2018 Air Quality Annual Status Report (ASR)

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

June 2018

Local Authority Officer	Thomas Moorhouse PhD MInstP
Department	Environmental Health
Address	3rd Floor Princess Buildings Halifax HX1 1TS
Telephone	01422 288001
E-mail	environmental.health@calderdale.gov.uk
Report Reference number	4729_ASR_Calderdale_2018
Date	June 2018

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 and older people, and those with heart and lung conditions. There is also often a strong correlation with equalities issues, because areas with poor air quality are also often the less affluent areas[1,2].

The annual health cost to society of the impacts of particulate matter alone in the UK is estimated to be around £16 billion[3].
In Calderdale the air quality is generally good, but there are areas, particularly associated with busy major roada, where pollution levels are of concern. Calderdale currently has seven Air Quality Management Areas, all declared because the annual average concentration of nitrogen dioxide is being, or is likely to be, exceeded. The areas, and the dates of declaration and amendment, are shown below. Further information can be found on the website

https://calderdale.gov.uk/v2/businesses/pollution/air-quality/air-quality-management-areas-aqma. The complete list of AQMAs in England can be found at http://uk-air.defra.gov.uk/aqma/list

Designation	Location	Declared	Amended
Calderdale No.1	Halifax A629	October 2005	April 2014
Calderdale No.2	Sowerby Bridge A58	July 2006	
Calderdale No.3	Hebden Bridge A646	August 2006	
Calderdale No.4	Luddendenfoot A646	July 2007	March 2014
Calderdale No.5	Stump Cross A58	July 2007	March 2014
Calderdale No.6	Brighouse centre	July 2007	
Calderdale No.7	Hipperholme A58	April 2014	

Air quality monitoring during 2017 gave a mixed picture of the trends in different areas. The continuous monitoring stations at Hebden Bridge and Sowerby Bridge showed a decrease in the annual average for nitrogen dioxide, although some of the diffusion tubes in those areas continued to show concentrations above the annual mean objective. The continuous monitor at Huddersfield Road, Salterhebble showed concentrations a little higher than those for 2016, possibly due to the start of roadworks on the A629. Particulate matter concentrations were similar to 2016.

Further monitoring of nitrogen dioxide concentrations along the A58 at New Bank indicate that the annual mean objective is being exceeded. The Council is preparing to declare an AQMA covering this area after consultation.

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

The full results of air quality monitoring across the Borough are presented in the body of this report.

During 2017 the Council drafted the revised Air Quality Action Plan. This is covered in more depth later in this report, but the aim is to set out actions to improve air quality, focussing on AQMAs but in practice often covering major routes through the Borough. The draft action plan consultation is in progress, with presentation to the Cabinet expected in the late summer. The Council wishes to ensure that it is a meaningful living document that reflects the importance of the issue across all areas of the Council's work and that it is accessible and relevant to our local communities.

In the same period the Low Emission Strategy has been developed. This has also been open for consultation. It addresses the fact that the air quality problems in the Borough are almost exclusively due to road vehicles, and focusses on traffic related measures to address this.

Both consultations can be found at

https://www.calderdale.gov.uk/v2/council/consultation-and-feedback/air-quality-consultation

The Council has set up an air quality strategy group attended by air quality officers, representatives of Public Health and Transport and the portfolio holder for the environment.

Actions to Improve Air Quality

The most significant work in this area has been started on the A629 at Salterhebble, one of the AQMAs. This is part of a long term scheme to improve traffic flows and capacity on the A629 between Halifax and Huddersfield. The Council is including urban traffic control measures to allow traffic to move more freely, particularly on the uphill stretch between Salterhebble Hill and Stafford Avenue. Several other major schemes are being funded through the West Yorkshire + Transport Fund and these schemes are an opportunity to reduce congestion and improve air quality. There are more details about this scheme in the Air Quality Action Plan.

Work is continuing to engage with operators of local public transport to improve the bus fleet, with significant investment committed to cleaner buses in West Yorkshire, and there is a commitment through the West Yorkshire Low Emissions Strategy, adopted by all five districts, to invest in lower emission vehicles. Improvements to the train services are imminent, and this is expected to make train travel a more attractive choice for commuters into and out of Calderdale.

After many years of work, funding has been secured for a new train station at Elland. This may reduce pressure on the road network, and will allow easier travel between Elland and the other local centres currently only easily accessible by road.

While many of the measures brought forward by the Council are road- and car-focussed the Council is seeking to improve the cycling network, for which funds have been secured, and is campaigning to increase active travel among Its residents, businesses and staff. The Council continues to investigate the potential for low

emissions transport, and is seeking to use existing funding streams to install EV recharging points. The Council is also seeking to engage the licensed trade in the development of a cleaner fleet, and there is at least one electric taxi operating in the Borough.

In 2017 the Council ran a publicity campaign to encourage people to leave their cars at home. This included billboards and bus advertising, which the local operator gave for free.

Infographics have been produced for in-house awareness raising of pollution issues and the Council is running several initiatives aimed at reducing staff use of cars. These include a pool travel card scheme, car sharing and pool bicycles.

The Ministerial Direction served on the Council in March 2018 requires the Council to produce a Targeted Feasibility Study to achieve reductions in emissions on the A62 at Cooper Bridge. The measures identified for this location may include some that have a wider beneficial effect, although this is not the focus of the Direction.

Conclusions and Priorities

The Council recognises that air quality is a central priority for the coming years. The air quality remains of concern in the AQMAs and will be the focus of efforts to implement the actions set out in the AQAP.

The Council is to declare an air quality management area on the A58 at New Bank, just outside Halifax town centre. Work on tackling the air quality problem on this stretch of road will be linked to wider efforts along this important transport corridor.

Local engagement and how to get involved

The Council has made improvements to its air quality web pages, and is working towards publication of 'live' data from its continuous monitoring stations (although there are some technical challenges to be overcome). There is an opportunity for the public to comment on the Low Emission Strategy and the Air Quality Action Plan, and the Council welcomes interest from the community on air quality matters.

Currently the level of interest in air quality appears to be rising, but this does not seem to translate into interaction between the Council and the local communities. The Council is therefore investigating the possibility of declaring a non-charging CAZ (Clean Air Zone) which will involve much closer engagement and consultation with local people and businesses. The resources for such a step may not be available.

As part of its continuing engagement on air quality matters, officers with air quality responsibilities have attended meetings with external partners including the other West Yorkshire Authorities, WYCA and public transport operators. This has been done in order to raise the profile of air quality and make sure it remains a central consideration in decisions. The meeting of the Calderdale District Consultation Sub-Committee on 10th April 2018 included a presentation on air quality and the Action Plan/ Low Emission Strategy by officers to representatives of the local community, transport operators and Councillors.

Air quality has been raised as a key consideration for the Local Plan, and the Council's adoption of the West Yorkshire Low Emissions Strategy has been an important development in planning terms.

The Council anticipates that its own actions will complement the UK Government's measures to tackle poor air quality, as set out in draft in the Clean Air Strategy consultation document [DE18].

Further information about local air quality is available on the Council's web pages. An appendix has been included in this report outlining how to obtain, and suggesting how to analyse, Calderdale's air quality monitoring data. Previous reports such as the 2017 Annual Status Report [ASR17] are also available on the website.

Table of Contents

List of Tables

List of Figures

1 Local Air Quality Management

This report provides an overview of air quality in Calderdale during 2017. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) and the relevant Policy and Technical Guidance documents. The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where an 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 can be found in Table E.1 in Appendix E.

2 Actions to Improve Air Quality

2.1 Air Quality Management Areas

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

A summary of AQMAs declared by Calderdale can be found in Table 1. Further information related to declared or revoked AQMAs, including maps of AQMA boundaries are available online at https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=43 . Alternatively, see Appendix D: Map(s) of Monitoring Locations and AQMAs, which provides a map of air quality monitoring locations in relation to the AQMA(s).

The Council proposes to declare a new AQMA on the A58 at New Bank, Halifax. For more details see the monitoring section.

Table 1 – Declared Air Quality Management Areas

AQMA Name	Date of Declaration	Pollutants and Air Quality Objectives	City / Town	One Line Description	Is air quality in the AQMA influenced by roads controlled by Highways England?	Level of Exceedance (maximum monitored/modelled concentration at a location of relevant exposure)		Action Plan		
						At Declaration*	Now*	Name	Date of Publication	Link
Calderdale No.1 Salterhebble	Declared October 2005, amended April 2014	NO2 Annual Mean	Halifax	Stretch of the A629 south of Dryclough Lane	YES	46 µg/m3 µg/m3	52µg/m3	AQAP 2009	2009 & 2018	See text
Calderdale No.2 Sowerby Bridge	Declared July 2006	NO2 Annual Mean	Sowerby Bridge	A58 through central Sowerby Bridge	YES	53 µg/m3 µg/m3	45µg/m3	AQAP 2009	2009 & 2018	See text
Calderdale No.3 Hebden Bridge	Declared August 2006	NO2 Annual Mean	Hebden Bridge	A646 through town centre	YES	48 µg/m3 µg/m3	50µg/m3	AQAP 2009	2009 & 2018	See text

Calderdale No.4 Luddendenfoot	Declared July 2007, amended March 2014	NO2 Annual Mean	Luddendenfoot	A646 through town centre	YES	50 µg/m3 µg/m3	39µg/m3	AQAP 2017	2018	See text
Calderdale No.5 Stump Cross	Declared July 2007	NO2 Annual Mean	Halifax	A58 at junction of Leeds Road and Bradford Road	YES	58 µg/m3 µg/m3	38µg/m3	AQAP 2017	2018	See text
Calderdale No.6 Brighouse	Declared July 2007, amended March 2014	NO2 Annual Mean	Brighouse	Encircling Brighouse town centre	YES	51 µg/m3 µg/m3	49µg/m3	AQAP 2017	2018	See text
Calderdale No.7 Hipperholme	Declared March 2014	NO2 Annual Mean	Hipperholme	A58 Leeds Road close to junction with Brighouse Road	YES	47 µg/m3 µg/m3	51µg/m3	AQAP 2017	2018	See text

Important NOTE: direct comparison between the concentrations at declaration and those for 2017 are not possible as the original sites may not coincide with those used in 2017.

☒ The Council confirms the information on UK-Air regarding their AQMA(s) is up to date (checked and corrected summer 2018)

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

2.2.1 Responses to comments on previous reports

Defra's appraisal of last year's ASR included the following comments.

Comment In light of the fact that the AQAP is being updated, it would be beneficial to ensure that the Defra template for the ASR report is being followed, particularly in relation to Section 1, Local Air Quality Management and the development of the Measures to Improve Air Quality in Table 2.2 as adding the detail specified in the table headings and itemising actions separately will make it easier to chart their progress in the future.
Response The Council has followed the template as closely as possible for this report. A complementary table indicating how the action plan is to be managed is provided in Appendix H.

Comment The Council states that its first Air Quality Strategy will be finalised in autumn 2017. This is supported and should be reported on in the next ASR.
Response The Council has developed a Low Emissions Strategy and Air Quality Action Plan, both of which are being consulted upon. Further information is included in this report.

Comment When it is finalised, the council will adopt the West Yorkshire Low Emissions Strategy. This is supported, and the benefits should be reported on in the next ASR.
Response The Council adopted the WYLES in 2016 and is working with its partners to deliver the objectives. This is set out in more detail below.

Comment In future ASRs, it would be helpful to include more information on trends within the main text, highlighting the change in concentrations within each AQMA. It would be informative to include a bar graph of trends over the last 5 years of the annual mean NO2 for each AQMA, and for monitoring locations outside AQMAs, so that improvements in air quality are clear to see.
Response This report includes more detailed information on trends within the body of the report. Consequently trends are not plotted in the appendices.

Comment There seems to be some confusion between the data presented in Table A.3 and Table B. For example, in Table A.3 the report states that the data is corrected for bias and distance and for site LV SCA and value of 53 is reported, while in Table B the comparable value is 56. The data needs to be checked for the two tables and the situation clarified in the next report.
Response This appears to be the correction for distance from receptors, and data are presented below in a less ambiguous way, following further guidance from Defra.

Comment In Table A.3 and Table B any exceedances should be shown in bold in accordance with the advice in the Defra template.
Response The Council has taken this into account.

Comment On the A58 at New Bank, Halifax (site LV NBN) the annual mean is greater than 60µmg/m3 which indicates that the NO2 1-hourly objective may be exceeded. It is encouraging that this site is being investigated and that additional monitoring has been installed and progress will be reported on in the next ASR.
Response An AQMA is going to be declared here for the annual mean nitrogen dioxide objective. There are no receptors for the one hour objective, as discussed below.

Comment Monitoring at the LV sites has been undertaken for one year, and many have been found to exceed the AQO. It is not clear what the next step is for these sites and whether monitoring will continue in the future. This should be clarified in the next ASR.
Response This is clarified below.

Comment Infrastructure improvements are underway on the A629 which should benefit the air quality along the road. Only 2 of the A629 monitoring locations are shown on a map. It would be informative to show all of them in future ASRs, and also to clarify if the monitoring will stay in place until the construction is complete.
Response This is clarified in the body of this report.

Comment It would be informative to include some screenshots of the distance calculations being undertaken so that it can be confirmed that the correct data is being used in the calculations.
Response Screen shots are included in Appendix C.

Comment In light of the fact that Calderdale MBC adopted the West Yorkshire Low Emissions Strategy in December 2016, including the technical planning guidance, it would be useful to provide an update on any recent planning applications or new developments that may have an impact on air quality in the next ASR.
Response This is set out in the body of this report.

Calderdale has taken forward a number of direct measures during the current reporting year of 2017 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.

More detail on these measures can be found in the Air Quality Action Plan 2017, currently under consultation) and the Low Emissions Strategy. Key completed measures are:

- A629 corridor improvements underway
- Cycling strategy published
- Rochdale Canal towpath improvements underway
- Electric bike loan, metro card and car sharing schemes extended
- Variable message sign (VMS) network established and being extended
- WYLES guidance being applied to all relevant new development proposals through planning

In connection with WYLES and planning the Local Plan will be open for consultation in August. Air quality will feature in the policies although the details are still to be

finalised. Major planning applications are in preparation for Phase 2 of the A629 corridor road improvements.

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

- Live air quality data available on web pages
- Urban traffic management improvements at major junctions
- Bus and freight partnerships explored
- Installation of electric vehicle charging points in strategic locations
- Novel and emerging technologies explored

The Council's priorities for the coming year are:

- Strengthen visible commitment to air quality improvements, fix terms of reference of action plan steering group and assign reportable actions
- Improve community involvement with air quality improvements
- Continue to drive the economic development of the Borough without compromising air quality, and wherever possible incorporating measures to improve air quality

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

- Developing novel solutions with limited financial and staffing resources

Whilst the measures stated above and in Table 2 will help to contribute towards compliance, The Council anticipates that further additional measures not yet prescribed will be required in subsequent years to achieve compliance and enable the revocation of the Calderdale AQMAs.

Table 2 should be viewed together with Table 3 in Appendix H, which sets out more detail about delivering the actions.

