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Bureau Veritas

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Calderdale Council

2021 Air Quality Annual Status Report (ASR)

In fulfilment of Part IV of the Environment Act 1995

Local Air Quality Management

Date: October 2021

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Executive Summary: Air Quality in Our Area

Air Quality in Calderdale

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

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

In Calderdale, the air quality is generally good owing to the large amount of rural land. However, there are some areas where vehicle emissions are trapped in the small space created by buildings near roads ('street canyons'), resulting in elevated concentrations of pollution. Currently Calderdale has eight Air Quality Management Areas (AQMAs), all of which have been declared alongside major roads in response to exceedances of the annual mean objective for NO_2. The most recent AQMA (Calderdale No. 8 New Bank) was declared on 26th February 2020 along the A58 at New Bank. Additional information including further assessment reports is available through the Council's AQMA page.

In 2020, the measured concentration of NO_2 reduced within the designated AQMAs and across the borough. This is believed to be a result of the impacts of the COVID-19 pandemic, where traffic volumes were observed to have decreased across the UK in urban areas in response to the Governments measures to control the pandemic.

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

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

[3] Defra. Air quality appraisal: damage cost guidance, July 2020

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

Furthermore, in February 2020 there was flooding to the Calder Valley caused by storm Ciara. Whilst for the most part the impacts on travel were limited to a few locations for a short time, following storm Ciara and storm Denis one week later a landslide above the A6025 between Elland and Brighouse occurred, leading to its closure for the remainder of 2020 (and much of 2021). East-West traffic had to be diverted via Halifax. This may have had an effect on the NO_2 non-automatic monitoring located on Halifax Road, Brighouse. Therefore, the concentrations observed during 2020 should be interpreted with caution.

Actions to Improve Air Quality

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

The 2019 Clean Air Strategy[5] sets out the case for action, with goals even more ambitious than EU requirements to reduce exposure to harmful pollutants. The Road to Zero[6] sets out the approach to reduce exhaust emissions from road transport through a number of mechanisms; this is extremely important given that the majority of AQMAs are designated due to elevated concentrations heavily influenced by transport emissions.

A number of key actions, covering a range of topics, are being undertaken by the Council to tackle sources of air pollution. The main strategies include:

- Promoting alternatives to private vehicle use, primarily through developing cycling infrastructure and encouraging car sharing.
- Providing accessible information to the public to influence behavioural change.
- Facilitating the use of low emission transport by improving the network of electric recharging points, bidding for ULEV funding whenever possible, and placing conditions on planning permissions requiring, where appropriate, the installation of electric vehicle recharge points.
- Improving infrastructure to increase the interconnectivity of the transport hub to control urban traffic congestion, prioritising public transport.

[5] Defra. Clean Air Strategy, 2019

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

Transport and infrastructure projects feature prominently within the Council's Air Quality Action Plan (AQAP) to target the main source of pollution (road traffic) within the borough. As the Council have minimal control over vehicle standards, the main focus is to influence other aspects of the road transport system. Therefore, the current AQAP is centred around actions that reduce congestion, improve the flow of vehicles and encourage the use of public transport or a more active form of travel (i.e. walking/cycling) to reduce the overall emissions from the transport sector.

Detailed information of each strategy, including progress and performance indicators, within the 2019 AQAP that has been adopted by the Council is provided in Table 2.2.

Conclusions and Priorities

During 2020, the annual mean concentration of NO_2 declined at the majority of sites across the diffusion tube network compared to 2019, likely reflecting the reduction in vehicle activity as a result of the COVID-19 pandemic. The average annual mean NO_2 concentration across all diffusion tubes was 11% lower than the previous year, with the majority of sites recording an annual mean concentration below 36µg/m^3. However, following the application of distance correction, the annual mean NO_2 concentration was exceeded at five sites within four AQMAs. The maximum concentration was recorded at LV-NBN within AQMA No. 8 New Bank, 53.5µg/m^3, although it should be noted that this figure was not representative of residential exposure. Based upon the 2020 monitoring results, following supplementary guidance released by Defra regarding the impacts of COVID-19 upon LAQM, all AQMAs are to remain.

The PM_{10} and $PM_{2.5}$ monitoring completed within the borough continues to show compliance with the relevant annual mean and short-term objectives.

In order to tackle the exceedance of NO_2, the Calderdale AQAP has recently been updated to outline the Council's proposed actions between 2019 and 2030. This action plan, though covering a broad range of approaches, mainly focuses on vehicle emissions and public information. The impact of the COVID-19 pandemic, particularly social distancing measures, has delayed some of the actions outlined in the AQAP. However, subject to funding being available, the Council remains willing to progress these measures as soon as possible.

Local Engagement and How to get Involved

The Council is committed to engaging with the public and, more importantly, involving the local community in tackling air pollution. Calderdale libraries have obtained funding for a project named ‘Something in the Air?’. This project, in partnership with local organisations and academic researchers, aims to educate the public on the impacts of air pollution to the extent that they become motivated to proactively change their behaviour and help improve air quality. The Council are also introducing ‘school streets’ from 15th June 2020. The initial six week trial is a community based approach that aims to reduce car usage and promote a more active form of travel such as walking and cycling. Priority four of the Council’s key priorities states that public engagement will be encouraged and interest improved through both communication and involvement, indicating the desire to involve the local community. The Council has also undertaken surveys which helped explore residents’ views on air quality and their understanding of work that is ongoing in the area to reduce air pollution.

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1 Local Air Quality Management

This report provides an overview of air quality in Calderdale during 2020. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) and the relevant Policy and Technical Guidance documents.

The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where an exceedance is considered likely the local authority must declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives. This Annual Status Report (ASR) is an annual requirement showing the strategies employed by Calderdale 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 12 months setting out measures it intends to put in place in pursuit of compliance with the objectives.

A summary of AQMAs declared by Calderdale can be found in Table 2.1. The table presents a description of the eight AQMAs that are currently designated within Calderdale. Appendix D: Maps of Monitoring Locations and AQMAs provides maps of AQMAs and also the air quality monitoring locations in relation to the AQMAs.

The air quality objective pertinent to the current AQMA designations is for the 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	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	YES	46µg/m^3	38.5µg/m^3	AQAP 2019	AQAP 2019
Calderdale No. 2 Sowerby Bridge	Declared July 2006	NO_2 Annual Mean	A58 through central Sowerby Bridge	YES	53µg/m^3	40.2µg/m^3	AQAP 2019	AQAP 2019
Calderdale No. 3 Hebden Bridge	Declared August 2006	NO_2 Annual Mean	A646 through town centre	YES	48µg/m^3	38.4µg/m^3	AQAP 2019	AQAP 2019
Calderdale No. 4 Luddendenfoot	Declared July 2007, amended March 2014	NO_2 Annual Mean	A646 through town centre	YES	50µg/m^3	33.9µg/m^3	AQAP 2019	AQAP 2019
Calderdale No. 5 Stump Cross	Declared July 2007	NO_2 Annual Mean	A58 at junction of Leeds Road and Bradford Road	YES	58µg/m^3	34.1µg/m^3	AQAP 2019	AQAP 2019
Calderdale No. 6 Brighouse	Declared July 2007, amended March 2014	NO_2 Annual Mean	Encircling town centre	YES	51µg/m^3	43.0µg/m^3	AQAP 2019	AQAP 2019
Calderdale No. 7 Hipperholme	Declared March 2014	NO_2 Annual Mean	A58 Leeds Road close to junction with Brighouse Road	YES	47µg/m^3	40.7µg/m^3	AQAP 2019	AQAP 2019
Calderdale No. 8 New Bank	Declared February 2020	NO_2 Annual Mean	A58 east of Halifax town centre	YES	42.4µg/m^3	42.4µg/m^3	AQAP 2019	AQAP 2019

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

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

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

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

"The Council are reminded to be careful of formatting and consistency between the excel sheet and ASR. Table 2.1 shows different AQAP publication dates, Table A.3 has lost some formatting of the data cells and accidentally omitted SB22. Diffusion tube site details also need to be updated to include AQMA 8, the sites within which are still flagged as being outside of an AQMA. In addition with the monitoring results table's only values that exceedance the relevant objective should be formatted as bold".

This year, AQMA 8 has been added and checks have been completed to ensure consistency between the excel sheet and ASR, in particular the formatting issues raised.

"Distance correction was only undertaken for five locations. Distance correction should be applied to all locations within 10% of the AQO not already at locations of relevant exposure. For NO_2 this applies to concentration of 36µg/m^3 and above".

Correction for distance calculation has been completed on all sites where the NO_2 concentration is within 10% of the air quality objective in the 2021 ASR.

"Specifically, it is advised that the Council keep a particularly close watch of the Mytholmroyd area due to the perceived short-term nature of the exceedance; and at the least provide greater content in the report surrounding the exceedance at LV-AT, and if the exceedance persist in 2020 there should be an AQMA declared (possibly in partnership with Kirklees' AQMA 3)".

LV-AT refers to monitoring location at Ainley Top in a different part of the Borough bordering with Kirklees. Unlike in previous years (2018: 47µg/m^3, 2019: 45µg/m^3), the NO_2 concentration at LV-AT did not exceed the annual limit of 40µg/m^3 in 2020 (34.7µg/m^3), therefore no AQMA has been declared. However, due to the caveat of COVID-19, this should be closely monitored in the future as the concentration may exceed the annual limit once road traffic increases.

"The figures are generally clear and show the AQMA boundaries, though Figure 18 does require updating to include the boundary of AQMA 8 as mentioned above. In addition, the labelling of monitoring sites is difficult to read in Figure 13, and Figure 11 has two locations overlapping which makes it hard to read them".

The figures in the 2021 ASR have been checked for clarity and updated to include the most recent AQMA boundaries, with labels correctly spaced to prevent overlapping.

The Council have taken forward a number of direct measures during the current reporting year of 2020 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 the Council have made during the reporting year of 2020 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:

- *School Streets*: Introduced at over 10 schools within the Calderdale area in July 2020 as part of an initial trial. On these streets, access to traffic is restricted during morning drop-off and evening pick-up time, reducing the emissions outside schools. Following the success of this trial, school streets have been introduced outside 12 schools (i.e. Trinity Academy, Sowerby Bridge and Holy Trinity Primary, Halifax). As a result, during school opening and closing times these schools are traffic free and 20% of parents surveyed reported a change in travel behaviour, reducing car use.
- *Public Information:* Live data available on the Council's website and a successful event was held in June 2019 that included branded messaging to improve understanding of air quality issues.
- *Travel Alternatives:* Bike racks installed in Halifax town centre and Car Club scheme continues to operate for over five years. Four rapid chargers and 13 on-street residential charging points installed. The community rail partnership, intended to encourage more train travel, has also been completed.

The Council's priorities for the coming year are:

- Priority 1 – Promoting alternatives to private vehicle use, recognising the contribution of diesel vehicles and bidding for ULEV funding whenever possible.
    - (Further information on ULEVs in Calderdale is provided in Appendix G: ULEVs and EVs in Calderdale).
- Priority 2 – Improving the transport network infrastructure, as set out in the Council's Transport Strategy and Local Plan.
- Priority 3 – Developing awareness of impacts and remedies, and integrating the priorities of other strategies and frameworks, such as public health (active travel),

sustainability (carbon reduction strategy) and local planning (sustainable development).

- Priority 4 – Encouraging public engagement and interest through improved communication and community involvement.

During 2020, the implementation of measures outlined in the AQAP was impacted and slowed by the COVID-19 pandemic.

Table 2.2 – Progress on Measures to Improve Air Quality

Measure No.	Measure	Category	Classification	Year Measure Introduced	Estimated / Actual Completion Year	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
AQAP 1 (1)	Achieve better understanding of local air quality, including monitoring and source appointment	Transport Planning and Infrastructure	Other	2009-2020	Ongoing	Calderdale MBC, neighbouring authorities, tools from Defra	Calderdale MBC, neighbouring authorities, tools from Defra				Implementation	Neutral	Data collection	Monitoring contracts extended. Live data now on website AQ dashboard	Funding ended 2019, contracts renewed for 2020
AQAP 1 (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				Implementation	Neutral	Improved traffic flows and reduced queue lengths at key network points	Implementation ongoing	Funding
AQAP 1 (3)	Urban Traffic Control (UT) improvements	Traffic Management	UTC, Congestion management, traffic reduction	Current	To be included in major projects and Corridor Improvement Plans. Further VMS included in Phase 4 scheme for A629.	Calderdale MBC, neighbouring authorities.	Calderdale MBC, neighbouring authorities				Implementation	Some reduction due to improved flows of traffic	Improved traffic flows and reduced queue lengths at key network points, less parking space hunting	Proposal to link all signals in centralised system (UTC) based in Leeds. Variable Message Signs giving route-specific messages now established Development of a new parking strategy commenced. Draft strategy completed. APPY parking technology now in use in town centres.	Modified since original action plan.
AQAP 1 (4)	Handling emissions data (Emissions Factor Toolkit)	Transport Planning and Infrastructure	Other	Current	Ongoing	Calderdale MBC, tools from Defra	Calderdale MBC, tools from Defra					Neutral	Effectiveness of predictions	Informs annual status report.	None identified.
AQAP 2 (1)	Air quality web pages – improve, e.g. include live data	Public Information	Via the internet	Ongoing	September 2019	Calderdale MBC	Calderdale MBC					Indirect, may influence behaviour	Web traffic, customer satisfaction	Web pages updated, live data now online.	NA
AQAP 2 (2)	Clean air campaign	Public Information	Via internet/social media/other	June 2019	Ongoing	Calderdale MBC	Calderdale MBC					Moderate impact behaviour change	Improved understanding of air quality issues, social media analytics	Successful event including branded messaging in June 2019	NA
AQAP 2 (3)	Investigate freight partnership	Freight and Delivery Management	Freight Partnerships for city centre deliveries	2019 onwards	2021	Kirklees MBC, Calderdale MBC, Highways England	Kirklees MBC, Calderdale MBC, Highways England				Planning	Significant improvements in longer term	Number of partners signed up	Preliminary work with operators	Resources to engage with potential partners
AQAP 3 (1)	Promote high occupancy travel	Transport Planning and Infrastructure	Strategic highways improvement, re-prioritising	Ongoing	Ongoing	Calderdale MBC, neighbouring authorities	Calderdale MBC, neighbouring authorities				Planning	Modest reduction in road emissions	Reduction in vehicle numbers	Campaign 2018	Resources and partner commitments
AQAP 3 (2)	Cycling infrastructure improvements and facilities	Promoting Travel Alternatives	Promotion of cycling	2018 onwards	Ongoing	Calderdale MBC	Calderdale MBC				Implementation	Significant improvements in longer term	Increases in numbers cycling and reduction in car use, kilometres of new cycle paths	Calderdale Cycling forum reports into the cabinet transport working party, CCF meets regularly made up of Calderdale cycle reps council officers, members, schools & other stakeholders. Upgrade of Upper Valley Towpath complete to Hebden Bridge – further work planned in Phase 2 to Todmorden is underway – planned completion February 2020. Hebble Trail extension plan now developed. Now incorporated into the WYTF Phase 4.	Funding and staffing resources and land ownership

Measure No.	Measure	Category	Classification	Year Measure Introduced	Estimated / Actual Completion Year	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
														Ryburn greenway feasibility study complete. Sustrans commissioned to progress study. Feasibility complete on N Halifax routes. Now incorporated into transforming cities bid. Bike racks in Halifax town centre now installed & plans in place for 4 district centres.	
AQAP 3 (3)	Active Calderdale Campaign	Promoting Travel Alternatives	Intensive active travel campaign & infrastructure	Ongoing	2022	Calderdale MBC	Calderdale MBC				Planning	Low impact on emissions but reduced exposure	Increases in cycling and walking, most active borough in the North by 2024	Walking and cycling infrastructure plan to be developed. LCWIP to be used in development.	Commitment from communities.
AQAP 3 (4)	Metro travel card pool scheme	Alternatives to Private Vehicle Use	Other	Ongoing	Ongoing	Calderdale MBC, Metro	Calderdale MBC, Metro				Implementation	Low initial impact	Increase in public transport use, number of staff car journeys replaced	Calderdale's first LCWIP is complete – Halifax for walking & Brighouse for cycling.	Further cards purchased 2018.
AQAP 3 (5)	20mph areas	Traffic Management	Reduction of speed limits, 20mph zones	2017	Completed 2017	Calderdale MBC	Calderdale MBC				Completed	Possible small reduction in road traffic emissions	Number of 20mph zones	Zones completed.	Opportunities for further extension
AQAP 3 (6)	Car sharing promotion	Alternatives to Private vehicle Use	Car & lift sharing schemes	2009-2020	Ongoing	Calderdale MBC	Calderdale MBC					Small reduction, behavioural change	Reduced private car use, number of car sharing partners	Car sharing scheme up and running – featured in Clean Air day 2018. Car club up and running for 5-years.	Interest appears to be growing.
AQAP 4 (1)	ULEV Procurement	Promoting Low Emission Transport	Company Vehicle Procurement – Prioritising uptake of low emission vehicles	2023 onwards	After 2023	Calderdale MBC	Calderdale MBC				Implementation	Reduction in emissions around schools	Reduce number of petrol and diesel cars and increase number of chargers (% ULEV in vehicle fleet)	30 ULEVs (electric vehicles) have now been ordered for Calderdale fleet, due to arrive end August 2020. A Project Teams has been set up to deliver new EV charging infrastructure across multiple corporate sites including Battinson Road, Mulcture House and Manor Heath. An additional 5 hybrid vehicles have also been ordered.	Funding availability
AQAP 4 (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.				Implementation	Reduced vehicle emissions	Number of EV charging points	4 rapid chargers installed. 13 on-street residential charge points are installed with OLEV funding.	Funding
AQAP 4 (3)	Retrofit school bus fleet	Promoting Low Emission Transport	Public Vehicle Procurement – Prioritising uptake of low emission vehicles	2017	Date	Calderdale MBC, neighbouring authorities	Calderdale MBC, neighbouring authorities					Reduced vehicle emissions	Proportion of fleet retrofitted		None
AQAP 5 (1)	Travel plans	Promoting Travel Alternatives	Workplace travel planning	Current	Ongoing	Calderdale MBC, neighbouring authorities	Calderdale MBC, neighbouring authorities					Potential moderate in long term	Number of workplaces with travel plans	Planning condition for travel plans created.	Enforcement.
AQAP 5 (2)	School travel plans	Promoting Travel Alternatives	School travel plans	2020 onwards	2020	Calderdale MBC, neighbouring authorities	Calderdale MBC, neighbouring authorities					Mainly behavioural influence	Schools with travel plans	Plan completed pre 2019	Many schools not with Local Authority.
AQAP 5 (3)	Local Plan Air Quality Policies	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	2017 onwards	2021	Calderdale MBC	Calderdale MBC					Significant improvements in longer term	Consistent approach to air quality in	WYLES adopted and used. Currently being revised by WYLES delivery group.	WYLES includes AQ guidance for developers.

