Bridge)	0.0	2.0	No	2.5
SB22	SB22	Roadside	405823	423395	NO2	Yes: AQMA No.2 (Sowerby Bridge)	0.0	2.0	No	2.0
SB3	SB3	Roadside	405961	423571	NO2	Yes: AQMA No.2 (Sowerby Bridge)	0.0	2.0	No	2.5
SB-AQ	SBAQ	Roadside	406075	423615	NO2	Yes: AQMA No.2 (Sowerby Bridge)	0.5	1.5	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)
BS1 HB	BS1 HB	Roadside	398990	427210	NO2	Yes: AQMA No.3 (Hebden Bridge)	8.0	3.0	Yes	1.5
HB6	HB6	Roadside	399502	427041	NO2	Yes: AQMA No.3 (Hebden Bridge)	0.0	4.0	No	2.0
HQ1	HQ1	Roadside	398794	427237	NO2	Yes: AQMA No.3 (Hebden Bridge)	0.0	3.0	No	2.0
HQ9	HQ9	Roadside	399236	427176	NO2	Yes: AQMA No.3 (Hebden Bridge)	0.0	2.0	No	2.5
LF1	LF1	Roadside	403810	424977	NO2	Yes: AQMA No.4 (Luddendenfoot)	0.0	2.0	No	2.5
LF2	LF2	Roadside	403738	425110	NO2	Yes: AQMA No.4 (Luddendenfoot)	0.0	1.0	No	2.5
SC5	SC5	Roadside	410823	426265	NO2	Yes: AQMA No.5 (Stump Cross)	0.0	3.0	No	3.0
BE2	BE2	Roadside	414385	422457	NO2	Yes: AQMA No.6 (Brighouse)	0.0	2.0	No	2.5
BE4	BE4	Roadside	414478	422692	NO2	Yes: AQMA No.6 (Brighouse)	0.0	1.0	No	2.5
BH3	BH3	Roadside	414671	422740	NO2	Yes: AQMA No.6 (Brighouse)	3.0	1.5	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)
HXR1	HXR1	Roadside	414218	422957	NO2	Yes: AQMA No.6 (Brighouse)	0.0	4.0	No	2.0
LV-BRD	LVBRD	Roadside	414683	423155	NO2	Yes: AQMA No.6 (Brighouse)	5.0	2.0	No	2.0
WR2	WR2	Roadside	415090	422817	NO2	Yes: AQMA No.6 (Brighouse)	0.0	4.0	No	2.5
HH-1A	HH1A	Roadside	412593	425497	NO2	Yes: AQMA No.7 (Hipperholme)	0.0	1.5	No	2.5
HH-LT	HHLT	Roadside	412450	425435	NO2	Yes: AQMA No.7 (Hipperholme)	0.0	3.0	No	2.5
HH-TC	HHTC	Roadside	412718	425556	NO2	Yes: AQMA No.7 (Hipperholme)	5.0	1.5	No	2.5
LV-NBN	LVNBN	Roadside	409715	425754	NO2	Yes: AQMA No.8 (New Bank)	40.0	1.0	No	2.5
LV-NBS	LVNBS	Roadside	409708	425737	NO2	Yes: AQMA No.8 (New Bank)	25.0	2.0	No	2.5
NB-GR	NBGR	Roadside	409957	425642	NO2	Yes: AQMA No.8 (New Bank)	4.0	3.0	No	2.0
NB-NB1	NBNB1	Roadside	409663	425740	NO2	Yes: AQMA No.8 (New Bank)	2.0	2.0	No	2.5

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
NB-NBX	NBNBX	Roadside	409602	425797	NO2	Yes: AQMA No.8 (New Bank)	30.0	1.0	No	2.5

Notes:

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

(2) N/A if not applicable.

Table A.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
AQS3	398990	427210	Roadside	93.5	93.5	34.3	26.7	32.8	30.3	32.4
AQS4	406075	423615	Roadside	99.7	99.7	36.0	29.6	33	37.2	32.7

☒ **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
AQ20	409483	423337	Roadside	100	98.4	22.0	18.7	18.5	18.4	19.9
AT-BR	411514	419548	Suburban	100	98.4	28.0	20.4	23.4	19.4	19.9
AT-MR	411581	419373	Roadside	91.7	89.0	25.0	19.9	23.9	20.6	22.4
CL1	413261	420686	Roadside	100	98.4	29.0	27.0	28.2	24.9	27.0
HTAH	411494	419594	Suburban	100	98.4	27.0	21.1	26.3	22.9	23.1
LV-62E	416717	422113	Roadside	100	98.4	36.0	32.2	31.8	30.2	31.5
LV-62W	416172	422282	Roadside	100	98.4	37.0	30.4	39.2	30.0	31.5
LV-AT	411533	419358	Roadside	91.7	91.0	**45.0**	34.7	**41.5**	35.4	38.8
LV-EWB	410104	421516	Roadside	100	98.4	27.0	21.2	19.8	19.1	17.3
LV-LEE	417698	420709	Roadside	100	98.4	27.0	25.0	26.9	24.9	27.6
LV-SAA	411201	419429	Roadside	100	98.4	25.0	23.7	22.4	17.1	20.0
LV-SCA	405911	416597	Roadside	91.7	90.4	37.0	33.6	37.1	34.9	31.3
MY01	401431	425995	Roadside	100	98.4	**44.0**	35.6	33.7	31.5	34.9

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
MY02	401275	426046	Urban Background	100	98.4	21.0	18.8	14.9	14.2	15.9
MY03	401204	426041	Roadside	100	98.4	39.0	34.8	32.4	30.8	34.1
MY-04	401059	426179	Roadside	100	98.4	27.0	23.5	20.6	19.7	21.8
MY-05	401040	426186	Roadside	100	98.4	28.0	24.9	22.4	21.1	22.5
NB-GL	410367	425975	Roadside	100	98.4	**49.0**	**47.6**	**43.5**	**40.4**	**44.4**
SB23	405701	423223	Roadside	100	98.4	-	23.4	23.4	21.6	24.4
SB40	405814	422611	Roadside	91.7	90.4	-	-	7.9	10.8	8.7
SB41	405727	422878	Roadside	91. 7	90.4	-	-	7.9	10.1	9.0
SB42	404938	422699	Roadside	91.7	90.4	-	-	23.0	24.7	24.1
SB43	405082	422999	Roadside	83.3	83.0	-	-	9.0	10.9	9.7
SB44	405234	423022	Roadside	91.7	90.4	-	-	11.5	13.0	13.9
SB45	405780	423349	Roadside	91.7	90.4	-	-	27.3	27.2	25.2
WV-SR1	409598	421167	Roadside	100	98.4	38.0	32.8	33.2	31.8	32.7
WV-SR2	409608	421160	Roadside	100	98.4	28.0	25.7	22.9	24.8	24.3

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
AQ21	409822	423167	Roadside	100	98.4	**44.0**	**43.0**	**53.1**	**46.1**	**50.1**
AQC1, AQC2, AQC3	409485	423431	Roadside	83.3	98.4	39.3	32.8	37.1	33.8	34.0
CRH1	409767	423011	Roadside	100	98.4	**42.0**	38.4	38.9	**40.5**	**41.3**
SB1	406135	423639	Roadside	100	69.3	**42.0**	**40.2**	37.0	39.4	**41.8**
SB15	406707	423824	Roadside	100	71.8	34.0	27.9	30.6	27.2	32.3
SB16	406638	423836	Roadside	75	88.5	36.0	31.2	25.4	30.7	36.6
SB22	405823	423395	Roadside	75	98.4	**40.0**	34.1	33.5	31.8	35.7
SB3	405961	423571	Roadside	91.7	98.4	35.0	35.9	37.0	37.4	39.5
SB-AQ	406075	423615	Roadside	100	64.7	**-**	33.5	31.6	32.3	34.0
BS1 HB	398990	427210	Roadside	100	98.4	33.0	29.7	30.5	36.7	31.4
HB6	399502	427041	Roadside	75	98.4	30.0	26.0	28.5	26.0	29.2
HQ1	398794	427237	Roadside	100	98.4	**44.0**	38.4	**42.6**	31.3	**41.1**
HQ9	399236	427176	Roadside	100	98.4	35.0	29.9	29.8	28.8	32.2

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
LF1	403810	424977	Roadside	100	98.4	34.0	33.9	32.0	32.7	34.6
LF2	403738	425110	Roadside	100	98.4	29.0	26.3	27.2	26.0	28.2
SC5	410823	426265	Roadside	100	98.4	35.0	34.1	32.3	31.7	34.0
BE2	414385	422457	Roadside	100	98.4	35.0	31.8	36.5	31.5	33.1
BE4	414478	422692	Roadside	100	86.0	**42.0**	33.6	**43.2**	36.6	37.7
BH3	414671	422740	Roadside	100	98.4	**43.0**	38.2	**42.7**	36.7	39.7
HXR1	414218	422957	Roadside	91.7	98.4	**42.0**	**43.0**	**43.6**	**41.2**	**41.9**
LV-BRD	414683	423155	Roadside	100	98.4	27.0	23.4	24.1	22.8	25.5
WR2	415090	422817	Roadside	100	57.3	33.0	30.9	31.1	28.3	31.3
HH-1A	412593	425497	Roadside	100	98.4	**-**	31.8	31.5	31.1	31.6
HH-LT	412450	425435	Roadside	66.7	98.4	**41.0**	**40.7**	**42.3**	39.0	39.2
HH-TC	412718	425556	Roadside	100	98.4	33.0	26.0	27.7	26.1	26.6
LV-NBN	409715	425754	Roadside	100	98.4	**55.0**	**53.5**	**53.2**	**52.0**	**58.6**
LV-NBS	409708	425737	Roadside	100	98.4	**41.0**	34.0	**40.7**	36.1	36.6

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
NB-GR	409957	425642	Roadside	100	98.4	**46.0**	**49.4**	**51.9**	**46.1**	**50.0**
NB-NB1	409663	425740	Roadside	100	98.4	**40.0**	35.2	36.6	34.1	37.2
NB-NBX	409602	425797	Roadside	100	98.4	39.0	36.3	36.9	34.3	36.2

☒ **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 (AQMA No.1 Salterhebble)

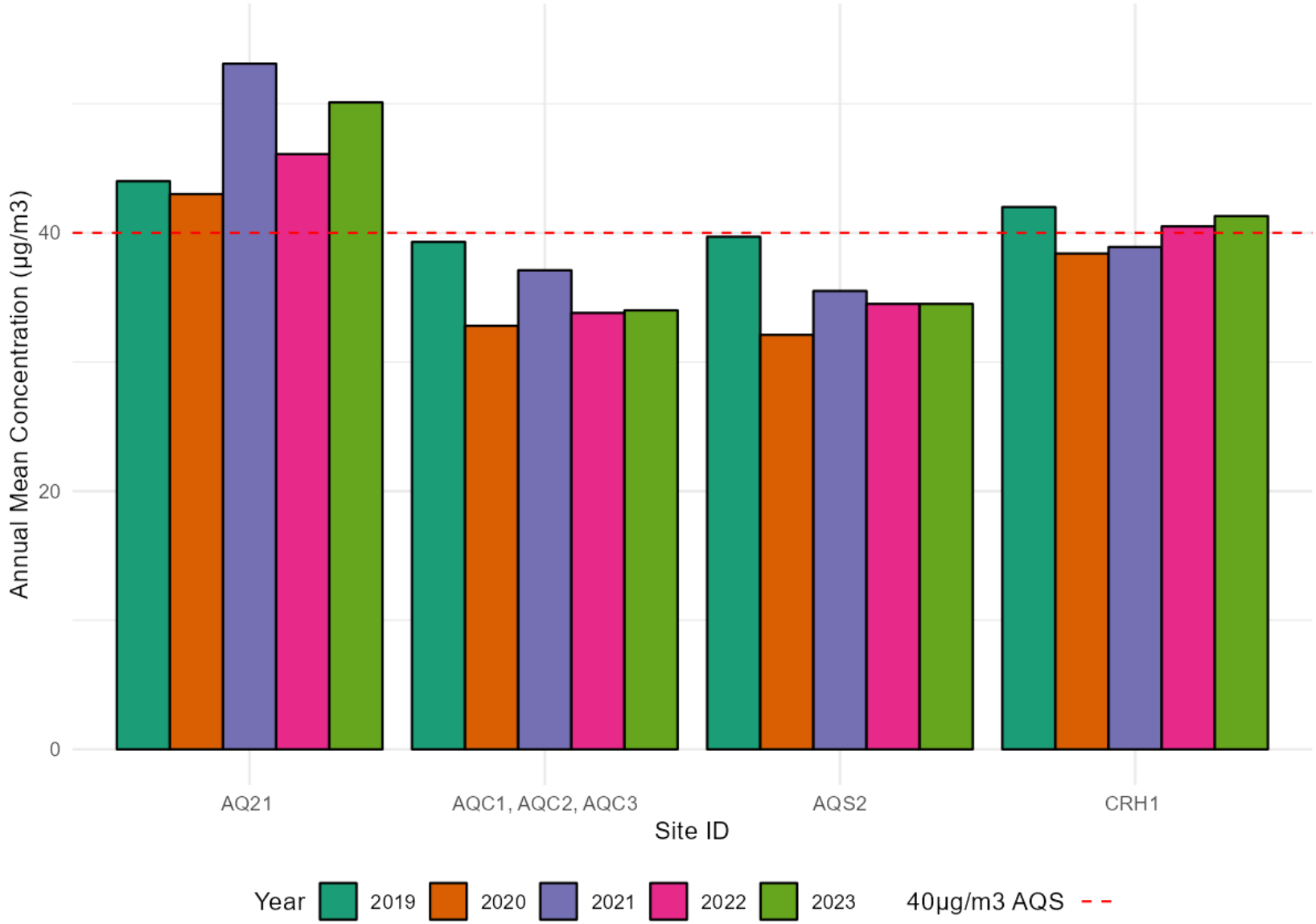


Figure A.2 – Trends in Annual Mean NO_2 Concentrations (AQMA No.2 Sowerby Bridge)