Table 2 – Progress on Measures to Improve Air Quality

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
AQAP1 (1)	Achieve better understanding of local air quality, including monitoring and source apportionment	Transport Planning and Infrastructure	Other	Calderdale MBC, neighbouring authorities, tools from Defra	2009-2014	2009-2020	% data collection	Neutral	funding in place until 2019	ongoing	funding ends 2019
AQAP1 (2)	Traffic flow and network improvements, Queue length and congestion studies	Traffic Management	UTC, Congestion management, traffic reduction	CMBC, Highways England, neighbouring LAs	current	current	data collection	Neutral	Implementation on-going	ongoing	Funding
AQAP1 (3)	UTC improvements	Traffic Management	UTC, Congestion management, traffic reduction	Calderdale MBC, neighbouring authorities	current	current	data collection	Neutral	Implementation on-going	Ongoing	Modified since original action plan
AQAP1 (4)	Handling emissions data (Emissions Factor Toolkit)	Transport Planning and Infrastructure	Other	Calderdale MBC, tools from Defra	NA	current	effectiveness of predictions	Neutral	EFT used e.g. for source apportionment	ongoing	
AQAP2 (1)	Local Air Quality Partnership	Public Information	Via other mechanisms	Calderdale MBC, neighbouring authorities	NA	NA	number of partners signed up	uncertain	Not active		Resources to engage with partners
AQAP2 (2)	Air Quality web pages - improve, e.g. include live data	Public Information	Via the Internet	Calderdale MBC	ongoing	ongoing	web traffic, customer satisfaction	indirect, may influence behaviour	web pages updated, work progressing on live data	late 2018	technical hurdles, not insurmountable

AQAP2 (3)	Investigate freight partnership	Freight and Delivery Management	Freight Partnerships for city centre deliveries	Kirklees MBC, Calderdale MBC	current	2019 onwards	number of partners signed up	significant improvements in longer term	Not active		Resources to engage with partners
AQAP3 (1)	Promote high occupancy travel	Transport Planning and Infrastructure	Strategic highway improvments, re-prioritising	CMBC, neighbouring Authorities	ongoing	ongoing	To be determined	modest reduction in road emissions	Car share scheme promoted e.g. on Clean Air day 2018	ongoing	
AQAP3 (2)	Cycling infrastructure improvements and facilities	Promoting Travel Alternatives	Promotion of cycling	CMBC	current	2018 onwards	kilomenters of new cycle paths	significant improvements in longer term	Various schemes underway, some stalled		Funding and staffing resources
AQAP3 (3)	Active Calderdale campaign	Promoting Travel Alternatives	Intensive active travel campaign & infrastructure	CMBC	current	ongoing	most active Borough in the North by 2024	low impact			
AQAP3 (4)	Metro travelcard pool scheme	Alternatives to private vehicle use	Other	CMBC, Metro	current	ongoing	% dwellings with access to fast broadband	low impact	take-up increasing	ongoing	further cards purchased 2018
AQAP3 (5)	20mph areas	Traffic Management	Reduction of speed limits, 20mph zones	CMBC		2017	% adults cycling	small reduction in road traffic emissions	zones completed	completed 2017	
AQAP3 (6)	Car sharing promotion	Alternatives to private vehicle use	Car & lift sharing schemes	CMBC	2009-2014	2009-2020	number of car sharing partners	small reduction, behavioural change	car sharing scheme up and running - featured in Clean Air day 2018	ongoing	interest appears to be growing
AQAP4 (1)	ULEV procurement	Promoting Low Emission Transport	Company Vehicle Procurement - Prioritising uptake of low emission vehicles	CMBC	2018-2023	2023 onwards	% low emission/ ULEV vehicles in fleet	Reduction in emissions around schools	Some ULEVs procured	after 2023	
AQAP4 (2)	EV recharging provision	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission	CMBC supported by OLEV etc.	current	current	Number of EV charging points	Reduced vehicle emissions	Implementation on-going	Some points installed late 2018	Funding, resources to plan

			Vehicles, EV recharging, Gas fuel recharging								
AQAP4 (3)	Retrofit school bus fleet	Promoting Low Emission Transport	Public Vehicle Procurement - Prioritising uptake of low emission vehicles	Calderdale MBC, neighbouring authorities	2015	2017	proportion of fleet retrofitted	Reduced vehicle emissions	Implementation on-going		
AQAP5 (1)	Travel plans	Promoting Travel Alternatives	Workplace Travel Planning	Calderdale MBC, neighbouring authorties	NA		number of workplaces with travel plans				
AQAP5 (2)	School travel plans	Promoting Travel Alternatives	School Travel Plans	Calderdale MBC, neighbouring authorties	NA		schools with travel plans	mainly behavioural influence	completed		Many schools not with Local Authority
AQAP5 (3)	Local Plan Air Quality Policies	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	CMBC	current	2017 onwards	Policies applied to all developments	significant improvements in longer term	WYLES adopted and used	ongoing	WYLES includes AQ guidance for developers
AQAP5 (4)	Promote uptake of electric vehicles eg. taxis	Promoting Low Emission Transport	Taxi emission incentives	CMBC	begun 2017	2017 onwards	number of ULEV taxis	moderate, especially in town centres			
AQAP6 (1)	Community renewable energy scheme	Promoting Low Emission Plant	Public Procurement of stationary combustion sources	CMBC	current	2019 onwards	number of schemes approved	significant improvements in longer term		ongoing	
AQAP6 (2)	Promote locally grown food, goods and services	Freight and Delivery Management	Other	CMBC, local partners including 'Incredible Edible'	current	2018 onwards	Policies applied to all developments	significant improvements in longer term	Second round of consultation starts mid 2018		
AQAP6 (3)	Improved energy efficiency	Other	Other				Number of developments incorporating energy efficiency measures				

AQAP6 (4)	Low Emissions Strategy	Policy Guidance and Development Control	Low Emissions Strategy	CMBC	up to 2017	2018	Adoption of strategy	Long term impact	Under consultation (June 2018)	To be presented to Council for approval 2018	

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 address $PM_{2.5}$:

- **Biomass combustion**. The Council is supporting Defra's information campaign on domestic emissions and has incorporated guidance on appropriate selection of fuels on its web pages. Burning of garden waste is discouraged where appropriate, and a green waste collection service has been introduced.

- **Industrial sources**. The Council is working with local operators who hold environmental permits for combustion plant to ensure that emissions are controlled in accordance with the permits and, where feasible, to a tighter standard. The number of incineration activities has fallen in the past year.

- **Domestic sources**. Much of urban Calderdale is covered by Smoke Control Areas, and the Council offers advice to householders about how to comply with the orders and where to seek further information.

- **Public information**. The Council has used publicity materials to inform the public about better travel choices, and in particular avoiding private vehicle use where possible. Fine particulates from brake and tyre wear are becoming the focus of more attention, and encouraging people to use alternative transport modes and active travel may assist with this.

Measures set out in the Action Plan to tackle nitrogen dioxide pollution are also expected to reduce concentrations of particulates. Guidance such as [TGB08] is also relevant to tackling fine particulates. $PM_{2.5}$ concentrations tend to have significant regional contributions and the local measures may have limited impact.

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

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

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

Calderdale Council undertook automatic (continuous) monitoring at three sites during 2017. Table A.1 in Appendix A shows the details of the sites. National monitoring results are available from the web.

AQS2 is located within Calderdale No. 1 AQMA (Salterhebble)
AQS3 is located within Calderdale No. 3 AQMA (Hebden Bridge)
AQS4 is located within Calderdale No. 2 AQMA (Sowerby Bridge)

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 (passive) monitoring of NO_2 at over 50 sites during 2017. Table A.2 in Appendix A shows the details of the sites. These are concentrated within AQMAs, with some in areas identified for further investigation.

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

3.2 Individual Pollutants

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

3.2.1 Nitrogen Dioxide (NO_2)

3.2.1.1 Overview of results

Table A.3 in Appendix A compares the ratified and adjusted monitored NO_2 annual mean concentrations for the past five years with the air quality objective of 40µg/m^3. For diffusion tubes, the full 2017 dataset of monthly mean values is provided in Appendix B.

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

The results for 2017 indicate that there were exceedances of the annual mean objective both within and outside the AQMAs. Of particular note are the results from the diffusion tubes located on the A58 at New Bank, Halifax. In this area the annual mean objective was exceeded and the diffusion tube LV-NBN indicates that the hourly mean objective may be exceeded. There is no relevant exposure close to LV-NBN, but there is public access (a footpath).

The Council has begun the process of declaring an AQMA (Calderdale No. 8 New Bank) covering this area.

3.2.1.2 The LV series diffusion tubes

The tubes prefixed LV were originally set up to monitor concentrations of nitrogen dioxide on road links identified by the UK government as exceeding the EU limit value. Although the modelling has been updated the Council has continued with some of the sites for longer term observations. One of the sites, LV-LEE, is on a link identified in the 2018 Ministerial Direction to Local Authorities.

3.2.1.3 Trends

The trends in nitrogen dioxide concentrations are generally decreasing, particularly at AQS3 (Figure 2) and AQS4 (Figure 3), although the data does suggest that the winter of 2017/18 was not typical in terms of recovery of nitrogen dioxide levels. The wind speeds for October to December 2017 were higher than those at the start of year (Figure 1). The trend at AQS2 (Figure 4) is less dramatic. In these plots The blue trace represents monthly means, the bold red line is the best fit to the linear trend, and the outer red dotted lines represent the range of possible trends that the data allows (with 95% confidence).

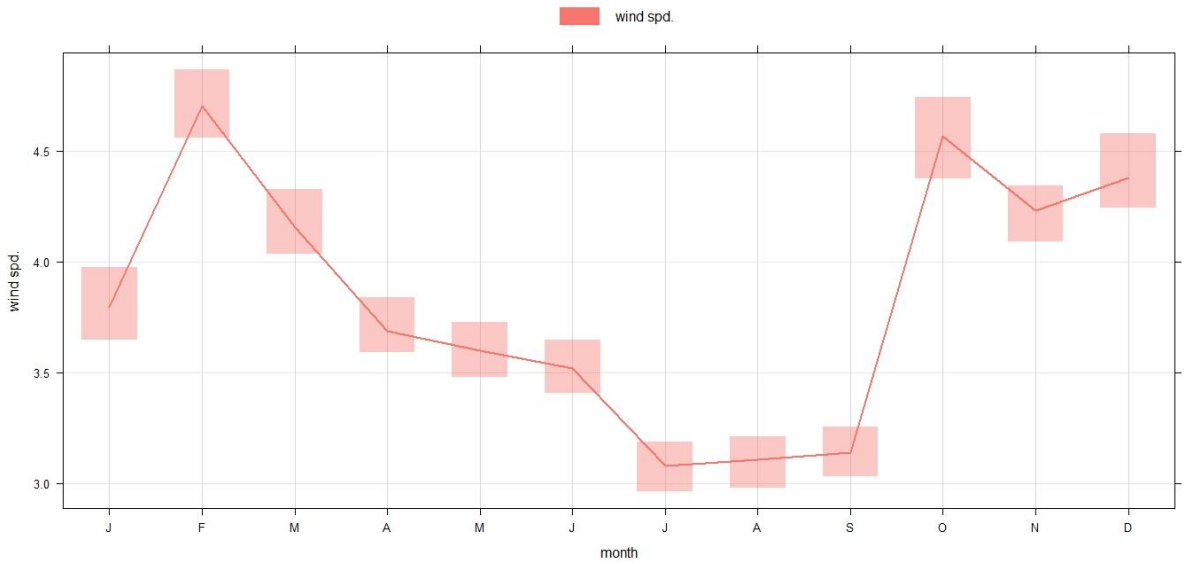


Figure 1 monthly average wind speeds during 2017 (Bingley)

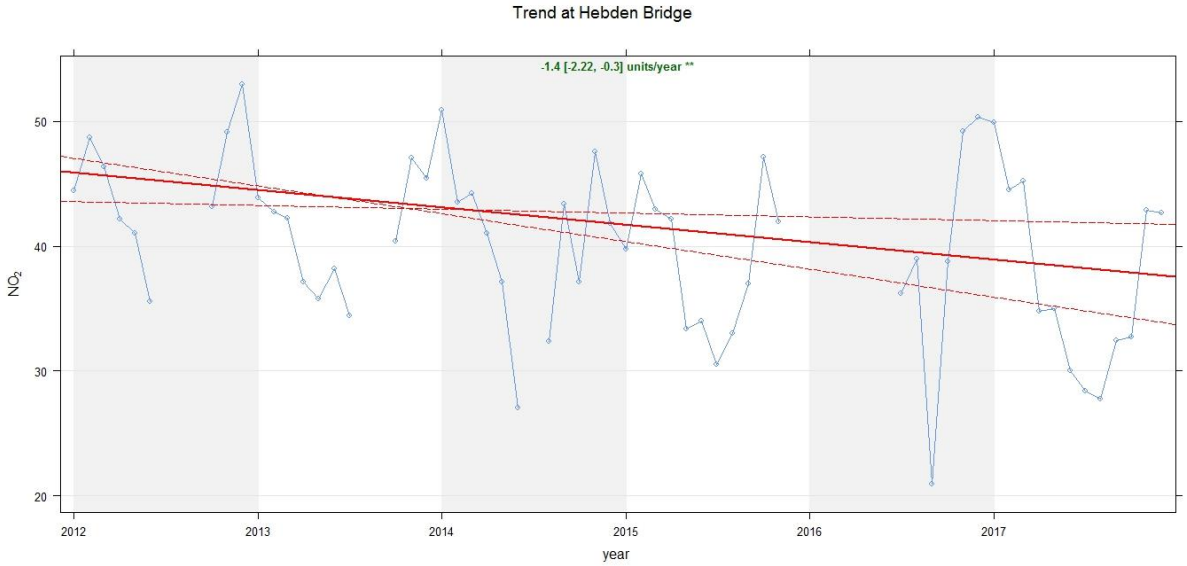


Figure 2 Hebden Bridge nitrogen dioxide trend

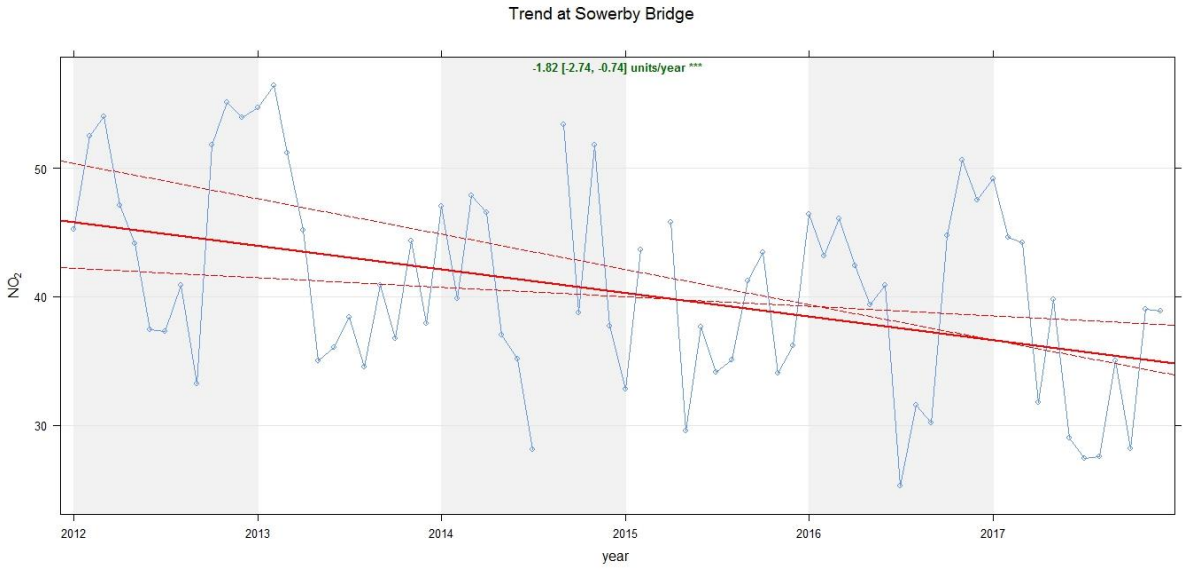


Figure 3 Sowerby Bridge nitrogen dioxide trend

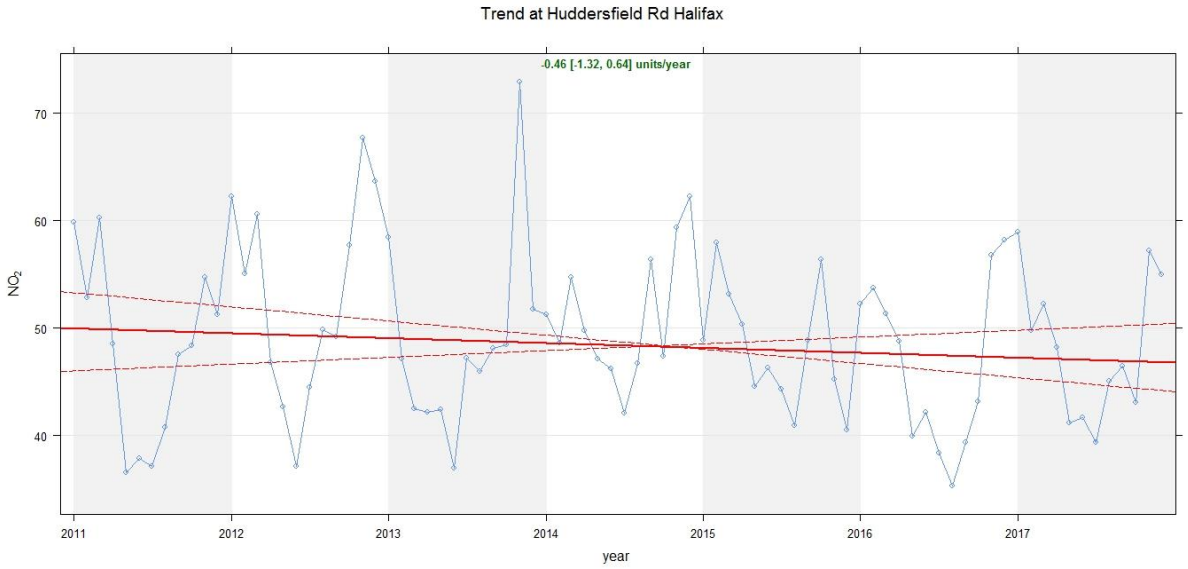


Figure 4 Huddersfield Road nitrogen dioxide trend (Halifax A629)

3.2.2 Particulate Matter (PM_{10})

The Council measured concentrations of PM10 at the site AQS4 on Wharf Street, Sowerby Bridge during 2017. All monitoring data has been ratified and scaled by the factor of 1/1.2 as described in TG16 (unheated BAM).