Measure No.	Measure	Category	Classification	Year Measure Introduced	Estimated / Actual Completion Year	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
													planning guidance		
AQAP 5 (4)	Promote uptake of electric vehicles, e.g. taxis	Promoting Low Emission Transport	Taxi emission incentives	2017 onwards	Ongoing	Calderdale MBC	Calderdale MBC					Moderate, especially in town centres	Reduction in number of petrol and/or diesel taxis	1 operating further promotion in place.	Engagement of licence trade.
AQAP 5 (5)	Promote and support use of public transport and improved infrastructure	Promoting Low Emission Transport	Public Vehicle Procurement – Prioritising uptake of low emission vehicles	2018	2019	Calderdale MBC, WYCA	Calderdale MBC, WYCA					Potentially moderate in the longer term	Passenger journeys on public transport.	Clean Bus Technology grants awarded and fleet being upgraded. Development of station at Elland included access and parking. Delivery expected 2022/2023. WYCA to start work on new base plan and production schedules being developed. Implemented the community rail partnership to encourage more train travel. Work with public transport partners.	Funding
AQAP 5 (6)	Promote good practice is domestic burning	Policy guidance and development control	Other	Current	Ongoing	Calderdale MBC and Defra	Calderdale MBC and Defra					Significant local impact	Number of complaints about smoke from chimneys	Published on website.	Enforcement
AQAP 6 (1)	Community renewable energy scheme	Promoting Low Emission Plant	Public Procurement of stationary combustion sources	2019 onwards	Ongoing	Calderdale MBC	Calderdale MBC					Significant improvements in longer term	Number of schemes approved	Feasibility modelling done.	Funding
AQAP 6 (2)	Promote locally grown food, goods and services	Freight and Delivery Management	Other	2018 onwards	Ongoing	CMBC, local partners including 'Incredible Edible'	CMBC, local partners including 'Incredible Edible'					Significant improvements in longer term	Policies applied to all developments	Council policy agreed & land use for growing promoted.	Ongoing community take up.
AQAP 6 (3)	Improved energy efficiency	Other	Other			Calderdale MBC	Calderdale MBC						Number of developments incorporating energy efficiency measures		
AQAP 6 (4)	Compliance checks for environmental permit	Promoting Low Emission Plant	Environmental Permits	Current	Ongoing	CMBC/Environment Agency	CMBC/ Environment Agency					Significant impact locally	Level of compliance with permit conditions	Part A1, A2, B and Schedule 9 and 13 permits in place	NA
AQAP 6 (5)	Introduction of green screens	Transport/Planning/ Infrastructure	Other	Current	Ongoing	Calderdale MBC	Calderdale MBC	Yes			Implementation	Moderate local impact	NO_2 monitoring, protection of children in playground from NO_2 and PM	First installation May 2019	Finance
AQAP 6 (6)	Pilot school road closure	Transport/Planning/ Infrastructure	Other	Current	Ongoing	Calderdale MBC/ Schools	Calderdale MBC/ Schools	Yes			Completed / Implementation	Significant local impact	Air quality monitored	12 in place – more in planning stages. 20% modal shift – following 12-month survey. Expansion around school areas to create Active Travel Neighbourhoods.	Community support
AQAP 6 (7)	Tackle idling vehicles	Traffic Management	Congestion management/traffic reduction	Current	Ongoing	Calderdale MBC	Calderdale MBC				Completed / Implementation	Moderate local impact	Number of idling vehicles in key destinations	Confirming legal orders. Within AQMAs, buses given priority and removal of park cars to improve the flow of traffic/reduce the stopping and starting of traffic on the key route network.	Compliance and resource

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

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

The Council is taking the following measures to reduce $PM_{2.5}$ emissions, and therefore concentrations:

- **Biomass combustion (including domestic wood burning):** The Council has included guidance on the appropriate selection of fuels on its web pages, and continues to support the information campaign by Defra surrounding domestic emissions. The latest announcement to phase out coal burning and other fuels has also been made available. In order to discourage the burning of garden waste, a green waste collection service is in operation. As large parts of Calderdale (especially urban areas) are covered by Smoke Control Areas, the Council advises households on how to comply with these measures and where any additional information can be obtained from.
- **Industrial sources:** The Council is engaging with local operators who hold environmental permits for combustion plant to ensure that emissions are within limits and, where possible, reduced even further. There has been a slight increase in the number of applications for small waste incineration plants. The Council have identified a number of premises burning waste below the permitted threshold and are offering advice on obtaining a U4 exemption and, more importantly, reducing the smoke emissions from their appliances. In order to identify and regularise waste burning in the borough, the Council is working with the Environment Agency.
- **Public information:** The Council have informed the public about less polluting ways of travel, in particular avoiding private vehicle use where possible. Encouraging people to use alternative modes of transport is hoped to assist in reducing fine particles from brake and tyre wear. The ‘Let’s Clean the Air’ Campaign was a successful event led by the Council to engage with the public on air quality and was followed by Calderdale libraries obtaining funding for a project named ‘Something in the Air?’, which educates the public on the impacts of air pollution.

Based on automatic monitoring of $PM_{2.5}$ within Calderdale over the last five years, the Air Quality Objective (AQO) of 20µg/m^3 has not been exceeded. This is an indicator of the success of the measures outlined that the Council are taking to reduce $PM_{2.5}$ emissions.

The measures outlined in the 2019 Calderdale Action Plan to tackle NO_2 are expected to also reduce the concentration of particulates. For example, guidance on open fires and wood burning is also applicable to tackling sources of fine particulates[7]. The concentration of $PM_{2.5}$ often have significant regional contributions and the local measures may therefore have limited overall impact in reducing the concentration of $PM_{2.5}$.

[7] Defra, Open Fires and Wood Burning Stoves – Practical Guide, 2019

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

This section sets out the monitoring undertaken within 2020 by the Council and how it compares with the relevant air quality objectives. In addition, monitoring results are presented for a five-year period between 2016 and 2020 to allow monitoring trends to be identified and discussed.

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

The Council undertook automatic (continuous) monitoring at three sites during 2020. Table A.1 in Appendix A shows the details of the automatic monitoring sites. The Dataworks page on the Council's website presents automatic monitoring results for Calderdale, with automatic monitoring results also available through the UK-Air website .

Maps showing the location of the monitoring sites with reference to the current AQMAs 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

The Council undertook non- automatic (i.e. passive) monitoring of NO_2 at 54 sites during 2020. This is an increase of one monitoring site when compared to 2019. Table A.2 in Appendix A presents the details of the non-automatic sites.

Maps showing the location of the monitoring site with reference to the current AQMAs 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 compares the 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 2020 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.

Figure A.1-A.10 illustrates how the trends in annual mean concentrations have continued to decrease in 2020 at all but three diffusion tube sites. It is likely that the reduction in traffic flows as a result of the COVID-19 lockdown measures has had an impact on the NO_2 concentrations within Calderdale. For example, compared to 2019, reductions of 12% and 13% were observed in AQMA No. 1 Salterhebble and AQMA No. 3 Hebden Bridge, respectively. However, despite this reduction, exceedances of the annual mean objective were still observed within four AQMAs, with the greatest exceedance observed in the most recent AQMA (No. 8 New Bank). As a result, the average annual concentration of NO_2 across all relevant monitoring sites was only 6% lower than 2019 in AQMA No. 8 New Bank. Outside of AQMAs, an average reduction of 14% was observed across the diffusion tube network. In 2020, no diffusion tube site recorded an annual mean concentration greater than 60µg/m^3, thus it can be assumed in line with LAQM.TG16 guidance that there have been no exceedances of the 1-hour objective within Calderdale.

Outside of AQMAs, the NO_2 annual limit was exceeded at one location, with an annual mean concentration of 47.6µg/m^3 (prior to any fall-off with distance correction) being recorded at diffusion tube site NB-GL – north-east of AQMA No. 8 New Bank. However, following the correction to nearest exposure, the concentration reduced to 29.4µg/m^3.

Site SB23 was the only site requiring annualisation as the data capture was less than 75%.

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.

The PM_{10} monitoring site (AQS4) is situated within the Sowerby Bridge AQMA. The annual mean concentration has remained relatively stable over the five year period presented, fluctuating by approximately 1-2µg/m^3 at around 24-25µg/m^3, with the concentration in 2020 rising slightly from the previous year to 26µg/m^3.

The 24-hour limit (50µg/m^3) was exceeded 20 times in 2020, compared to a similar number of times (19) in the previous year. However, this remains below the air quality objective of 35.

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 by the two remaining automatic monitoring stations (AQS2 and AQS3) that do not record PM_{10}. When comparing the two sites, the reduction compared to the previous year was greater at AQS3 than for AQS2. The concentration in 2020 was 13% lower than 2019 at site AQS2, yet was 45% lower at site AQS3.

3.2.4 Sulphur Dioxide (SO_2)

The concentrartion of SO_2 is not routinely monitored in Calderdale.

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	NO_2, $PM_{2.5}$	YES; AQMA No. 1 (Salterhebble)	Chemiluminescent; BAM	NA	3	1.5
AQS3	Hebden Bridge	Roadside	398990	427210	NO_2, $PM_{2.5}$	YES; AQMA No. 3 (Hebden Bridge)	Chemiluminescent; BAM	NA	3	1.5
AQS4	Sowerby Bridge	Roadside	406075	423615	NO_2, PM_{10}	YES; AQMA No. 2 (Sowerby Bridge)	Chemiluminescent; BAM	NA	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)
AQC1	AQC1	Roadside	409485	423431	NO_2	YES; AQMA No. 1 (Salterhebble)	2.0	2.0	YES	1.5
AQC2	AQC2	Roadside	409485	423431	NO_2	YES; AQMA No. 1 (Salterhebble)	2.0	2.0	YES	1.5
AQC3	AQC3	Roadside	409485	423431	NO_2	YES; AQMA No. 1 (Salterhebble)	2.0	2.0	YES	1.5
AQ21	AQ21	Roadside	409822	423167	NO_2	YES; AQMA No. 1 (Salterhebble)	2.0	2.0	NO	2.5
CRH1	CRH1	Roadside	409767	423011	NO_2	YES; AQMA No. 1 (Salterhebble)	0.0	2.0	NO	2.5
SB1	SB1	Roadside	406135	423639	NO_2	YES; AQMA No. 2 (Sowerby Bridge)	0.0	2.0	NO	2.5
SB3	SB3	Roadside	405961	423571	NO_2	YES; AQMA No. 2 (Sowerby Bridge)	0.0	2.0	NO	2.5
SB15	SB15	Roadside	406707	423824	NO_2	YES; AQMA No. 2 (Sowerby Bridge)	1.0	2.0	NO	2.0
SB16	SB16	Roadside	406638	423836	NO_2	YES; AQMA No. 2 (Sowerby Bridge)	0.0	2.0	NO	2.5
SB22	SB22	Roadside	405823	423395	NO_2	YES; AQMA No. 2 (Sowerby Bridge)	0.0	2.0	NO	2.0
SB-AQ*	SB-AQ	Roadside	406075	423615	NO_2	YES; AQMA No. 2 (Sowerby Bridge)	0.5	1.5	YES	2.0
HB6	HB6	Roadside	399502	427041	NO_2	Yes; AQMA No. 3. (Hebden Bridge)	0.0	4.0	NO	2.0
HQ1	HQ1	Roadside	398794	427237	NO_2	Yes; AQMA No. 3. (Hebden Bridge)	0.0	3.0	NO	2.0
HQ9	HQ9	Roadside	399236	427176	NO_2	Yes; AQMA No. 3. (Hebden Bridge)	0.0	2.0	NO	2.5
BS1 HB	BS1 HB	Roadside	398990	427210	NO_2	Yes; AQMA No. 3. (Hebden Bridge)	>10	3.0	YES	1.5
LF1	LF1	Roadside	403810	424977	NO_2	YES; AQMA No. 4 (Luddendenfoot)	0.0	2.0	NO	2.5
LF2	LF2	Roadside	403738	425110	NO_2	YES; AQMA No. 4 (Luddendenfoot)	0.0	1.0	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)
SC5	SC5	Roadside	410823	426265	NO_2	YES; AQMA No. 5 (Stump Cross)	0.0	3.0	NO	3.0
LV-BRD	LV-BRD	Roadside	414683	423155	NO_2	YES; AQMA No. 6 (Brighouse)	5.0	2.0	NO	2.0
WR2	WR2	Roadside	415090	422817	NO_2	YES; AQMA No. 6 (Brighouse)	0.0	4.0	NO	2.5
BH3	BH3	Roadside	414671	422740	NO_2	YES; AQMA No. 6 (Brighouse)	3.0	1.5	NO	2.5
BE4	BE4	Roadside	414478	422692	NO_2	YES; AQMA No. 6 (Brighouse)	0.0	1.0	NO	2.5
BE2	BE2	Roadside	414385	422457	NO_2	YES; AQMA No. 6 (Brighouse)	N/A	2.0	NO	2.5
HXR1	HXR1	Roadside	414218	422957	NO_2	YES; AQMA No. 6 (Brighouse)	0.0	4.0	NO	2.0
HH-TC	HH-TC	Roadside	412718	425556	NO_2	YES; AQMA No. 7 (Hipperholme)	5.0	1.5	NO	2.5
HH-1A*	HH-1A	Roadside	412593	425497	NO_2	YES; AQMA No. 7 (Hipperholme)	0.0	1.5	NO	2.5
HH-LT	HH-LT	Roadside	412450	425435	NO_2	YES; AQMA No. 7 (Hipperholme)	0.0	3.0	NO	2.5
NB-NB1	NB-NB1	Roadside	409663	425740	NO_2	YES; AQMA No. 8 (New Bank)	2.0	2.0	NO	2.5
NB-GR	NB-GR	Roadside	409957	425642	NO_2	YES; AQMA No. 8 (New Bank)	4.0	3.0	NO	2.0
LV-NBN	LV-NBN	Roadside	409715	425754	NO_2	YES; AQMA No. 8 (New Bank)	N/A	1.0	NO	2.5
LV-NBS	LV-NBS	Roadside	409708	425737	NO_2	YES; AQMA No. 8 (New Bank)	N/A	2.0	NO	2.5
LV-NBX	LV-NBX	Roadside	409602	425797	NO_2	YES; AQMA No. 8 (New Bank)	N/A	1.0	NO	2.5
LV-SCA	LV-SCA	Roadside	405911	416597	NO_2	NO	N/A	N/A	NO	1.0
LV-SAA	LV-SAA	Roadside	411201	419429	NO_2	NO	11.0	N/A	NO	2.5
LV-AT	LV-AT	Roadside	411533	419358	NO_2	NO	14.0	4.0	NO	2.5
LV-62W	LV-62W	Roadside	416172	422282	NO_2	NO	N/A	3.0	NO	2.5
LV-62E	LV-62E	Roadside	416717	422113	NO_2	NO	N/A	4.0	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)
LV-LEE	LV-LEE	Roadside	417698	420709	NO_2	NO	N/A	3.0	NO	2.0
LV-EWB	LV-EWB	Roadside	410104	421516	NO_2	NO	N/A	1.0	NO	2.5
NB-GL	NB-GL	Roadside	410367	425975	NO_2	NO	17.0	2.0	NO	2.5
CL1	CL1	Roadside	413261	420686	NO_2	NO	0.0	2.0	NO	2.5
HTAH	HTAH	Suburban	411494	419594	NO_2	NO	0.0	N/A	NO	2.0
AT-BR	AT-BR	Suburban	411514	419548	NO_2	NO	6.0	N/A	NO	2.0
AT-MR	AT-MR	Roadside	411581	419373	NO_2	NO	10.0	N/A	NO	2.5
AQ20	AQ20	Roadside	409483	423337	NO_2	NO	0.0	5.0	NO	2.0
WV-SR1	WV-SR1	Roadside	409598	421167	NO_2	NO	0.0	2.0	NO	2.5
WV-SR2	WV-SR2	Roadside	409608	421160	NO_2	NO	3.0	2.0	NO	2.5
MY01	MY01	Roadside	401431	425995	NO_2	NO	0.0	1.0	NO	2.5
MY02	MY02	Urban Background	401275	426046	NO_2	NO	N/A	>10	NO	2.5
MY03	MY03	Roadside	401204	426041	NO_2	NO	0.0	2.0	NO	2.5
MY-04	MY-04	Roadside	401059	426179	NO_2	NO	12.0	2.0	NO	2.5
MY-05	MY-05	Roadside	401040	426186	NO_2	NO	19.0	2.0	NO	2.5
TD01*	TD01	Roadside	393822	424166	NO_2	NO	4.0	1.5	NO	2.5
SB23*	SB23	Roadside	405701	423223	NO_2	NO	3.0	1.5	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.

(3) Values indicated with an asterisk (*) are estimated using grid reference in QGIS.

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 2020 (%) (2)	2016	2017	2018	2019	2020
AQS2	409485	423430	Roadside	94	94	-	-	38.6	39.7	32.1
AQS3	398990	427210	Roadside	75	75	-	-	35.0	34.3	26.7
AQS4	406075	423615	Roadside	99	99	-	-	38.1	36.0	29.6

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

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

Notes:

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

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

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

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

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

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

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

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2020 (%) [2]	2016	2017	2018	2019	2020
AQC1	409485	423431	Roadside	100	100.0	**46**	**41**	36	**40**	33.5
AQC2	409485	423431	Roadside	100	100.0	**46**	**43**	36	39	32.7
AQC3	409485	423431	Roadside	100	100.0	**46**	**41**	36	39	32.2
AQ21	409822	423167	Roadside	100	100.0	**50**	**48**	**45**	**44**	**43.0**
CRH1	409767	423011	Roadside	92.3	92.3	**54**	**52**	**52**	**42**	38.4
SB1	406135	423639	Roadside	100	100.0	**50**	**45**	**46**	**42**	**40.2**
SB3	405961	423571	Roadside	100	100.0	**46**	**40**	**43**	35	35.9
SB15	406707	423824	Roadside	100	100.0	**42**	37	34	34	27.9
SB16	406638	423836	Roadside	100	100.0	**42**	38	**40**	36	31.2
SB22	405823	423395	Roadside	100	100.0	**48**	**42**	**45**	**40**	34.1
SB-AQ	406075	423615	Roadside	100	100.0	-	-	-	-	33.5
HB6	399502	427041	Roadside	100	100.0	38	35	31	30	26.0
HQ1	398794	427237	Roadside	100	100.0	**52**	**50**	**46**	**44**	38.4
HQ9	399236	427176	Roadside	100	100.0	**42**	36	39	35	29.9
BS1 HB	398990	427210	Roadside	100	100.0	**42**	38	37	33	29.7
LF1	403810	424977	Roadside	100	100.0	**46**	39	**41**	34	33.9
LF2	403738	425110	Roadside	100	100.0	38	35	34	29	26.3
SC5	410823	426265	Roadside	100	100.0	**43**	38	39	35	34.1
LV-BRD	414683	423155	Roadside	100	100.0	28	31	28	27	23.4
WR2	415090	422817	Roadside	100	100.0	**41**	38	36	33	30.9
BH3	414671	422740	Roadside	100	100.0	**48**	**46**	**42**	**43**	38.2
BE4	414478	422692	Roadside	100	100.0	**50**	**47**	**45**	**42**	33.6
BE2	414385	422457	Roadside	100	100.0	**45**	38	37	35	31.8
HXR1	414218	422957	Roadside	100	100.0	**53**	**49**	**49**	**42**	**43.0**
HH-TC	412718	425556	Roadside	100	100.0	**42**	36	35	33	26.0
HH-1A	412593	425497	Roadside	100	100.0	-	-	-	-	31.8

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 2020 (%) [2]	2016	2017	2018	2019	2020
HH-LT	412450	425435	Roadside	100	100.0	**58**	**51**	**48**	**41**	**40.7**
NB-NB1	409663	425740	Roadside	92.3	92.3	-	**44**	**42**	**40**	35.2
NB-GR	409957	425642	Roadside	100	100.0	-	**53**	**53**	**46**	**49.4**
LV-NBN	409715	425754	Roadside	100	100.0	**67**	**66**	**64**	**55**	**53.5**
LV-NBS	409708	425737	Roadside	100	100.0	**55**	**42**	**44**	**41**	34.0
LV-NBX	409602	425797	Roadside	100	100.0	**46**	**43**	39	39	36.3
LV-SCA	405911	416597	Roadside	100	100.0	**56**	**48**	**46**	37	33.6
LV-SAA	411201	419429	Roadside	100	100.0	31	33	30	25	23.7
LV-AT	411533	419358	Roadside	100	100.0	**54**	**47**	**47**	**45**	34.7
LV-62W	416172	422282	Roadside	100	100.0	**43**	**40**	**40**	37	30.4
LV-62E	416717	422113	Roadside	100	100.0	**42**	**40**	38	36	32.2
LV-LEE	417698	420709	Roadside	100	100.0	32	32	30	27	25.0
LV-EWB	410104	421516	Roadside	100	100.0	30	27	27	27	21.2
NB-GL	410367	425975	Roadside	100	100.0	-	**57**	**52**	**49**	**47.6**
CL1	413261	420686	Roadside	100	100.0	**43**	34	33	29	27.0
HTAH	411494	419594	Suburban	100	100.0	38	35	31	27	21.1
AT-BR	411514	419548	Suburban	100	100.0	37	35	30	28	20.4
AT-MR	411581	419373	Roadside	100	100.0	30	34	27	25	19.9
AQ20	409483	423337	Roadside	92.3	92.3	30	24	24	22	18.7
WV-SR1	409598	421167	Roadside	100	100.0	-	39	38	38	32.8
WV-SR2	409608	421160	Roadside	100	100.0	-	29	31	28	25.7
MY01	401431	425995	Roadside	100	100.0	-	28	**52**	**44**	35.6
MY02	401275	426046	Urban Background	100	100.0	-	**42**	24	21	18.8
MY03	401204	426041	Roadside	100	100.0	-	-	**42**	39	34.8
MY-04	401059	426179	Roadside	100	100.0	-	-	29	27	23.5
MY-05	401040	426186	Roadside	100	100.0	-	-	33	28	24.9
TD01	393822	424166	Roadside	7.7	7.7	-	-	-	-	-

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 2020 (%) (2)	2016	2017	2018	2019	2020
SB23	405701	423223	Roadside	34.6	34.6	-	-	-	-	23.4

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

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

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

Notes:

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

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

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

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

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

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

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

(3) Site TD01 had insufficient data capture (one month) to present any data for the 2020 reporting year.