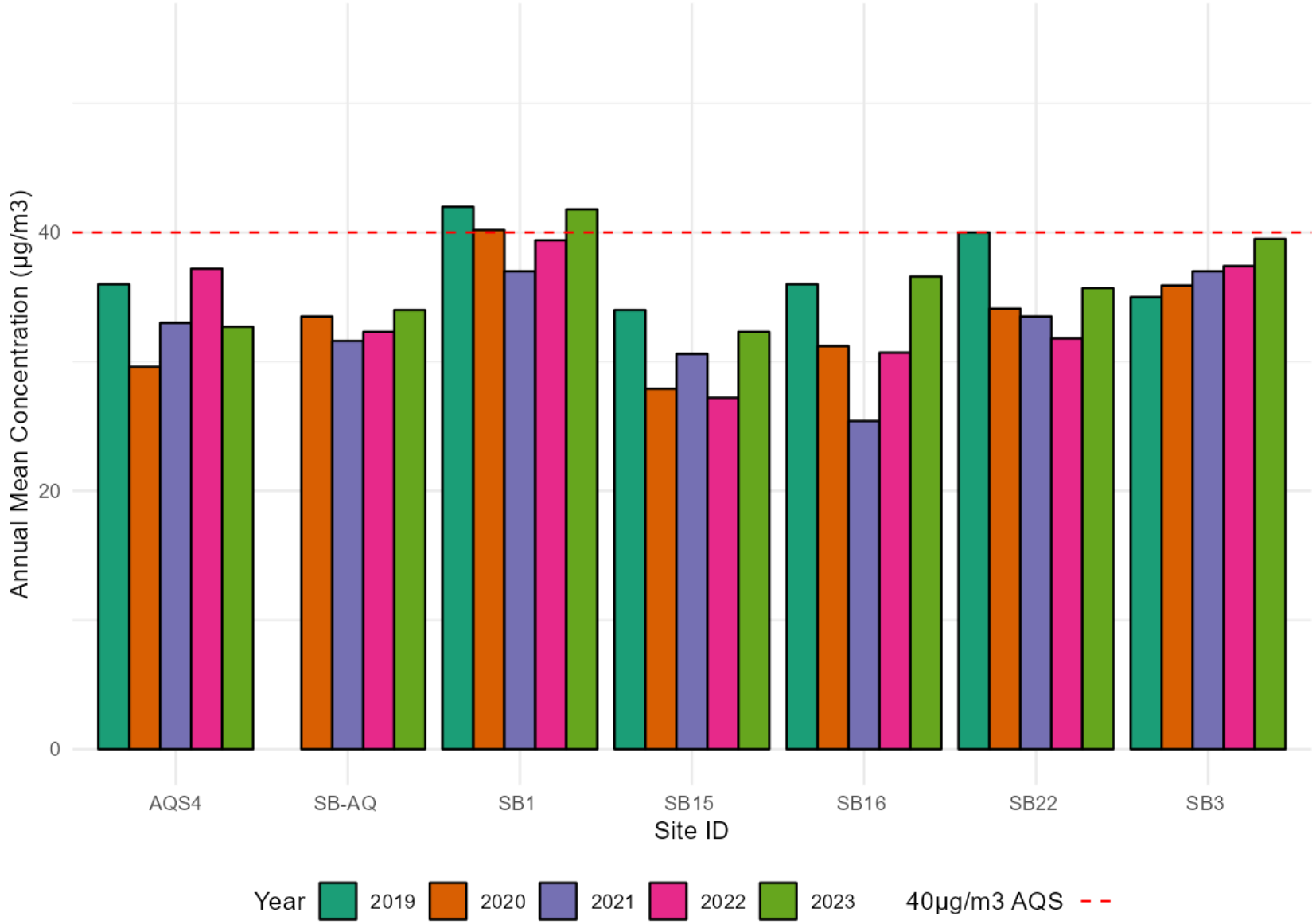


Figure A.3 – Trends in Annual Mean NO_2 Concentrations (AQMA No.3 Hebden Bridge)

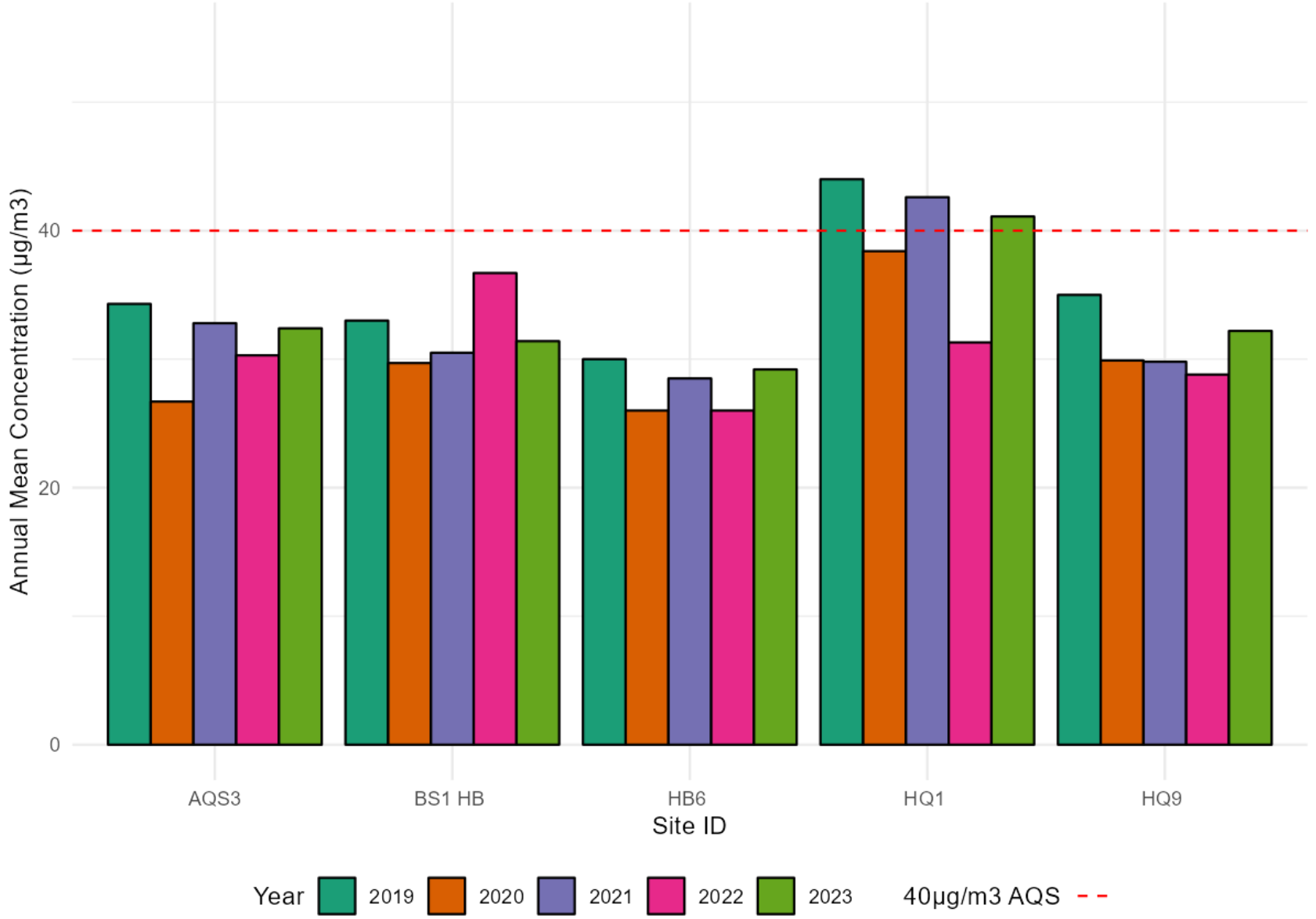


Figure A.4 – Trends in Annual Mean NO_2 Concentrations (AQMA No.4 Luddendenfoot)

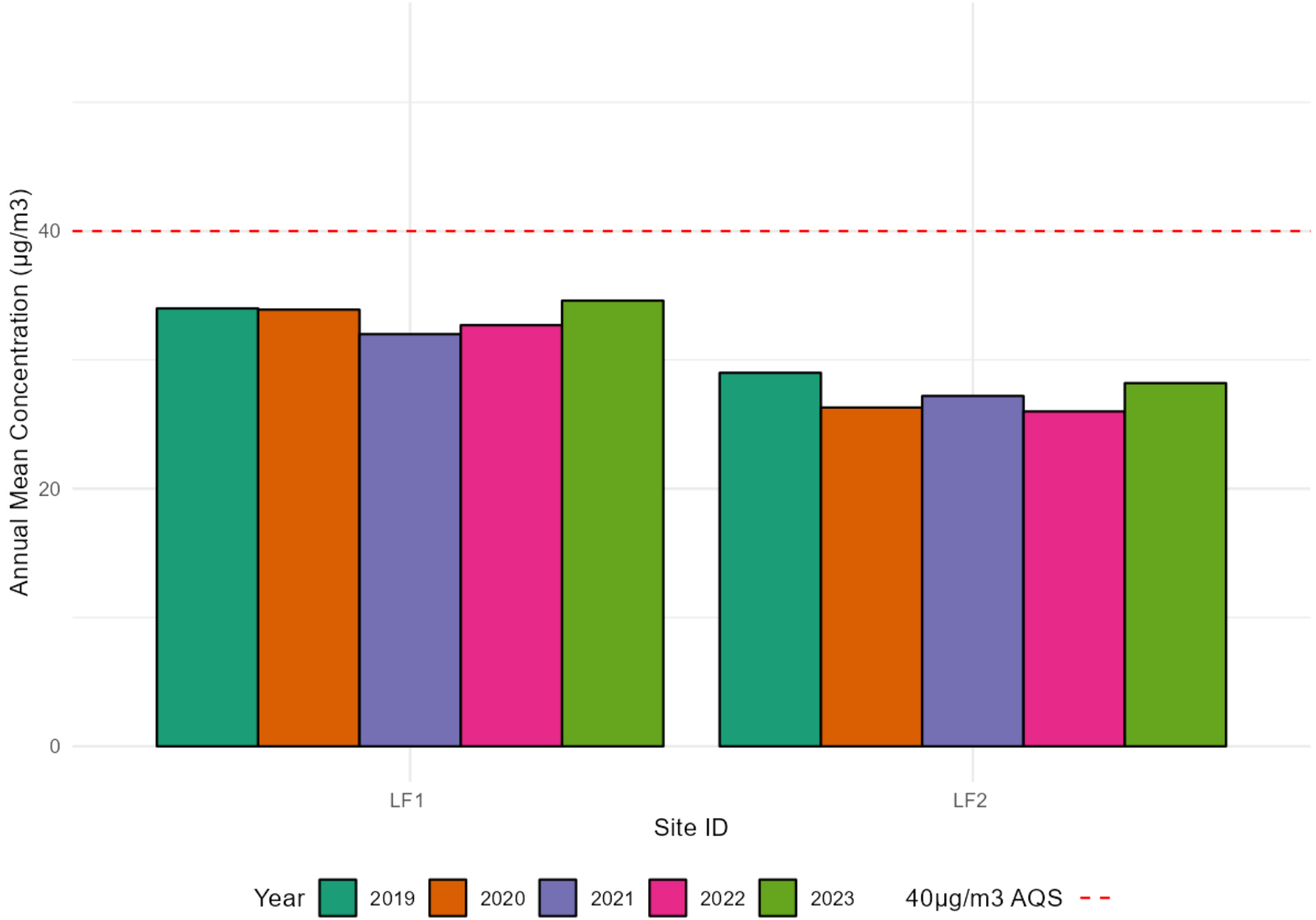


Figure A.5 – Trends in Annual Mean NO_2 Concentrations (AQMA No.5 Stump Cross)

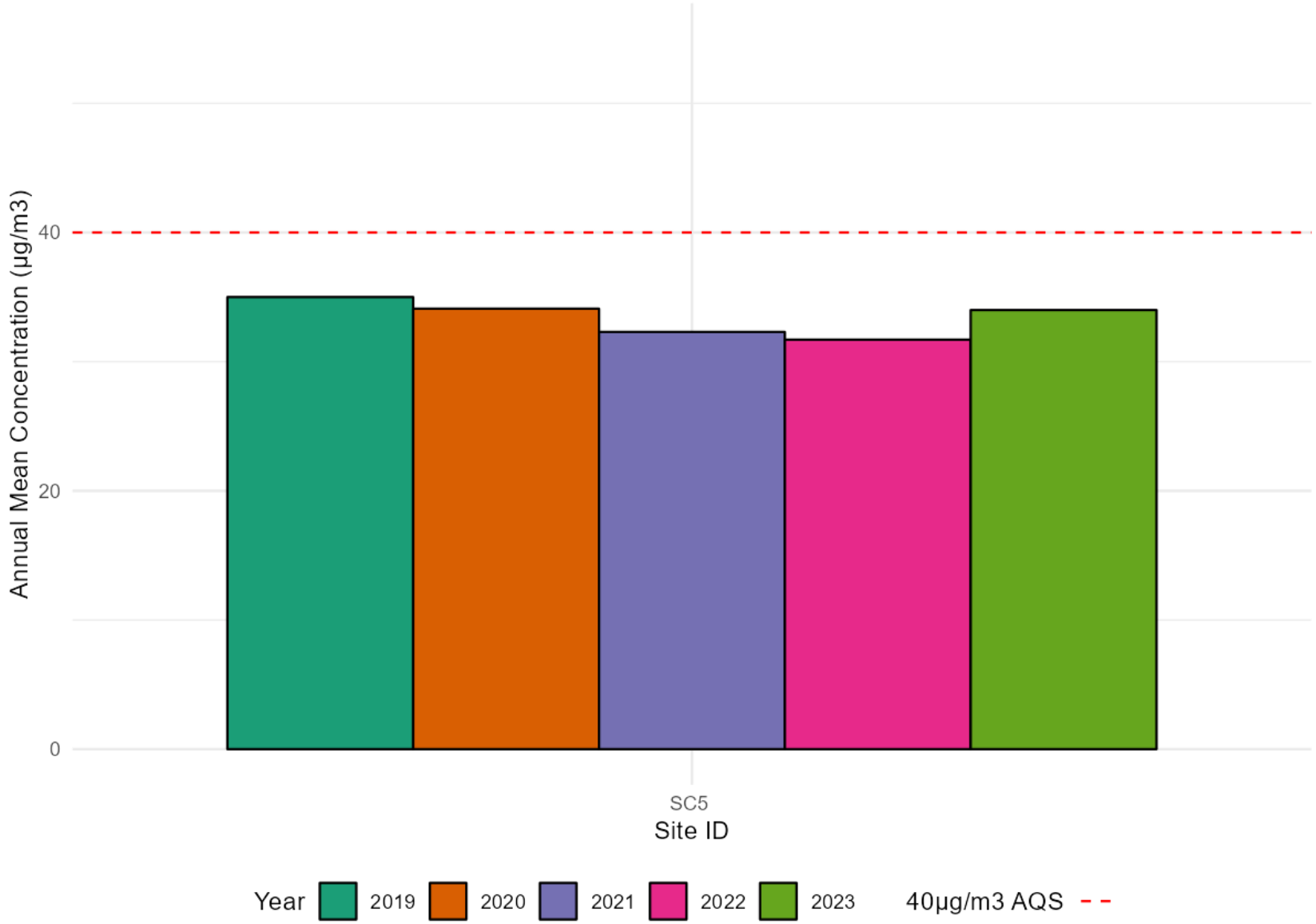


Figure A.6 – Trends in Annual Mean NO_2 Concentrations (AQMA No.6 Brighouse)