A review of the 2016 data indicate that there were 15 days on which the daily mean exceeded 50μgm^{-3}, not exceeding the objective of 35 days. In 2017 the number of days dropped to 8, and the objective was not exceeded. The annual mean objective was not exceeded during 2017.

The days on which the 50μgm^{-3} daily average concentration was exceeded are shown in Figure 5. Note that none of these occurred in October, November or December.

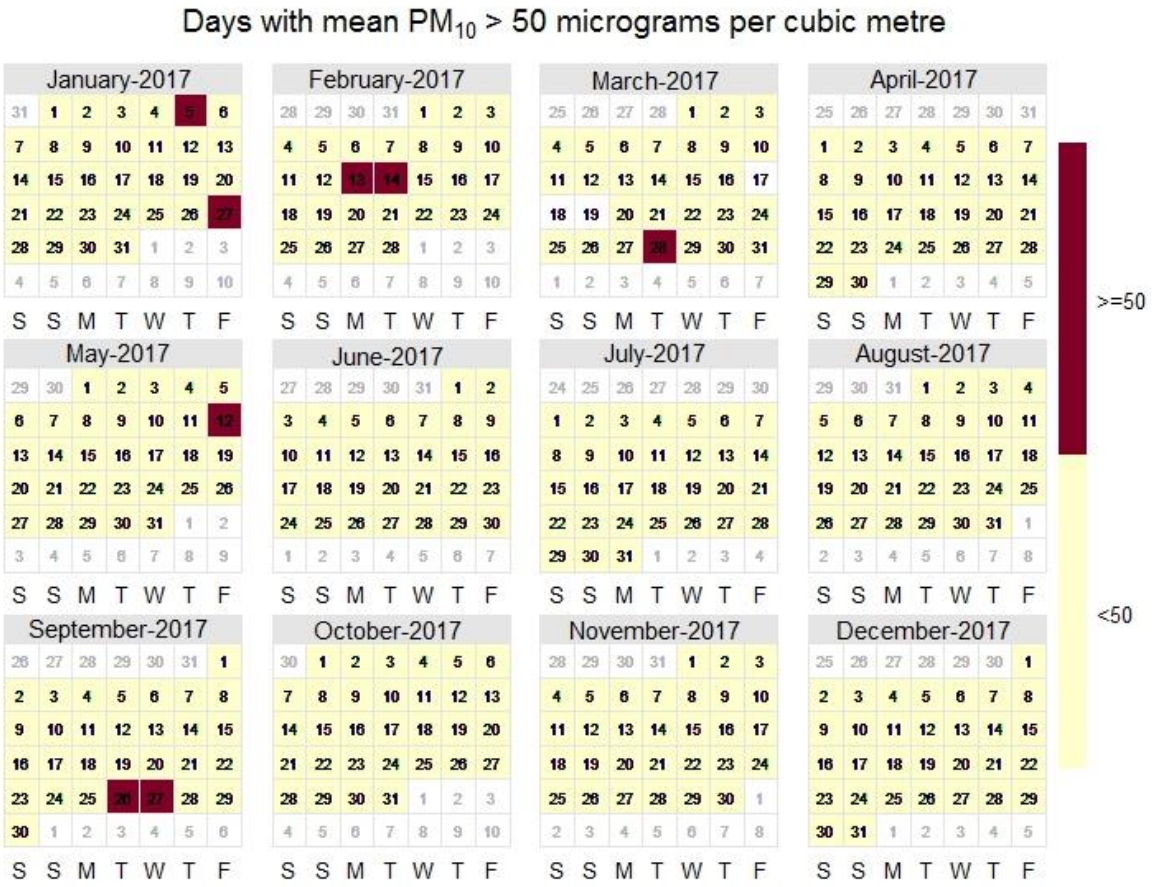


Figure 5 calendar of PM_{10} concentrations

Only two years of data are available, but the indicative trend over the last two years is shown in Figure 66 (note the wide 95% confidence interval). It appears to show a gradual decrease although further data (to be obtained over the coming years) is needed to establish this with greater certainty.

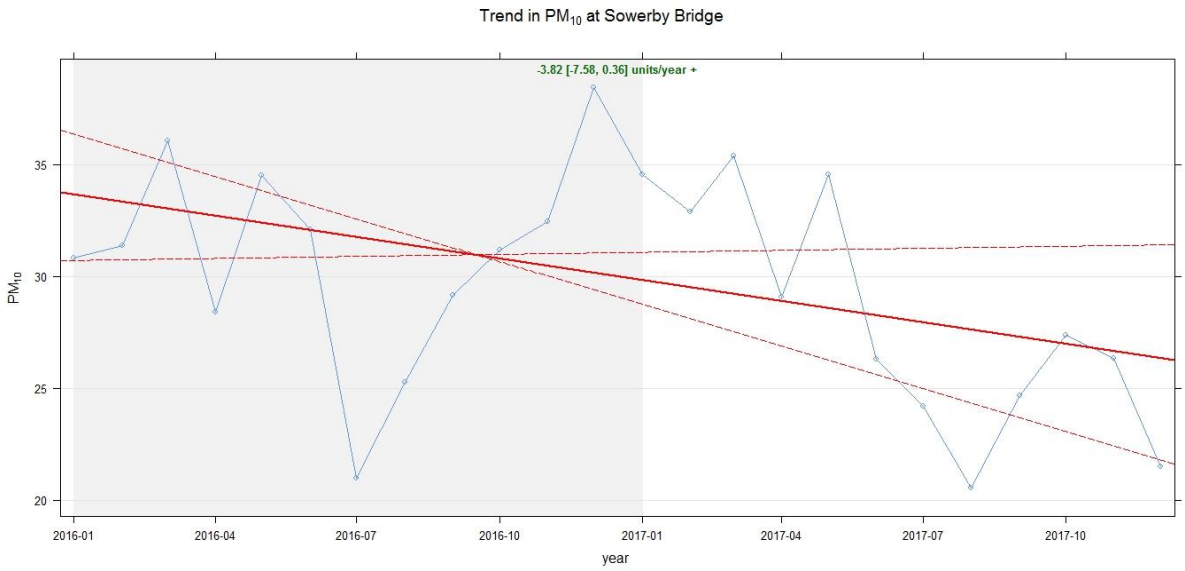


Figure 6 PM_{10} trend at Sowerby Bridge

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

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

3.2.3 Particulate Matter ($PM_{2.5}$)

The Council measured concentrations of PM2.5 at two sites in 2017. These were AQS2 at Huddersfield Rd Salterhebble and AQS3 at Market Street, Hebden Bridge. All data have been ratified, and no correction factor has been applied, in accordance with TG16 (heated BAM).

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

The data have only been collected at these two sites for three years, and the Hebden Bridge data have gaps due to flooding in 2015. The indicative trend over two years is not a reliable guide to the longer term picture, nor is a trend obvious, as seen from the plot for AQS2 in Figure 7. The blue trace represents monthly means, the bold line is the best fit to the linear trend, and the outer red dotted lines represent the range of possible trends that the data allow (with 95% confidence).

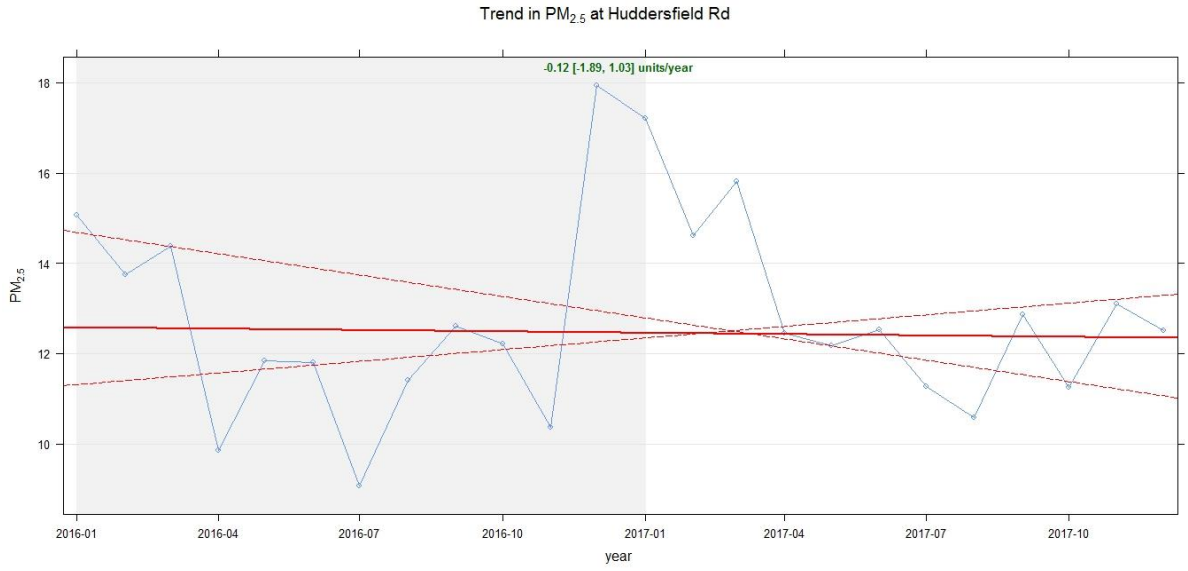


Figure 7 $PM_{2.5}$ at Huddersield Road

Appendix A: Monitoring Results

Table A.1 – Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Inlet Height (m)
AQS2	Huddersfield Road	Roadside	409485	423430	NO_2; $PM_{2.5}$	YES	Chemiluminescent; BAM	5	3	1.5
AQS3	Hebden Bridge	Roadside	398990	427210	NO_2; $PM_{2.5}$	YES	Chemiluminescent; BAM	NA	3	1.5
AQS4	Sowerby Bridge	Roadside	406075	423615	NO_2; PM_{10}	YES	Chemiluminescent; BAM	NA	3	1.5

The sites are all covered by a service and maintenance contract until December 2019. They are serviced twice a year. Trained Council staff visit the site every two weeks to prevent faults and to check the NO_2 span and zero readings against cylinder values. The BAM tapes are changed when required and basic maintenance is carried out by trained Council staff.

Notes:

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

(2) N/A if not applicable.

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

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
A629-1	A629-1	Roadside	409331	424224	NO2	no	0	4	NO	2.5
A629-2	A629-2	Roadside	409344	424199	NO2	no	0	4	NO	2
A629-3	A629-3	Roadside	409371	423965	NO2	no	0	5	NO	2.5
A629-4	A629-4	Roadside	409443	423709	NO2	no	0	5	NO	2
A629-5	A629-5	Roadside	409432	423543	NO2	no	0	5	NO	2
A629-6	A629-6	Roadside	409677	423250	NO2	yes	0	5	NO	2
A629-7	A629-7	Urban Background	409823	423206	NO2	yes	2	>10	NO	2
A629-8	A629-8	Roadside	409780	422803	NO2	no	0	7	NO	2
LV-SAA	LV-SAA	Roadside	411201	419429	NO2	no	NA	NA	NO	2.5
LV-SCA	LV-SCA	Roadside	405911	416597	NO2	no	NA	NA	NO	1
LV-AT	LV-AT	Roadside	411533	419358	NO2	no	NA	4	NO	2.5
LV-62W	LV-62W	Roadside	416172	422282	NO2	no	NA	3	NO	2.5
LV-62E	LV-62E	Roadside	416717	422113	NO2	no	NA	4	NO	2.5
LV-LEE	LV-LEE	Roadside	417698	420709	NO2	no	NA	3	NO	2
LV-BRD	LV-BRD	Roadside	414683	423155	NO2	no	NA	2	NO	2
LV-NBN	LV-NBN	Roadside	409715	425754	NO2	no	NA	1	NO	2.5
LV-NBS	LV-NBS	Roadside	409708	425737	NO2	no	NA	2	NO	2.5
LV-NBX	LV-NBX	Roadside	409602	425797	NO2	no	NA	1	NO	2.5
LV-EWB	LV-EWB	Roadside	410104	421516	NO2	no	NA	1	NO	2.5

NB-NB1	NB-NB1	Roadside			NO2	no	2	2	NO	2.5
NB-GR	NB-GR	Roadside			NO2	no	3	3	NO	2
NB-GL	NB-GL	Roadside			NO2	no	11	2	NO	2.5
SC5	SC5	Roadside	410823	426265	NO2	yes	0	3	NO	2
HH-TC	HH-TC	Roadside	412718	425556	NO2	yes	5	1.5	NO	2.5
HH-LB	HH-LB	Roadside	412430	425479	NO2	yes	0	4	NO	2
HH-LT	HH-LT	Roadside	412450	425435	NO2	yes	0	3	NO	2.5
HH1	HH1	Roadside	412618	425503	NO2	yes	0	3	NO	2
WR2	WR2	Roadside	415090	422817	NO2	yes	0	4	NO	2.5
BH3	BH3	Roadside	414671	422740	NO2	yes	3	1.5	NO	2.5
BE4	BE4	Roadside	414478	422692	NO2	yes	0	1	NO	2.5
BE2	BE2	Roadside	414385	422457	NO2	yes	NA	2	NO	2.5
HXR1	HXR1	Roadside	414218	422957	NO2	yes	0	4	NO	2
CL1	CL1	Roadside	413261	420686	NO2	no	0	2	NO	2.5
HTAH	HTAH	Suburban	411494	419594	NO2	no	0	NA	NO	2
AT-BR	AT-BR	Suburban	411514	419548	NO2	no	10	NA	NO	2
AT-MR	AT-MR	Roadside	411581	419373	NO2	no	10	NA	NO	2.5
AT-MR2	AT-MR2	Roadside	411530	419377	NO2	no	12	9	NO	1.5
AQC1	AQC1	Roadside	409485	423431	NO2	yes	5	2	YES	1.5
AQC2	AQC2	Roadside	409485	423431	NO2	yes	5	2	YES	1.5
AQC3	AQC3	Roadside	409485	423431	NO2	yes	5	2	YES	1.5
CRH1	CRH1	Roadside	409767	423011	NO2	yes	0	2	NO	2.5
AQ20	AQ20	Roadside	409483	423337	NO2	no	0	5	NO	2
AQ21	AQ21	Roadside	409822	423167	NO2	yes	2	2	NO	2.5

HB6	HB6	Roadside	399502	427041	NO2	yes	0	4	NO	2
HQ1	HQ1	Roadside	398794	427237	NO2	yes	0	3	NO	2
HQ9	HQ9	Roadside	399236	427176	NO2	yes	0	2	NO	2.5
LF1	LF1	Roadside	403810	424977	NO2	yes	0	2	NO	2.5
LF2	LF2	Roadside	403738	425110	NO2	yes	0	1	NO	2.5
SB1	SB1	Roadside	406135	423639	NO2	yes	0	2	NO	2.5
SB3	SB3	Roadside	405961	423571	NO2	yes	0	2	NO	2.5
SB15	SB15	Roadside	406707	423824	NO2	yes	1	2	NO	2
SB16	SB16	Roadside	406638	423836	NO2	yes	0	2	NO	2.5
SB18	SB18	Roadside	406936	423800	NO2	no	0	5	NO	2.5
SB20	SB20	Roadside	405825	423415	NO2	yes	0	2	NO	2.5
SB21	SB21	Urban Background	406035	423442	NO2	no	>10	NA	NO	2.5
SB22	SB22	Roadside	405823	423395	NO2	yes	0	2	NO	2
BS1 HB	BS1 HB	Roadside	398990	427210	NO2	yes	>10	3	YES	1.5
WV-SR1	WV-SR1	Roadside	409598	421167	NO2	no	0	2	NO	2.5
WV-SR2	WV-SR2	Roadside	409608	421160	NO2	no	3	2	NO	2.5
NB-RB	NB-RB	Urban Background	409453	425835	NO2	no	5	NA	NO	2
NB-SJ	NB-SJ	Other	409624	425798	NO2	no	NA	NA	NO	2

Diffusion tubes are exposed according to the national calendar. A local colocation study is undertaken.

Notes:

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

(2) N/A if not applicable.