Figure A.1 – Trends in Annual Mean NO_2 Concentration at Salterhebble (AQMA No. 1)

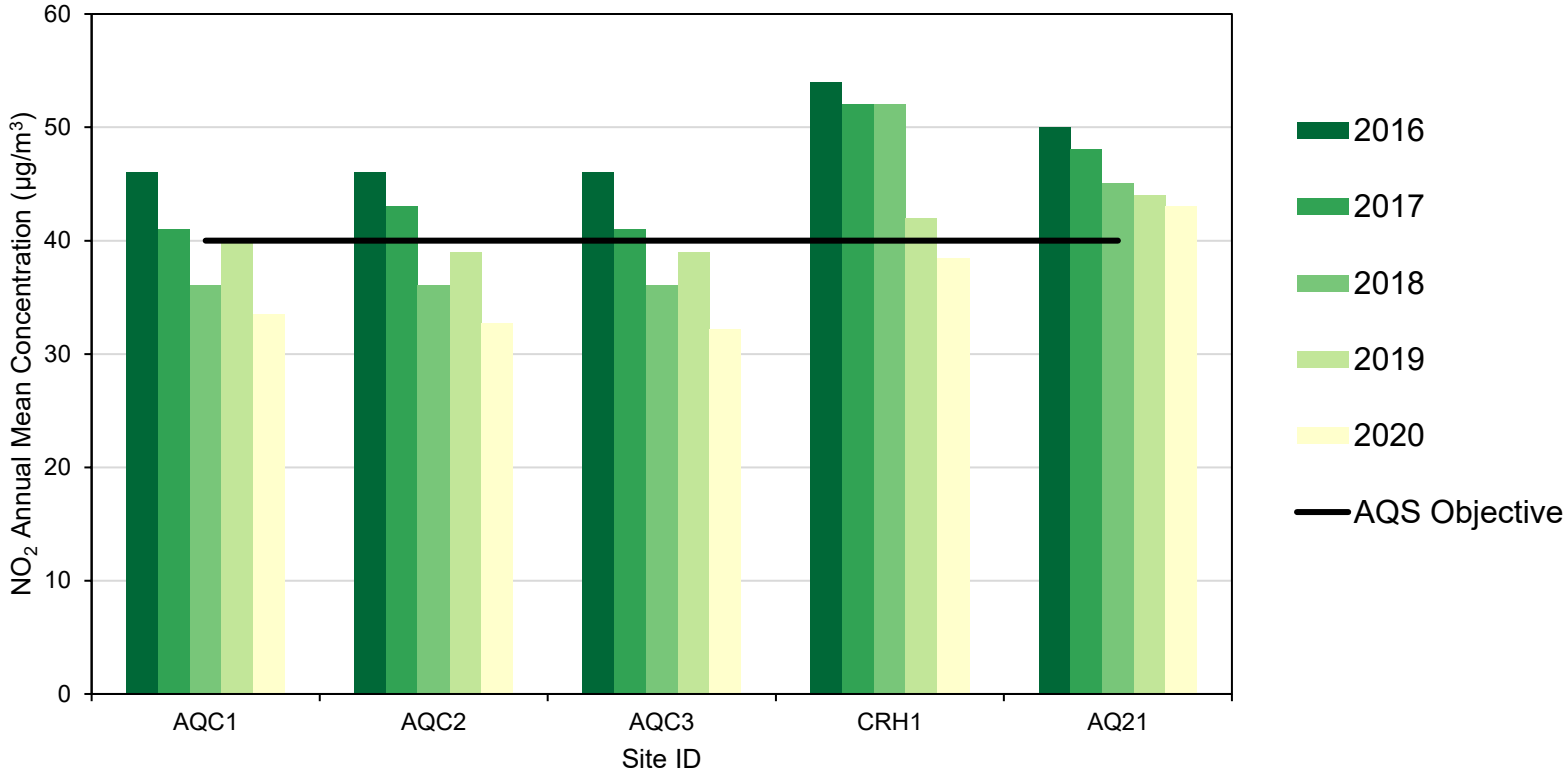


Figure A.2 – Trends in Annual Mean NO_2 Concentration at Sowerby Bridge (AQMA No. 2)

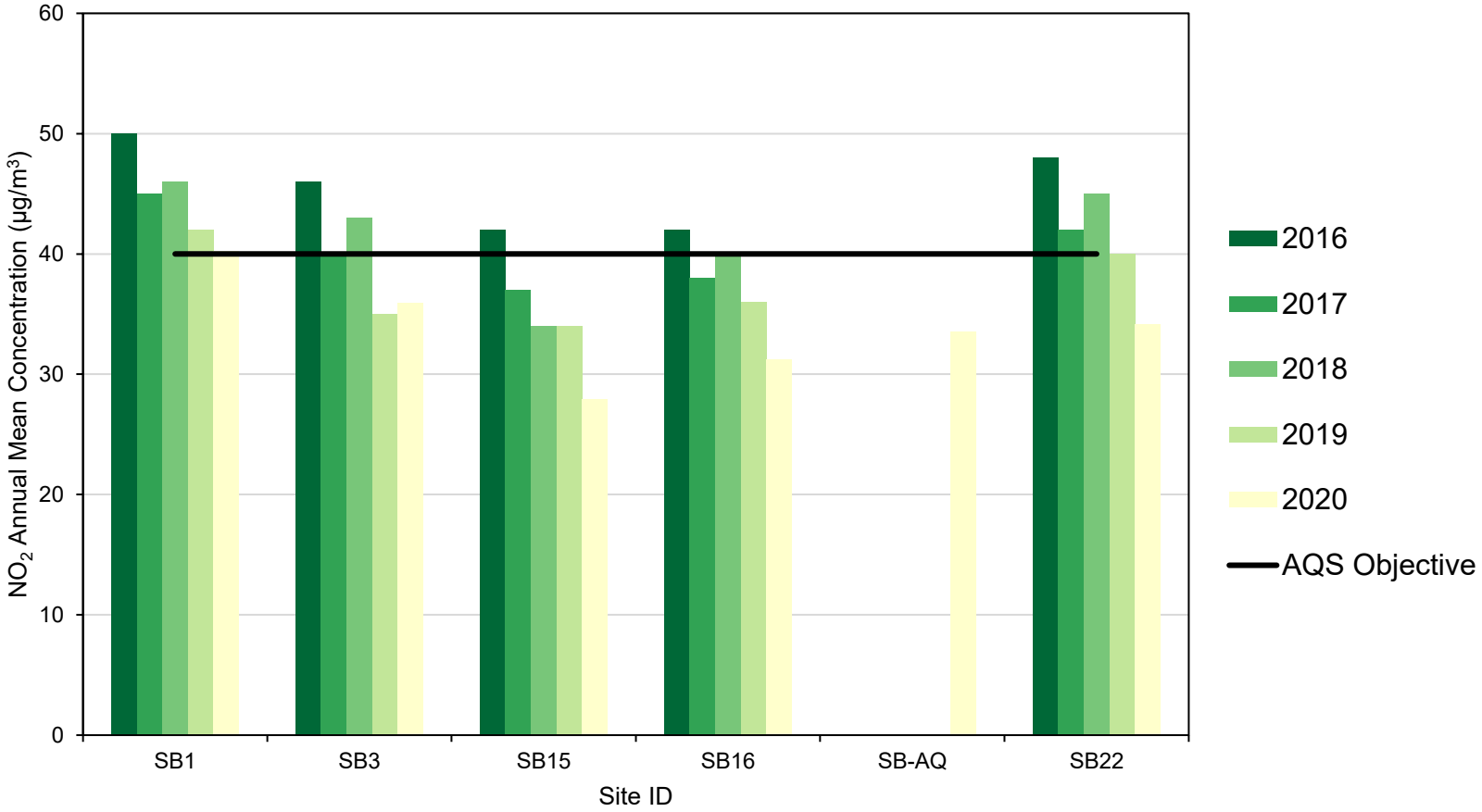


Figure A.3 – Trends in Annual Mean NO_2 Concentration at Hebden Bridge (AQMA No. 3)

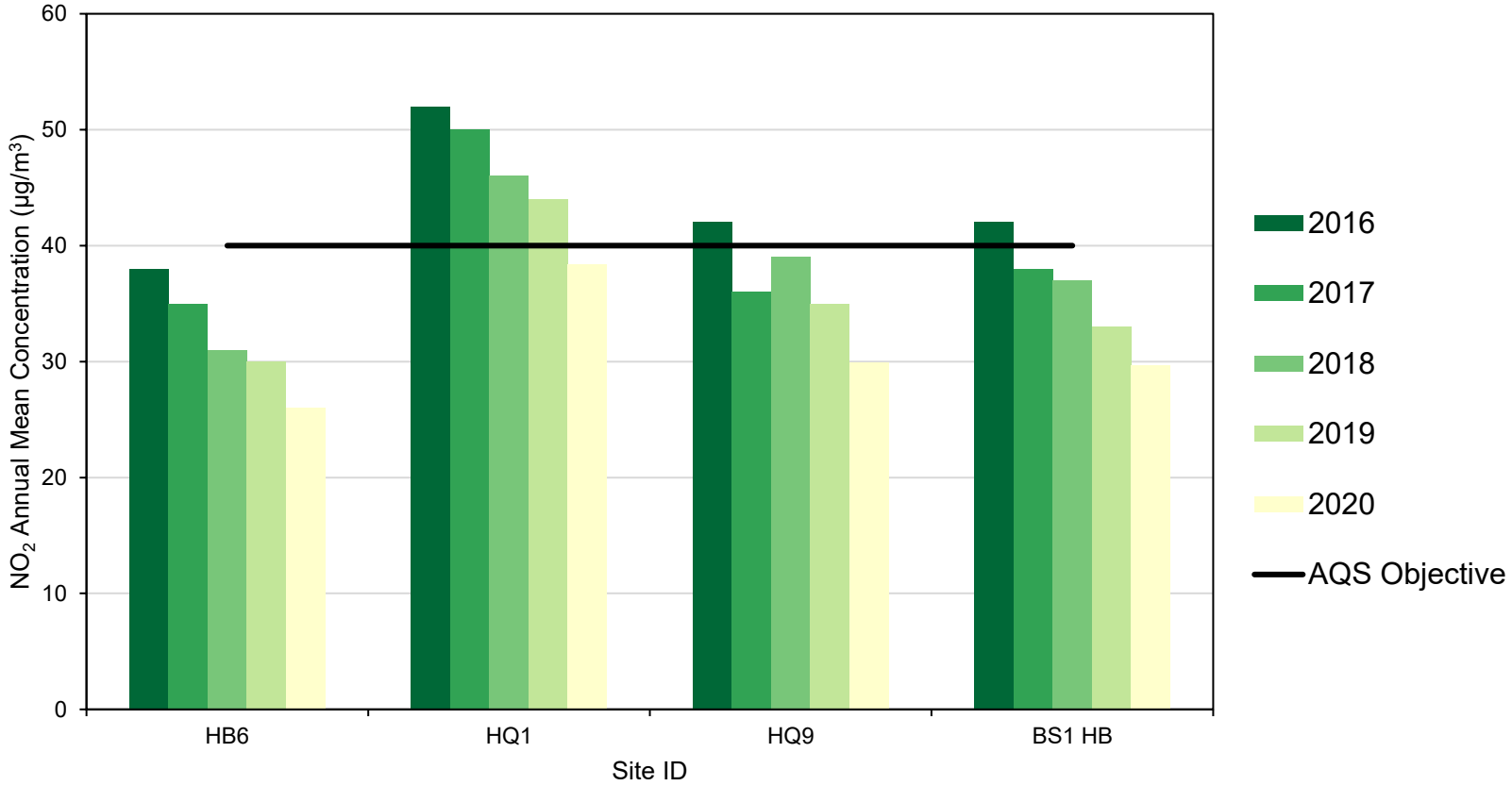


Figure A.4 – Trends in Annual Mean NO_2 Concentration at Luddendenfoot (AQMA No. 4)

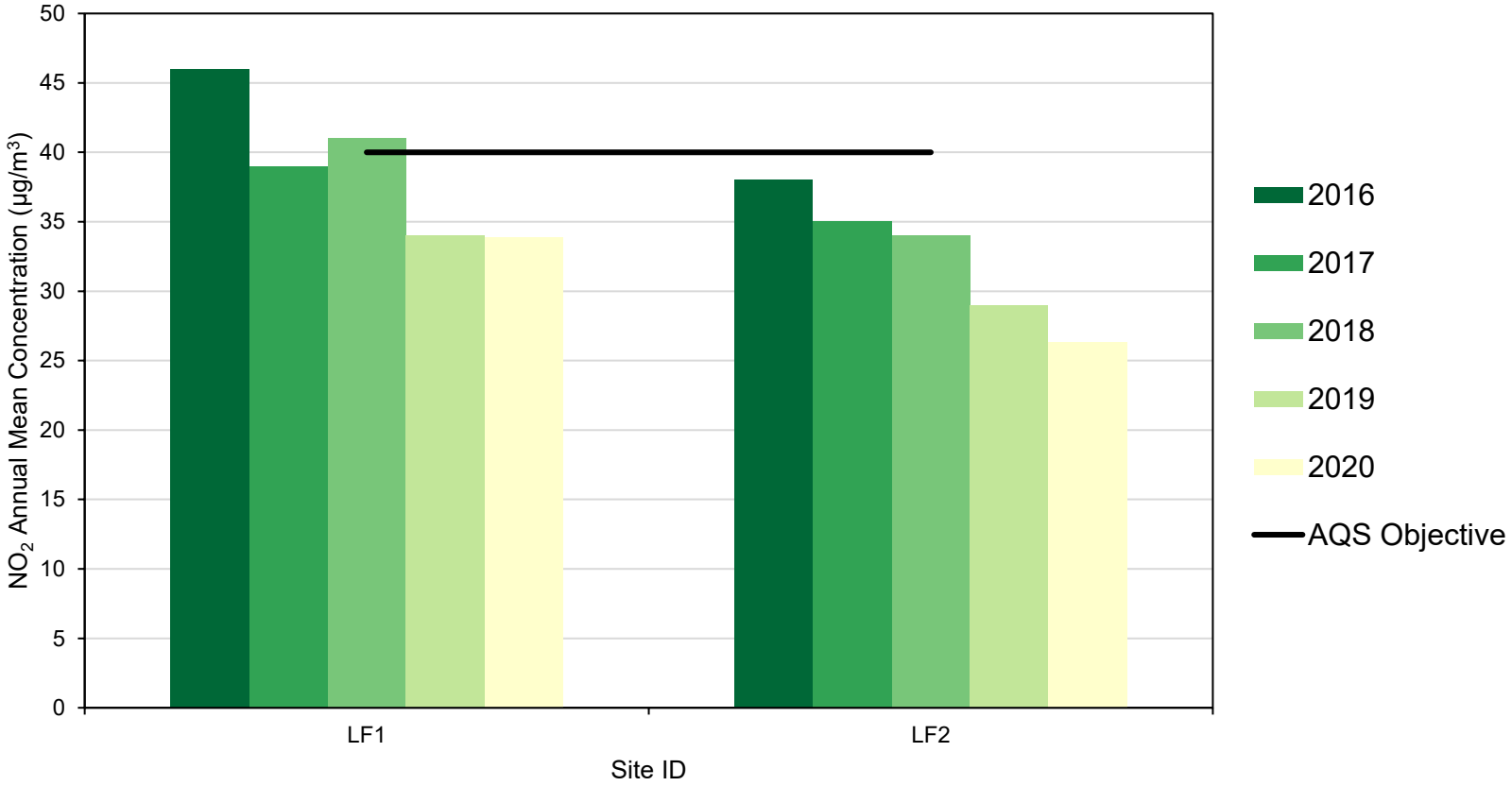


Figure A.5 – Trends in Annual Mean NO_2 Concentration at Stump Cross (AQMA No. 5) & New Bank (AQMA No. 8)

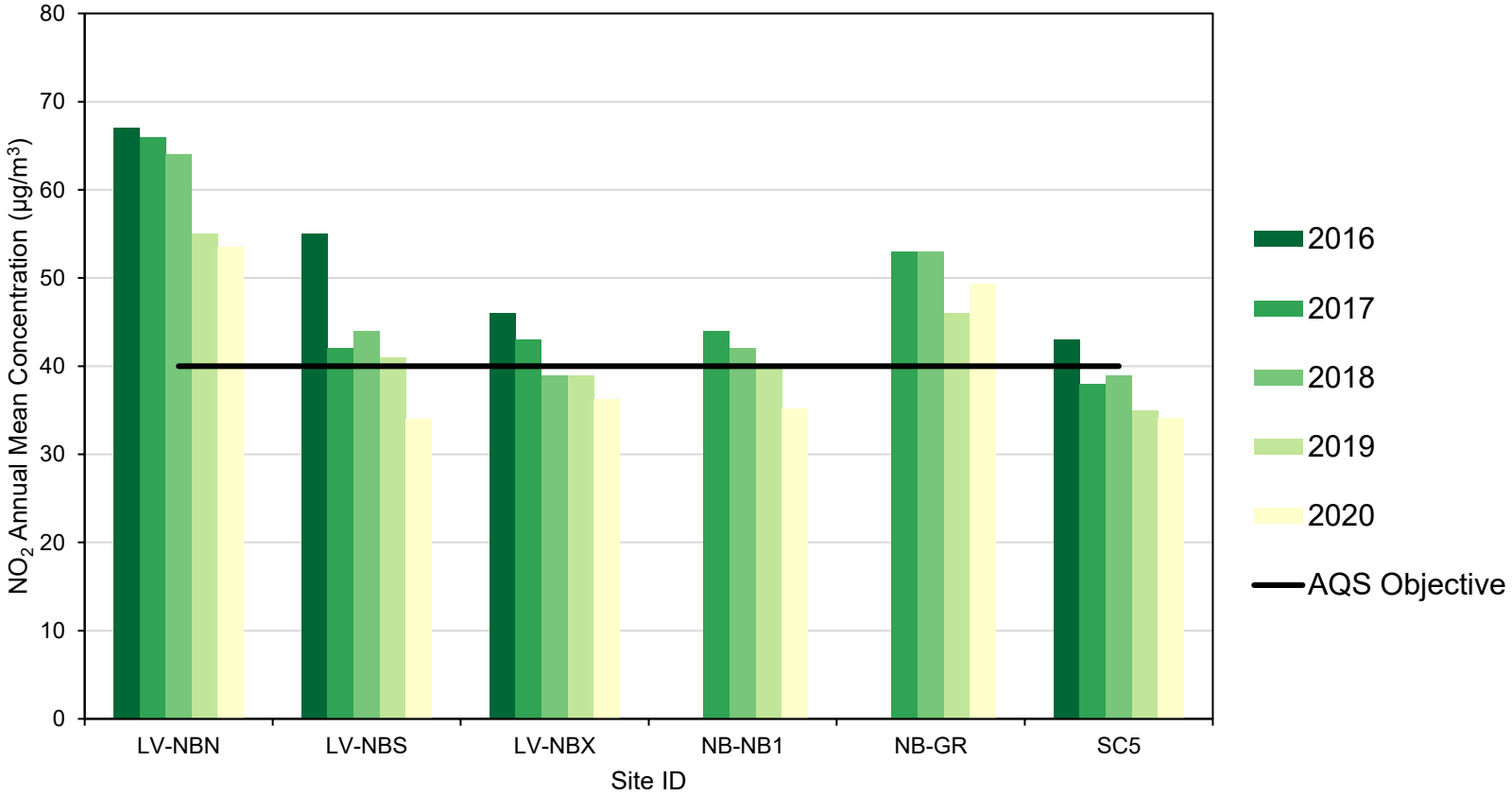


Figure A.6 – Trends in Annual Mean NO_2 Concentration at Brighouse (AQMA No. 6)