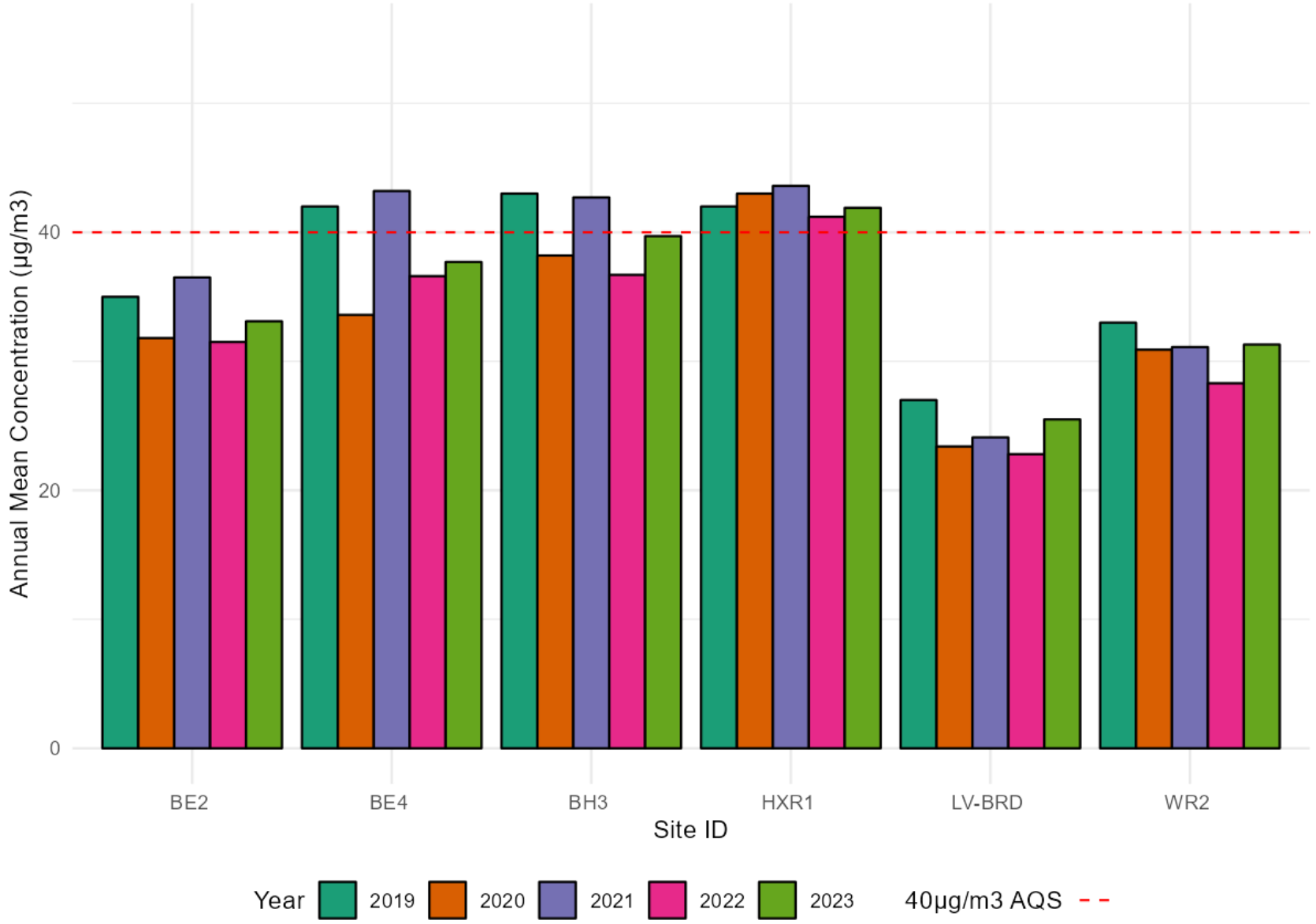


Figure A.7 – Trends in Annual Mean NO_2 Concentrations (AQMA No.7 Hipperholme)

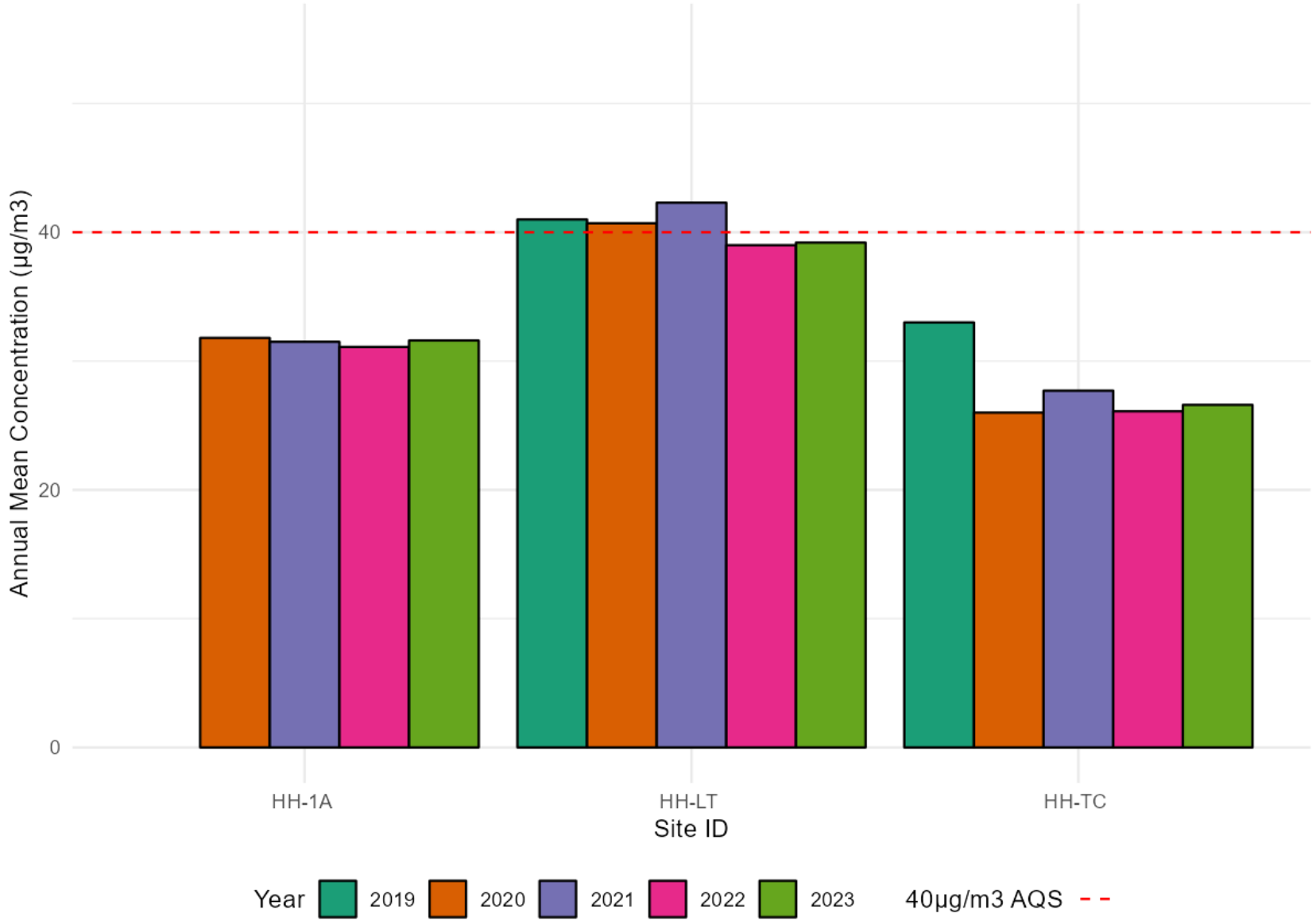


Figure A.8 – Trends in Annual Mean NO_2 Concentrations (AQMA No.8 New Bank)

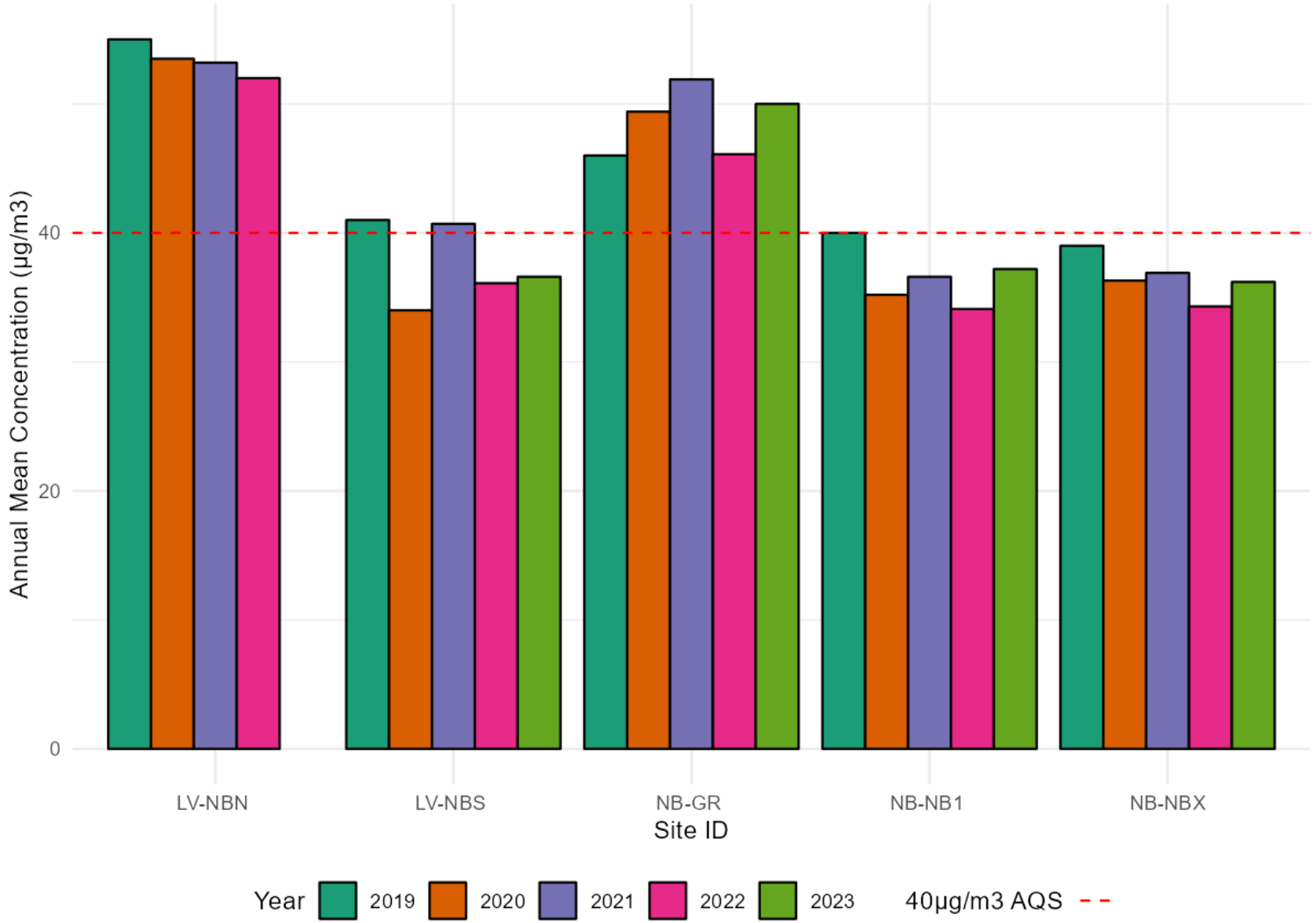


Figure A.9 – Trends in Annual Mean NO_2 Concentrations (Outside AQMA 1)

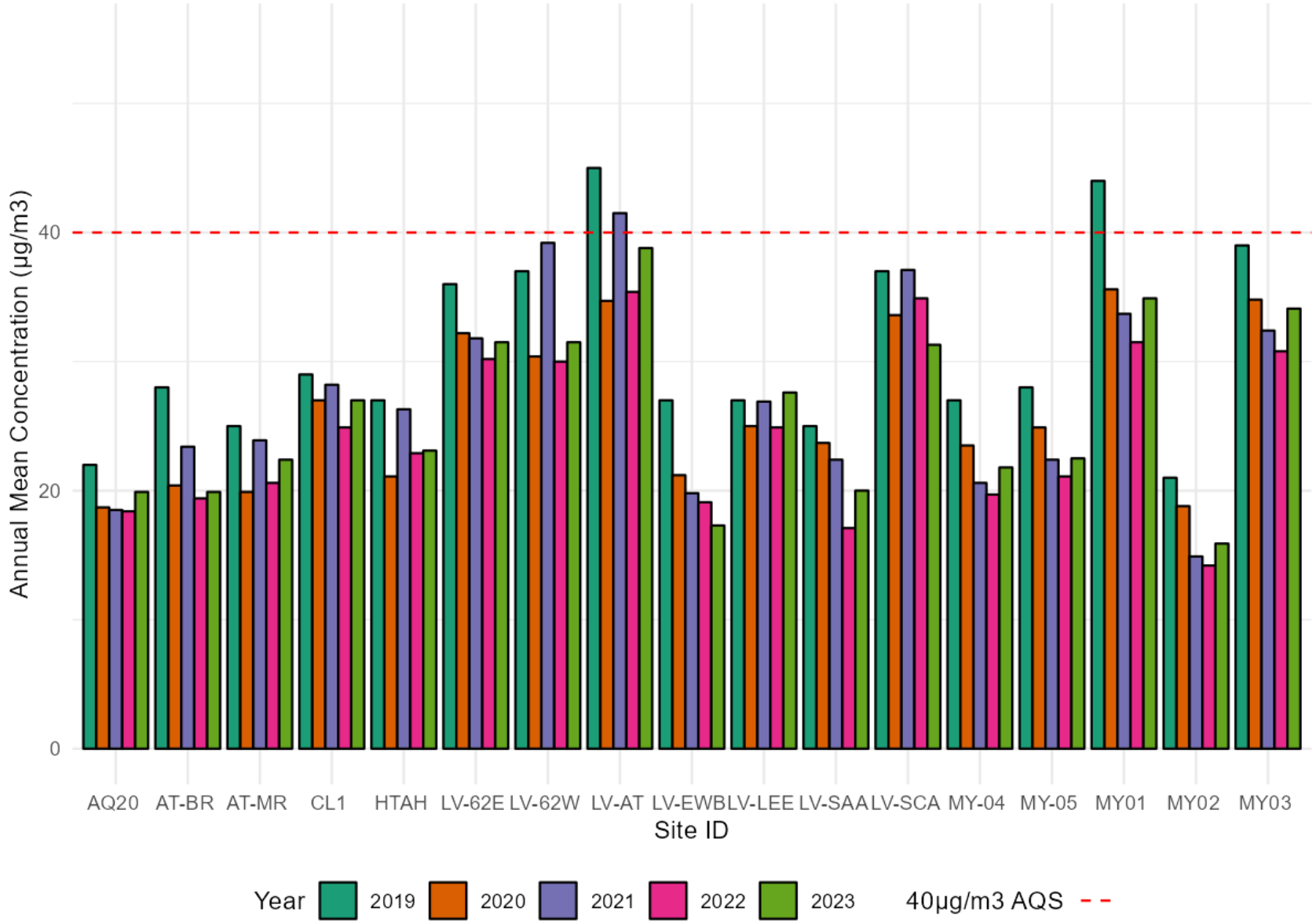


Figure A.10 – Trends in Annual Mean NO_2 Concentrations (Outside AQMA 2)