Table A.3 – Annual Mean NO_2 Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2017 (%) [2]	NO_2 Annual Mean Concentration ($\mu g/m^3$) [3]				
					2013	2014	2015	2016	2017
A629-1	Roadside	Diffusion Tube	100	100				27	24
A629-2	Roadside	Diffusion Tube	100	100				34	31
A629-3	Roadside	Diffusion Tube	100	100				30	25
A629-4	Roadside	Diffusion Tube	100	100				25	21
A629-5	Roadside	Diffusion Tube	100	100				24	23
A629-6	Roadside	Diffusion Tube	100	100				35	34
A629-7	Roadside	Diffusion Tube	100	100				28	29
A629-8	Roadside	Diffusion Tube	100	100				31	25
LV-SAA	Roadside	Diffusion Tube	100	100				31	33
LV-SCA	Roadside	Diffusion Tube	100	100				**56**	**48**
LV-AT	Roadside	Diffusion Tube	100	100				**54**	**47**
LV-62W	Roadside	Diffusion Tube	100	100				**43**	**40**
LV-62E	Roadside	Diffusion Tube	100	100				**42**	**40**
LV-LEE	Roadside	Diffusion Tube	100	100				32	32
LV-BRD	Roadside	Diffusion	100	100				28	31

		Tube							
LV-NBN	Roadside	Diffusion Tube	100	100				**67**	**66**
LV-NBS	Roadside	Diffusion Tube	100	100				**55**	**42**
LV-NBX	Roadside	Diffusion Tube	100	100				**46**	**43**
LV-EWB	Roadside	Diffusion Tube	100	100				30	27
NB-NB1	Roadside	Diffusion Tube	100	100					**44**
NB-GR	Roadside	Diffusion Tube	100	100					**53**
NB-GL	Roadside	Diffusion Tube	100	100					**57**
SC5	Roadside	Diffusion Tube	100	100	**44**	**41**	**45**	**43**	38
HH-TC	Roadside	Diffusion Tube	100	100			**40**	**42**	36
HH-LB	Roadside	Diffusion Tube	100	100	**44**	**43**	**43**	**45**	36
HH-LT	Roadside	Diffusion Tube	100	100	**47**	**48**	**46**	**58**	**51**
HH1	Roadside	Diffusion Tube	100	100	**43**	**41**	**42**	**42**	39
WR2	Roadside	Diffusion Tube	100	100	**43**	39	**40**	**41**	38
BH3	Roadside	Diffusion Tube	100	100	**46**	**43**	**45**	**48**	**46**
BE4	Roadside	Diffusion Tube	100	100	**49**	**50**	**52**	**50**	**47**
BE2	Roadside	Diffusion Tube	100	100			**42**	**45**	38
HXR1	Roadside	Diffusion Tube	100	100	**50**	**50**	**54**	**54**	**49**

CL1	Roadside	Diffusion Tube	100	100	**38**	**37**	**38**	**43**	34
HTAH	Roadside	Diffusion Tube	100	100	36	31	27	38	35
AT-BR	Roadside	Diffusion Tube	100	100	34	31	35	37	35
AT-MR	Roadside	Diffusion Tube	100	100	-			30	34
AT-MR2	Roadside	Diffusion Tube	58	58	-				34
AQC1	Roadside	Diffusion Tube	100	100	-			**46**	**41**
AQC2	Roadside	Diffusion Tube	100	100	-			**46**	**43**
AQC3	Roadside	Diffusion Tube	100	100	-			**46**	**41**
CRH1	Roadside	Diffusion Tube	100	100	**58**	**56**	**53**	**54**	**52**
AQ20	Roadside	Diffusion Tube	100	100	-		29	30	24
AQ21	Roadside	Diffusion Tube	100	100	-		**53**	**50**	**48**
HB6	Roadside	Diffusion Tube	100	100	37	35	**40**	38	35
HQ1	Roadside	Diffusion Tube	100	100	**49**	**50**	**54**	**52**	**50**
HQ9	Roadside	Diffusion Tube	100	100	**43**	**40**	**42**	**42**	**36**
LF1	Roadside	Diffusion Tube	100	100	**48**	**45**	**46**	**46**	**39**
LF2	Roadside	Diffusion Tube	100	100	38	**36**	**38**	**38**	**35**
SB1	Roadside	Diffusion Tube	100	100	**54**	**51**	**53**	**50**	**45**
SB3	Roadside	Diffusion Tube	100	100	**47**	**45**	**44**	**46**	**40**

SB15	Roadside	Diffusion Tube	100	100	**42**	**41**	**45**	**42**	37
SB16	Roadside	Diffusion Tube	100	100	**41**	**41**	**43**	**42**	38
SB18	Roadside	Diffusion Tube	100	100	34	34	36	35	**44**
SB21	Roadside	Diffusion Tube	100	100	-		24	28	28
SB22	Roadside	Diffusion Tube	100	100	-		**45**	**48**	**42**
BS1 HB	Roadside	Diffusion Tube	100	100	-			42	38
WV-SR1	Roadside	Diffusion Tube	100	100	-				39
WV-SR2	Roadside	Diffusion Tube	100	100	-				29
NB-RB	Roadside	Diffusion Tube	75	75	-				23
NB-SJ	Roadside	Diffusion Tube	67	67	-				24
AQS2	Roadside	Automatic	100	100	-			**46**	**48**
AQS3	Roadside	Automatic	100	100	-			**42**	37
AQS4	Roadside	Automatic	100	100	-			**41**	36

.

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

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

Notes:

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

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

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

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

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

Trends in diffusion tube results

The following figures indicate the trend in nitrogen dioxide concentrations at sites across Calderdale.

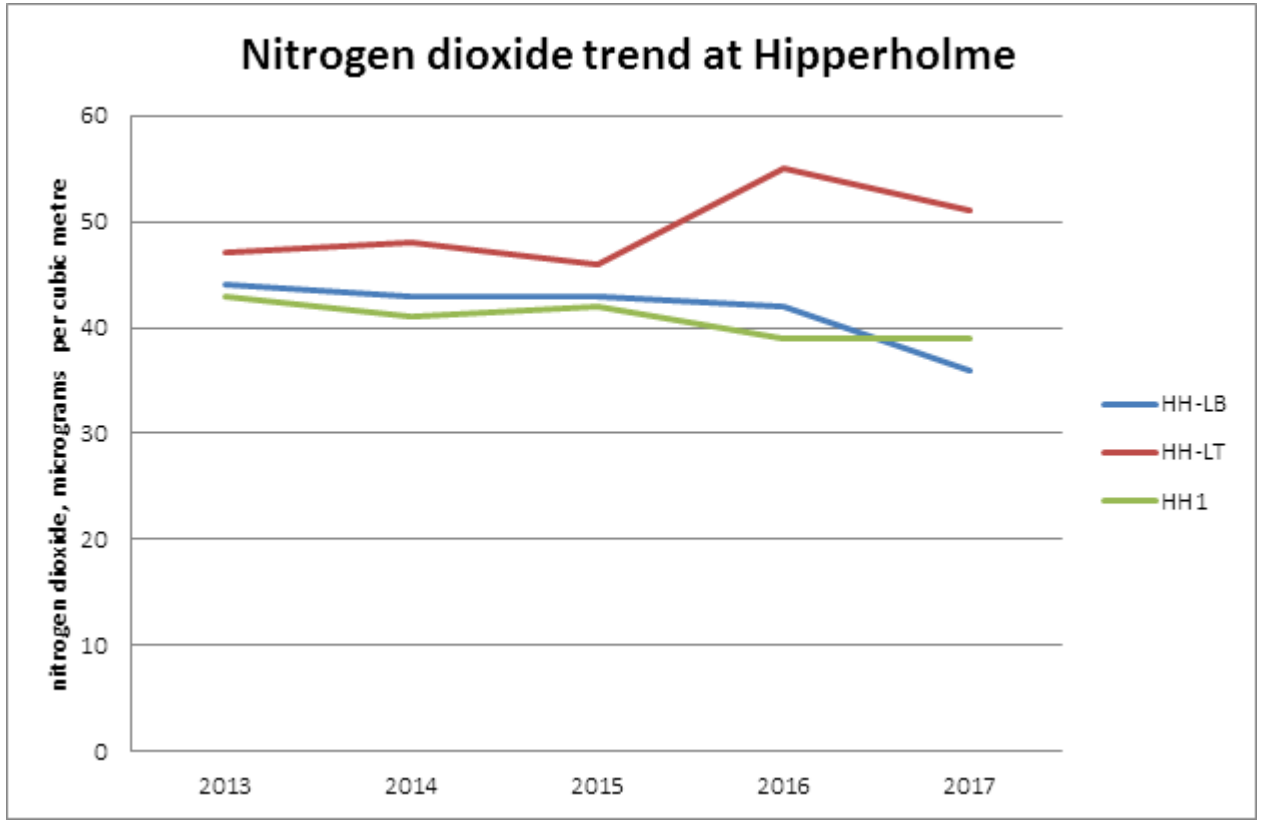


Figure 8 nitrogen dioxide trend at Hipperholme (AQMA No. 7)

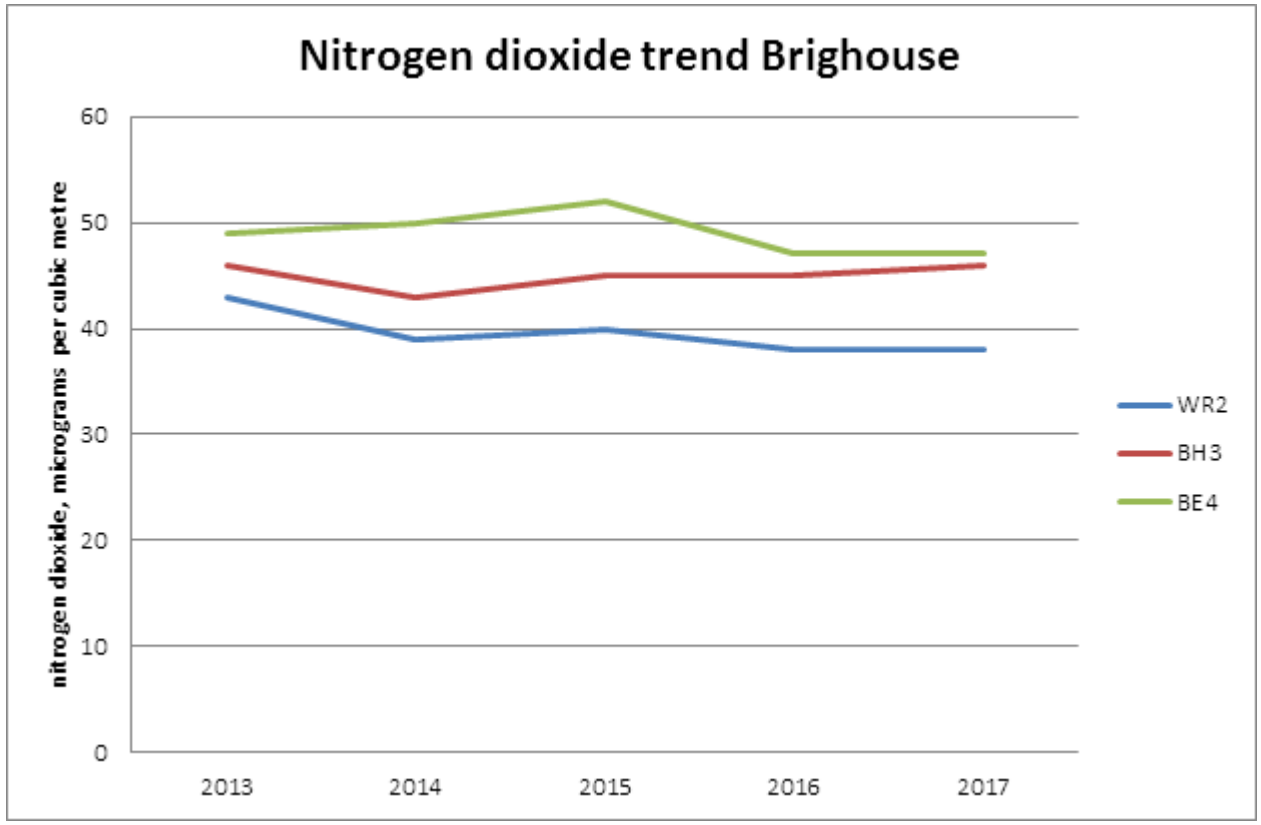


Figure 9 nitrogen dioxide trend at Brighouse (AQMA No. 6)

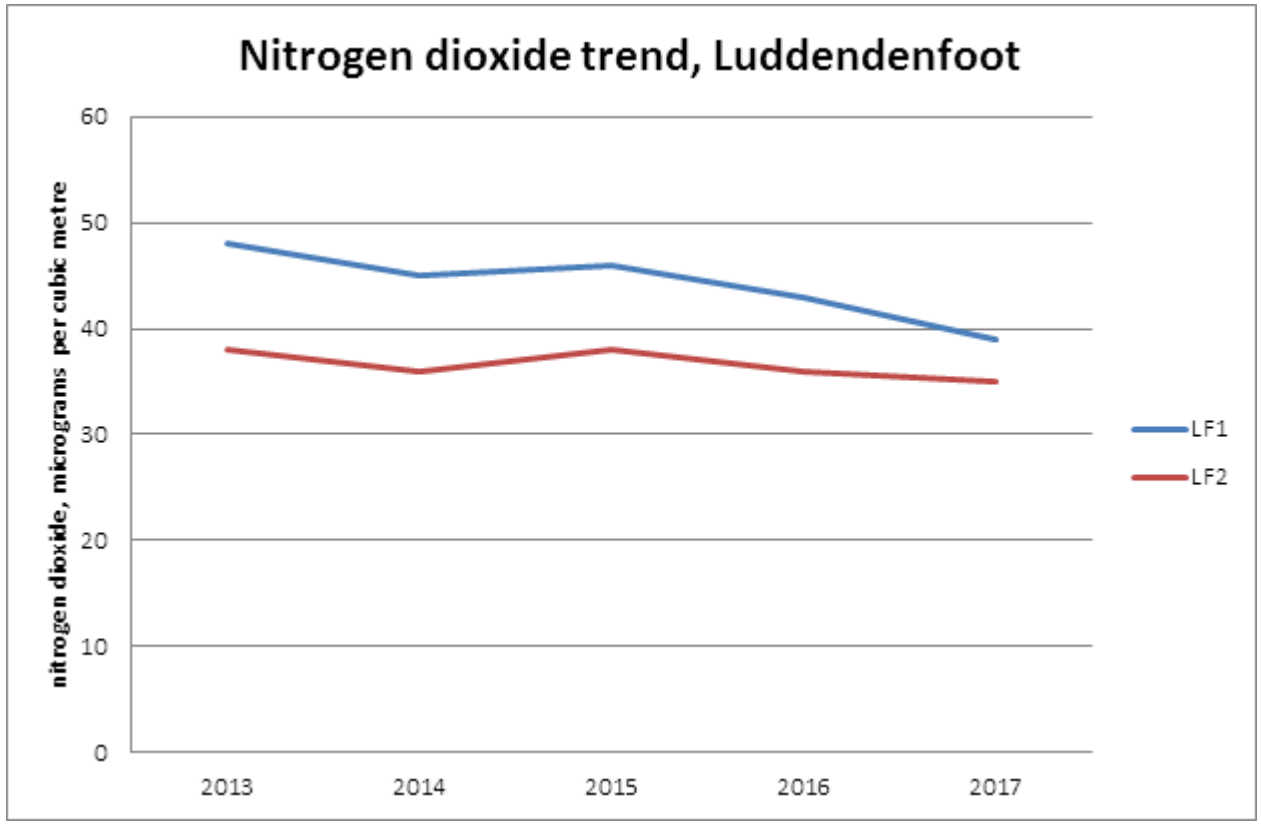


Figure 10 nitrogen dioxide trend at Luddendenfoot (AQMA No. 4)

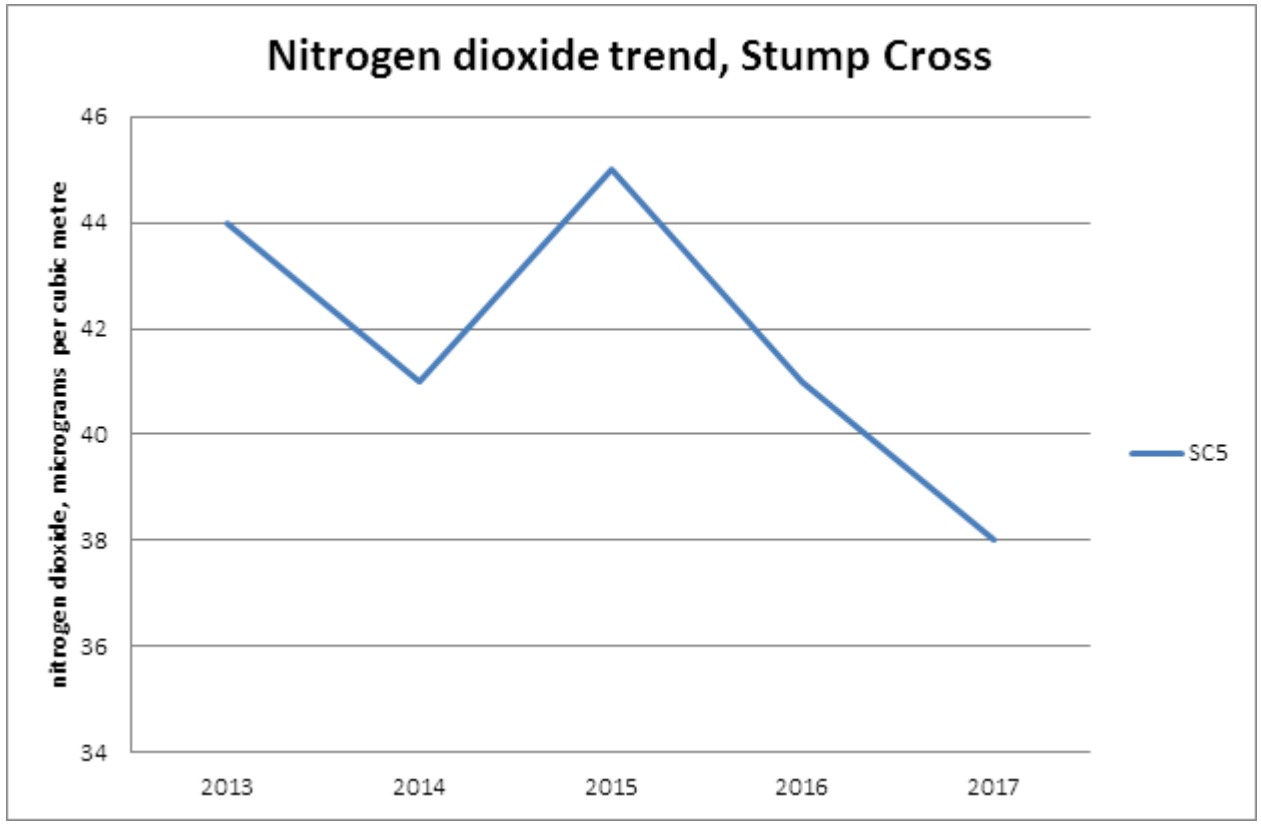


Figure 11 nitrogen dioxide trend at Stump Cross (AQMA No. 5)

The trend is mostly decreasing, with varying rates. Tube HH-LT was moved closer to the Leeds Rd/ Halifax Rd junction in 2016.