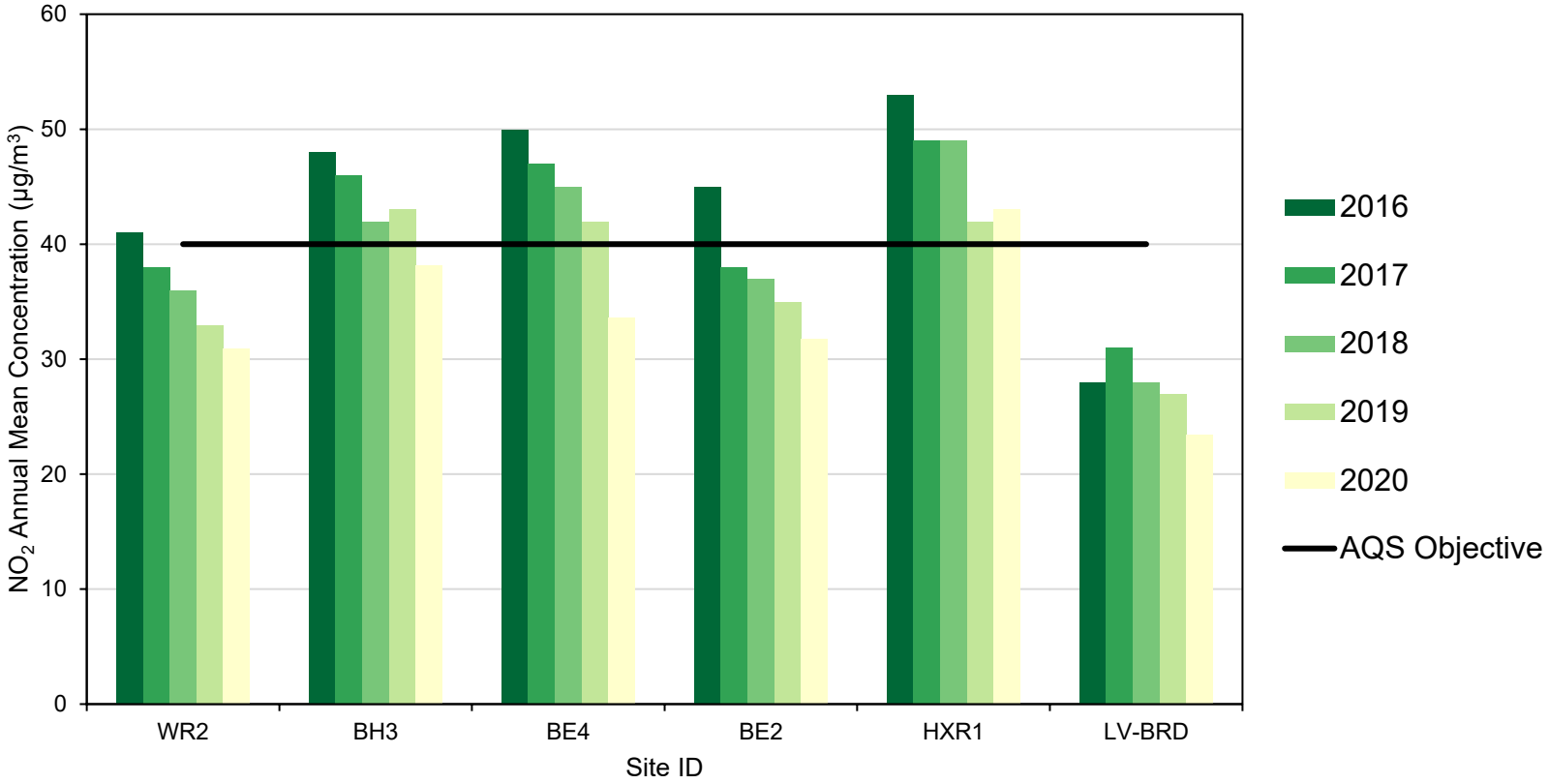


Figure A.7 – Trends in Annual Mean NO_2 Concentration at Hipperholme (AQMA No. 7)

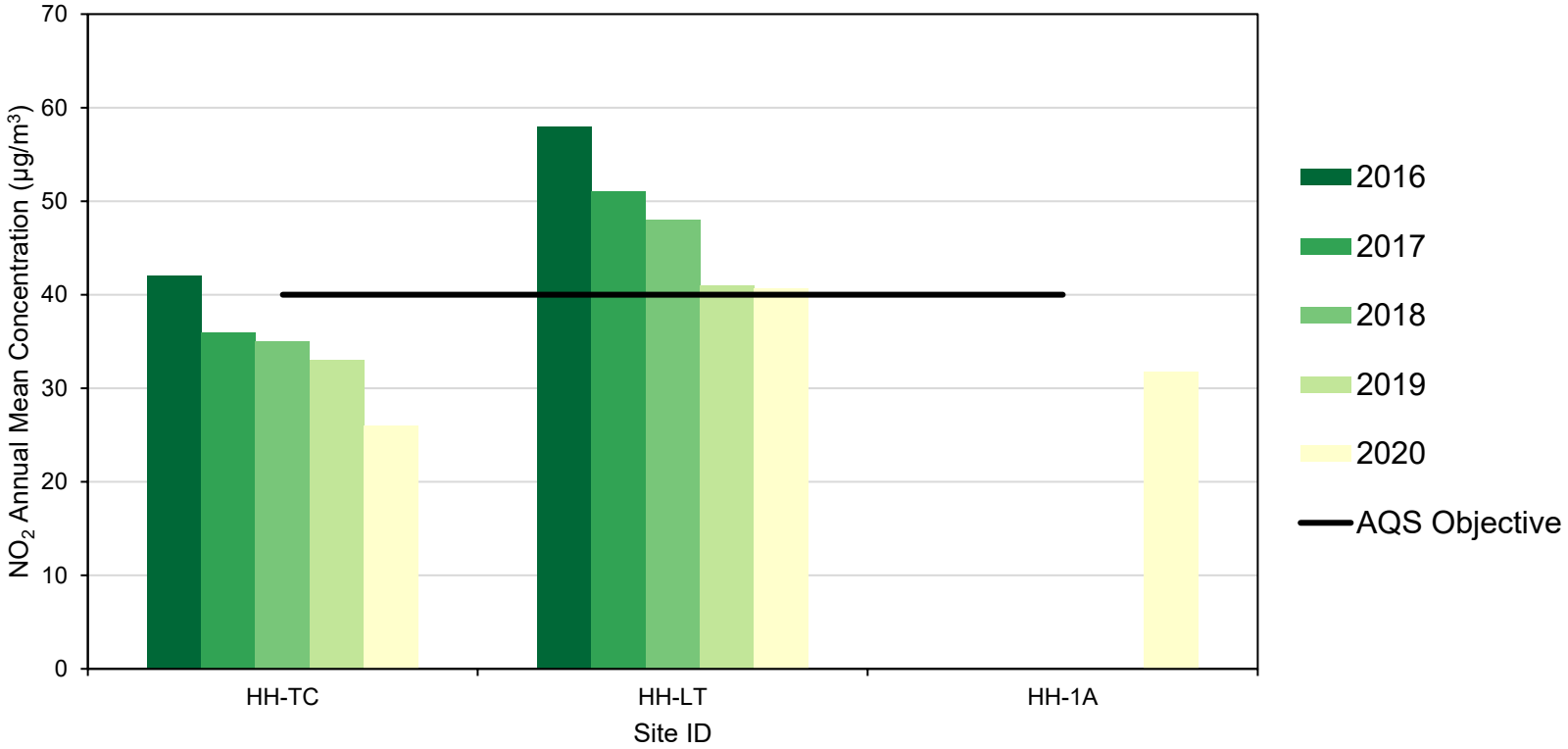


Figure A.8 – Trends in Annual Mean NO_2 Concentration Outside of AQMAs (Ainley Top & Rastrick)

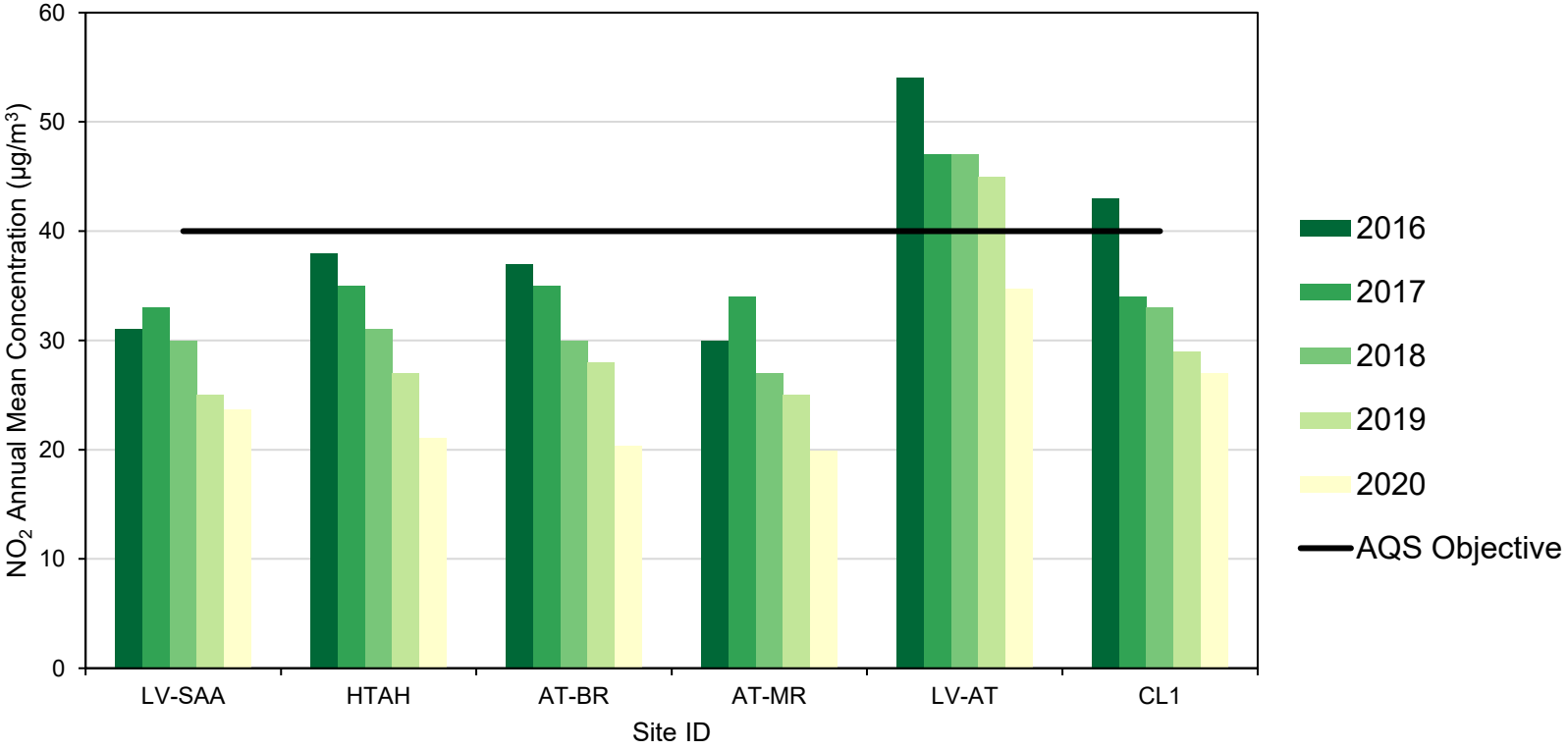


Figure A.9 – Trends in Annual Mean NO_2 Concentration Outside of AQMAs (Mytholmroyd & West Vale)

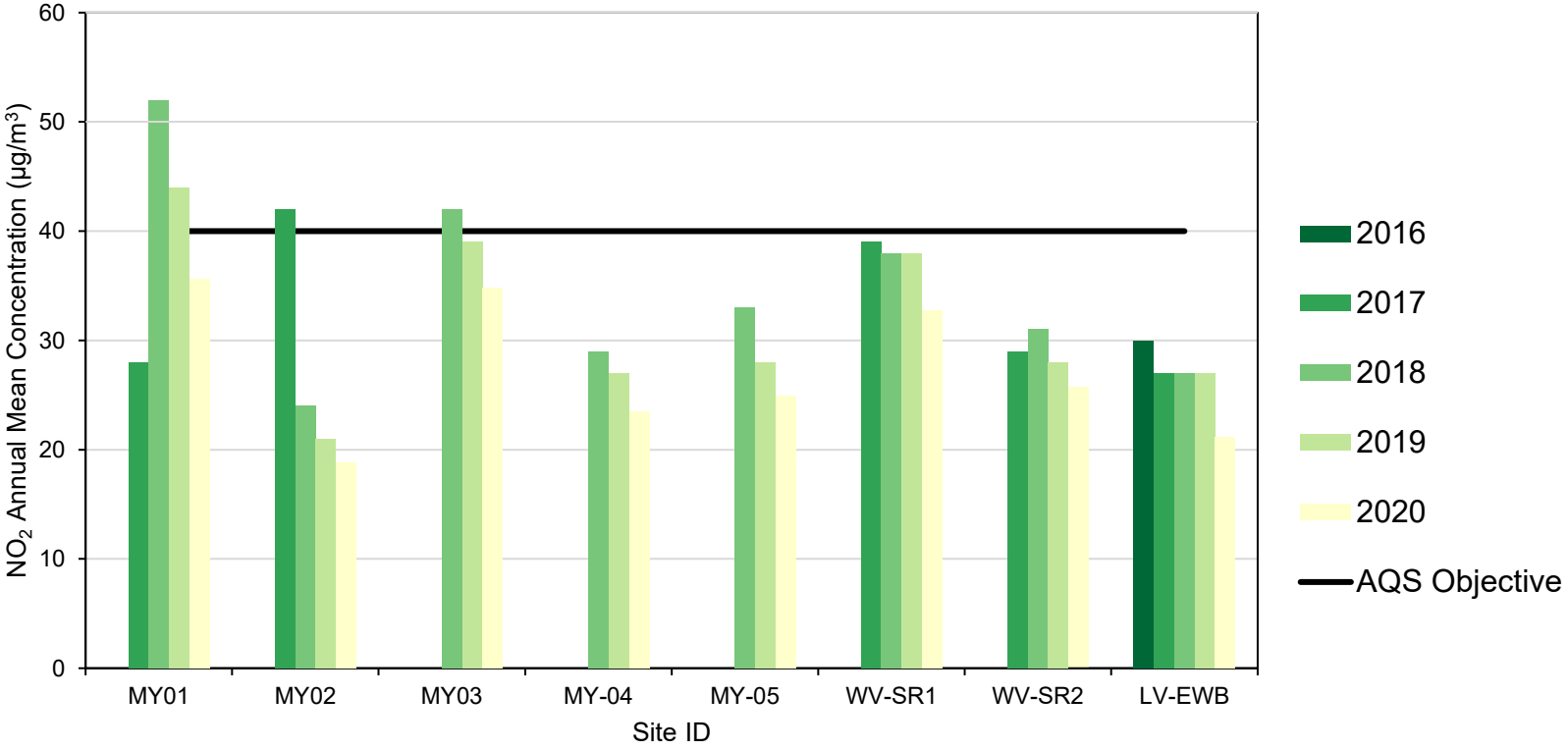


Figure A.10 - Trends in Annual Mean NO_2 Concentration Outside of AQMAs (Brighouse South, Sowerby Bridge, Scammonden, Salterhebble & New Bank)

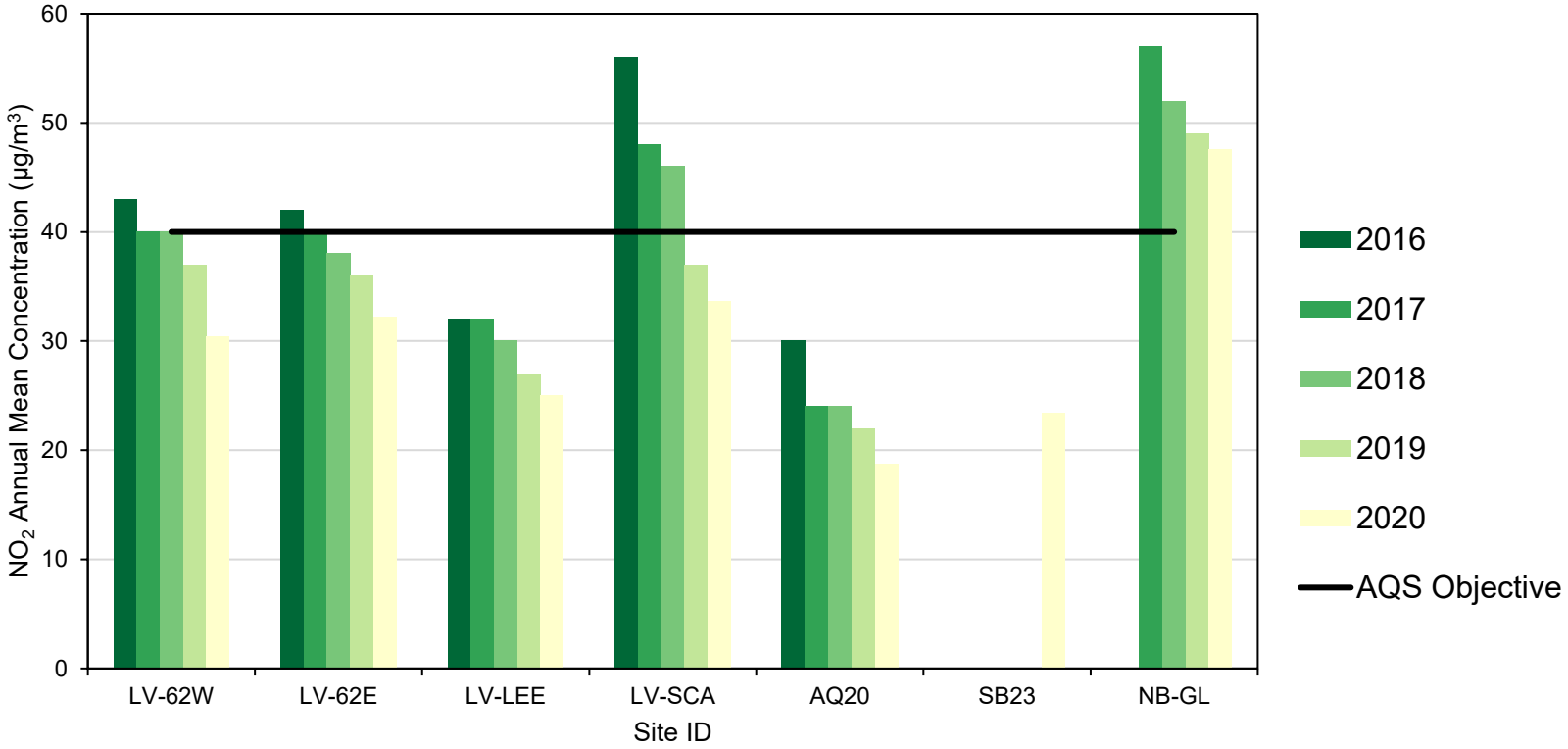


Table A.5 – 1-Hour Mean NO_2 Monitoring Results, Number of 1-Hour Means > 200µg/m^3

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2020 (%) (2)	2016	2017	2018	2019	2020
AQS2	409485	423430	Roadside	94	94	0	0	4	4 (133.7)	0
AQS3	398990	427210	Roadside	75	75	0	0	0	0	0 (98.8)
AQS4	406075	423615	Roadside	99	99	0	0	1	1	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%).