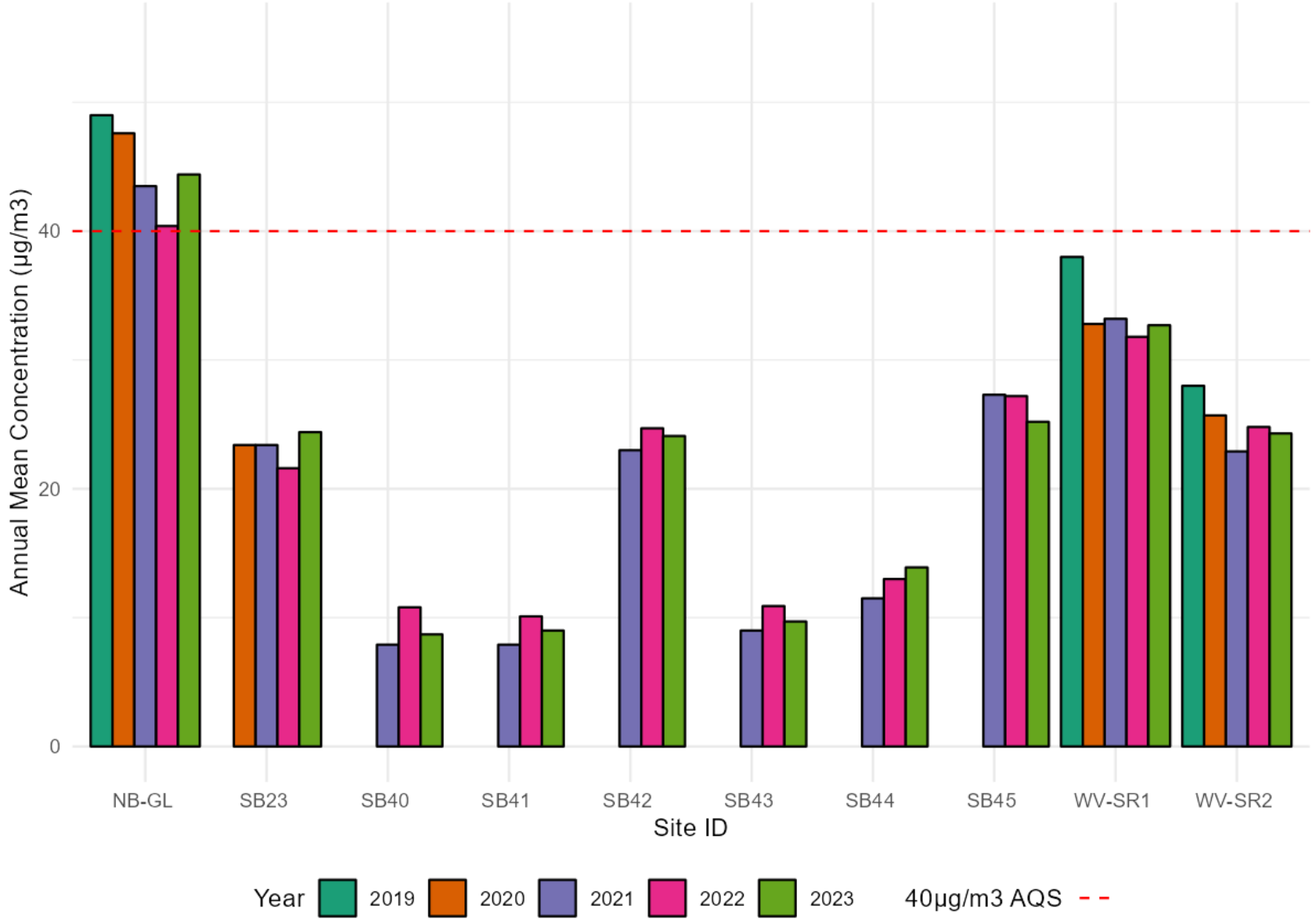


Table A.5 – 1-Hour Mean NO_2 Monitoring Results, Number of 1-Hour Means > 200µg/m^3

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
AQS2	409485	423430	Roadside	99.5	99.5	99.5	0	0	0	0
AQS3	398990	427210	Roadside	98.3	93.5	93.5	0	0	0	0
AQS4	406075	423615	Roadside	99.7	99.7	99.7	0	0	0	0

Notes:

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

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

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

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

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

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

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2023 (%) (2)	2019	2020	2021	2022	2023
AQS4	406075	423615	Roadside	97	97	24	26.4	24.5	24.5	19.9

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

Notes:

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

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

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

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

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

Figure A.11 – Trends in Annual Mean PM_{10} Concentrations

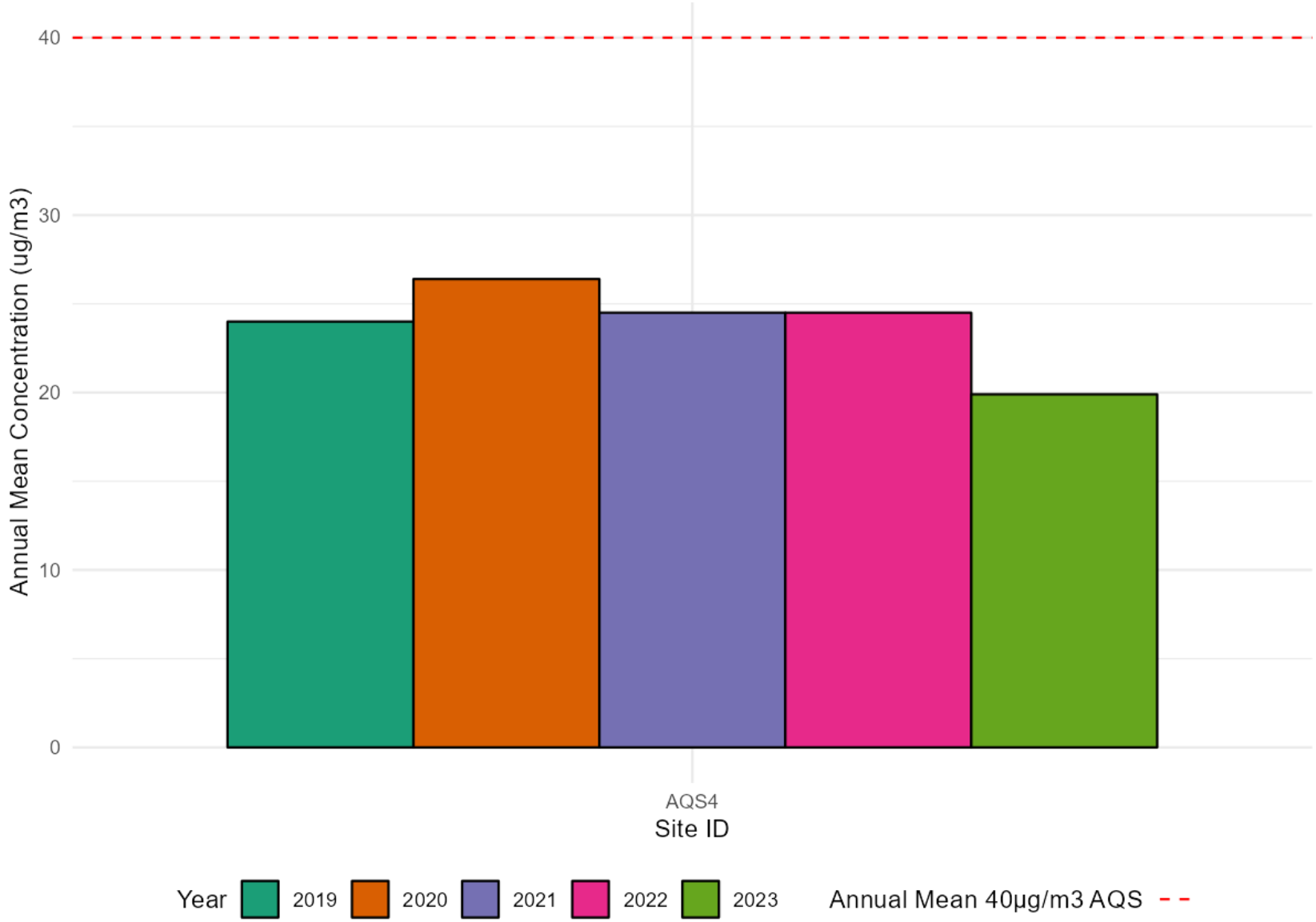


Table A.7 – 24-Hour Mean PM_{10} Monitoring Results, Number of PM_{10} 24-Hour Means > 50µg/m^3

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2023 (%) (2)	2019	2020	2021	2022	2023
AQS4	406075	423615	Roadside	97	97	19	20	11	17	4

Notes:

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

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

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

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

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

Figure A.12 – Trends in Number of 24-Hour Mean PM_{10} Results > 50µg/m^3

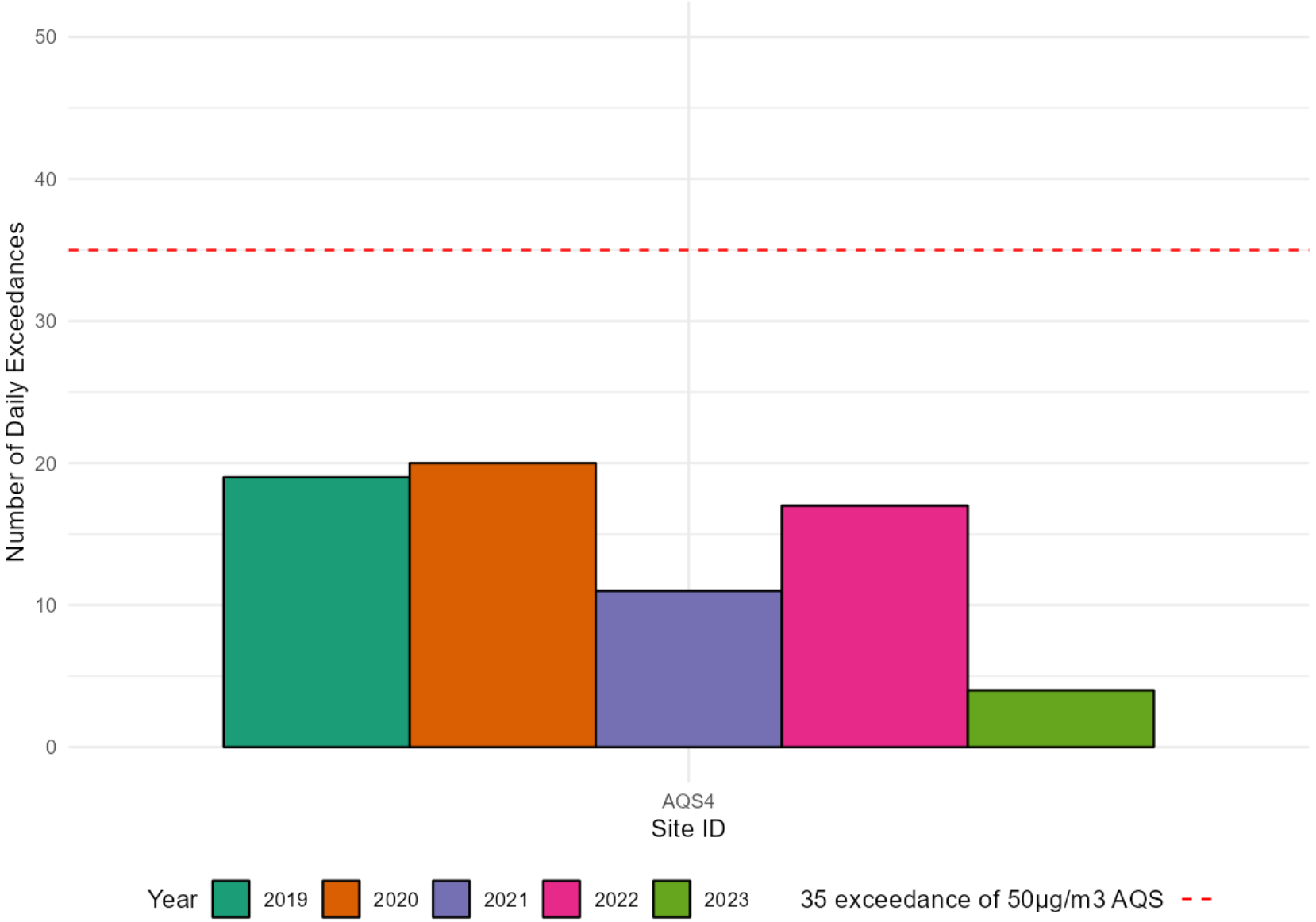


Table A.8 – Annual Mean $PM_{2.5}$ Monitoring Results ($\mu g/m^3$)

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2023 (%) (2)	2019	2020	2021	2022	2023
AQS2	409485	423430	Roadside	94.2	94.2	11	9.6	10	9.3	8.1
AQS3	398990	427210	Roadside	93.2	93.2	20	11	8.5	9.9	11.1

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

Notes:

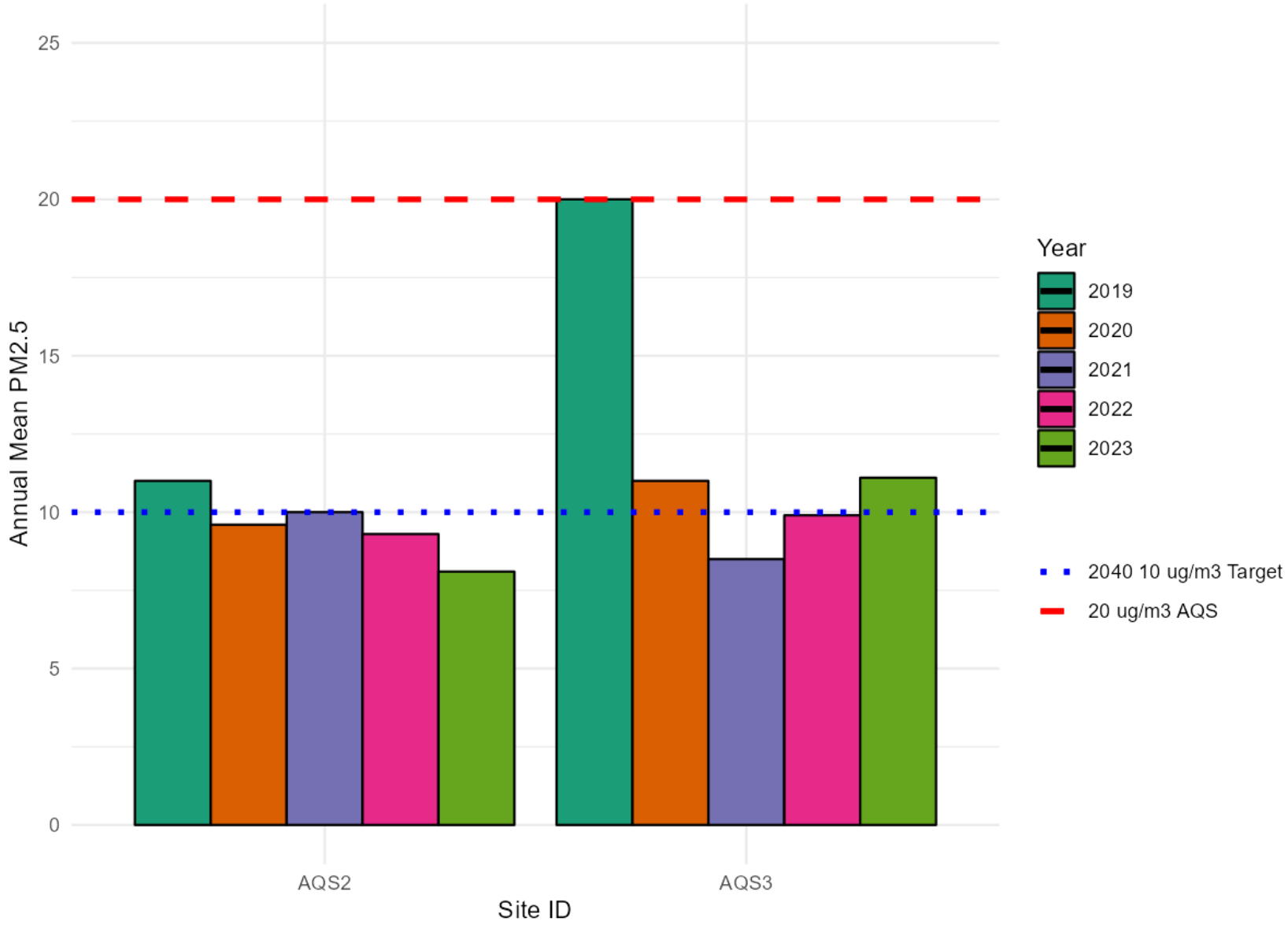
The annual mean concentrations are presented as $\mu g/m^3$.

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

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

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

Figure A.13 – Trends in Annual Mean $PM_{2.5}$ Concentrations



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 0.88	Annual Mean: Distance Corrected to Nearest Exposure	Comment
AQ20	409483	423337	34.2	26.5	21.3	21.0	22.4	19.1		15.2	22.4	21.1	26.5	23.8	22.6	19.9	-	
AT-BR	411514	419548	35.7	30.6	24.7	19.8	20.4	14.4		16.2	21.7	23.7	28.5	19.8	22.7	19.9	-	
AT-MR	411581	419373	40.2	20.2	19.1	20.7	17.3	14.7		16.5	40.3	43.0		27.7	25.5	22.4	-	
CL1	413261	420686	40.3	34.5	27.8	31.6	32.6	26.2		19.2	36.7	30.4	34.0	31.3	30.7	27.0	-	
HTAH	411494	419594	36.3	16.8	25.6	25.3	31.7	21.5		20.3	27.3	29.6	33.1	27.7	26.3	23.1	-	
LV-62E	416717	422113	45.3	40.3	35.9	32.4	31.9	27.0		29.5	35.7	32.8	46.0	39.5	35.7	31.5	-	
LV-62W	416172	422282	52.0	40.7	34.6	31.4	36.8	29.6		25.6	39.7	39.1	35.6	35.9	35.7	31.5	-	
LV-AT	411533	419358	59.4	47.6	39.1	46.2	46.6	39.4		34.1	47.5		48.4	40.4	44.1	38.8	26.5	
LV-EWB	410104	421516	31.1	13.1	23.3	19.7	18.9	13.7		14.9	24.3	26.7	7.9	27.8	19.7	17.3	-	
LV-LEE	417698	420709	45.1	35.3	27.3	22.7	23.5	26.3		24.0	35.8	31.4	39.6	34.3	31.3	27.6	-	
LV-SAA	411201	419429	30.8	22.9	20.5	22.9	18.3	13.3		17.1	24.3	28.4	28.9	27.2	22.8	20.0	-	
LV-SCA	405911	416597		36.6	40.4	30.9	24.3	30.5		32.3	46.8	37.2	39.8	34.3	35.6	31.3	-	
MY01	401431	425995	49.6	40.4	38.5	35.7	35.7	30.8		31.3	43.7	47.9	42.3	45.0	39.6	34.9	-	
MY02	401275	426046	31.2	17.4	17.7	13.1	11.2	13.3		13.0	16.2	20.5	25.3	21.0	18.0	15.9	-	
MY03	401204	426041	48.9	36.4	38.0	37.9	36.7	29.1		31.3	44.0	41.7	45.5	42.1	38.8	34.1	-	
MY-04	401059	426179	38.0	25.3	25.2	20.8	17.6	19.4		16.8	25.3	29.8	30.8	27.0	24.8	21.8	-	
MY-05	401040	426186	36.7	26.8	25.8	25.1	18.1	22.2		17.6	27.0	28.8	29.6	25.9	25.5	22.5	-	
NB-GL	410367	425975	60.2	52.9	51.8	47.0	58.3	40.3		46.2	54.3	46.2	51.6	52.8	50.4	**44.4**	24.5	

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 0.88	Annual Mean: Distance Corrected to Nearest Exposure	Comment
SB23	405701	423223	41.4	27.0	27.3	27.3	25.1	23.4		19.7	29.0	28.4	34.0	27.0	27.7	24.4	-	
SB40	405814	422611		9.6	10.9	9.0	6.8	7.0		5.7	10.3	12.9	15.0	13.2	9.9	8.7	-	
SB41	405727	422878		11.2	9.5	10.1	7.4	7.4		6.0	10.6	12.9	15.1	13.3	10.2	9.0	-	
SB42	404938	422699		31.8	28.1	24.8	30.9	27.3		23.9	34.9	29.3	25.8	20.1	27.4	24.1	-	
SB43	405082	422999		12.1	11.6	8.5	9.0	7.4		6.2	12.2		17.4	15.7	11.0	9.7	-	
SB44	405234	423022		16.0	13.1	13.7	14.4	11.5		9.3	23.8	19.8	21.2	17.5	15.8	13.9	-	
SB45	405780	423349		33.6	31.0	29.4	32.5	26.8		24.0	35.1	29.3	10.7	37.1	28.6	25.2	-	
WV-SR1	409598	421167	50.6	43.8	37.6	36.1	33.2	30.6		27.5	40.2	39.8	38.7	36.2	37.1	32.7	-	
WV-SR2	409608	421160	33.6	29.5	31.1	34.6	28.7	27.9		18.9	32.7	23.1	33.4	15.0	27.6	24.3	-	
AQ21	409822	423167	67.3	62.8	53.6	55.9	45.3	51.2		43.9	60.4	58.7	70.3	59.2	56.9	**50.1**	**44.6**	
AQC1	409485	423431	58.7	39.2	45.7	41.5	36.0	28.2		31.1			42.3	35.5	-	-	-	Triplicate Site with AQC1, AQC2 and AQC3 - Annual data provided for AQC3 only
AQC2	409485	423431	47.3	42.2	30.0	41.3	37.1	34.1		30.6	43.1	36.0	31.6	37.7	-	-	-	Triplicate Site with AQC1, AQC2 and AQC3 - Annual data provided for AQC3 only
AQC3	409485	423431	62.0	43.6	39.6	37.4	32.7	29.8		27.8	37.3	40.3	51.1	43.8	38.6	34.0	-	Triplicate Site with AQC1, AQC2 and AQC3 - Annual data provided for AQC3 only
CRH1	409767	423011	59.0	56.2	43.8	39.5	42.3	34.1		36.1	47.7	45.7	61.4	55.3	46.9	**41.3**	-	
SB1	406135	423639	31.6	52.1	44.8	44.2	51.6	41.3		39.9		50.0			43.7	**41.8**	-	
SB15	406707	423824	42.2	34.1	33.0	28.5	29.3	29.7		23.0	45.4				32.8	32.3	-	
SB16	406638	423836	47.9	34.7	34.3	44.4	50.0	43.3		36.9	45.1	39.9	42.8		41.5	36.6	-	
SB22	405823	423395	42.7	40.8	43.3	44.2	44.8	34.1		28.4	47.4	49.8	39.0	41.9	40.6	35.7	-	
SB3	405961	423571	53.1	48.8	51.7	53.9	51.8	48.7		35.0	55.0	15.1	33.5	49.2	44.9	39.5	-	
SB-AQ	406075	423615	45.4	43.2	41.2	46.3	44.8					43.6	45.0	36.4	43.0	34.0	-	
BS1 HB	398990	427210	45.9	37.6	41.5	34.7	39.0	25.6		25.2	37.0	36.5	40.3	37.8	35.6	31.4	-	

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 0.88	Annual Mean: Distance Corrected to Nearest Exposure	Comment
HB6	399502	427041	44.7	32.8	31.8	30.8	35.2	26.5		24.7	35.3	35.5	38.7	35.6	33.2	29.2	-	
HQ1	398794	427237	68.5	54.4	49.3	42.6	38.3	37.5		38.6	47.8	43.5	48.4	49.4	46.7	**41.1**	-	
HQ9	399236	427176	42.3	35.9	39.5	38.1	32.6	34.1		26.8	39.3	38.1	41.0	37.9	36.6	32.2	-	
LF1	403810	424977	47.4	44.5	42.2	39.4	41.2	31.9		28.8	41.2	41.6	39.3	42.6	39.3	34.6	-	
LF2	403738	425110	42.5	34.0	31.7	31.3	31.2	25.9		24.9	29.6	32.4	38.1	36.3	32.1	28.2	-	
SC5	410823	426265	44.0	29.8	38.2	39.4	50.1	42.9		29.1	47.1	32.2	37.7	39.5	38.7	34.0	-	
BE2	414385	422457	51.5	41.7	42.0	37.6	35.4	34.2		29.2	40.6	35.8	41.5	29.3	37.6	33.1	-	
BE4	414478	422692	61.4	32.4	43.2	40.9	36.6	34.8			49.9	31.7	52.0	43.5	42.9	37.7	-	
BH3	414671	422740	63.0	52.3	41.8	41.0	39.6	37.1		40.2	50.1	35.0	51.5	46.0	45.1	39.7	34.0	
HXR1	414218	422957	56.4	47.7	49.9	42.3	51.8	44.4		54.8	54.5	42.5	48.3	31.2	47.6	**41.9**	-	
LV-BRD	414683	423155	38.2	30.3	28.2	28.3	24.2	23.0		20.2	34.0	30.3	32.2	32.9	28.9	25.5	-	
WR2	415090	422817	46.0	35.1	41.5	27.2	26.4						47.9	44.3	39.3	31.3	-	
HH-1A	412593	425497	45.5	35.6	40.1	26.6	34.9	37.3		27.5	40.5	42.3	39.5	29.3	35.9	31.6	-	
HH-LT	412450	425435	67.7	51.3	20.0	41.5	46.3	36.1		42.3	45.3	46.3	53.6	44.5	44.5	39.2	-	
HH-TC	412718	425556	33.8	31.5	29.1	28.2	30.6	24.6		23.1	30.0	37.3	38.4	31.7	30.3	26.6	-	
LV-NBN	409715	425754	67.2	83.3	70.3	63.8	70.0	54.1		57.8	71.7	59.9	72.3	69.8	66.6	**58.6**	24.0	
LV-NBS	409708	425737	61.0	40.8	38.2	37.0	36.2	29.6		33.9	49.5	42.8	48.5	44.3	41.6	36.6	21.8	
NB-GR	409957	425642	78.1	65.4	62.0	54.8	55.7	47.3		36.8	60.7	51.7	67.9	56.0	56.8	**50.0**	**40.6**	
NB-NB1	409663	425740	58.7	39.5	49.4	39.7	35.4	33.6		34.7	48.3	41.1	47.4	40.9	42.3	37.2	32.3	
NB-NBX	409602	425797	51.4	36.7	40.6	39.0	39.1	34.9		34.3	46.4	41.6	46.3	44.8	41.1	36.2	16.1	

☐ **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.**

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

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 Calderdale Council During 2023

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

Additional Air Quality Works Undertaken by Calderdale Council During 2023

Calderdale Council will revoke AQMA No.4 and AQMA No.5 after this document has been submitted. No detailed assessment has been undertaken to support the revocation as the historic area of exceedance in Luddendenfoot and Stump Cross is small and is adequately covered by air quality monitoring.

A new AQAP has also been prepared. This will be submitted alongside the 2024 ASR.

QA/QC of Diffusion Tube Monitoring

The diffusion tubes are supplied and analysed by SOCOTEC Didcot using the 50% TEA (triethanolamine) in acetone preparation method. SOCOTEC Didcot takes part in the QA/QC Field Intercomparison, operated on behalf of Defra. SOCOTEC Didcot are a UKAS accredited laboratory.

The precision of the current 28 local authority co-location studies in 2023 (who used the 50% TEA in water method at SOCOTEC Didcot) detailed within the national bias adjustment factor spreadsheet (version 03/24) was rated as ‘good’ (tubes are considered to have "good" precision where the coefficient of variation of duplicate or triplicate diffusion tubes for eight or more periods during the year is less than 20%), adding to the confidence in the measurements and SOCOTEC Didcot procedures.

During 2023, Calderdale’s diffusion tubes were not deployed fully in line with the Defra’s monitoring calendar, with there being three cases of over-exposure (June, August and December), where tubes were exposed for over 6 weeks, and one period of under-exposure (May), where the tubes were exposed for 3 weeks.

For the December monitoring period, the diffusion tubes were removed on the 18/01/2024, meaning that the December measurements were reflective of a December 2023/ January 2024 period mean. Over-exposure generally results in a reduction in measured concentrations, and on three occasions tubes were exposed for longer than the recommended maximum amount of time (5 weeks, four days).

The omittance of three periods of data (June, August and December) due to this issue was considered; however, 3 periods of data constituted over a quarter of the year, and as such, these period's omittance would have significantly reduced the amount of data available in the ASR and the new AQAP.

As December measurements were generally above the raw annual mean concentration, it was decided to retain December 2023/ January 2024 measurements as their omittance would have likely led to an even greater underprediction of measured concentrations in Calderdale, with potential ramifications for Public Health and the amendment/ revocation of AQMAs.