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

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	NO_2 1-Hour Means > 200µg/m^3 (3)				
					2013	2014	2015	2016	2017
AQS2	Roadside	Automatic	100	100	**15**	**10**	**2**	**0**	**0**
AQS3	Roadside	Automatic	100	100	**0**	**0**	**0**	**0**	**0**
AQS4	Roadside	Automatic	100	100	**0**	**0**	**0**	**0**	**0**

Notes:

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

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

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

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

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

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	PM_{10} Annual Mean Concentration ($\mu g/m^3$) (3)				
				2013	2014	2015	2016	2017
AQS4	Roadside	100	100			25	25	23

☐ **Annualisation has been conducted where data capture is <75% (NA)**

Notes:

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

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

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

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

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

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	PM_{10} 24-Hour Means > 50µg/m^3 (3)				
				2013	2014	2015	2016	2017
AQS4	Roadside	100	100				15	8

Notes:

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

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

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

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

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

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	$PM_{2.5}$ Annual Mean Concentration ($\mu g/m^3$) (3)				
				2013	2014	2015	2016	2017
AQS2	Roadside	100	100			11	13	13
AQS3	Roadside	100	100			11	17	15

☐ **Annualisation has been conducted where data capture is <75% (NA)**

Notes:

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

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

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

Appendix B: Full Monthly Diffusion Tube Results for 2017

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

Site ID	NO_2 Mean Concentrations ($\mu g/m^3$)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
													Raw Data	Bias Adjusted (0.78) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
A629-1	52	41	31	25	30	21	25	21	23	21	35	38	30	24	24
A629-2	61	47	44	41	29	36	34	30	30	33	48	49	40	31	31.0
A629-3	48	36	42	27	27	25	31	25	31	29	33	30	32	25	25.0
A629-4	40	35	38	19	26	18	21	21	25	20	31	34	27	21	21.0
A629-5	43	37	42	26	25	19	22	19	22	25	36	40	30	23	23.0
A629-6	53	52	56	38	40	38	42	36	41	31	46	44	43	34	34.0
A629-7	57	50	48	34	28	29	26	30	23	33	47	45	38	29	NA
A629-8	48	40	48	24	39	28	27	20	32	27	4	43	32	25	25.0
LV-SAA	52	54	59	35	36	33	30	32	38	35	52	46	42	33	33.0
LV-SCA	61	69	52	71	51	53	63	60	55	48	70	83	61	**48**	NA
LV-AT	48	76	55	55	70	42	57	57	63	58	77	69	61	**47**	NA
LV-62W	40	71	67	35	55	49	45	44	41	40	61	62	51	**40**	NA
LV-62E	43	61	59	55	48	44	44	47	49	42	67	63	52	**40**	NA
LV-LEE	53	46	57	36	30	31	29	37	36	36	53	53	41	32	NA
LV-BRD	59	45	65	30	34	27	25	28	38	38	48	42	40	31	NA

LV-NBN	126	45	139	84	65	62	76	62	82	64	100	107	84	**66**	NA
LV-NBS	48	46	59	52	57	50	52	45	63	48	74	59	54	**42**	NA
LV-NBX	69	57	65	48	45	52	45	42	53	45	67	67	55	**43**	NA
LV-EWB	54	48	43	20	37	26	26	24	24	26	41	43	34	27	NA
NB-NB1	48	69	69	58	45	52	48	48	61	57	71	54	57	**44**	**44.0**
NB-GR	94	60	95	65	71	58	57	49	49	67	95	61	68	**53**	**47.0**
NB-GL	116	71	80	81	66	63	57	63	65	70	70	77	73	**57**	39.0
SC5	59	57	57	44	51	49	50	41	45	39	52	41	49	38	38.0
HH-TC	60	60	52	45	48	29	39	38	39	41	58	52	47	36	29.0
HH-LB	66	58	55	47	48	33	37	32	45	37	51	51	47	36	36.0
HH-LT	94	74	67	72	59	58	59	42	70	47	75	75	66	**51**	**51.0**
HH1	66	58	59	43	50	45	39	46	47	38	56	53	50	39	39.0
WR2	67	61	57	46	42	33	37	35	46	40	60	56	48	38	37.0
BH3	76	71	65	61	37	53	53	51	61	50	65	69	59	**46**	**40.0**
BE4	85	69	65	57	44	44	55	53	53	51	72	72	60	**47**	**46.0**
BE2	74	60	39	55	49	40	41	33	38	49	56	58	49	38	38.0
HXR1	81	71	73	36	58	67	63	52	61	50	72	65	62	**49**	**49.0**
CL1	64	56	51	31	42	35	41	31	43	40	49	36	43	34	34.0
HTAH	55	45	48	58	44	36	37	39	42	37	54	49	45	35	35.0
AT-BR	56	46	43	65	39	38	38	31	40	41	47	50	45	35	NA
AT-MR	55	48	51	80	22	34	30	24	38	33	52	49	43	34	NA
AT-MR2						35	40	35	42	37	59	60	44	34	NA
AQC1	72	62	63	49	45	51	39	49	38	47	63	54	53	**41**	**41.0**
AQC2	72	52	61	86	42	48	49	49	49	34	60	53	55	**43**	**43.0**
AQC3	74	51	65	52	48	45	45	42	48	40	61	53	52	**41**	**41.0**
CRH1	83	78	76	54	59	57	57	31	68	60	89	81	66	**52**	**52.0**
AQ20	51	41	41	26	29	24	25	15	22	26	36	37	31	24	24.0

AQ21	84	70	72	55	57	47	53	50	53	51	73	72	61	**48**	**42.0**
HB6	69	49	50	38	37	42	38	32	40	31	56	59	45	35	34.0
HQ1	76	67	66	64	57	59	58	52	59	54	83	81	65	**50**	**50.0**
HQ9	64	54	51	41	39	41	43	33	42	34	55	54	46	36	36.0
LF1	63	64	58	36	52	48	40	41	41	42	59	55	50	39	39.0
LF2	65	50	53	44	38	37	34	34	30	37	57	53	44	35	35.0
SB1	81	69	70	55	52	46	36	50	52	49	68	68	58	**45**	**45.0**
SB3	74	60	66	37	63	41	43	31	39	44	59	55	51	**40**	**40.0**
SB15	72	56	60	41	46	42	39	30	33	41		59	47	37	37.0
SB16	69	64	57	39	47	36	43	31	39	47	53	52	48	38	38.0
SB18	66	55	47										56	**44**	NA
SB20	80												80	62	NA
SB21	48	41	36	25	28								36	28	NA
SB22	79	64	42	48	61	47	missing	41	58	35	61	58	54	**42**	**42.0**
BS1 HB	70	53	66	37	48	42	46	35	45	48	47	50	49	38	38.0
WV-SR1	76	60	57	48	40	46	39	38	43	55	36	63	50	39	39.0
WV-SR2	51	48	50	32	43	29	20	28	32	25	39	44	37	29	29.0
NB-RB				30	33	31	24	22	11	28	44	37	29	23	23.0
NB-SJ					32	31	28	25	31	20	35	41	33	26	NA

☐ **Local bias adjustment factor used**

☒ **National bias adjustment factor used**

☒ **Annualisation has been conducted where data capture is <75% (AT-MR2 and NB-SJ)**

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

Notes: tubes SB18, SB20 and SB21 were discontinued during 2017 and no annualisation has been carried out

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

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

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

(2) Distance corrected to nearest relevant public exposure. NOTE: where the limitations of the falloff calculator apply, or where there is no relevant exposure, the cell is marked NA.

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

C1. Overview of continuous monitoring

The continuous monitoring station at Salterhebble measures nitrogen oxides and fine particulate matter ($PM_{2.5}$). The station is referred to as AQS2.

The continuous monitoring station at Hebden Bridge measures nitrogen oxides and fine particulate matter ($PM_{2.5}$). The station is referred to as AQS3.

The continuous monitoring station in Sowerby Bridge measures nitrogen oxides and particulate matter (PM_{10}). This station is referred to as AQS4.

C.2 Supply and analysis of nitrogen dioxide diffusion tubes

The nitrogen dioxide diffusion tubes are supplied and analysed by West Yorkshire Analytical Services. The tubes are prepared with 50% TEA in acetone. West Yorkshire Analytical Services AIR-PT (which includes the former WASP scheme) scores improved from the 2015 findings, although they were not consistently 100% for 2017. The Council has discussed the scores with the laboratory and is satisfied that the laboratory has appropriate quality assurance procedures in respect of the analyses. The laboratory scores well in another quality assurance scheme which appears to be better aligned with the diffusion tube exposure process, involving exposing banks of diffusion tubes rather than spiking the tubes with a solution.

A “travel blank” is submitted for analysis with each batch of tubes, and the concentrations recorded for this tube have been consistently negligible.

C.3 Maintenance and data preparation and analysis

The automatic analysers are covered by a maintenance and callout contract, which allows for six-monthly maintenance visits and callouts for instrument faults. Council staff visit the sites every two weeks to check for faults and to check the instrument nitrogen oxides span and zeros. Staff have been trained to change the BAM tapes, and to clean the inlet and nozzle between service visits. There were no significant problems with the operation of the analysers during 2017.

The measurements from all three automatic sites are collected using WinAQMS and Airodis software. It is checked for obvious errors and outliers and backed up to the Council's secure network. For analysis the data is first conditioned using a spreadsheet. This involves scaling the raw data using the span and zero values obtained on site every two weeks, checking for obvious items such as values well below zero or long periods of missing data, and marking these abnormal values.

Particulate matter measurements are made using a beta attenuation monitor (BAM) with the appropriate inlets for PM_{10} or $PM_{2.5}$. Data is collected using the same system as the nitrogen dioxide analysers.

Periods embedded within long sections of missing data may need to be removed from the data as they are likely to be affected by instrument faults (and this is normally picked up during routine checks). Periods known to be affected by instrument faults are also removed. The data may then be put into a suitable format for importing into the open source software package “openair” ([R17], [CR12], [CR16]), or manipulated in a spreadsheet. The Council has chosen to use “openair” due to the range of analysis tools, ease of data manipulation and simple production of graphics.

Dealing with missing data is a delicate problem, but the data for 2017 was almost complete (nominally 100% as reported above) for each site.

C4 Choice of bias correction factor for 2017

The Council runs a local colocation study at AQS2, Huddersfield Road. In June 2017 major work started on a highways improvement project (A629 Phase 1a). For much of the later part of 2017 there was disruption to traffic flows on this stretch of road and this may have affected the colocation study. The local bias correction factor was 0.92 based on data from the continuous monitor and from the diffusion tubes AQC1, AQC2 and AQC3.

The mean from AQS2 itself does not appear to be in question, and some simple data checks show that the span/ zero procedure was robust and that the instrument response was good (see Figure 7, which shows the linear relationship between the raw NO_2 figure (NO_x – NO) and the scaled figure based on regular span and zero checks).

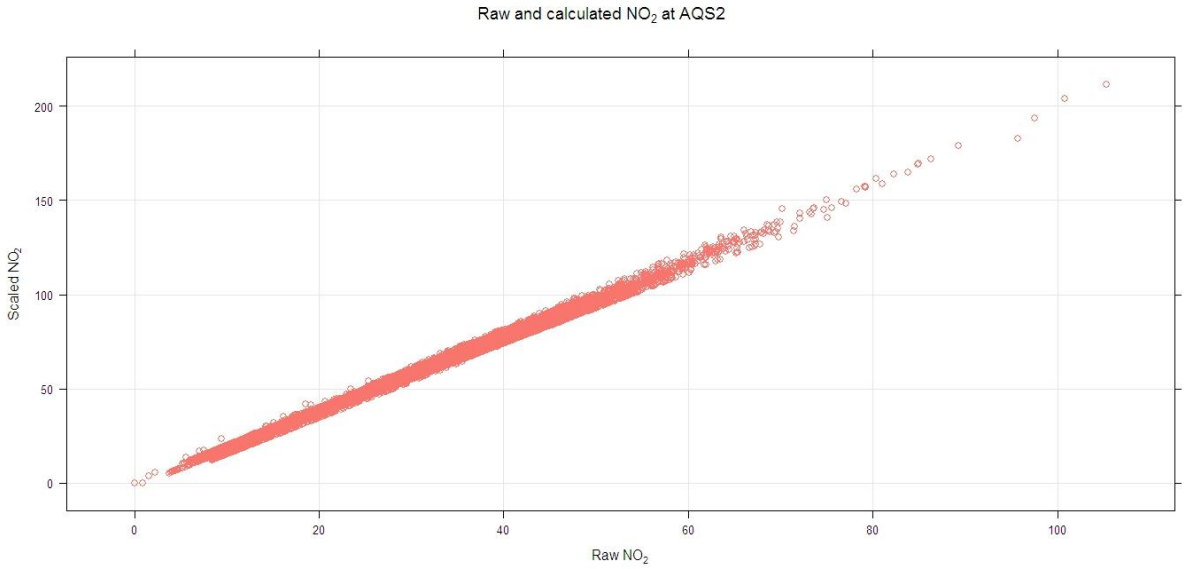
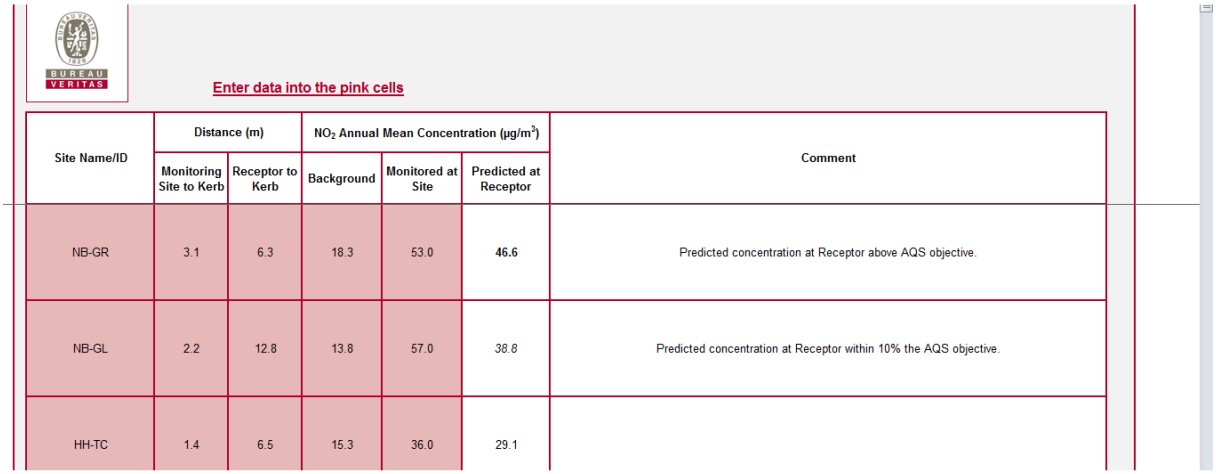


Figure 12 scatter plot of raw (ppb) and adjusted (μgm^{-3}) NO_2 concentrations

Possibly the diffusion tubes gave a false lower reading for reasons yet to be determined, but in any case the factor of 0.92 is much higher than previous studies and would give implausibly high readings when applied to other sites.