Figure A.11 – Trends in Number of NO_2 1-Hour Means >200µg/m^3

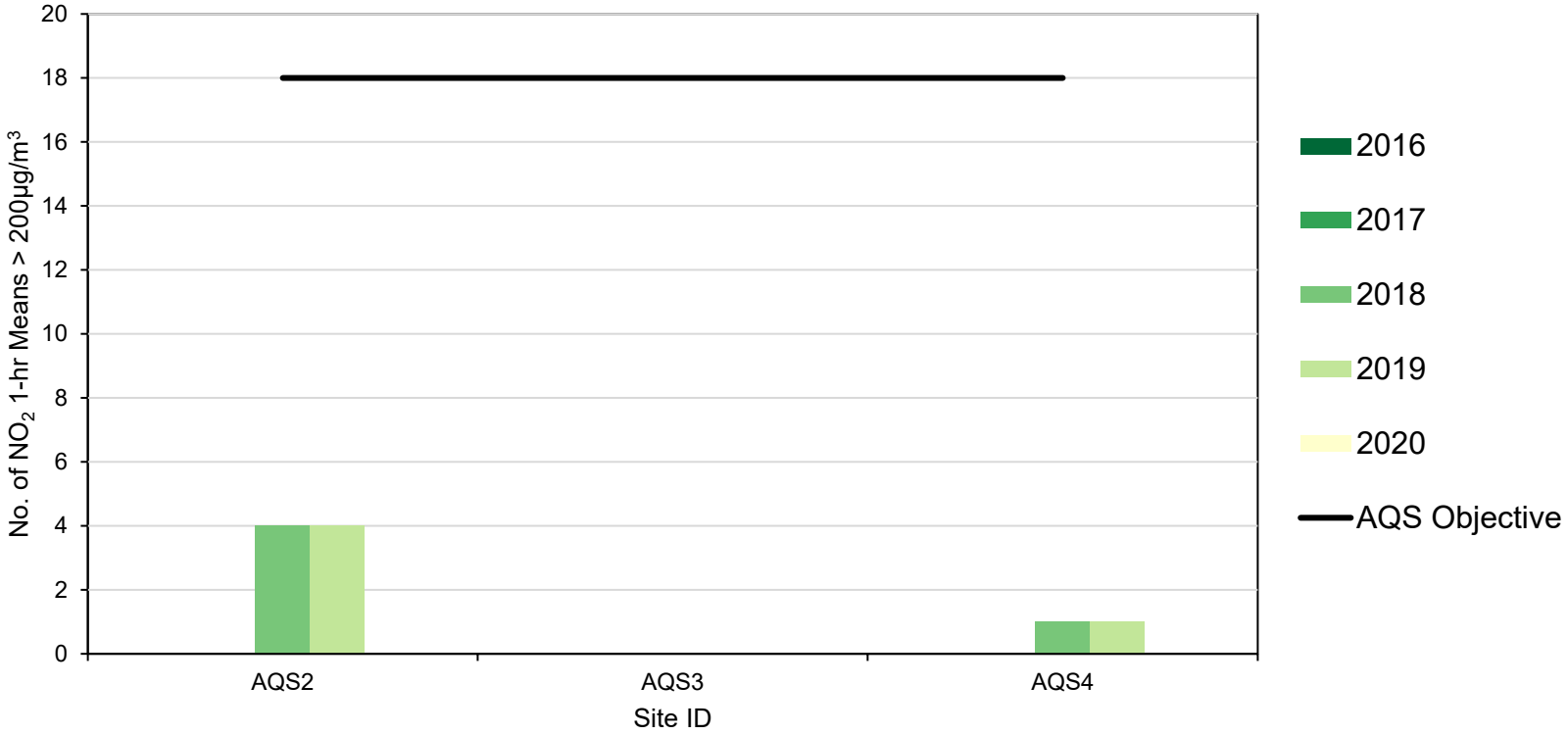


Table A.6 – Annual Mean PM_{10} Monitoring Results (µg/m^3)

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2020 (%) (2)	2016	2017	2018	2019	2020
AQS4	406075	423615	Roadside	86	86	25	23	25	24	26.4

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

Notes:

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

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

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

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

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

Figure A.12 – Trends in Annual Mean PM_{10} Concentrations

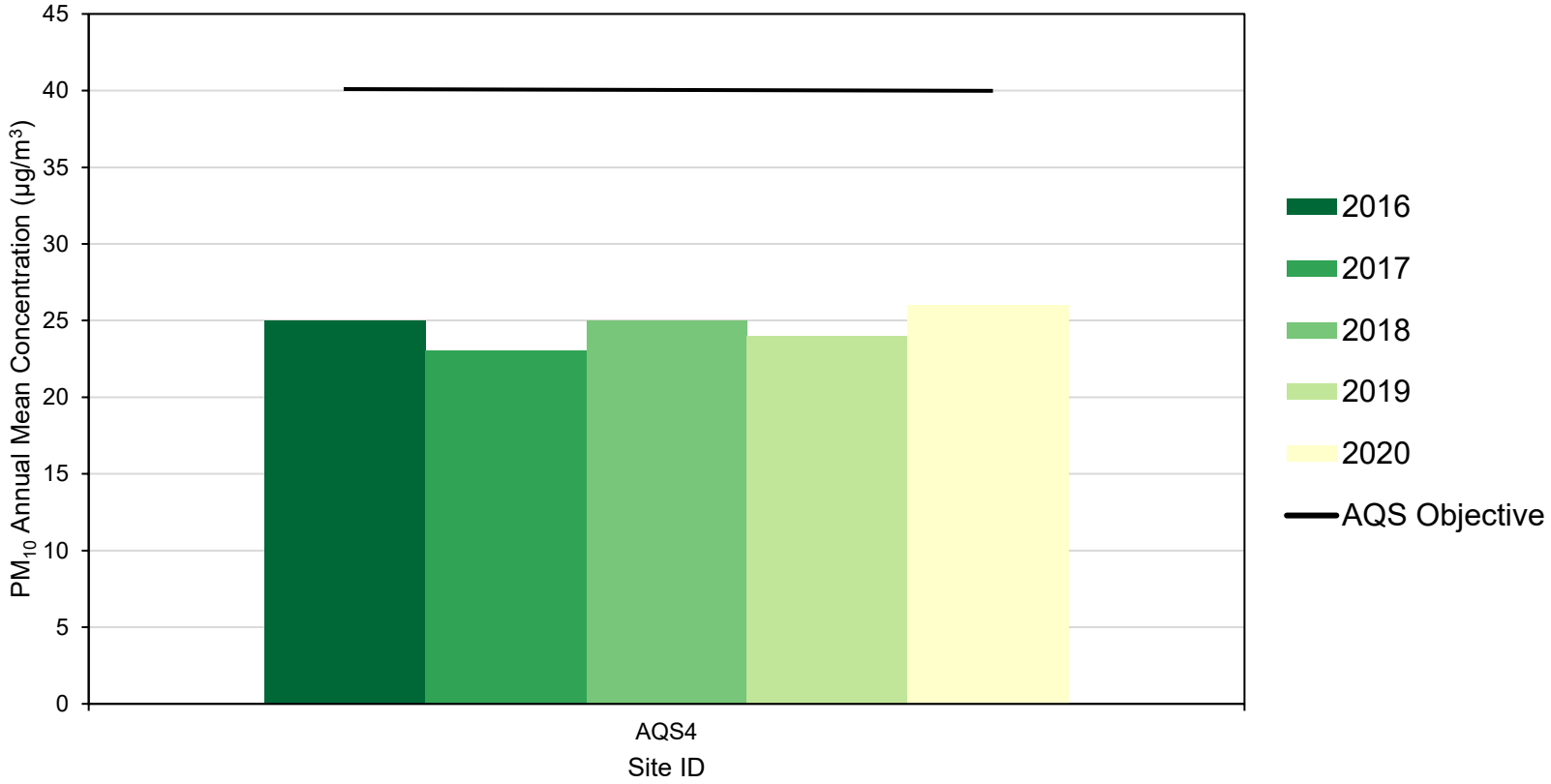


Table A.7 – 24-Hour Mean PM_{10} Monitoring Results, Number of PM_{10} 24-Hour Means > 50µg/m^3

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2020 (%) (2)	2016	2017	2018	2019	2020
AQS4	406075	423615	Roadside	86	86	15	8	12	19	20

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

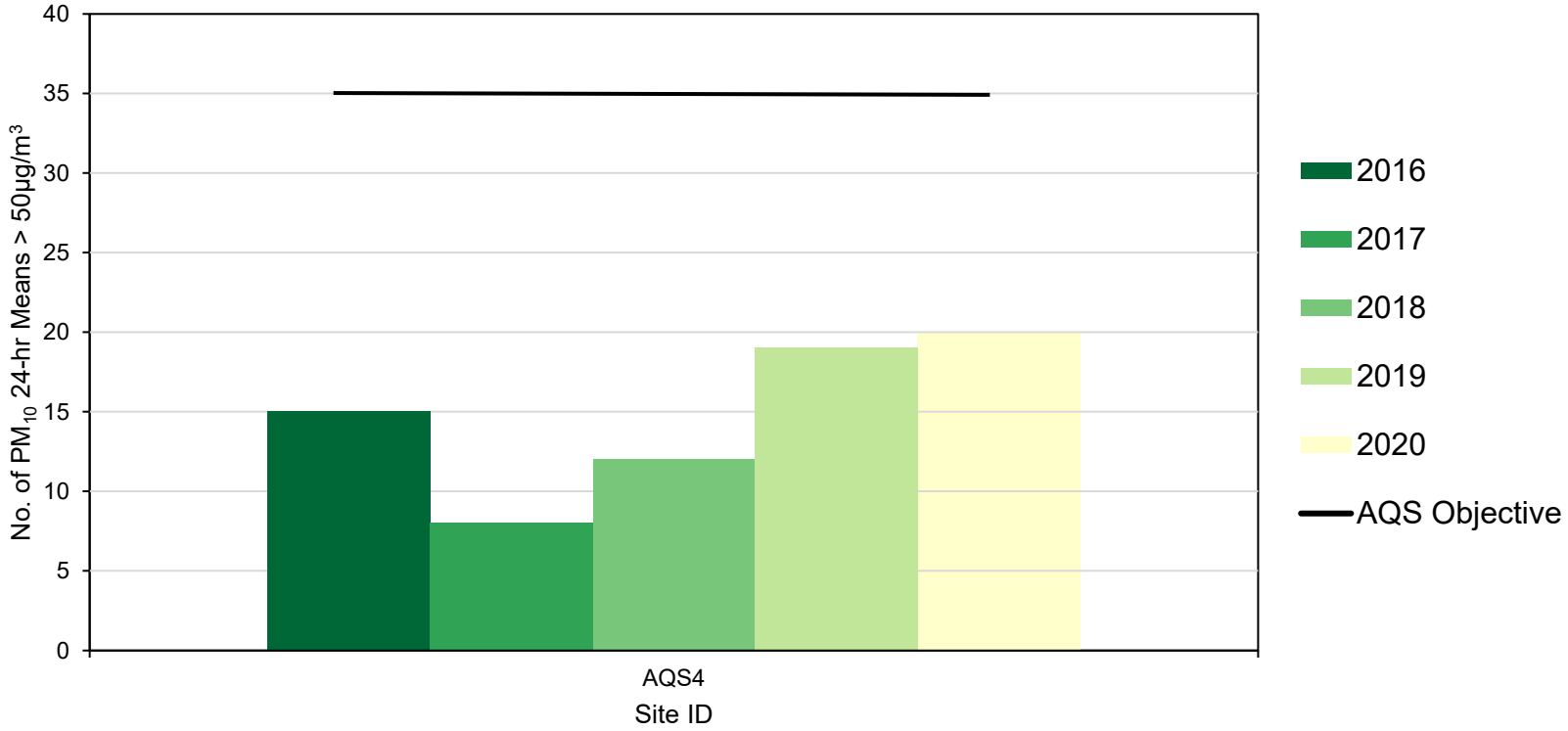


Table A.8 – Annual Mean $PM_{2.5}$ Monitoring Results (µg/m^3)

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2020 (%) (2)	2016	2017	2018	2019	2020
AQS2	409485	423430	Roadside	91	99	13	13	13	11	9.6
AQS3	398990	427210	Roadside	77	77	17	15	17	20	11.0

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

Notes:

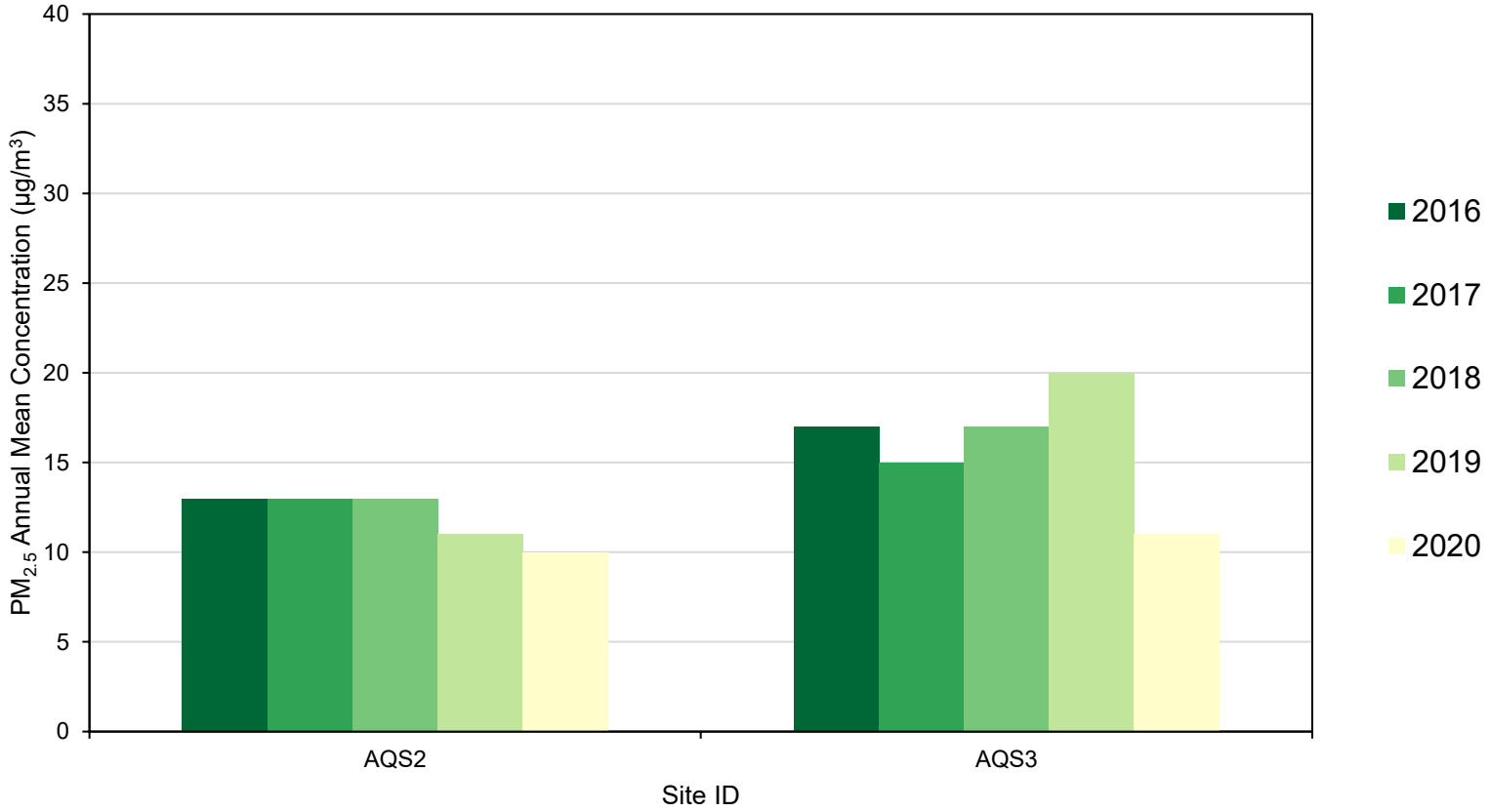
The annual mean concentrations are presented as µg/m^3.

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

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

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

Figure A.14 – Trends in Annual Mean $PM_{2.5}$ Concentrations



Appendix B: Full Monthly Diffusion Tube Results for 2020

Table B.1 – NO_2 2020 Diffusion Tube Results (µg/m^3)

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted (0.87)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
AQC1	409485	423431	38	40	44	23	25	36	33	21	45	46	56	55	38.5	33.5	-	
AQC2	409485	423431	41	40	40	25	26	35	31	18	41	47	53	54	37.6	32.7	-	
AQC3	409485	423431	36	38	37	24	27	35	30	21	44	49	55	48	37.0	32.2	-	
AQ21	409822	423167	61	57	52	32	34	42	39	17	52	58	77	72	49.4	**43.0**	38.5	
CRH1	409767	423011	43	51	54	27	38	48	38	24	-	50	54	59	44.2	38.4	-	
SB1	406135	423639	39	44	46	30	37	54	38	52	50	55	53	56	46.2	**40.2**	-	
SB3	405961	423571	35	31	36	31	32	50	29	51	47	45	54	54	41.3	35.9	-	
SB15	406707	423824	32	28	31	23	24	31	26	28	37	40	43	42	32.1	27.9	-	
SB16	406638	423836	24	33	36	29	29	42	26	41	39	41	45	45	35.8	31.2	-	
SB22	405823	423395	32	38	42	27	25	44	29	46	43	48	47	50	39.3	34.1	-	
SB-AQ	406075	423615	32	30	41	27	31	46	26	42	43	46	50	48	38.5	33.5	-	
HB6	399502	427041	30	37	26	19	21	28	27	17	35	36	41	41	29.8	26.0	-	
HQ1	398794	427237	51	56	44	27	35	43	44	23	50	54	54	49	44.2	38.4	-	
HQ9	399236	427176	32	34	35	22	23	37	22	37	35	45	44	46	34.3	29.9	-	
BS1 HB	398990	427210	34	29	34	22	26	34	24	34	36	45	45	46	34.1	29.7	-	
LF1	403810	424977	31	42	40	30	30	42	30	43	42	45	47	45	38.9	33.9	-	
LF2	403738	425110	33	30	26	20	21	29	23	27	32	39	42	41	30.3	26.3	-	
SC5	410823	426265	38	31	35	29	31	46	36	45	44	49	44	42	39.2	34.1	-	
LV-BRD	414683	423155	31	29	28	17	18	27	19	24	28	26	38	38	26.9	23.4	-	
WR2	415090	422817	36	47	38	21	25	33	26	28	33	44	49	46	35.5	30.9	-	
BH3	414671	422740	33	53	43	26	31	46	40	39	50	54	56	56	43.9	38.2	33.2	
BE4	414478	422692	29	40	45	22	22	29	38	38	47	50	52	51	38.6	33.6	-	
BE2	414385	422457	36	42	44	24	18	25	28	35	39	49	51	47	36.5	31.8	-	
HXR1	414218	422957	60	54	47	30	39	52	46	52	54	56	54	49	49.4	**43.0**	-	
HH-TC	412718	425556	23	28	29	18	21	30	22	31	33	36	47	40	29.8	26.0	-	
HH-1A	412593	425497	34	39	35	22	26	41	30	33	41	42	50	45	36.5	31.8	-	
HH-LT	412450	425435	44	60	47	18	35	44	44	45	52	54	60	59	46.8	**40.7**	-	
NB-NB1	409663	425740	35	49	42	24	32	40	37	37	46	55	-	48	40.5	35.2	-	
NB-GR	409957	425642	45	61	60	40	42	63	43	62	59	74	67	65	56.8	**49.4**	**42.4**	
LV-NBN	409715	425754	41	74	69	42	53	63	43	71	68	71	73	70	61.5	**53.5**	-	

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 (0.87)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
LV-NBS	409708	425737	20	33	45	24	31	39	33	42	48	48	55	51	39.1	34.0	-	
LV-NBX	409602	425797	42	39	45	27	31	41	39	42	45	49	50	50	41.7	36.3	-	
LV-SCA	405911	416597	43	21	46	25	31	37	38	38	49	47	49	39	38.6	33.6	-	
LV-SAA	411201	419429	24	53	28	15	16	23	18	23	29	30	34	34	27.3	23.7	-	
LV-AT	411533	419358	40	48	47	28	33	34	30	40	50	47	41	41	39.9	34.7	-	
LV-62W	416172	422282	25	34	36	25	26	37	29	36	39	47	42	43	34.9	30.4	-	
LV-62E	416717	422113	35	36	39	24	30	37	30	35	41	40	49	48	37.0	32.2	-	
LV-LEE	417698	420709	26	29	29	16	20	23	25	25	33	40	38	41	28.8	25.0	-	
LV-EWB	410104	421516	16	25	28	18	16	19	15	24	27	29	37	39	24.4	21.2	-	
NB-GL	410367	425975	46	59	55	35	44	61	51	58	56	65	62	64	54.7	**47.6**	29.4	
CL1	413261	420686	28	28	38	21	24	37	24	35	36	38	41	23	31.1	27.0	-	
HTAH	411494	419594	21	4	29	18	21	25	21	26	35	25	34	32	24.3	21.1	-	
AT-BR	411514	419548	23	30	18	15	14	21	20	21	29	26	34	31	23.5	20.4	-	
AT-MR	411581	419373	16	27	28	13	17	19	20	11	27	30	34	32	22.8	19.9	-	
AQ20	409483	423337	20	20	23	14	16	19	-	11	23	27	32	32	21.5	18.7	-	
WV-SR1	409598	421167	42	28	38	26	26	43	32	37	39	43	49	49	37.7	32.8	-	
WV-SR2	409608	421160	27	25	24	22	24	39	19	33	32	34	38	38	29.6	25.7	-	
MY01	401431	425995	55	54	48	24	22	38	32	39	42	46	47	44	40.9	35.6	-	
MY02	401275	426046	49	22	25	13	11	15	14	16	19	21	29	25	21.6	18.8	-	
MY03	401204	426041	47	47	48	32	29	35	32	38	41	41	48	42	40.0	34.8	-	
MY-04	401059	426179	45	29	27	19	18	23	19	23	25	25	36	35	27.0	23.5	-	
MY-05	401040	426186	39	32	36	22	20	25	20	23	28	30	36	32	28.6	24.9	-	
TD01	393822	424166	-	-	-	-	-	-	19	-	-	-	-	-	-	-	-	
SB23	405701	423223	-	-	-	-	-	-	19	-	-	33	36	38	31.5	23.4	-	

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

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

☒ **Local bias adjustment factor used.**

☐ **National bias adjustment factor used.**

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

☒ **Calderdale confirm that all 2020 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 Calderdale During 2020

The Council have identified the following (ranging from planning applications to new access routes) as having the potential to impact air quality:

- *Planning Applications:* 18/01544/FUL and 20/00217/FUL – alterations to A629 south of Salterhebble, Halifax and Phase 2 for Halifax Town.
- *Access Routes:* Opening of a new bridge at A646 Mytholmroyd as part of works to repair damage from 2015 and 2020 flooding, easing traffic congestion around the construction site.