Diffusion Tube Annualisation

Table C.1 – Annualisation Summary (concentrations presented in µg/m^3)

Site ID	Annualisation Factor Dewsbury Ashworth Grove	Annualisation Factor Barnsley Gawber	Annualisation Factor Leeds Centre	Annualisation Factor Manchester Piccadilly	Average Annualisation Factor	Raw Data Annual Mean	Annualised Annual Mean
SB1	1.0561	1.0835	1.1140	1.0917	1.0863	43.7	47.5
SB15	1.0921	1.1230	1.1341	1.1220	1.1178	32.8	36.7
SB-AQ	0.8865	0.8995	0.9052	0.9002	0.8979	43.0	38.6
WR2	0.8863	0.9162	0.9043	0.9136	0.9051	39.3	35.6

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.TG (22) 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.

Calderdale Council have applied a local bias adjustment factor of 0.88 to the 2023 monitoring data. A summary of bias adjustment factors used by Calderdale Council over the past five years is presented in Table C.2.

Table C.2 – Bias Adjustment Factor

Monitoring Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2023	Local	-	0.88
2022	Local/ National	-	0.76
2021	National	03/22	0.78
2020	Local	-	0.87
2019	National	03/19	0.80

Table C.3 – Local Bias Adjustment Calculation

	Local Bias Adjustment Input 1 (AQS2)	Local Bias Adjustment Input 2 (AQS3)
Periods used to calculate bias	9	0
Bias Factor A	0.88 (0.83 - 0.94)	0.83
Bias Factor B	13% (6% - 21%)	-
Diffusion Tube Mean (µg/m^3)	39.0	43.2
Mean CV (Precision)	8.5%	-
Automatic Mean (µg/m^3)	34.4	33.7
Data Capture	99%	99.5%
Adjusted Tube Mean (µg/m^3)	34 (32 - 37)	NA

Notes:

A single local bias adjustment factor has been used to adjust the 2023 diffusion tube results. The bias adjustment factor was derived from a co-location study at AQS2 (Huddersfield Road), using diffusion tubes AQC1, AQC2 and AQC3.

There is a significant difference between the national factor (0.77) and the calculated local factor (0.88). If the national factor were used instead, all locations would have been considered compliant with the national standards. As such, the choice of factor this year

has had significant influence on the overall picture of air pollution in Calderdale. A local factor was selected because:

- Although there is no triplicate or duplicate co-location at the Sowerby Bridge AQ monitoring station (AQS4), by simply comparing the period means for SB-AQ with measured concentrations at AQS4, a site-specific bias adjustment factor of 0.83 was calculated. As such, the use of the local factor of 0.88, derived from monitoring at AQS2 was considered reasonable.
- Of the 28 studies carried out by SOCOTEC Didcot, a factor of 0.88 would have been the second highest local adjustment factor, behind Horsham, where a factor of 1.06 was calculated. The Wirral and North East Lincolnshire derived factors of 0.86 and 0.85 respectively, and were the next highest factors. As such, the local bias adjustment factor, whilst high is within reasonable boundaries.
- Furthermore, as the diffusion tube measurements did not fully follow the Defra Calendar, with periods of over-exposure and under-exposure, a generic National factor was not considered appropriate.

To overcome this issue in the future, we plan to carry out additional monitoring for the purposes of strengthening our co-location study at AQS3 (Hebden Bridge) and AQS4 (Sowerby Bridge).

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 NO_2 annual mean concentration was corrected for distance to relevant exposure at 9 diffusion tube sites in 2023. These sites were subject to such calculation as the annual mean concentration was greater than 36 µg/m^3 and the monitoring site is not located at a point of relevant exposure. A summary is provided in Table C.4

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
LV-AT	4.0	18.0	38.8	9.5	26.5	
NB-GL	2.0	19.0	44.4	6.7	24.5	
AQ21	2.0	4.0	50.1	16.2	**44.6**	*Predicted concentration at Receptor above AQS objective.*
BH3	1.5	4.5	39.7	16.17983	34.0	
LV-NBN	1.0	41.0	58.6	12.3755	24.0	*Warning: your receptor is more than 20m further from the kerb than your monitor - treat result with caution.*
LV-NBS	2.0	27.0	36.6	12.4	21.8	*Warning: your receptor is more than 20m further from the kerb than your monitor - treat result with caution.*
NB-GR	3.0	7.0	50.0	7.2	**40.6**	*Predicted concentration at Receptor above AQS objective.*
NB-NB1	2.0	4.0	37.2	6.7	32.3	
NB-NBX	1.0	31.0	36.2	7.2	16.1	*Warning: your receptor is more than 20m further from the kerb than your monitor - treat result with caution.*

QA/QC of Automatic Monitoring

The three automatic monitors are covered by a maintenance and callout contract, allowing six monthly maintenance visits and callouts for any instrument faults. Each site is visited every two weeks by a contractor to routinely monitor and detect any faults whilst checking the instrument nitrogen oxide span and zeros.

Data from all three automatic monitoring sites is collected using WinAQMS and Airodis software, then checked for erroneous readings and backed up to Calderdale Council's secure network. The raw values are checked for inconsistencies before using the span and zero values obtained on site each week to scale the data. Calderdale Council's 2023 automatic air quality monitoring site data has been ratified by Air Quality Data Management to the LAQM TG.22 standards.

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

Measurements of particulate matter are made using a beta attenuation monitor (BAM) with the appropriate inlets for PM_{10} and $PM_{2.5}$ and the data is collected using the same system as the NO_2 analysers. The BAM tape is changed by Council staff when required. Sections of the record where there is a consistent amount of missing data may need to be removed from the data as they are likely to be affected by instrument faults (something which is not normally detected

Automatic Monitoring Annualisation

All automatic monitoring locations within Calderdale Council 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.

No automatic NO_2 monitoring locations within Calderdale required distance correction during year.

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

Figure D.1 – Map of Non-Automatic Monitoring Site (Calderdale)

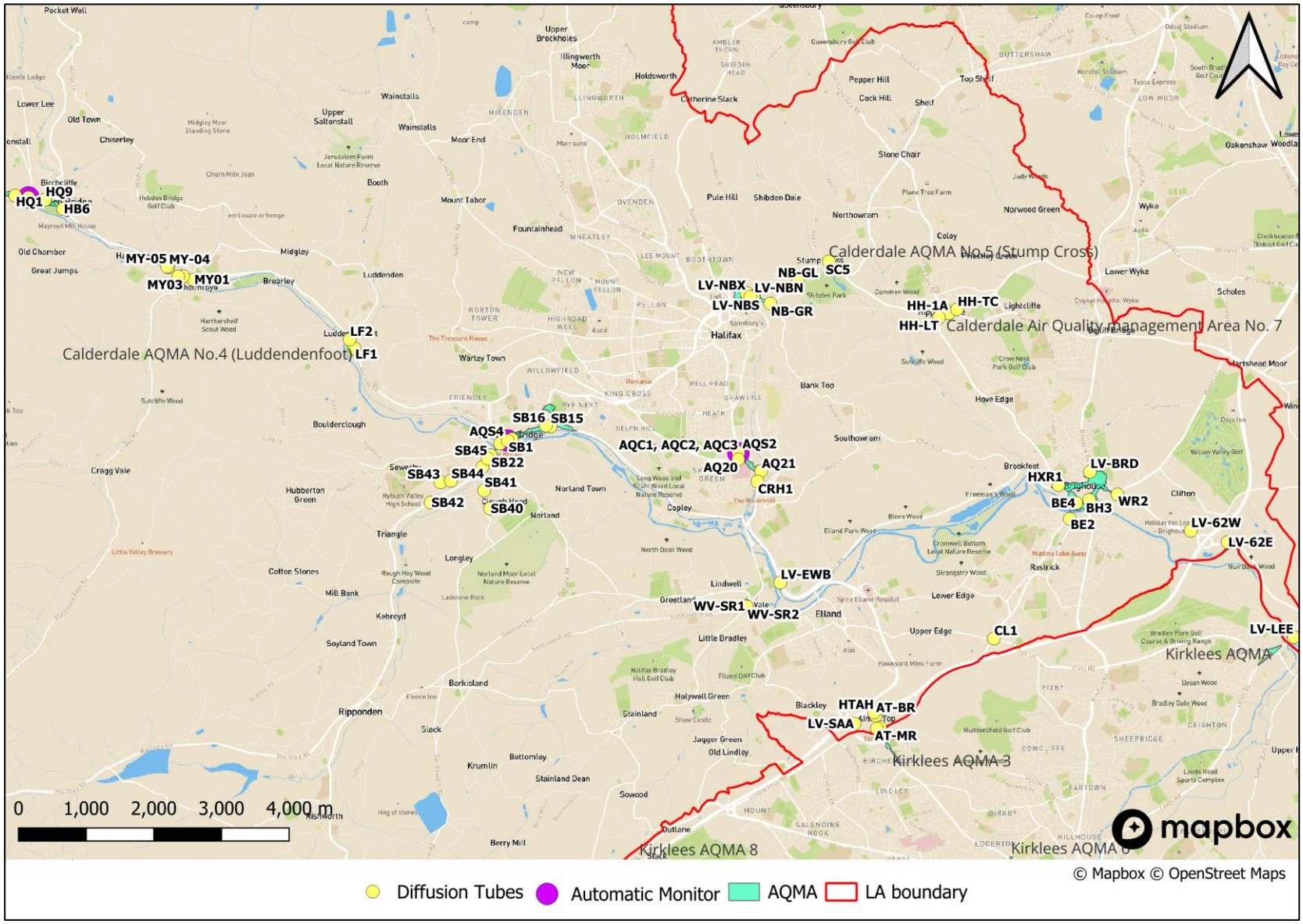


Figure D.2 – Map of Non-Automatic Monitoring Site (AQMA 1)

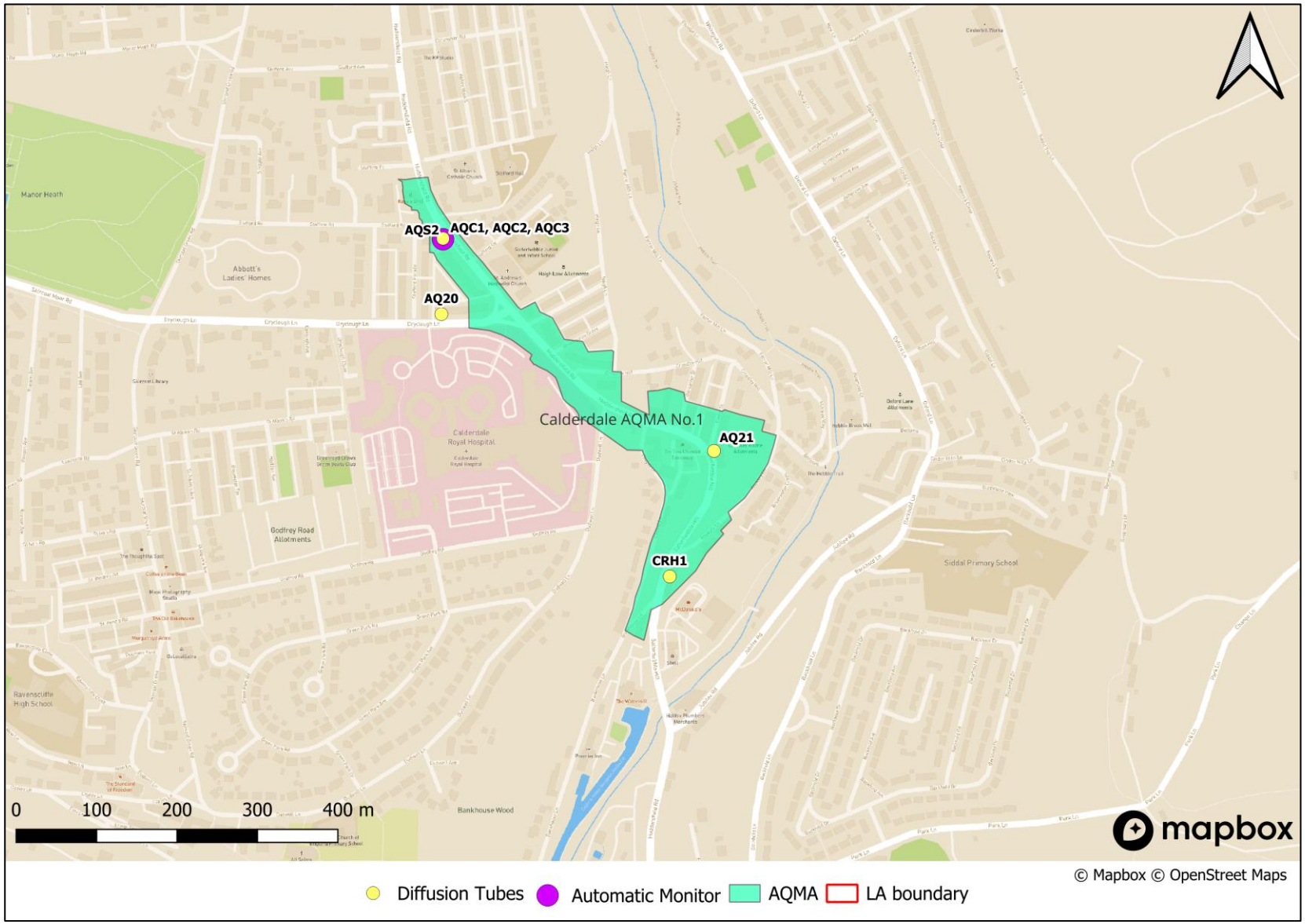


Figure D.3 – Map of Non-Automatic Monitoring Site (AQMA No.2)