The Council has therefore chosen to adopt the factor from the 2017 national study (0.78).

Figure 9 below is a screenshot of the falloff with distance calculation used to produce Table B1. All background concentrations were taken from the 2015 background maps with the year set to 2017.



Enter data into the pink cells

Site Name/ID	Distance (m)		NO_2 Annual Mean Concentration ($\mu g/m^3$)			Comment
	Monitoring Site to Kerb	Receptor to Kerb	Background	Monitored at Site	Predicted at Receptor	
NB-GR	3.1	6.3	18.3	53.0	**46.6**	Predicted concentration at Receptor above AQS objective.
NB-GL	2.2	12.8	13.8	57.0	*38.8*	Predicted concentration at Receptor within 10% the AQS objective.
HH-TC	1.4	6.5	15.3	36.0	29.1	

Figure 13: falloff with distance calculation (sample screenshot)

Annualisation (TG16 Box 7.9) was applied to AT-MR2, which was exposed for less than 75% of the year. Data are not available from national background stations closer than 50km, and so local data were used.

From AQS3 the annual mean was A_m = 36.48µg/m3, while that for the period of exposure was P_m = 33.83µg/m3, and the annualisation factor was 1.08.

For comparison the factor derived from diffusion tubes in the same area was (quoting raw means) as shown in the left hand panels of the table below. The right-hand panels show the calculations for tubes with a similar mean to NB-SJ. In both cases the annualisation factor works out to around 1.11.

tube	A_m	P_m	A_m/P_m	tube	A_m	P_m	A_m/P_m
HTAH	45.33	42	1.079	A629-1	30.25	26.75	1.13
AT-BR	44.5	40.71	1.093	A629-3	32	28.88	1.108
AT-MR	43.0	37.14	1.158	A629-4	27.33	24.5	1.116
Annualisation factor			1.11	Annualisation factor			1.11

In the case of AT-MR2 the annual mean was 34µg/m3, which annualised (using the factors above) to 37 ± 1 µg/m3 taking into account rounding. In the case of NB-SJ the annualised bias-corrected mean was 26 µg/m3.

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

The following symbols have been used in the maps:

- AQMA boundary.
- Diffusion tube exposed in 2017.
- Diffusion tube exposed before 2017 and discontinued.

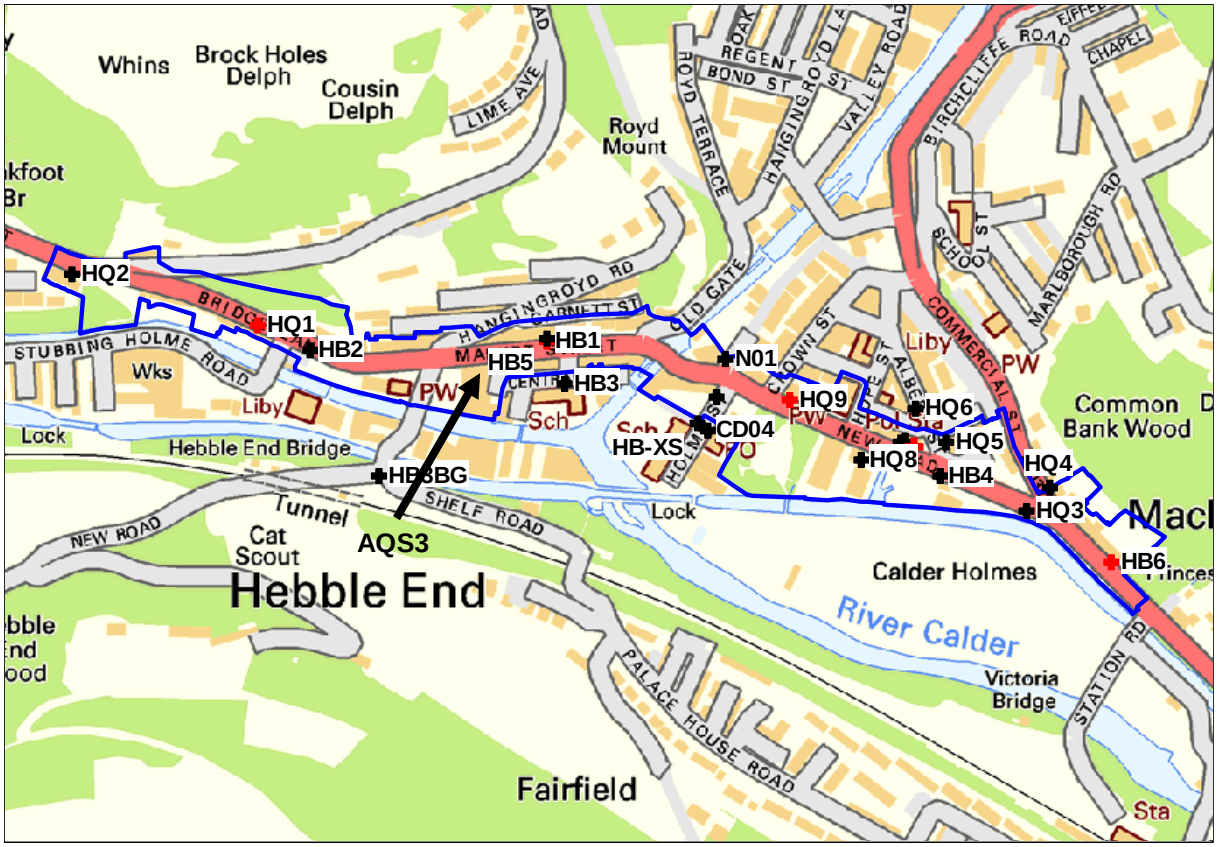


Figure D1: diffusion tubes and station AQS3 in Hebden Bridge (AQMA No.3)

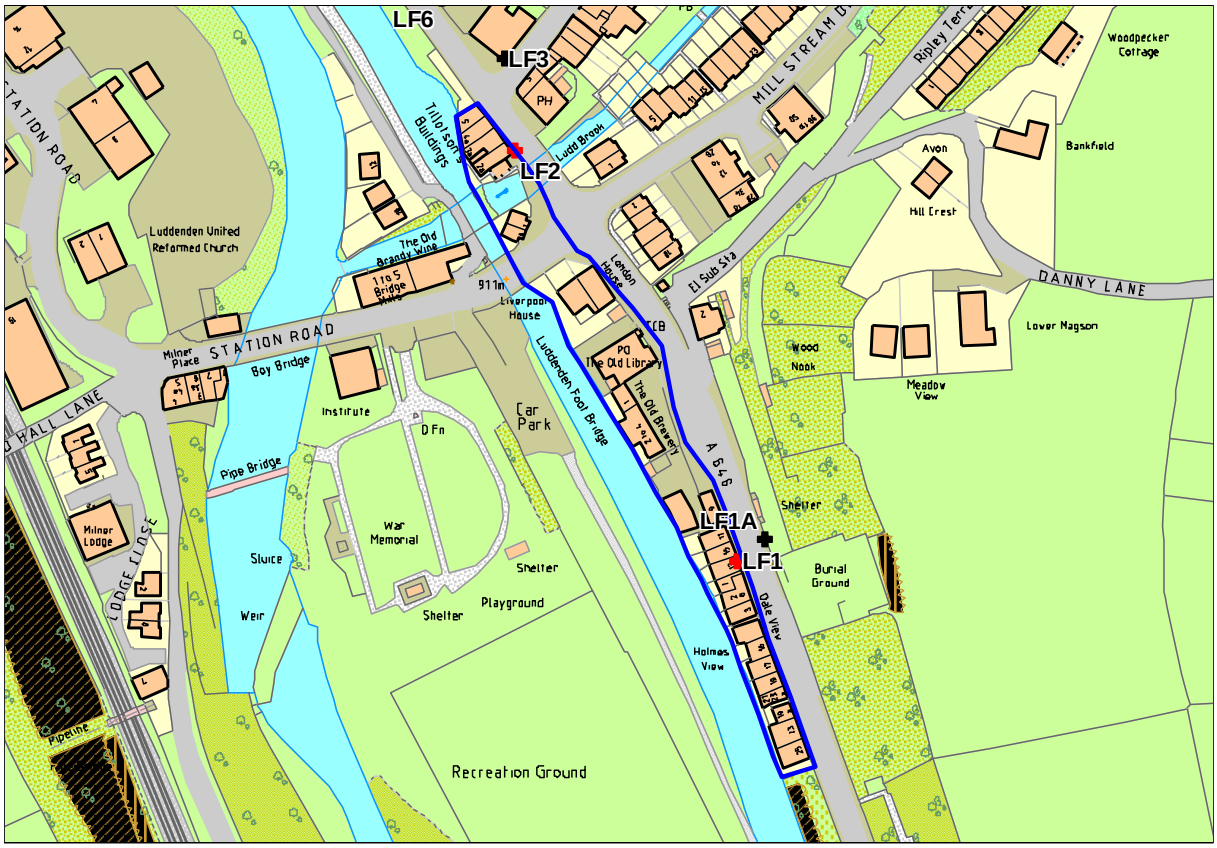


Figure D2: diffusion tubes in Luddendenfoot (AQMA No. 4)

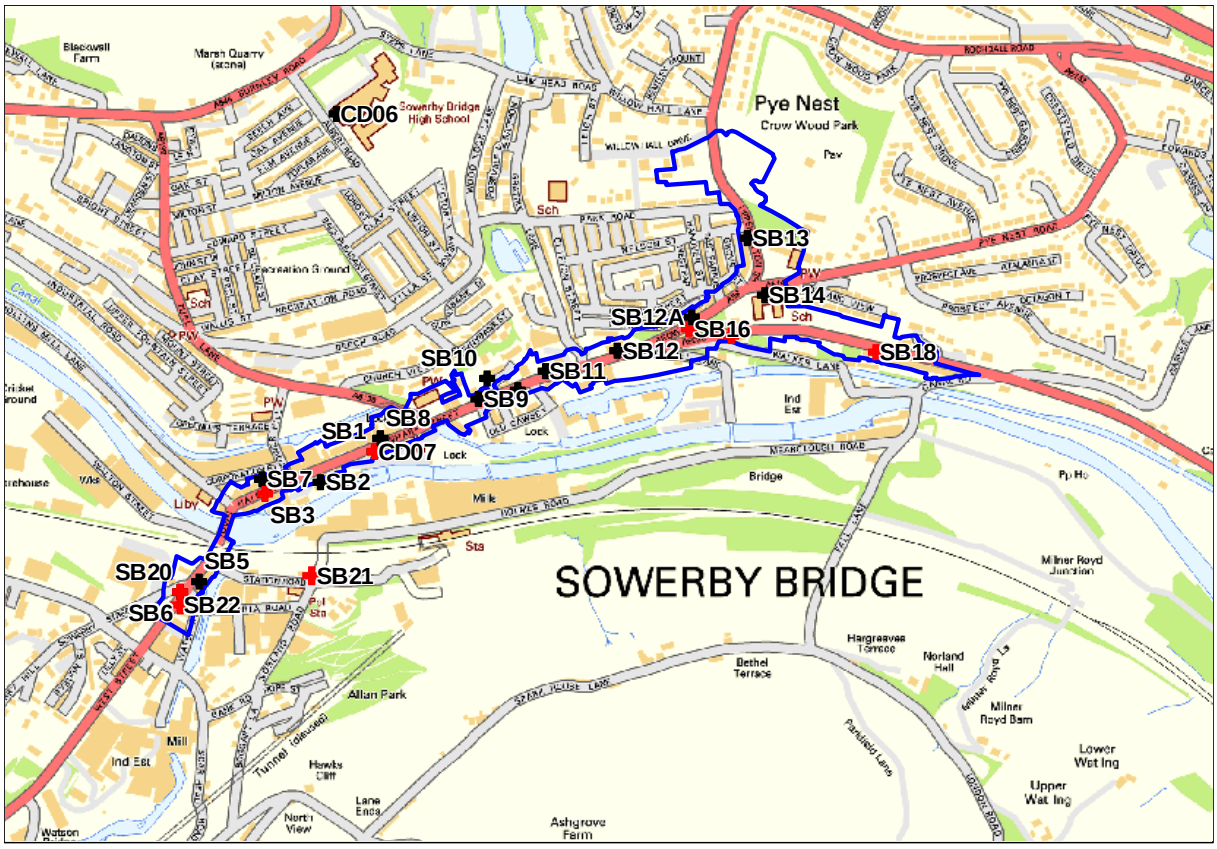


Figure D3: diffusion tubes in Sowerby Bridge (AQMA No. 2)