Additional Air Quality Works Undertaken by Calderdale During 2020

The Council's libraries continue to develop and deliver the 'Something in the Air?' project, which is a community project aimed at educating people on the impacts of air pollution. By having a greater understanding of the issue, individuals are more likely to act. Therefore, the building and delivery of this project is an indication of additional work that is being undertaken in an attempt to improve air quality not just in the designated AQMAs, but also across the wider Calderdale area.

QA/QC of Diffusion Tube Monitoring

The diffusion tubes are supplied and analysed by SOCOTEC Didcot using the 50% in triethanolamine (TEA) in acetone preparation method. For the 2020 reporting year, based on 24 studies, a national bias adjustment factor of 0.76 was derived from the national bias adjustment calculator spreadsheet (version number 09/21).

SOCOTEC Didcot, a UKAS accredited laboratory, participate in the AIR-PT scheme for NO_2 diffusion tube analysis and the Annual Field Intercomparison Exercise. These provide

strict criteria relating to performance that participating laboratories must meet, thereby ensuring that the reported NO_2 concentrations are of a high calibre. In the latest AIR-PT results, AIR-PT AR036 (January – February 2020) and AIR-PT AR040 (September – October 2020), SOCOTEC were awarded a score of 100% - the percentage score is an indication of the results deemed satisfactory based upon the z-score of < ±2. The AIR-PT rounds from May – June (AR037) were however cancelled as a result of the COVID-19 pandemic. For all observations in 2020, the precision of the NO_2 diffusion tubes supplied by SOCOTEC Didcot was classified as 'good'. The precision is an indication of the laboratory's performance and consistency in both the preparation, analysis and handling of the diffusion tubes. All diffusion tubes were collected in line with the monitoring calendar.

Diffusion Tube Annualisation

Annualisation was required for one non-automatic monitoring site (SB23) during 2020. The annualisation was carried out by calculating an annualisation factor using background concentrations from the three closest automatic background monitoring sites to Calderdale; Dewsbury Ashworth Grove, Leeds Centre and Manchester Piccadilly.

Results of the calculations completed are presented in Table C.2.

Diffusion Tube Bias Adjustment Factors

The diffusion tube data presented within the 2020 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.TG16 provides guidance with regard to the application of a bias adjustment factor to correct diffusion tube monitoring. Triplicate co-location studies can be used to determine a local bias factor based on the comparison of diffusion tube results with data taken from NO_x/NO_2 continuous analysers. Alternatively, the national database of diffusion tube co-location surveys provides bias factors for the relevant laboratory and preparation method.

The Council runs a co-location study at Huddersfield Road (AQS2), where the diffusion tubes (AQC1, AQC2 and AQC3) are co-located within 30cm of the monitor inlet. During 2020, as per LAQM.TG16 guidance the overall data capture of both the continuous monitoring station and the diffusion tubes was good. Therefore, the bias adjustment factor used in this report (0.87) is derived from this local study, instead of from the national factor.

A summary of bias adjustment factors used by the Council over the past five years is presented in Table C.1.

Table C.1 – Bias Adjustment Factor

Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2020	Local	-	0.87
2019	National	03/19	0.80
2018	National	03/18	0.78
2017	Local	-	0.80
2016	Local	-	0.84

NO_2 Fall-off with Distance from the Road

Wherever possible, local authorities should ensure that monitoring locations are representative of exposure. However, where this is not possible, the NO_2 concentration at the nearest location relevant for exposure should be estimated using the NO_2 fall-off with distance methodology. Where appropriate, annual mean NO_2 concentrations corrected for distance are presented in Table B.1.

The annual mean NO_2 concentration was corrected for distance to relevant exposure at six diffusion tube sites. These diffusion tubes were subject to fall-off with distance correction as the annual mean concentration was greater than 36µg/m^3 and the monitoring site is not located at a point of relevant exposure.

Table C.4. presents the fall-off with distance calculations for the six diffusion tube sites.

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. Prior to September 2020, each site was visited every two weeks by the Council's staff to routinely monitor and detect any faults whilst checking the instrument nitrogen oxide span and zeros. Staff were trained to change the BAM tapes and clean the inlet nozzle between services. However, since September 2020 this duty is now being performed by a contractor.

Data from all three automatic monitoring sites is collected using WinAQMS and Airodis software, then checked for erroneous readings and backed up to the 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's 2020 automatic air quality monitoring sites' data has been ratified by Air Quality Data Management (AQDM) to the LAQM.TG(16) 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 during routine checks). Similarly, a period of known instrument faults is also removed. Once the data is in a suitable format, it can be imported into the open source software package "openair". The Council has chosen to use "openair" primarily due to the range of analysis tools and ease of data manipulation.

Automatic Monitoring Annualisation

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

NO_2 Fall-off with Distance from the Road

Wherever possible, local authorities should ensure that monitoring locations are representative of exposure. However, where this is not possible, the NO_2 concentration at the nearest location relevant for exposure should be 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 2020.

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

Site ID	Annualisation Factor Dewsbury Ashworth Grove	Annualisation Factor Leeds Centre	Annualisation Factor Manchester Piccadilly	Annualisation Factor Site 4	Average Annualisation Factor	Raw Data Annual Mean	Annualised Annual Mean	Comments
SB23	0.7839	0.8608	0.9137	-	0.8528	31.5	26.9	

Table C.3 – Local Bias Adjustment Calculation

	Local Bias Adjustment Input 1
Periods used to calculate bias	11
Bias Factor A	0.87 (0.78 – 1)
Bias Factor B	14% (0% - 28%)
Diffusion Tube Mean (µg/m^3)	36.4
Mean CV (Precision)	4.7%
Automatic Mean (µg/m^3)	31.8
Data Capture	100%
Adjusted Tube Mean (µg/m^3)	32 (28 – 36)

Notes:

A single local bias adjustment factor has been used to bias adjust the 2020 diffusion tube results.

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

Site ID	Distance (m): Monitoring Site to Kerb	Distance (m): Receptor to Kerb	Monitored Concentration (Annualised and Bias Adjusted	Background Concentration	Concentration Predicted at Receptor	Comments
AQ21	2.0	4.0	43.0	15.1	*38.5*	*Predicted concentration at Receptor within 10% of the AQS objective*
BH3	1.5	4.5	38.2	17.5	33.2	
NB-GR	3.0	7.0	49.4	17.5	**42.4**	*Predicted concentration at Receptor above the AQS objective*
LV-NBN	1.0	-	53.5	17.5	-	
LV-NBX	1.0	-	36.3	17.5	-	
NB-GL	2.0	19.0	47.6	13.2	29.4	

Appendix D: Maps of Monitoring Locations and AQMAs

Figure D.1 – Map of Non-Automatic & Automatic Monitoring Sites in Salterhebble (AQMA No. 1)

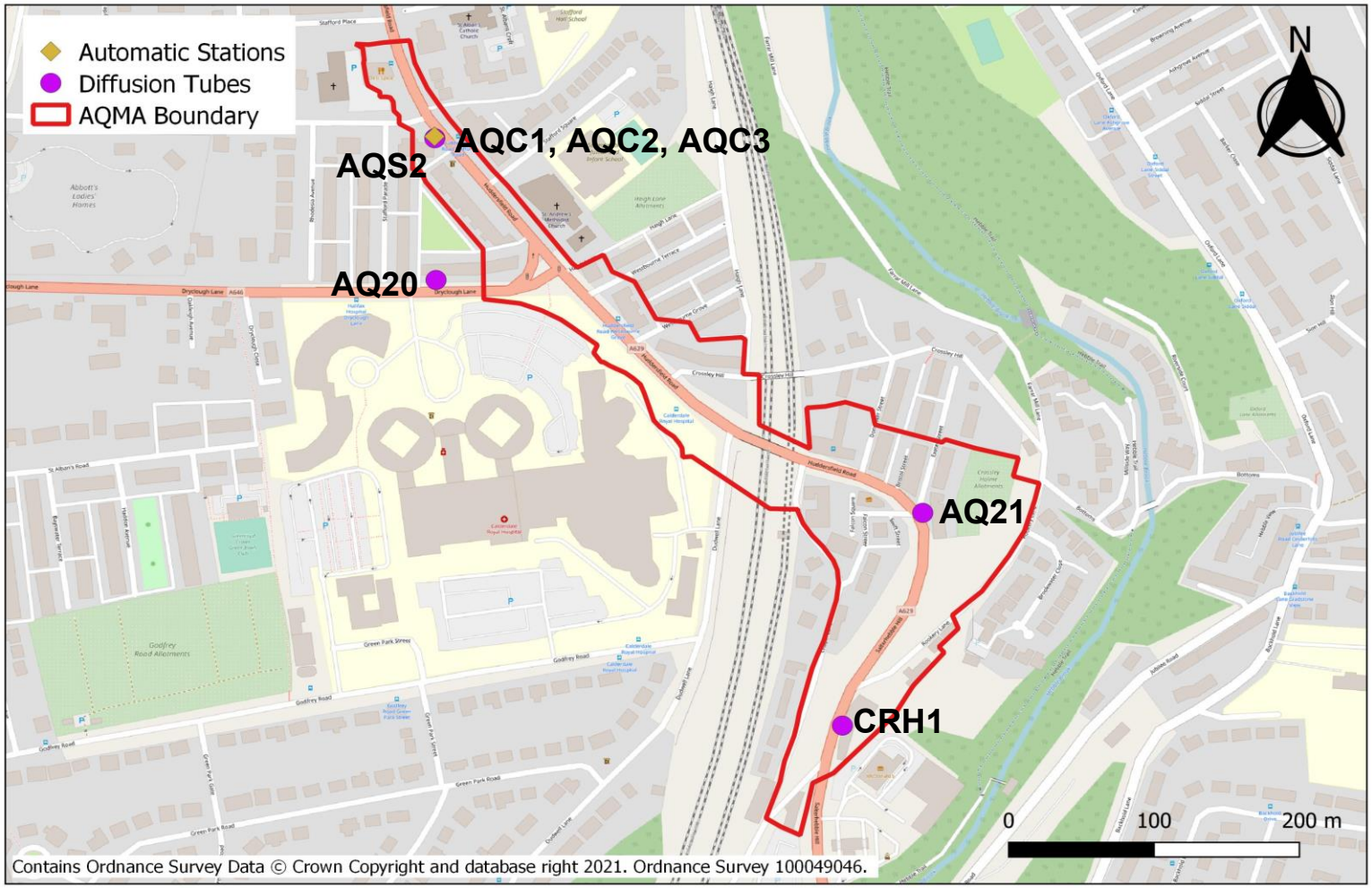


Figure D.2 – Map of Non-Automatic & Automatic Monitoring Sites in Sowerby Bridge (AQMA No. 2)

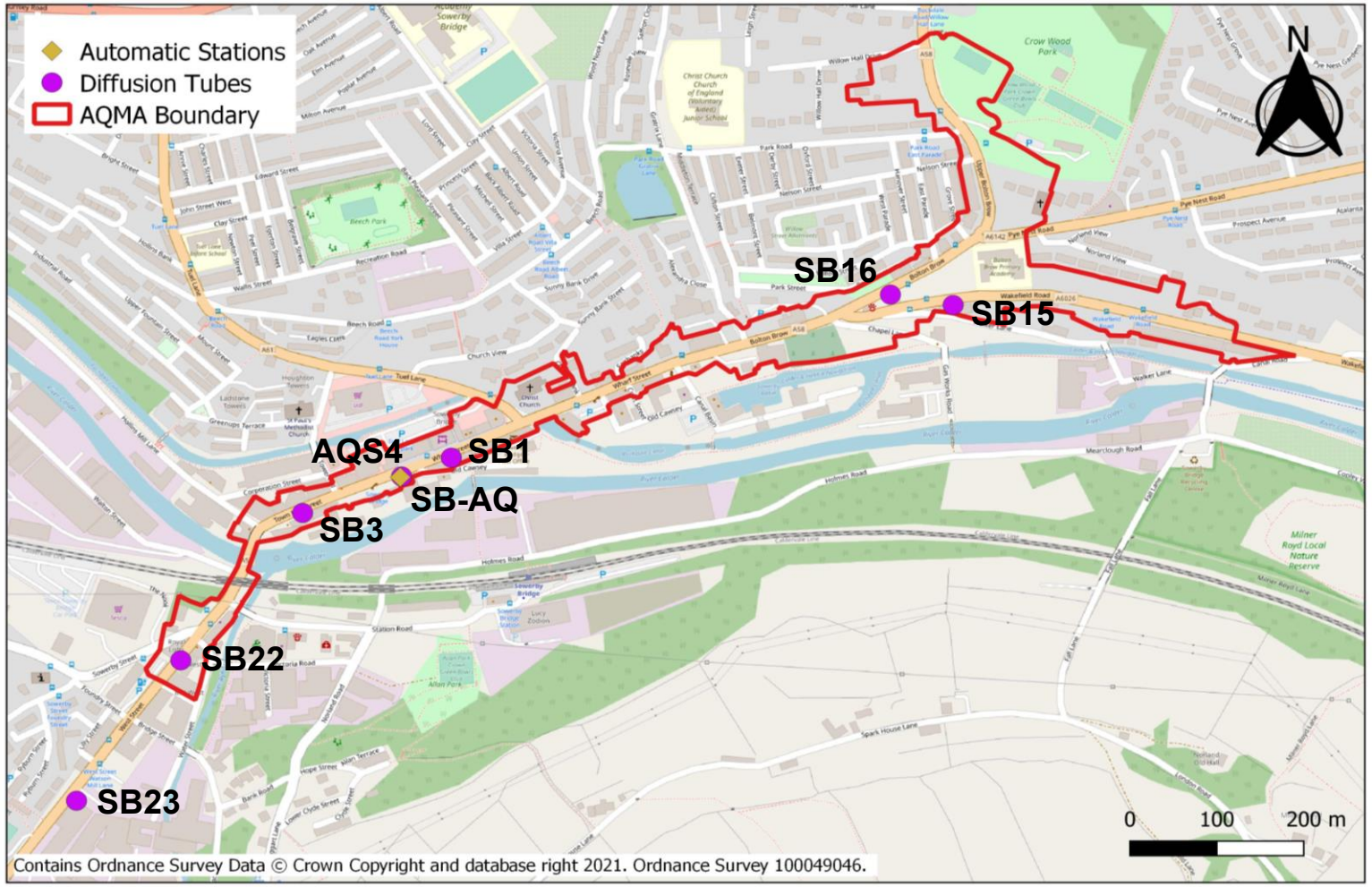


Figure D.3 – Map of Non-Automatic & Automatic Monitoring Sites in Hebden Bridge (AQMA No. 3)

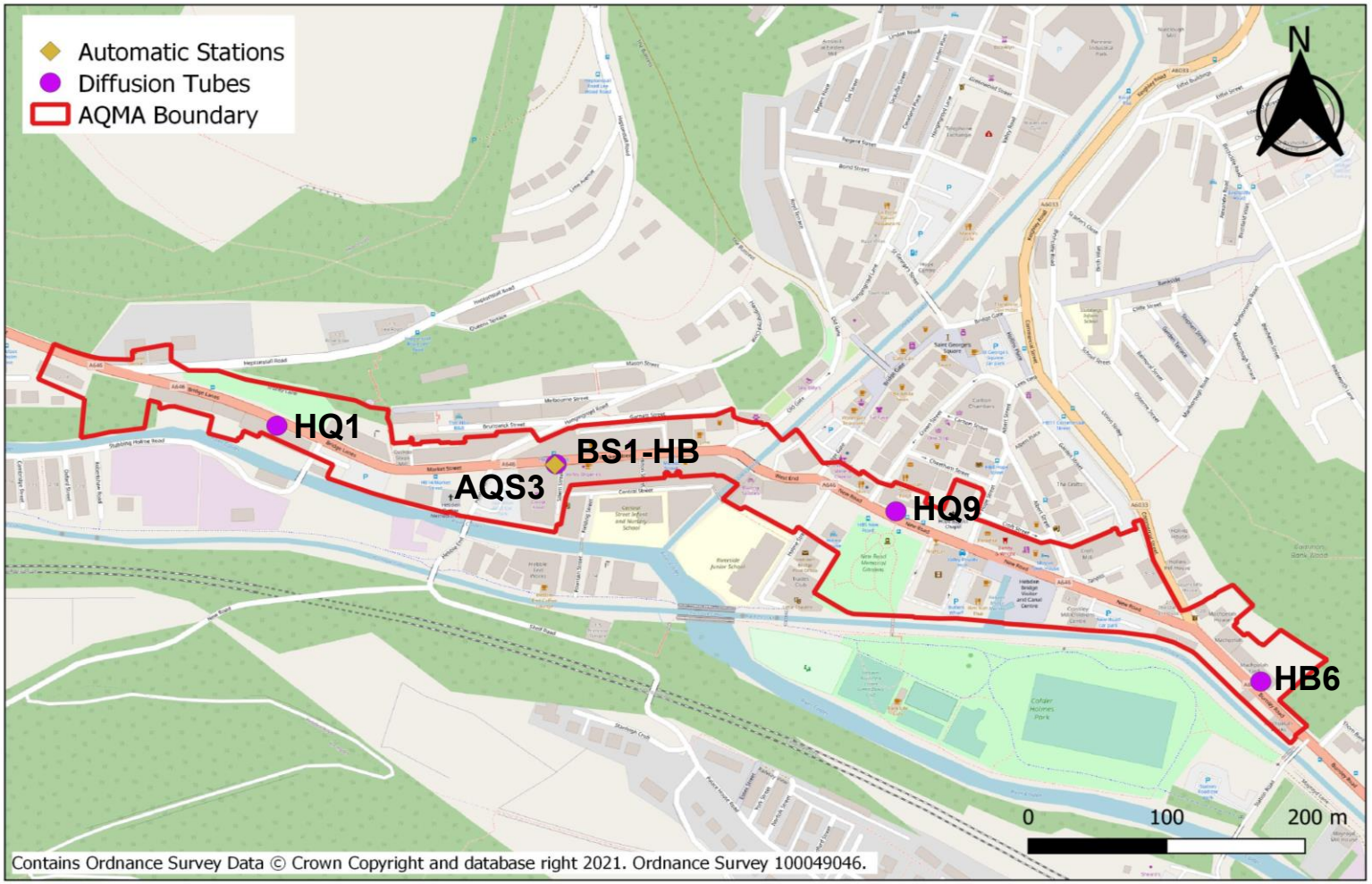


Figure D.4 – Map of Non-Automatic Monitoring Sites in Luddendenfoot (AQMA No. 4)

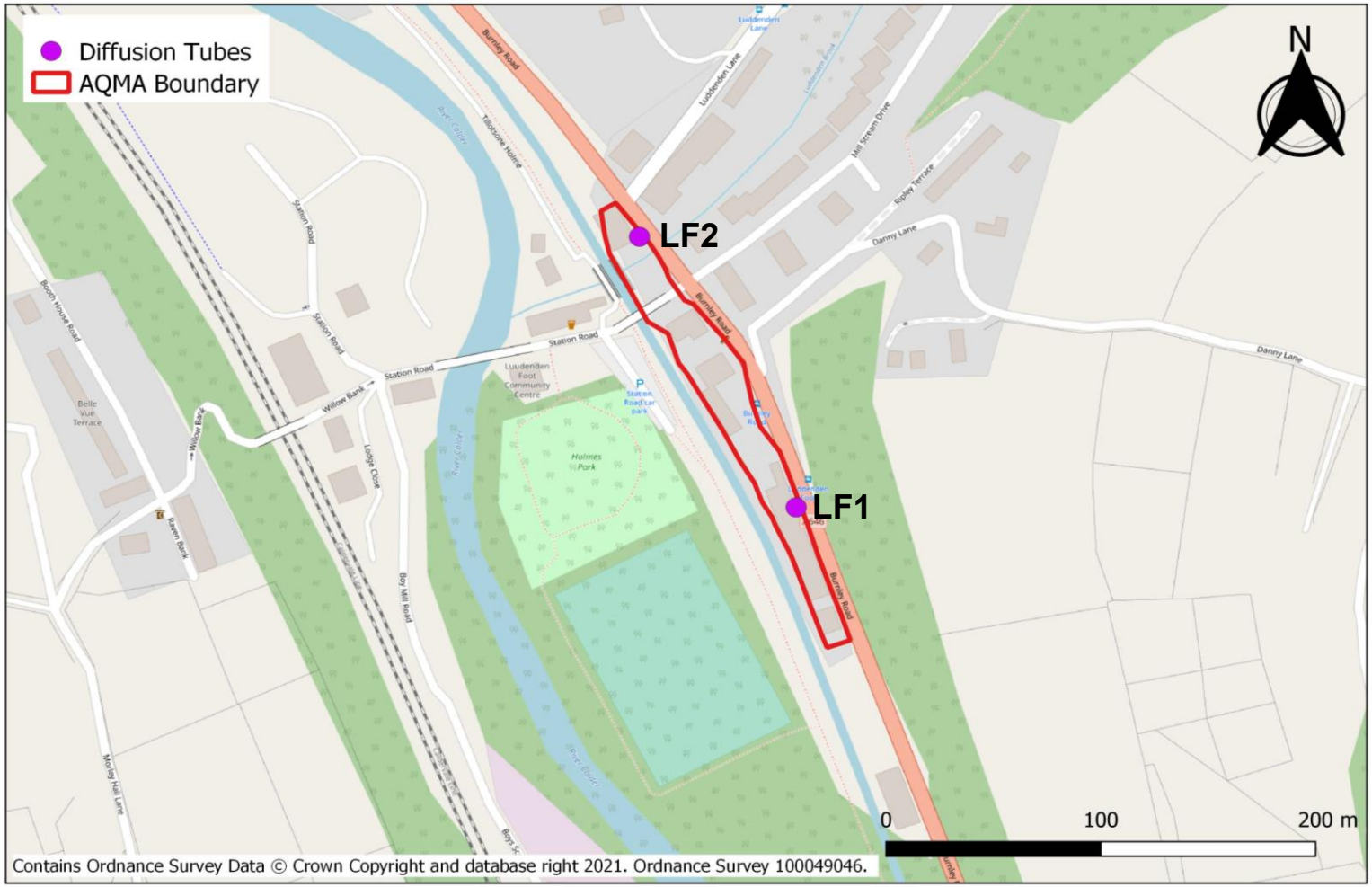


Figure D.5 – Map of Non-Automatic Monitoring Sites in Stump Cross (AQMA No. 5) & New Bank (AQMA No. 8)