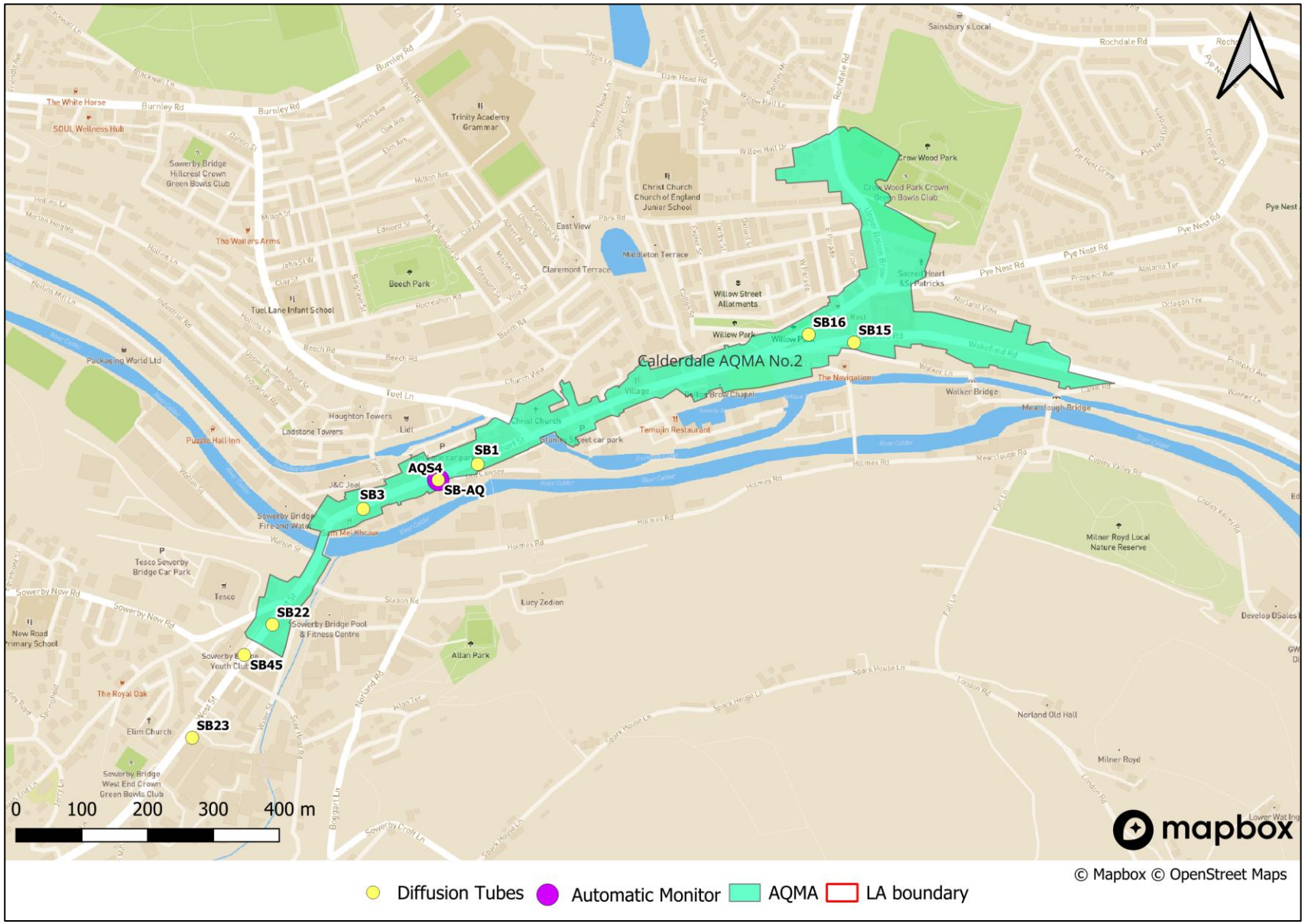


Figure D.4 – Map of Non-Automatic Monitoring Site (AQMA No.2 and South)

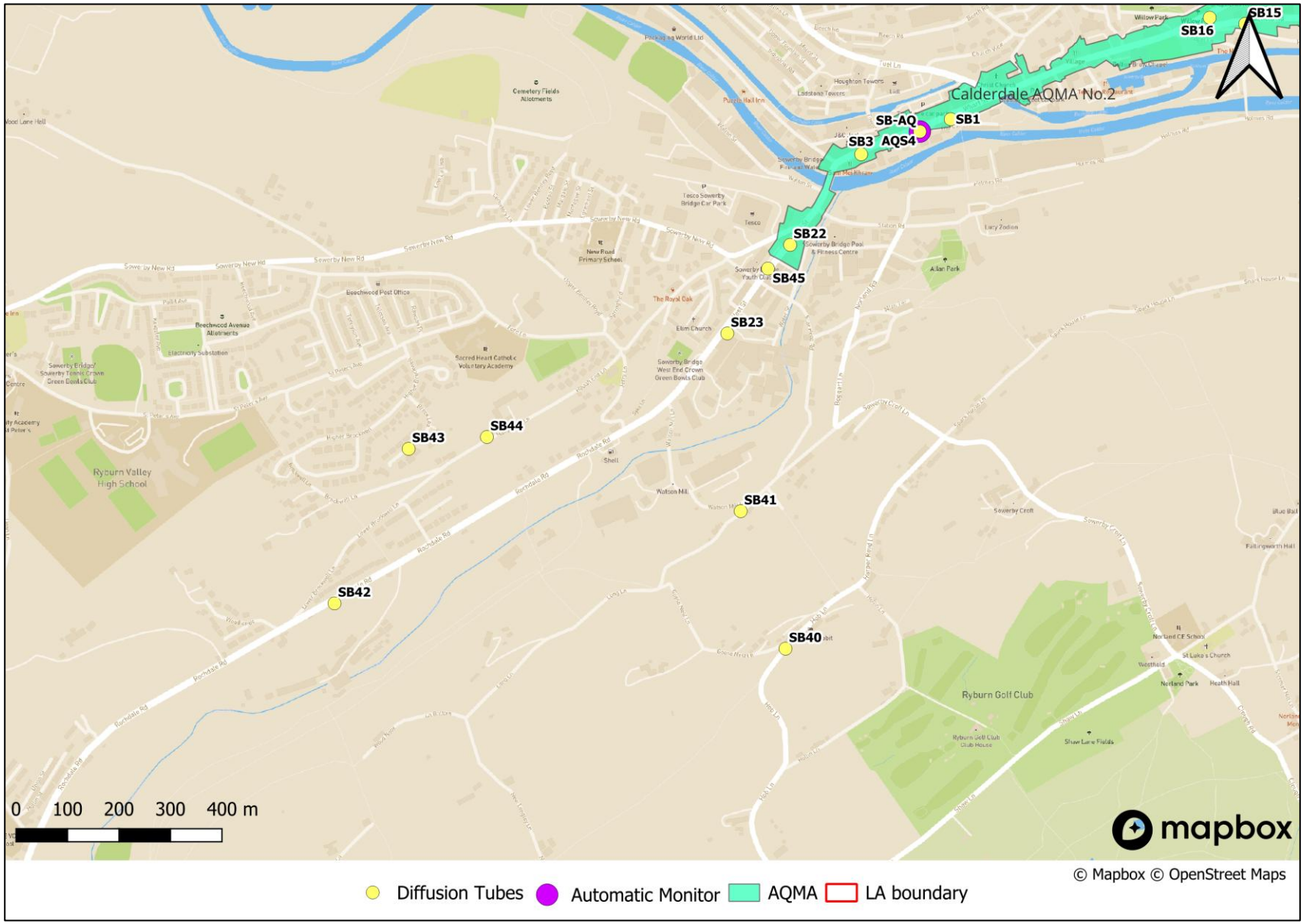


Figure D.5 – Map of Non-Automatic Monitoring Site (AQMA No.3)

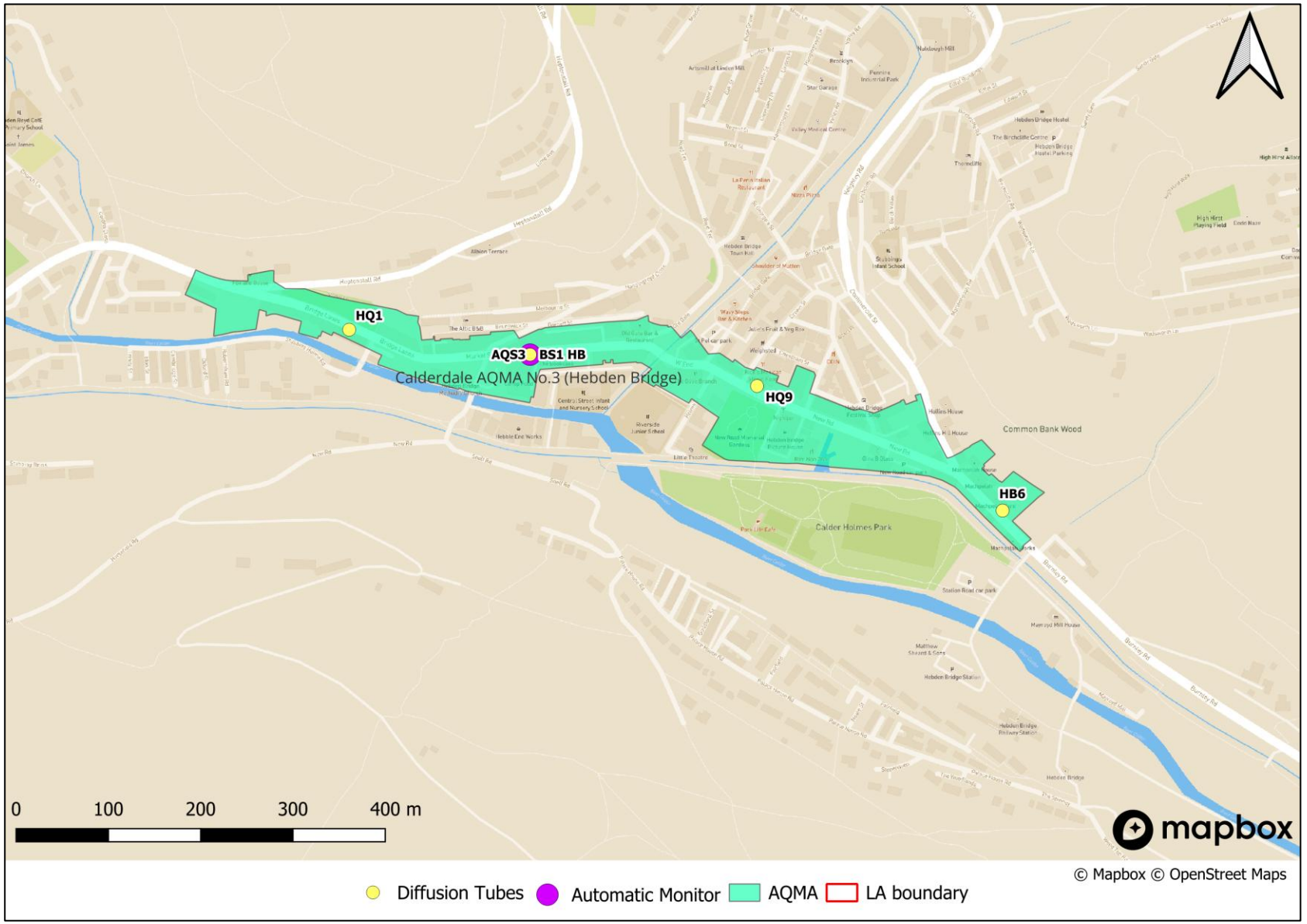


Figure D.6 – Map of Non-Automatic Monitoring Site (AQMA No.4)

Figure D.7 – Map of Non-Automatic Monitoring Site (AQMA No.5)

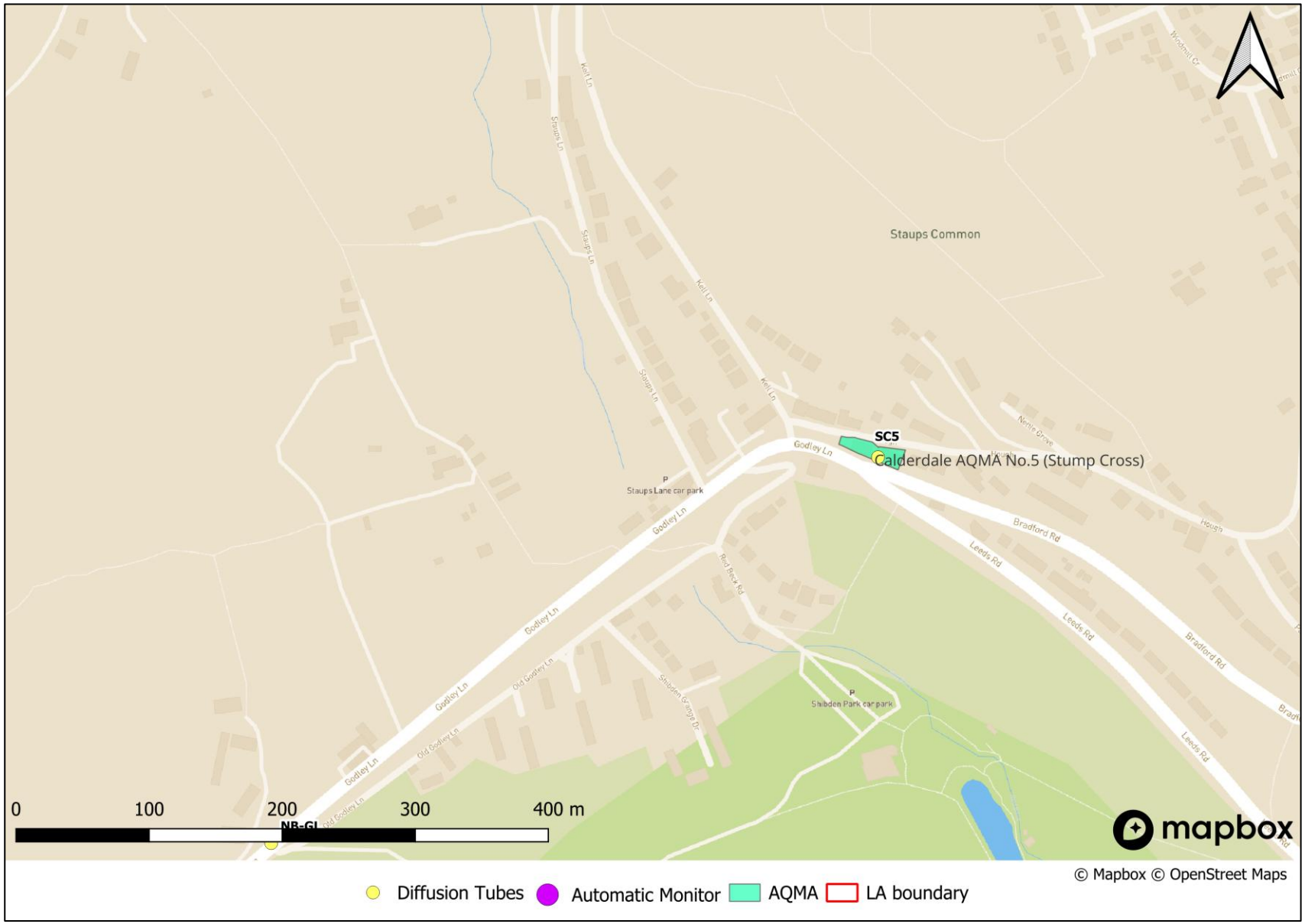


Figure D.8 – Map of Non-Automatic Monitoring Site (AQMA No.6)