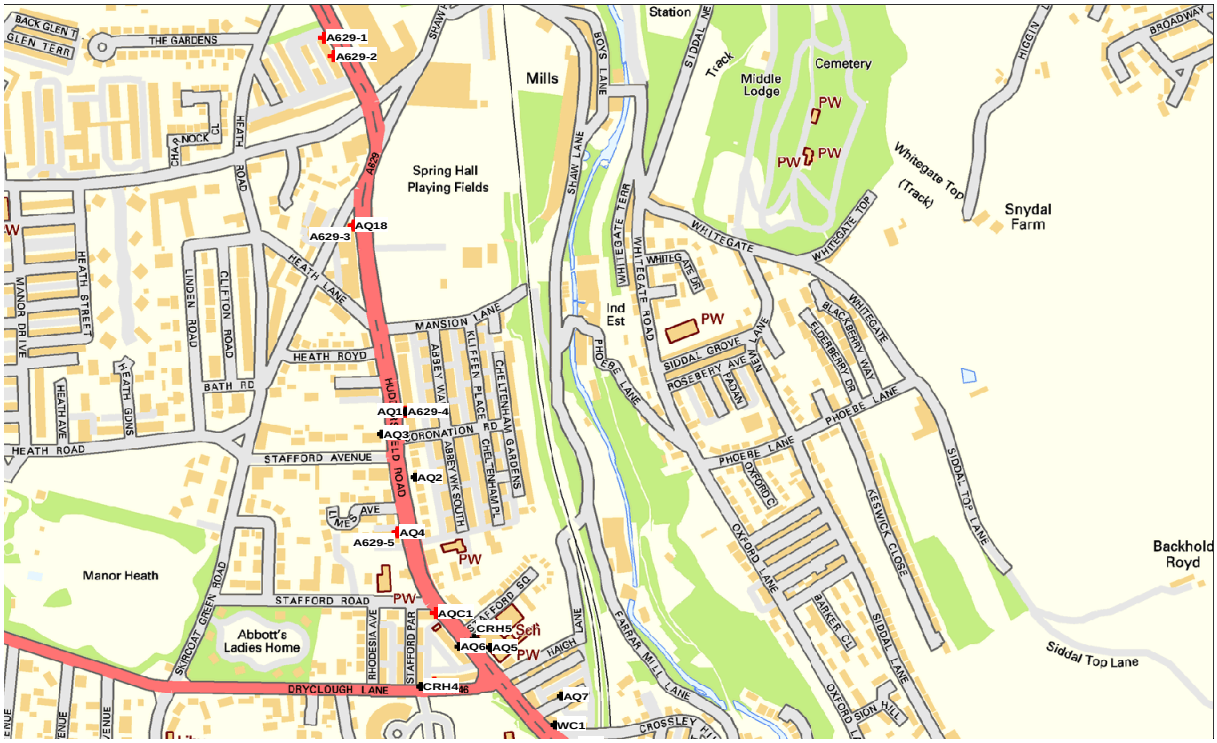


Figure D4: A629 series tubes at Salterhebble

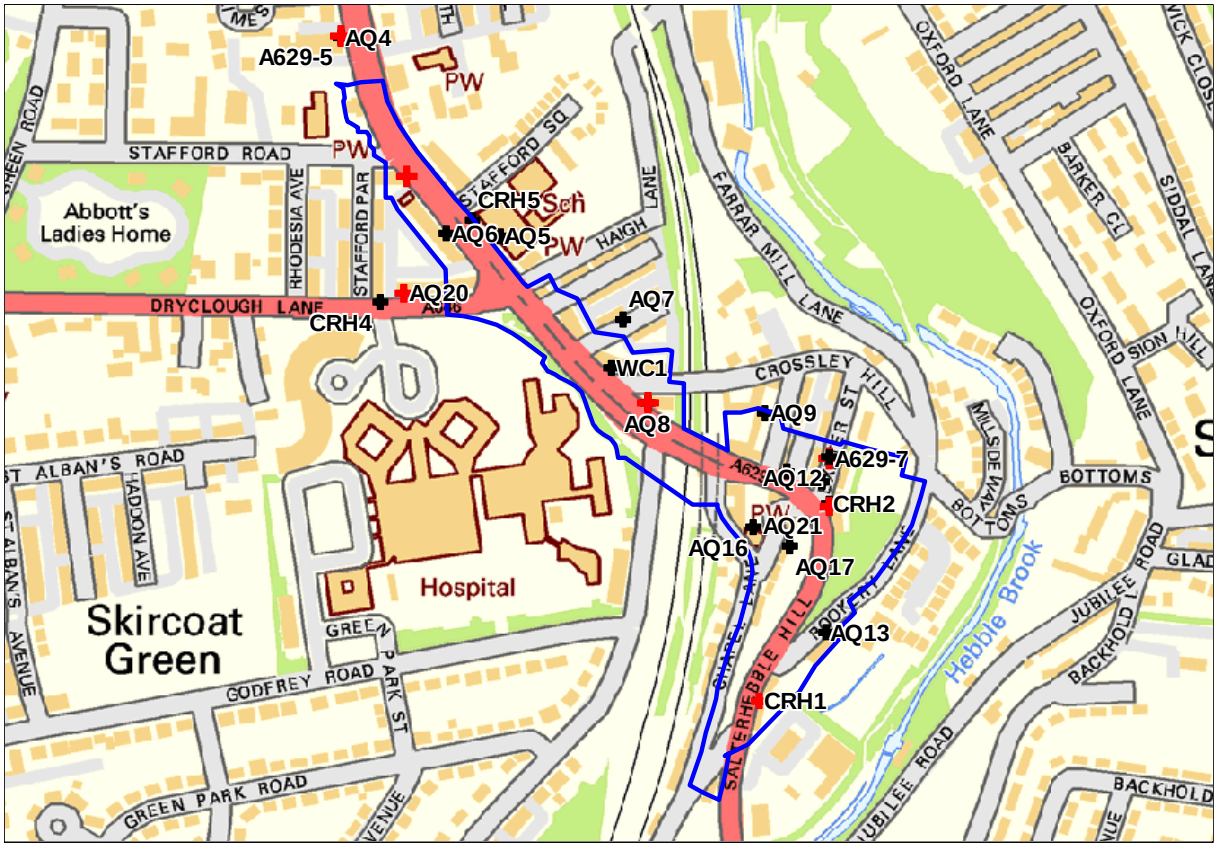


Figure D5: diffusion tubes in Salterhebble (AQMA No. 1)

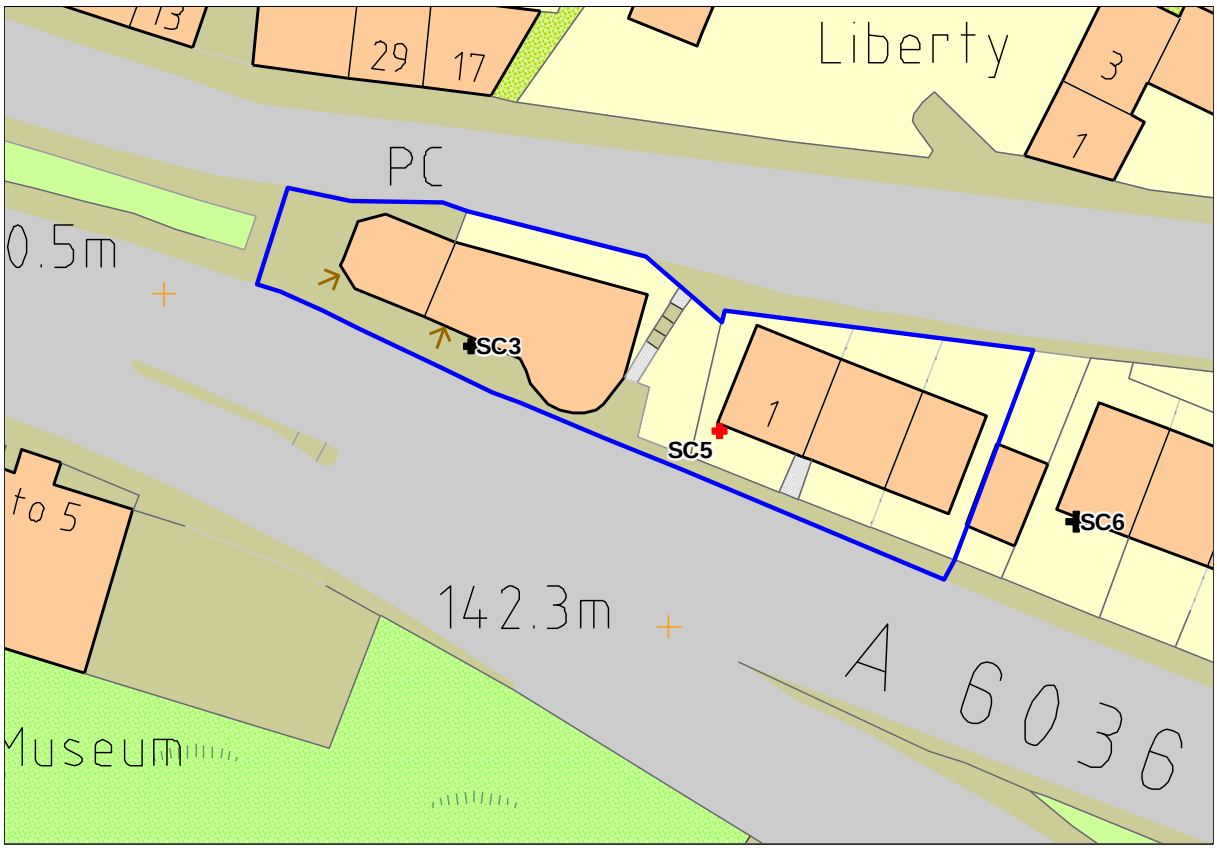


Figure D6: diffusion tube SC5 at Stump Cross (AQMA No.5)

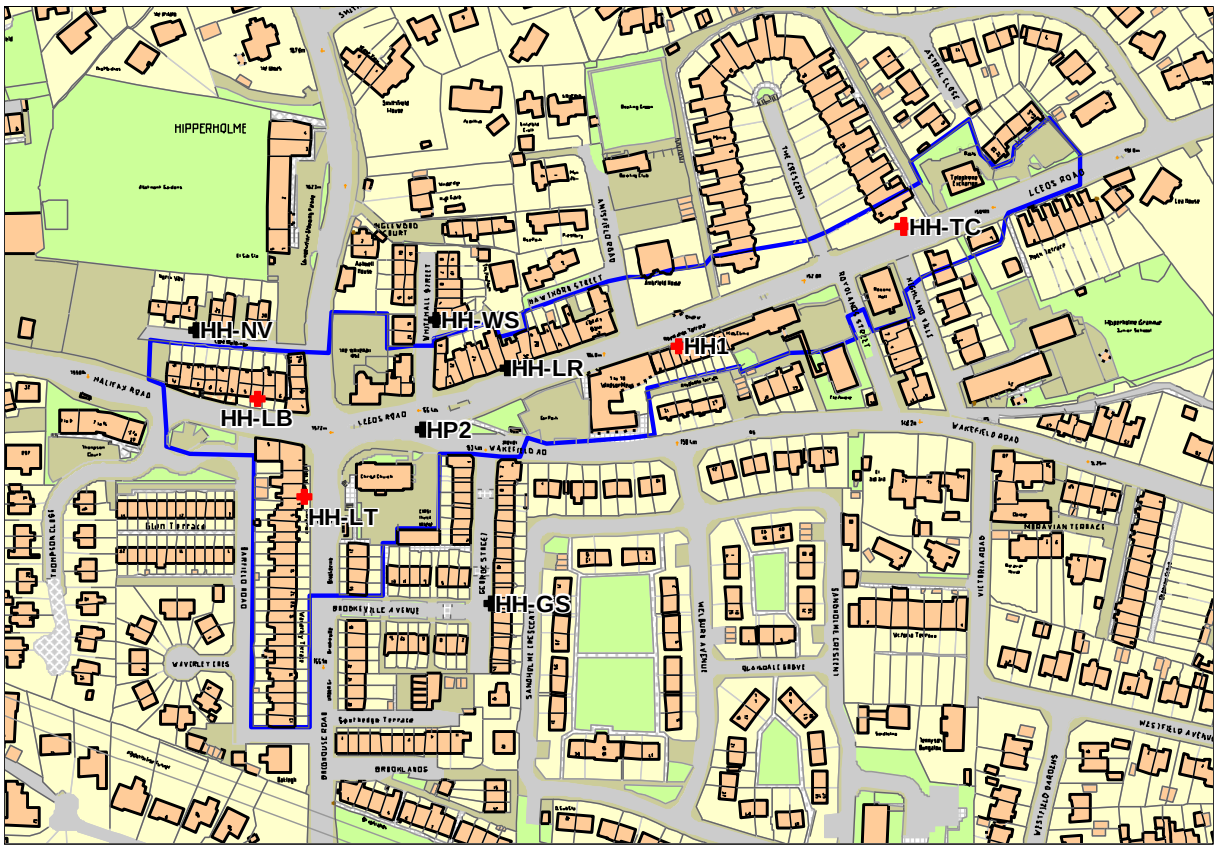


Figure D7: diffusion tubes in Hipperholme (AQMA No. 7)

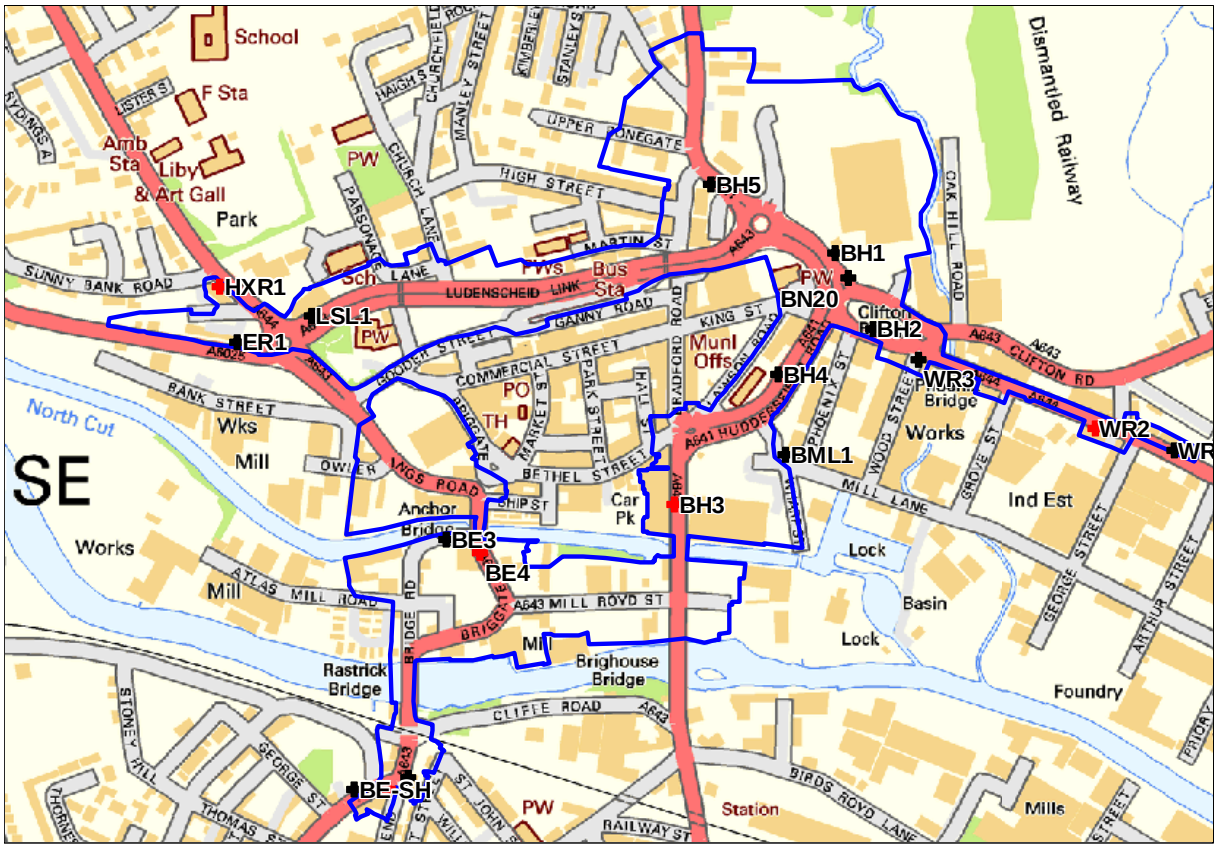


Figure D8: diffusion tubes in Brighouse (AQMA No. 6)

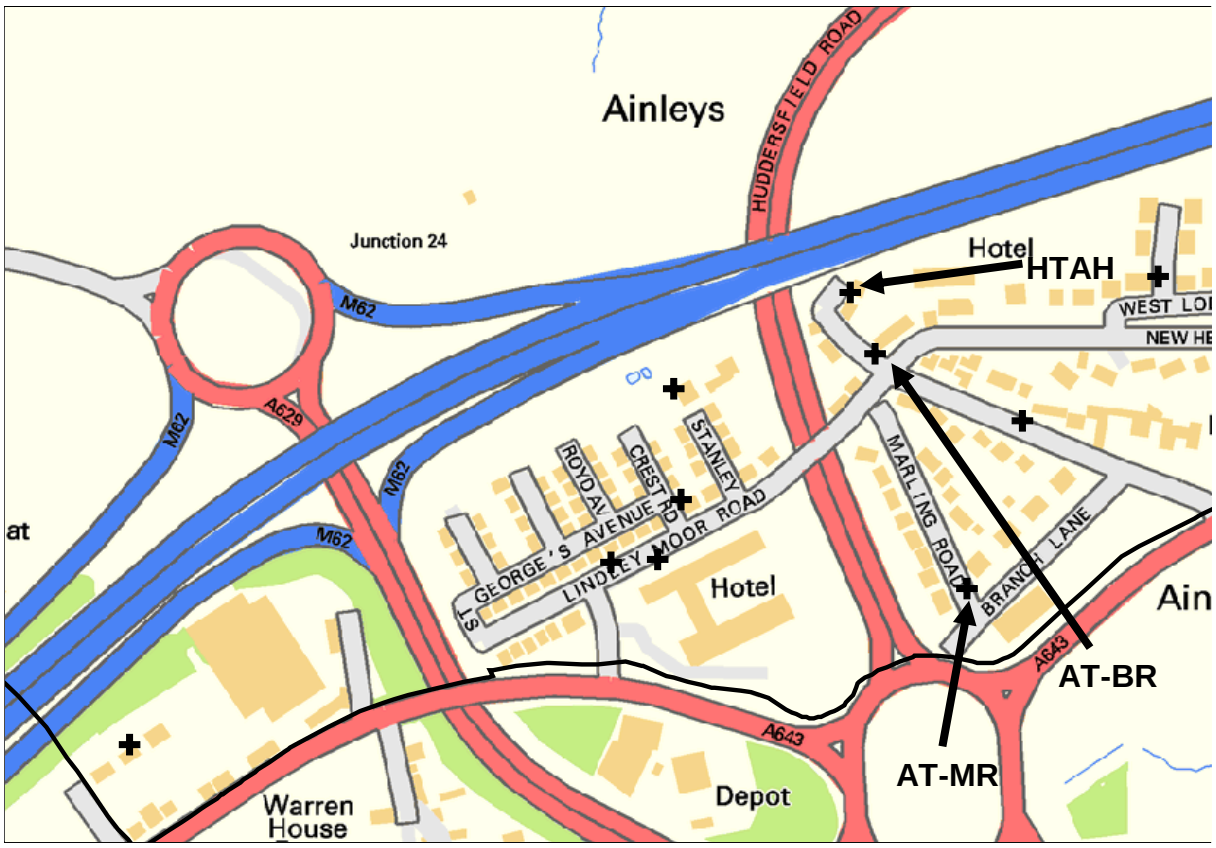


Figure D9: diffusion tubes at Ainley Top (not in an AQMA)