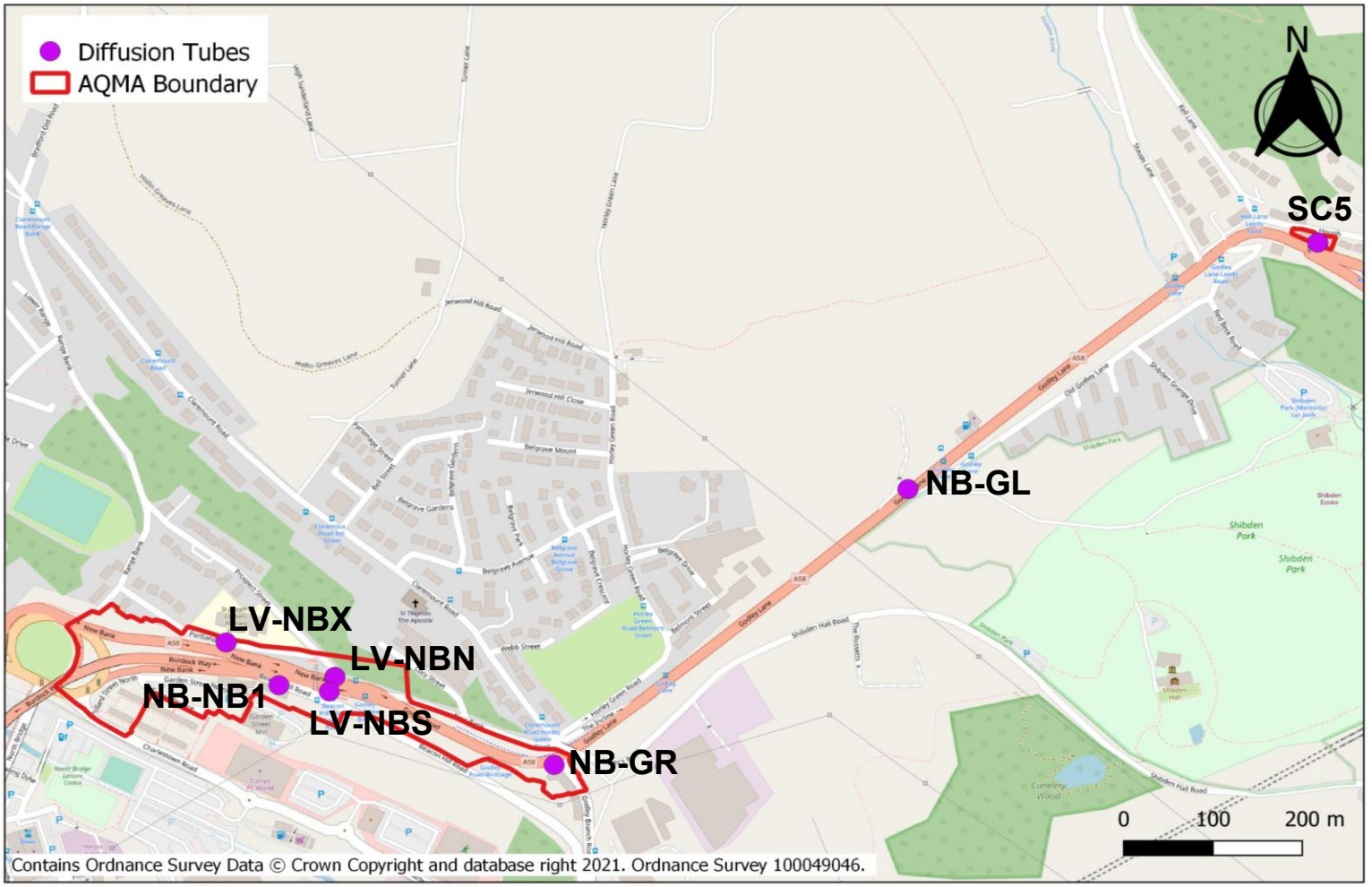


Figure D.6 – Map of Non-Automatic Monitoring Sites in Brighouse (AQMA No. 6)

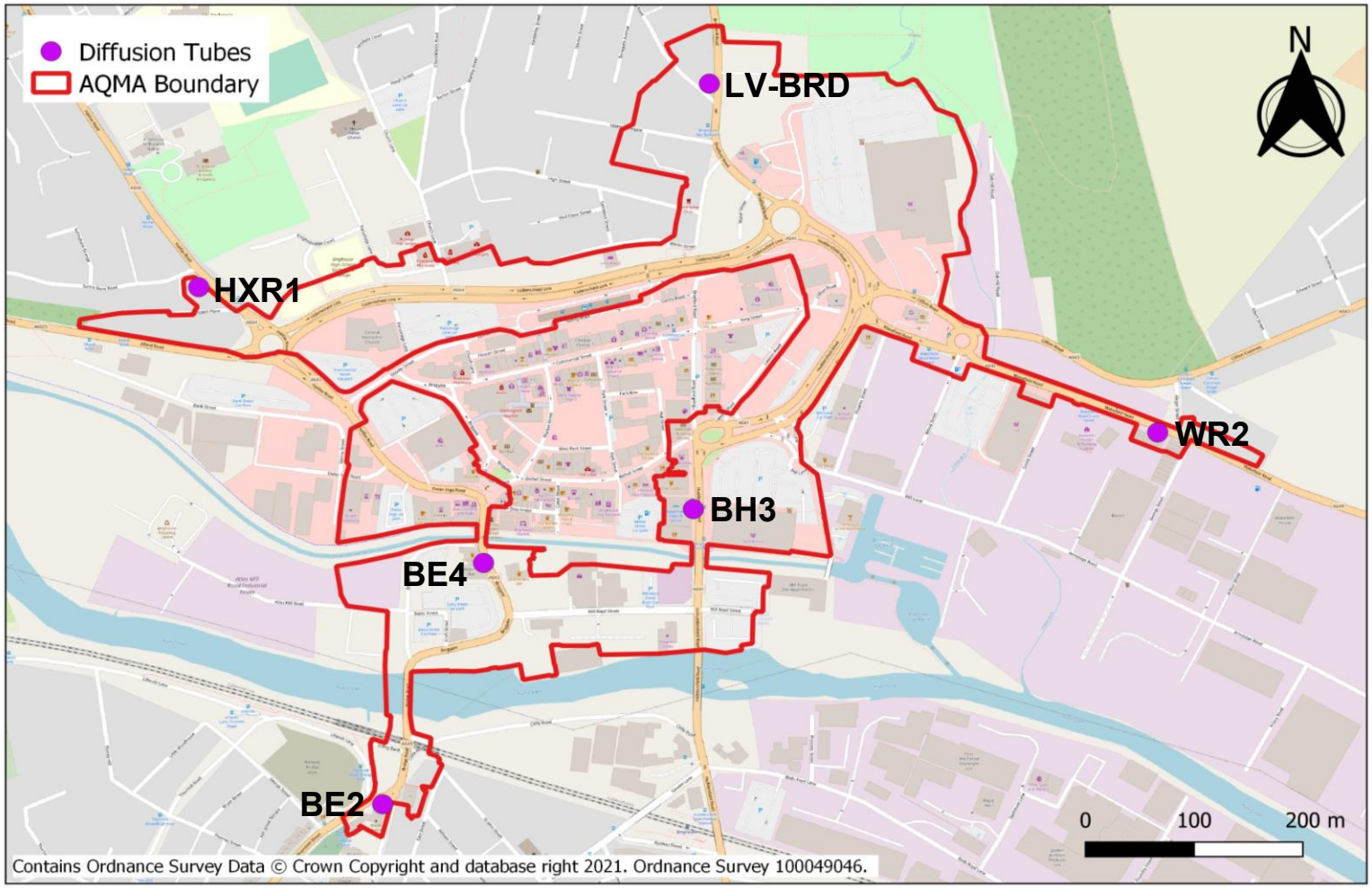


Figure D.7 – Map of Non-Automatic Monitoring Sites in Hipperholme (AQMA No. 7)

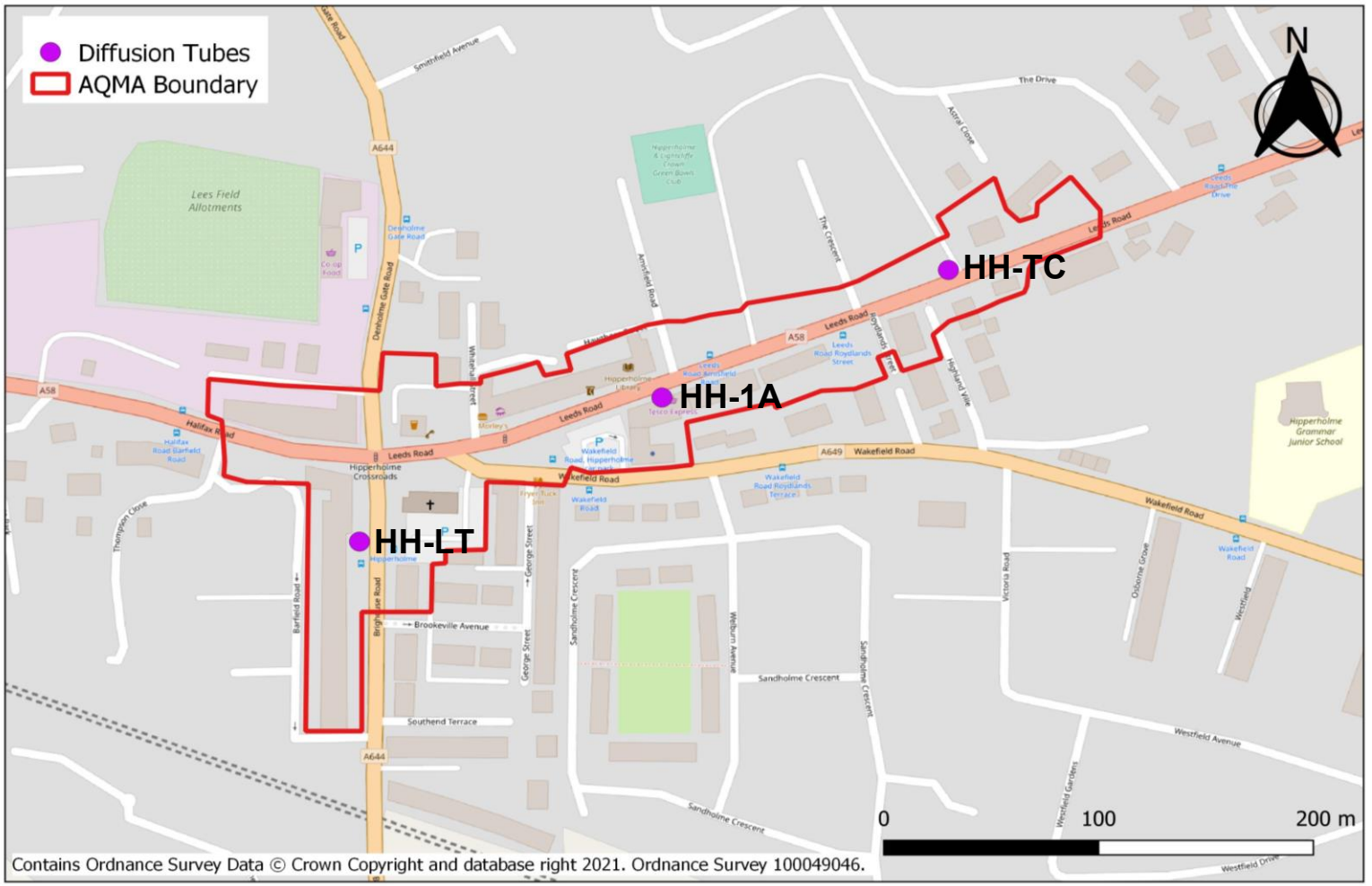


Figure D.8 – Map of Non-Automatic Monitoring Sites in Mytholmroyd

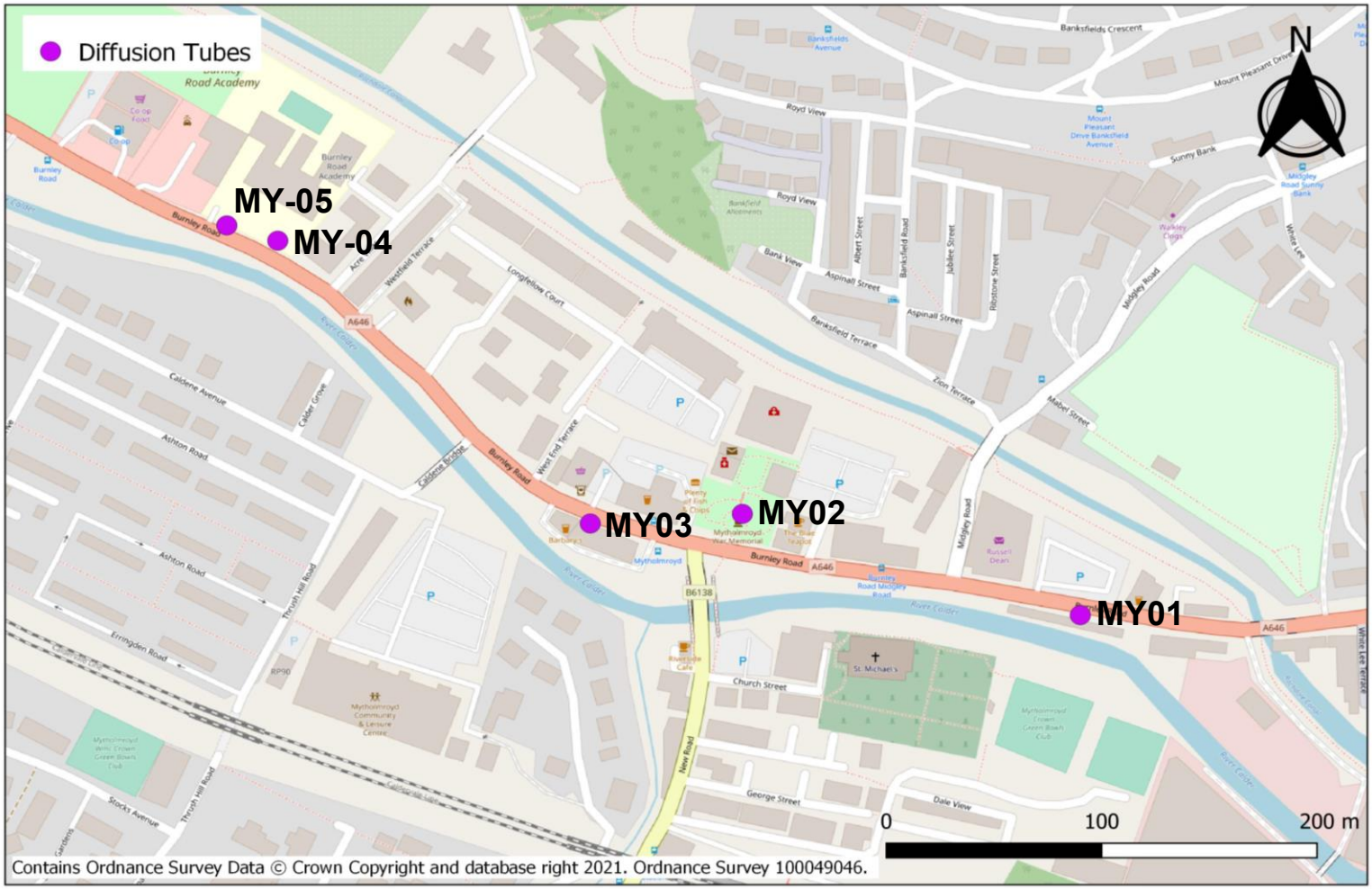


Figure D.9 – Map of Non-Automatic Monitoring Sites in West Vale, Ainley Top & Rastrick

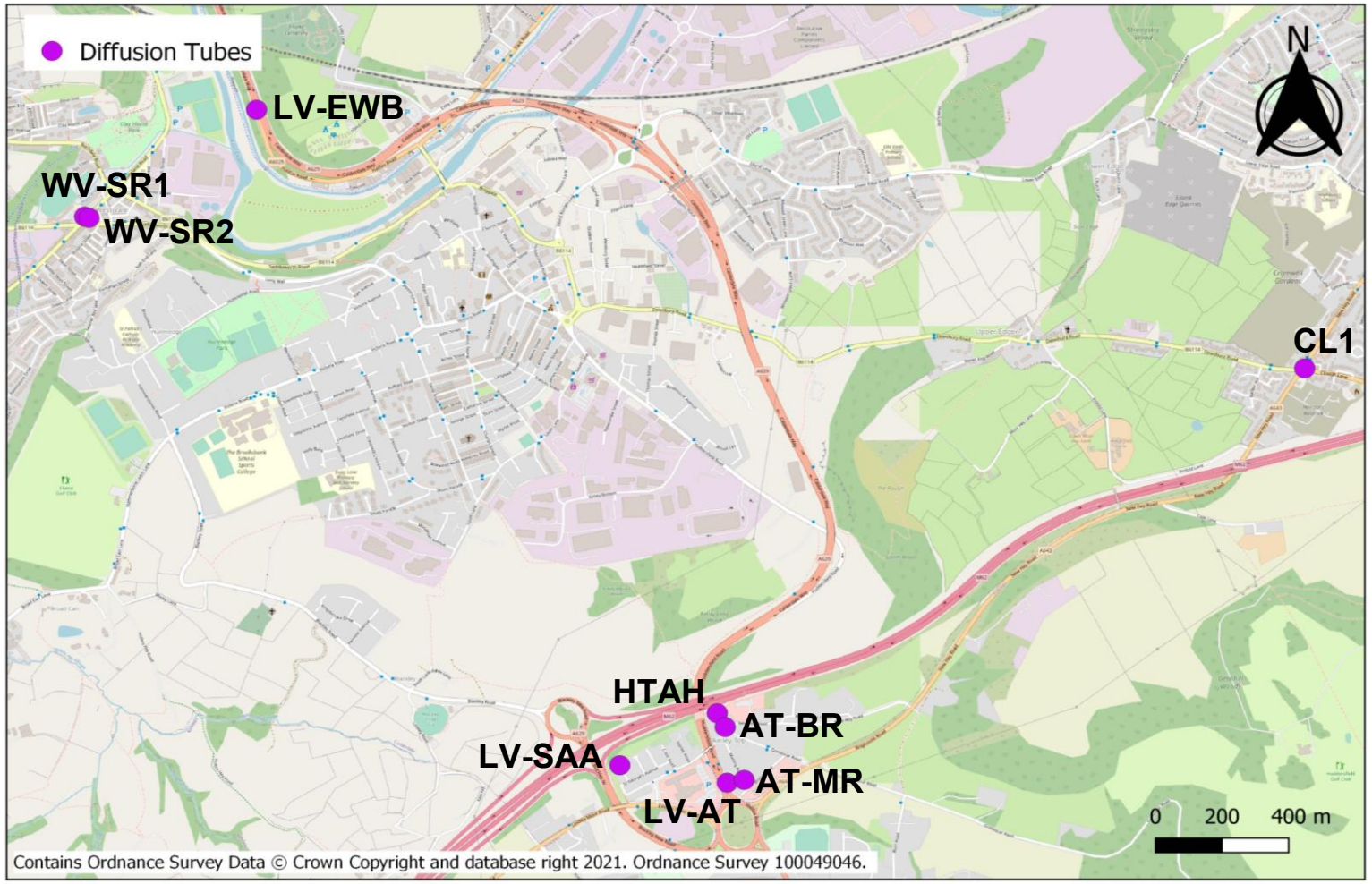


Figure D.10 – Map of Non-Automatic Monitoring Sites in Brighouse South & Cooper Bridge