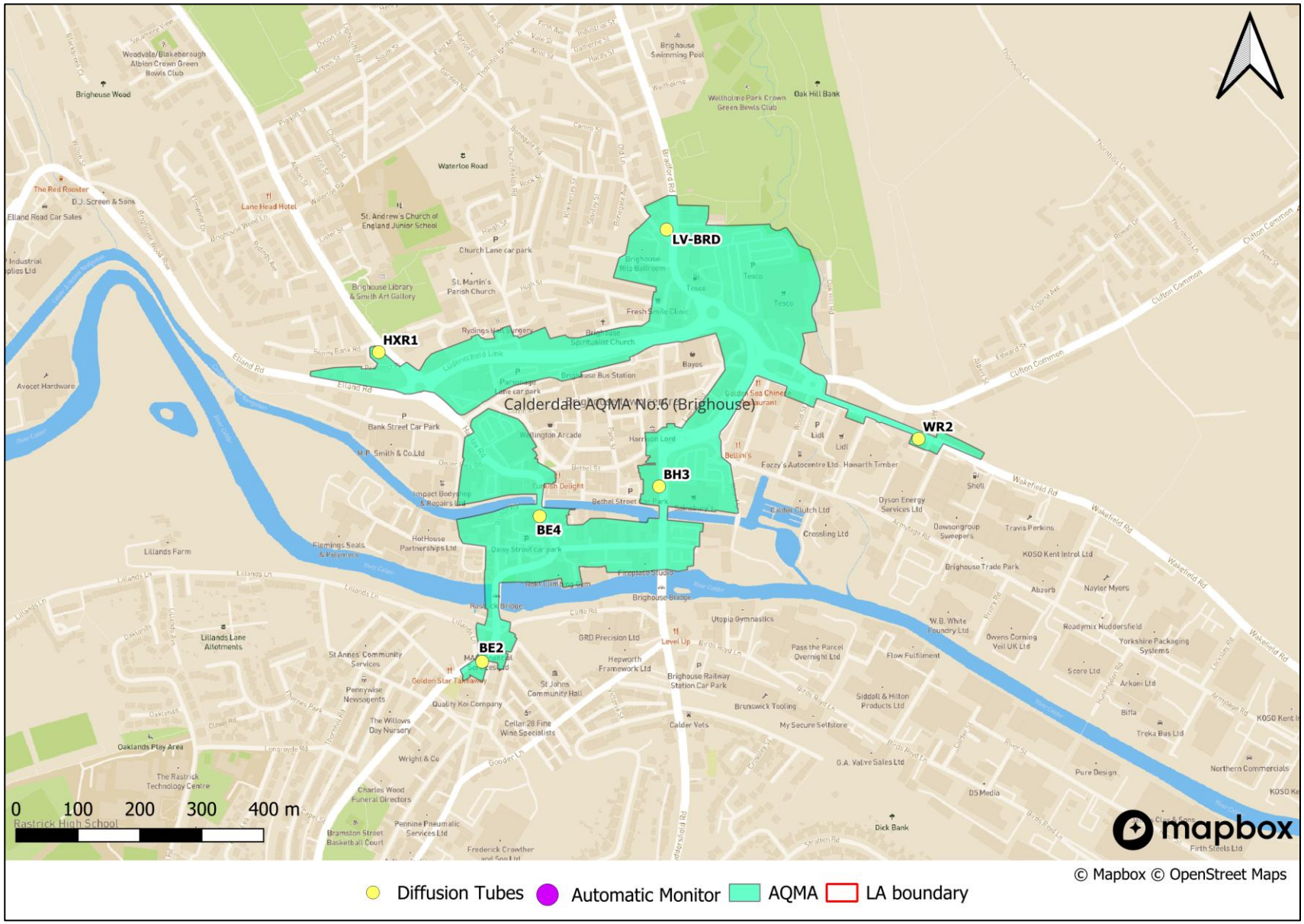


Figure D.9 – Map of Non-Automatic Monitoring Site (AQMA No.6 and South)

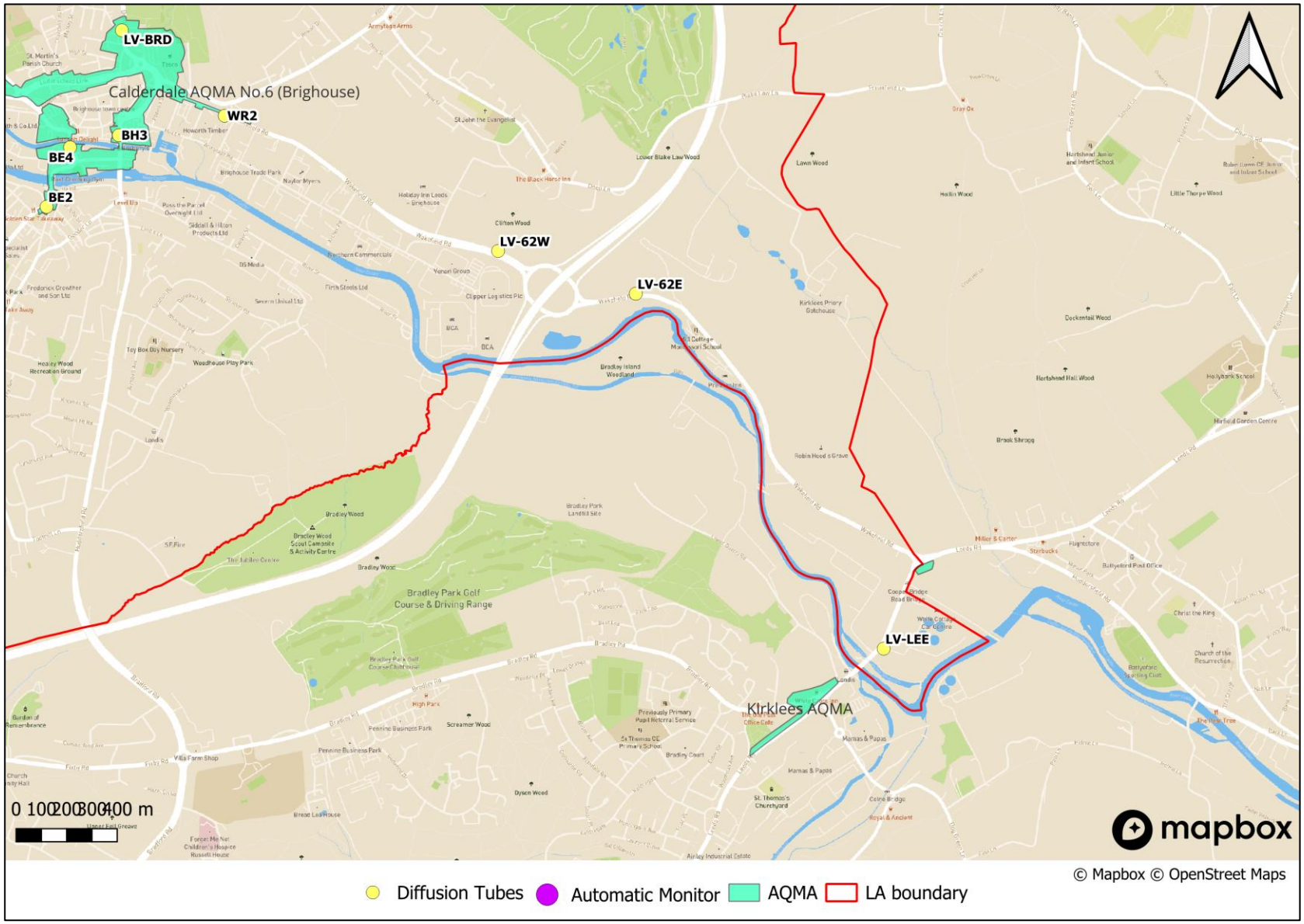


Figure D.10 – Map of Non-Automatic Monitoring Site (AQMA No.7)

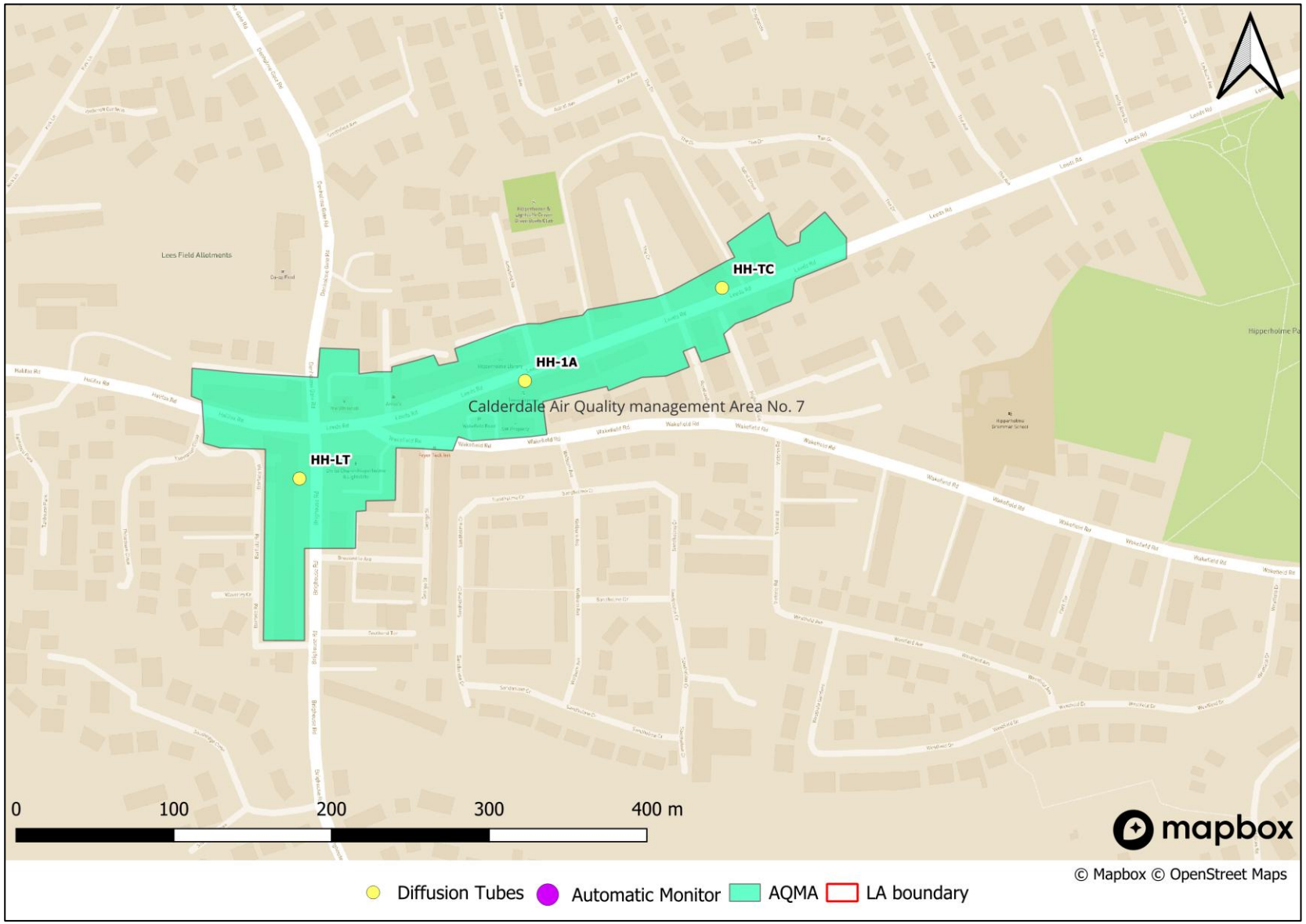
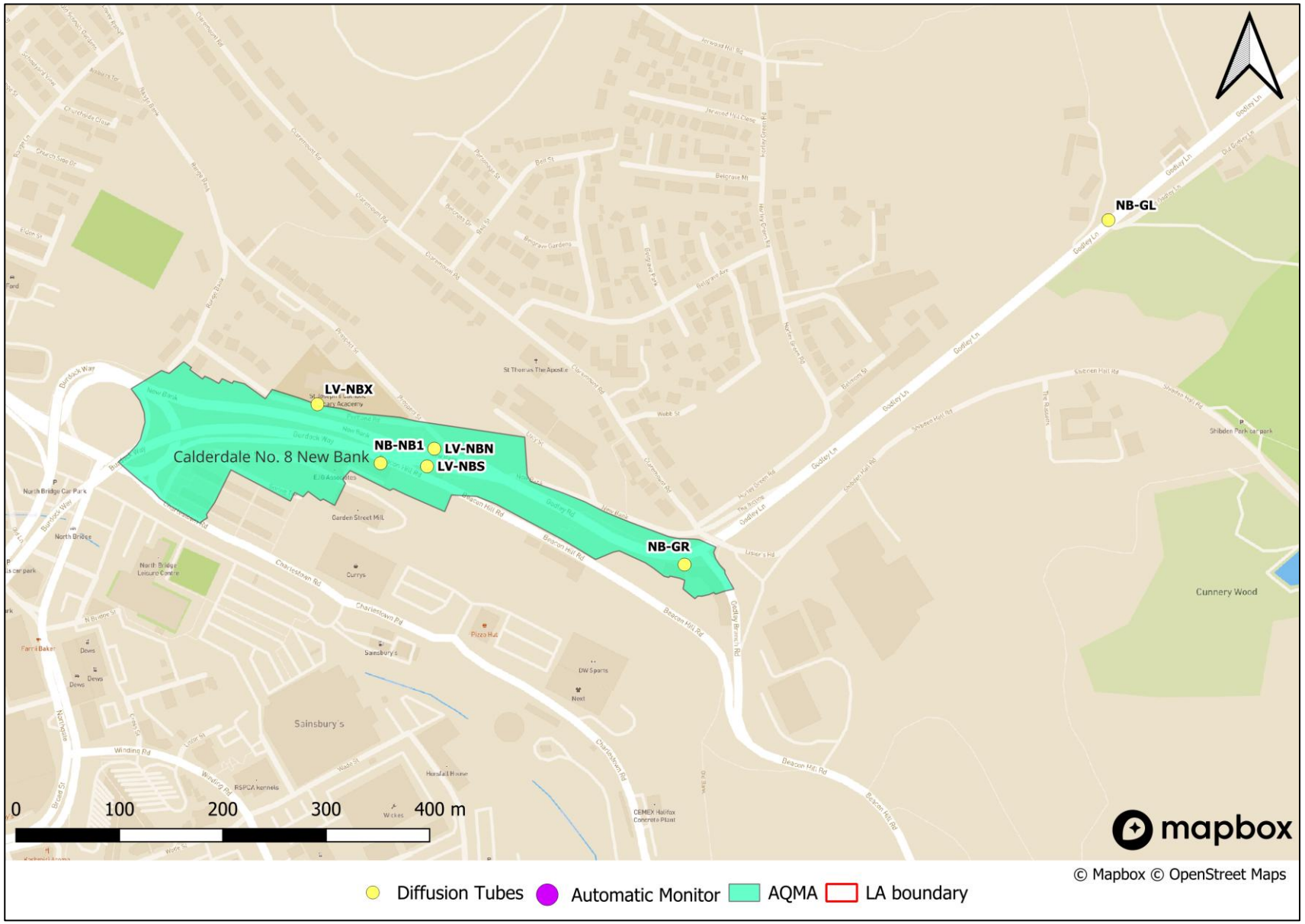


Figure D.11 – Map of Non-Automatic Monitoring Site (AQMA No.8)



Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England[8]

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

[8] 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.
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