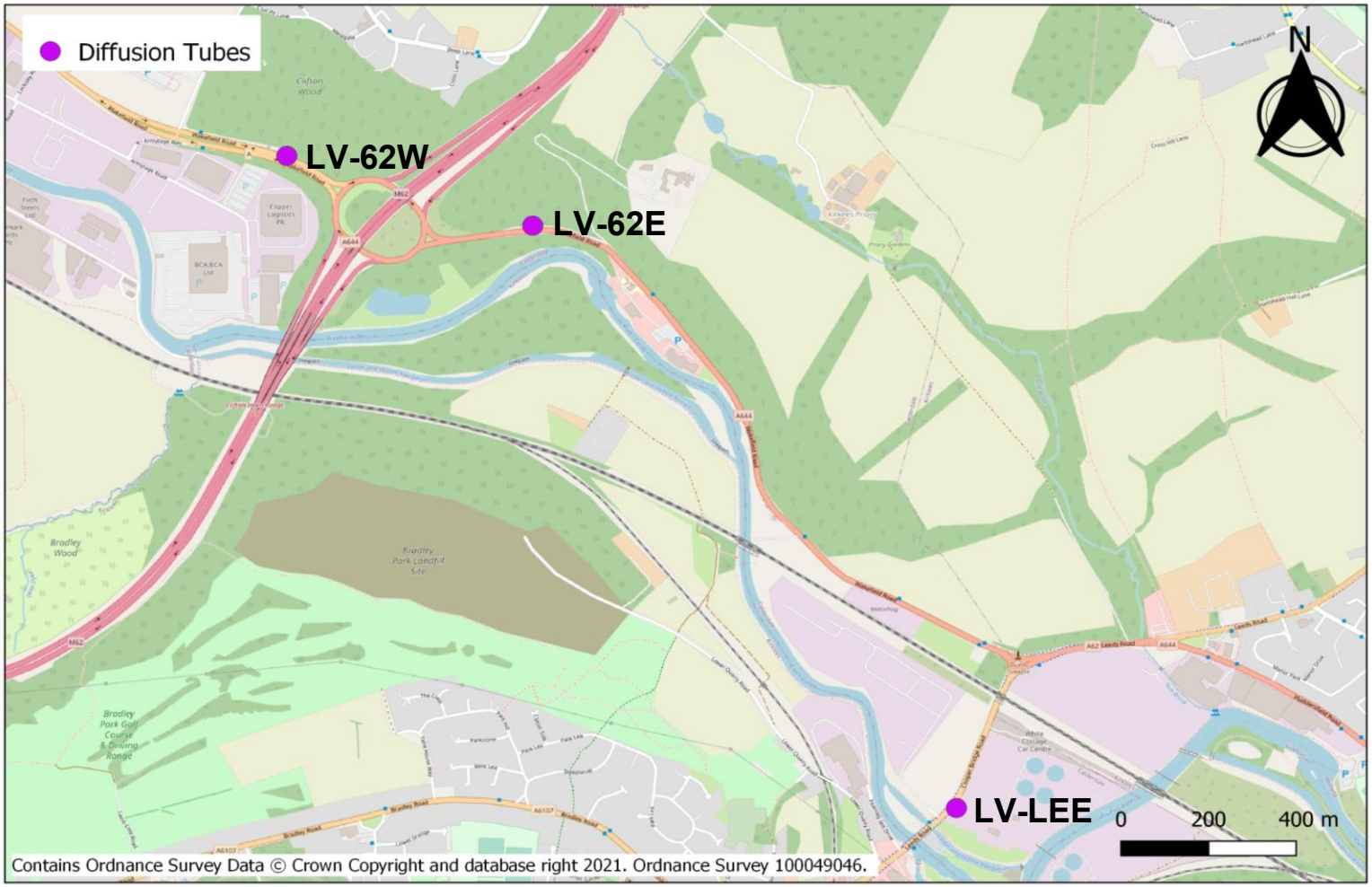


Figure D.11 – Map of Non-Automatic Monitoring Sites in Todmorden

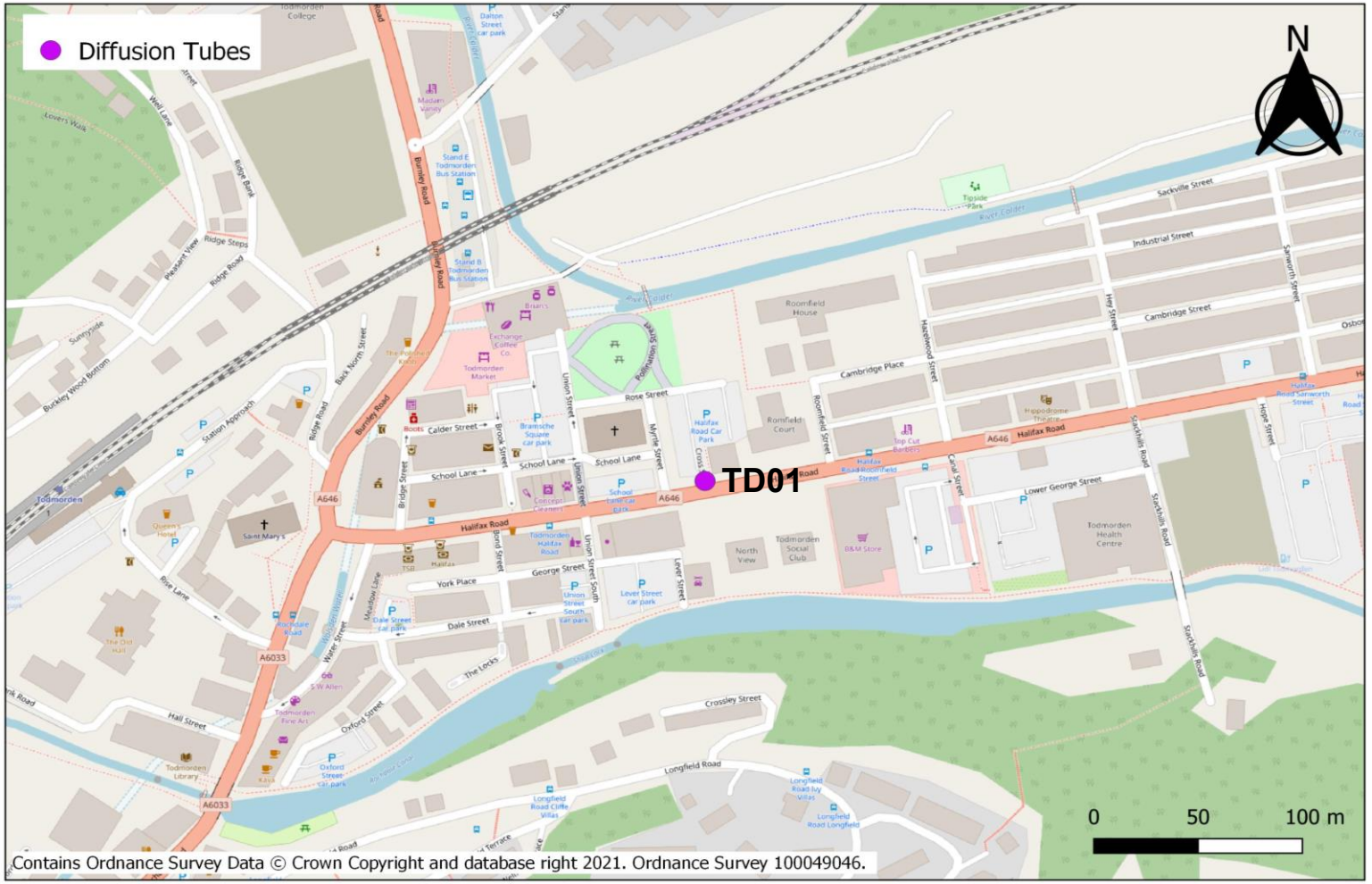


Figure D.12 – Map of Non-Automatic Monitoring Stations in Scammonden

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).

Appendix F: Impact of COVID-19 upon LAQM

COVID-19 has had a significant impact on society. Inevitably, COVID-19 has also had an impact on the environment, with implications to air quality at local, regional and national scales.

COVID-19 has presented various challenges for Local Authorities with respect to undertaking their statutory LAQM duties in the 2021 reporting year. Recognising this, Defra provided various advice updates throughout 2020 to English authorities, particularly concerning the potential disruption to air quality monitoring programmes, implementation of Air Quality Action Plans (AQAPs) and LAQM statutory reporting requirements. Defra has also issued supplementary guidance for LAQM reporting in 2021 to assist local authorities in preparing their 2021 ASR. Where applicable, this advice has been followed.

Despite the challenges that the pandemic has given rise to, the events of 2020 have also provided Local Authorities with an opportunity to quantify the air quality impacts associated with wide-scale and extreme intervention, most notably in relation to emissions of air pollutants arising from road traffic. The vast majority (>95%) of AQMAs declared within the UK are related to road traffic emissions, where attainment of the annual mean objective for nitrogen dioxide (NO_2) is considered unlikely. On 23rd March 2020, the UK Government released official guidance advising all members of public to stay at home, with work-related travel only permitted when absolutely necessary. During this initial national lockdown (and to a lesser extent other national and regional lockdowns that followed), marked reductions in vehicle traffic were observed; Department for Transport (DfT) data[9] suggests reductions in vehicle traffic of up to 70% were experienced across the UK by mid-April, relative to pre COVID-19 levels.

This reduction in travel in turn gave rise to a change of air pollutant emissions associated with road traffic, i.e. nitrous oxides (NO_x), and exhaust and non-exhaust particulates (PM). The Air Quality Expert Group (AQEG)[10] has estimated that during the initial lockdown period in 2020, within urbanised areas of the UK reductions in NO_2 annual mean concentrations were between 20 and 30% relative to pre-pandemic levels, which

[9] Prime Minister's Office, COVID-19 briefing on the 31st of May 2020

[10] Air Quality Expert Group, Estimation of changes in air pollution emissions, concentrations and exposure during the COVID-19 outbreak in the UK, June 2020

represents an absolute reduction of between 10 to 20µg/m^3 if expressed relative to annual mean averages. During this period, changes in $PM_{2.5}$ concentrations were less marked than those of NO_2. $PM_{2.5}$ concentrations are affected by both local sources and the transport of pollution from wider regions, often from well beyond the UK. Through analysis of AURN monitoring data for 2018-2020, AQEG have detailed that $PM_{2.5}$ concentrations during the initial lockdown period are of the order 2 to 5µg/m^3 lower relative to those that would be expected under business-as-usual conditions.

As restrictions are gradually lifted, the challenge is to understand how these air quality improvements can benefit the long-term health of the population.

Impacts of COVID-19 and Flooding on Air Quality within Calderdale

During 2020, the average annual mean concentration of NO_2 across the entire diffusion tube network was 11% lower than that in 2019. This reduction is significantly greater than that seen between 2018 and 2019 (8%), and is likely reflective of the reduced level of vehicle activity during the COVID-19 lockdown period. Indeed, Calderdale was subject to both national and local lockdowns from March to December 2020. However, despite the reduced level of vehicle activity that results from the lockdown restrictions, the NO_2 annual mean objective was still exceeded within four AQMAs. Following distance correction, the greatest overall exceedance was in AQMA No. 8 New Bank, with diffusion tube NB-GR recording an NO_2 annual mean of 42.4µg/m^3.

In addition to the impact of the travel restrictions that the COVID-19 pandemic presented, Calderdale experienced a period of flooding which resulted in the closure of A6025. This road remained closed for the remainder of 2020 and, as a result, vehicles were diverted along Halifax Road, Brighouse.

Opportunities Presented by COVID-19 upon LAQM within Calderdale

No specific LAQM related opportunities have arisen as a consequence of the COVID-19 pandemic within Calderdale. However, a suggestion can be made that the implementation of the Council's 'School Streets' project was given greater motivation and became even

more necessary during the COVID-19 restrictions[11]. For example, the measures initially intended to reduce pollution facilitated social distancing outside of the school grounds. Therefore, the COVID-19 pandemic provided extra motivation to implement the 'School Streets' project to simultaneously control air pollution and the spread of COVID-19.

Challenges and Constraints Imposed by COVID-19 upon LAQM within Calderdale

The COVID-19 pandemic has presented multiple challenges and constraints upon LAQM within Calderdale. The planned initiative to reduce air pollution that were impacted primarily relate to reduce emissions from road transport. For example, the Zero Emission Bus Roadmap was halted due to financial pressures facing the bus companies and the promotion of car sharing was halted in response to social distancing measures.

Prior to the impact of COVID-19 national and regional lockdowns, Calderdale suffered extensive flooding in February 2020. Owing to the delay in the implementation of these measures as a result of both the COVID-19 pandemic and flooding of the area, the overall impact is deemed small in line with the matrix of Table F1.

[11] Calderdale Gov, School Streets Initiative, 2021

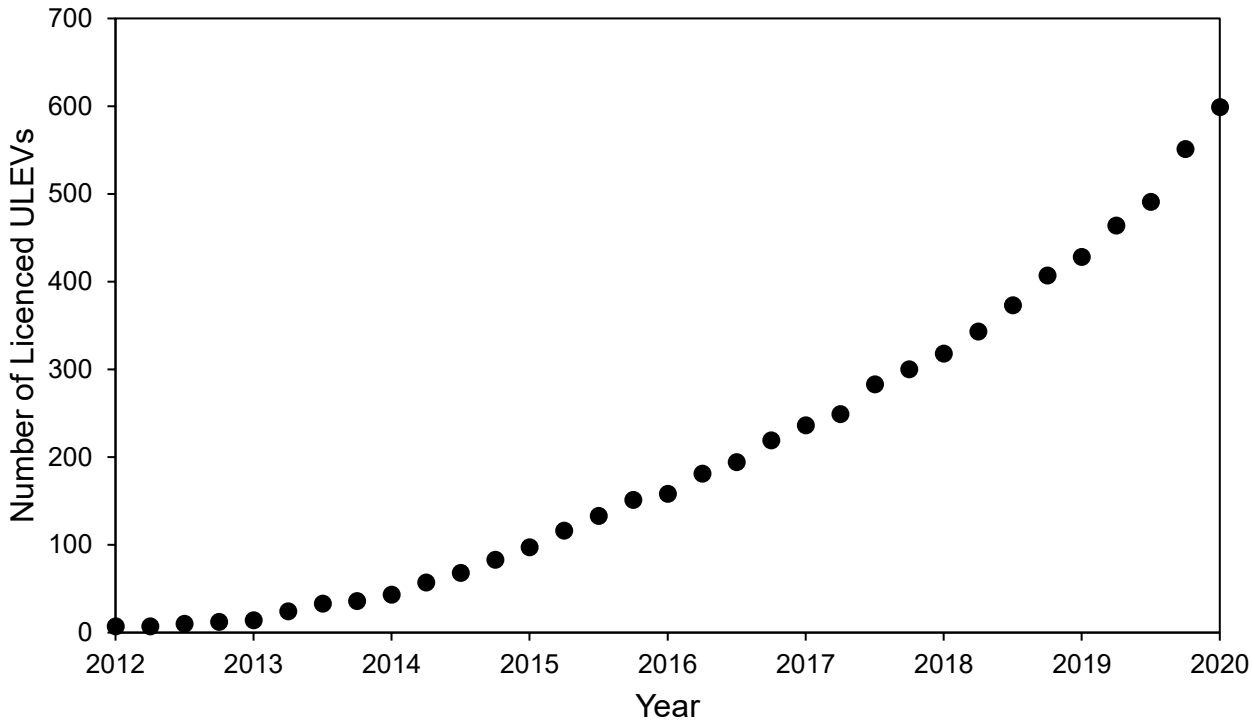
Table F.1 – Impact Matrix

Category	Impact Rating: None	Impact Rating: Small	Impact Rating: Medium	Impact Rating: Large
Automatic Monitoring – Data Capture (%)	More than 75% data capture	50 to 75% data capture	25 to 50% data capture	Less than 25% data capture
Automatic Monitoring – QA/QC Regime	Adherence to requirements as defined in LAQM.TG16	Routine calibrations taken place frequently but not to normal regime. Audits undertaken alongside service and maintenance programmes	Routine calibrations taken place infrequently and service and maintenance regimes adhered to. No audit achieved	Routine calibrations not undertaken within extended period (e.g. 3 to 4 months). Interruption to service and maintenance regime and no audit achieved
Passive Monitoring – Data Capture (%)	More than 75% data capture	50 to 75% data capture	25 to 50% data capture	Less than 25% data capture
Passive Monitoring – Bias Adjustment Factor	Bias adjustment undertaken as normal	<25% impact on normal number of available bias adjustment colocation studies (2020 vs 2019)	25-50% impact on normal number of available bias adjustment studies (2020 vs 2019)	>50% impact on normal number of available bias adjustment studies (2020 vs 2019) and/or applied bias adjustment factor studies not considered representative of local regime
Passive Monitoring – Adherence to Changeover Dates	Defra diffusion tube exposure calendar adhered to	Tubes left out for two exposure periods	Tubes left out for three exposure periods	Tubes left out for more than three exposure periods
Passive Monitoring – Storage of Tubes	Tubes stored in accordance with laboratory guidance and analysed promptly.	Tubes stored for longer than normal but adhering to laboratory guidance	Tubes unable to be stored according to be laboratory guidance but analysed prior to expiry date	Tubes stored for so long that they were unable to be analysed prior to expiry date. Data unable to be used
AQAP – Measure Implementation	Unaffected	Short delay (<6 months) in development of a new AQAP, but is on-going	Long delay (>6 months) in development of a new AQAP, but is on-going	No progression in development of a new AQAP
AQAP – New AQAP Development	Unaffected	Short delay (<6 months) in development of a new AQAP, but is on-going	Long delay (>6 months) in development of a new AQAP, but is on-going	No progression in development of a new AQAP

Appendix G: ULEVs and EVs in Calderdale

At the end of 2020, a total of 113,176 licenced vehicles of all body types were registered in Calderdale[12]. Of these, a small proportion are ultra-low emission vehicles (ULEVs); defined as any road vehicle which emits less than 75 grams of CO_2 per kilometre[13]. For example, in Q4 of 2020 the number of ULEVs was 599[14]; equating to a 0.5% share of the total fleet in Calderdale. Therefore, owing to the relatively small proportion of vehicles, it is evident that the number of ULEVs in Calderdale needs to increase. Indeed, there is evidence that the number of ULEVs is growing with an exponential trend observed (Figure G.1). However, despite this upward trajectory, it is apparent that this growth needs to be sustained and there needs to be a significant increase in ULEVs to have a noticeable impact on the level of air pollution.

Figure G.1 – Number of Licenced ULEVs in Calderdale



[12] Department for Transport. VEH0105 – Licenced vehicles at the end of the year by body type and upper and lower tier local authority. September 2021.

[13]Vehicle Certification Agency. New car fuel consumption & emission figures – zero and ultra-low emission vehicles (ULEVs). September 2021.

[14] Department for Transport. VEH0132 – Licenced ultra-low emission vehicles by local authority. September 2021

With respect to electrical vehicle licenced plug-in cars and LGVs (EVs), the share of the total vehicle fleet in Q4 of 2020 was also 0.5%, totalling 588 vehicles[15]. Therefore, despite the growth of EVs being similar to that of ULEVs, there is still a large amount of progress to be made in order for these types of vehicles to exert a significant contribution on reducing the overall concentration of air pollution. This is of particular importance as road traffic emissions are the main source of pollution (especially NO_2) in the eight AQMAs that have been declared in Calderdale.

[15] Department for Transport. VEH0131 – Licenced plug-in cars, LGVs and quadricycles by local authority. September 2021.

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 Highways England
EU	European Union
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
PM_{10}	Airborne particulate matter with an aerodynamic diameter of 10µm 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.TG16. April 2021. 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.PG16. May 2016. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.
- Calderdale Air Quality Action Plan 2019. May 2019. Published by Calderdale Metropolitan Borough Council.