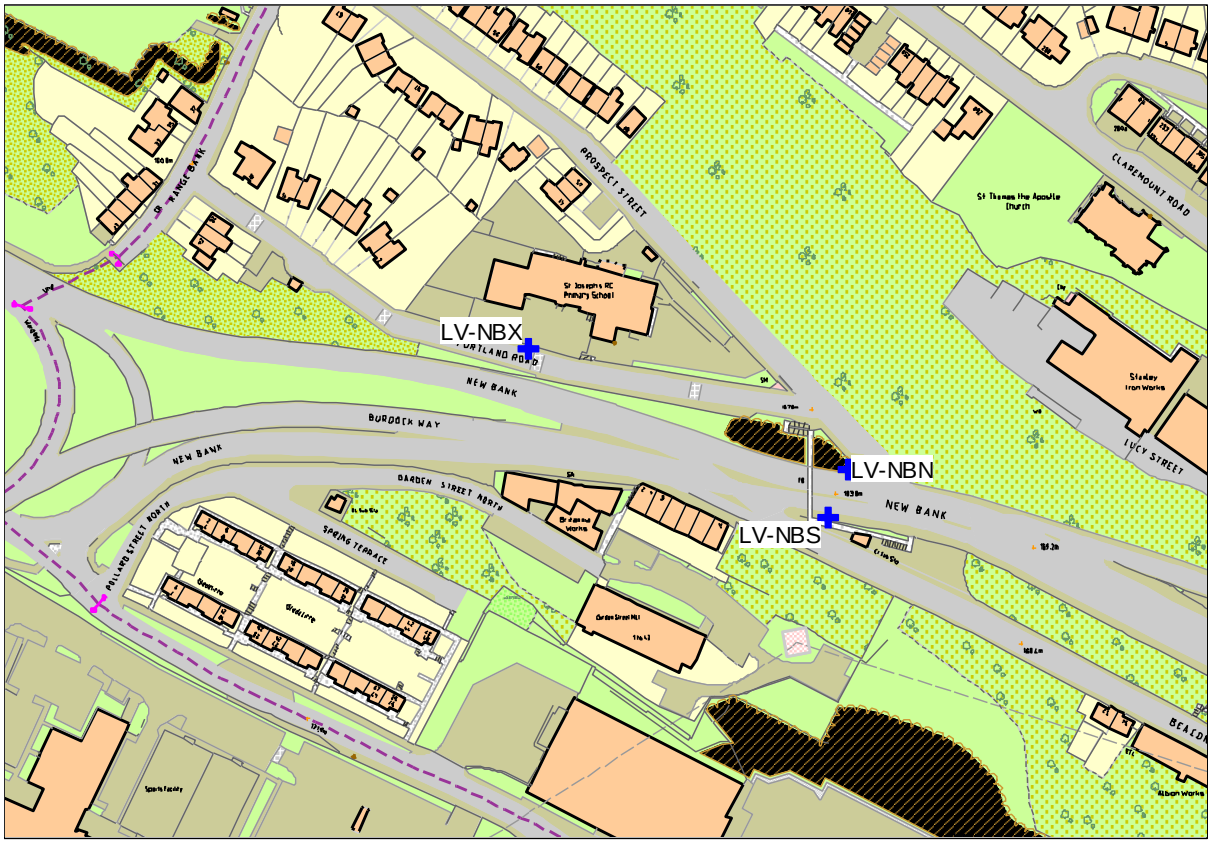


Figure D10: diffusion tubes at New Bank (not in an AQMA)

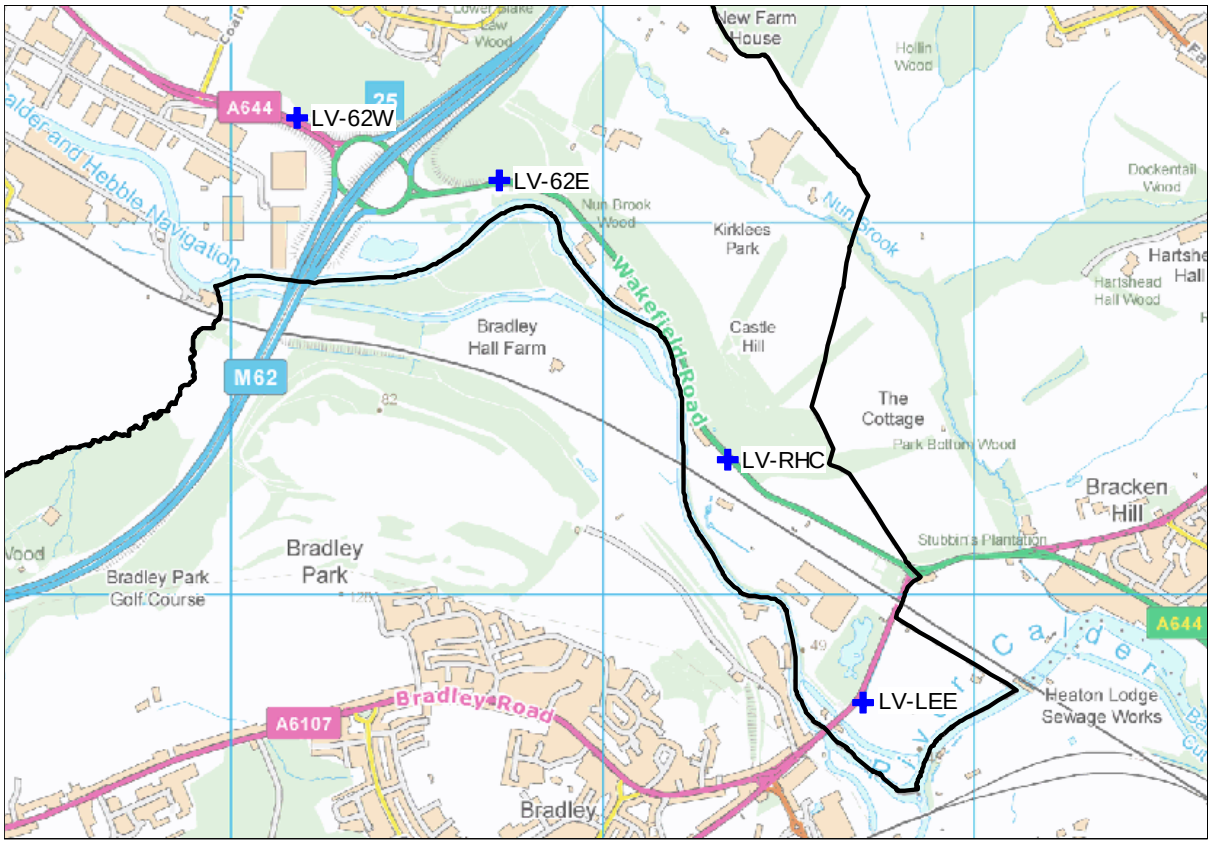


Figure D11: diffusion tubes along A644 at Brighouse (not in an AQMA)

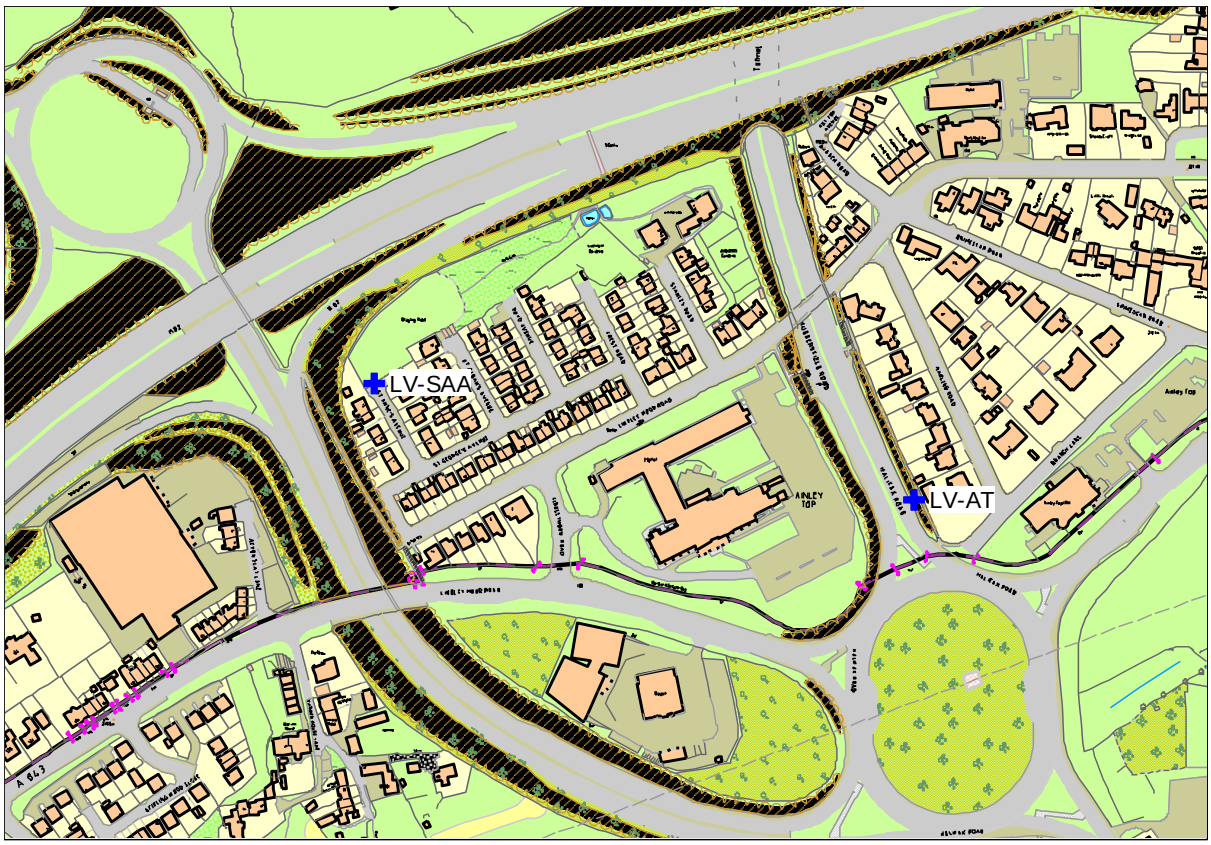


Figure D12: LV series diffusion tubes at Ainley Top (not in an AQMA)

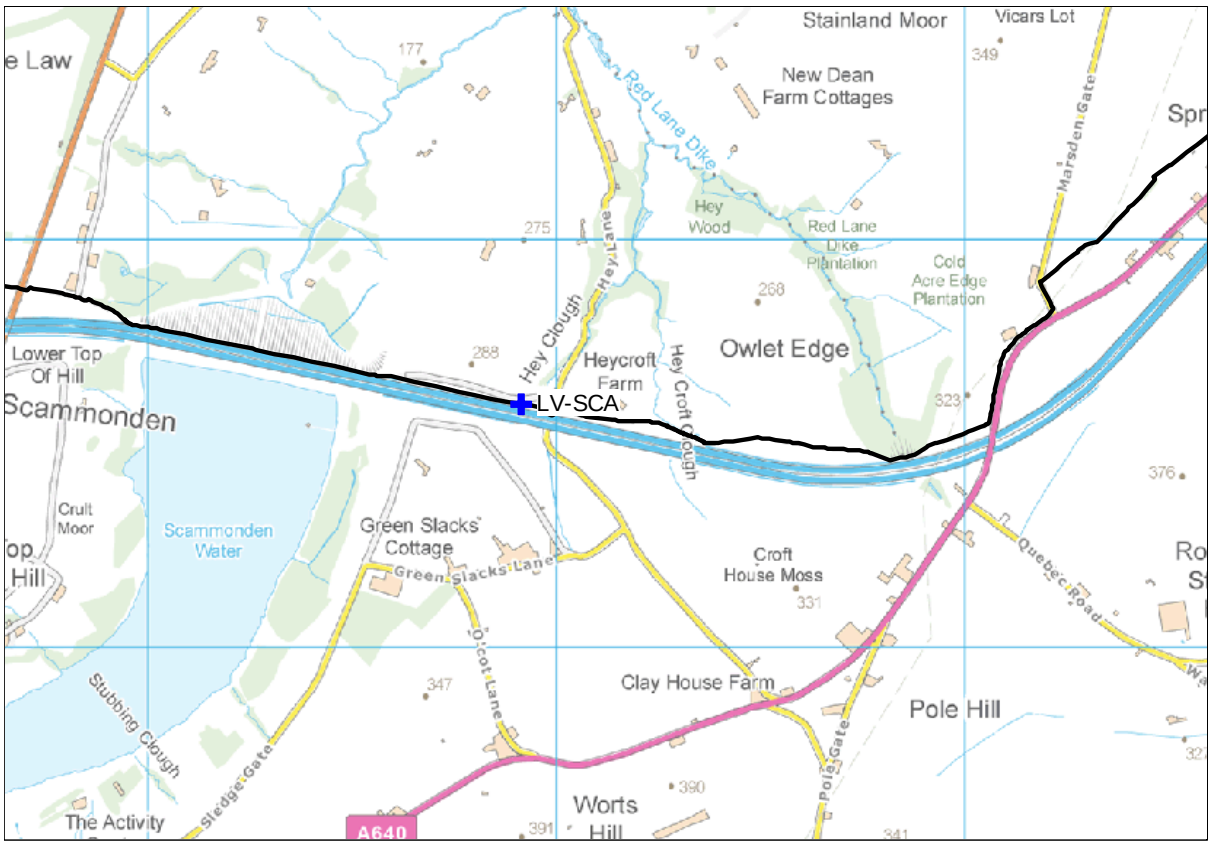


Figure D13: diffusion tube LV-SCA on M62 (not in an AQMA)

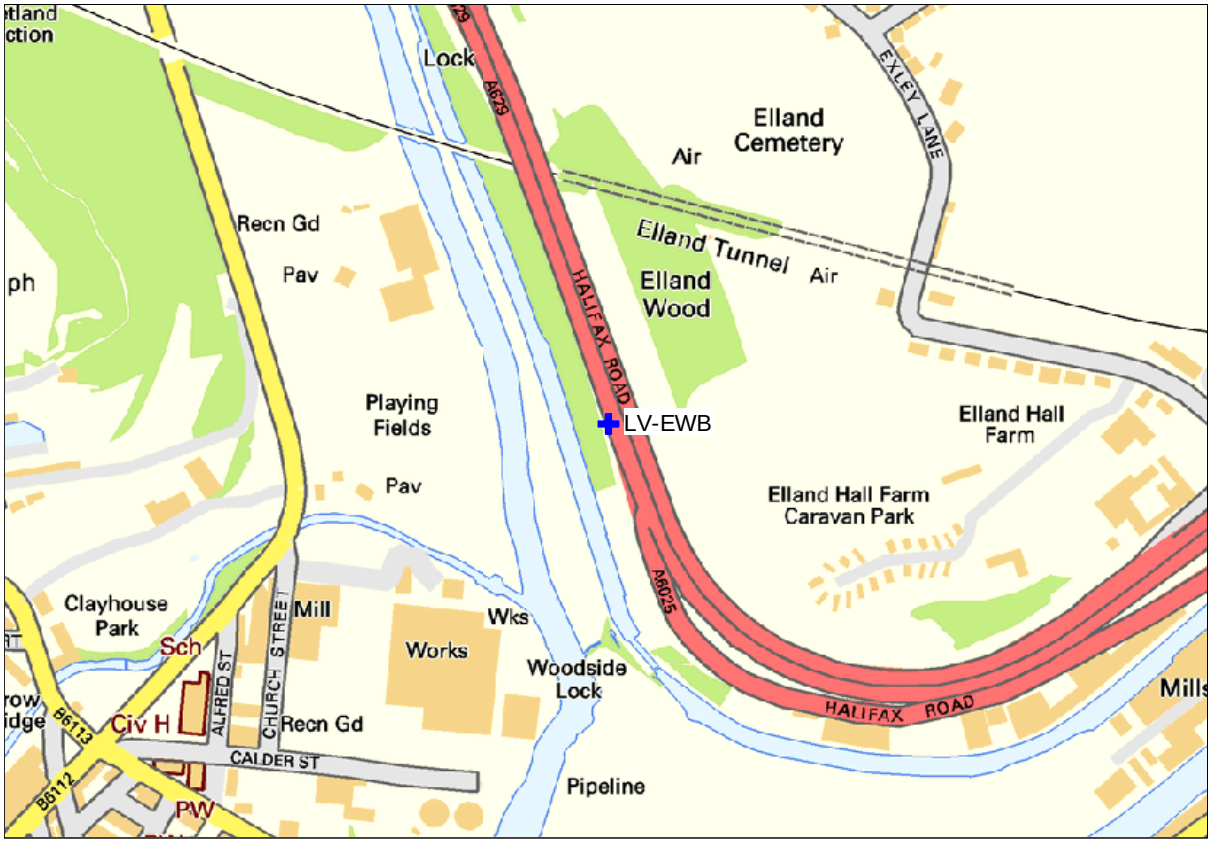


Figure D14: diffusion tube LV-EWB on A629 Elland Wood Bottom (not in AQMA)

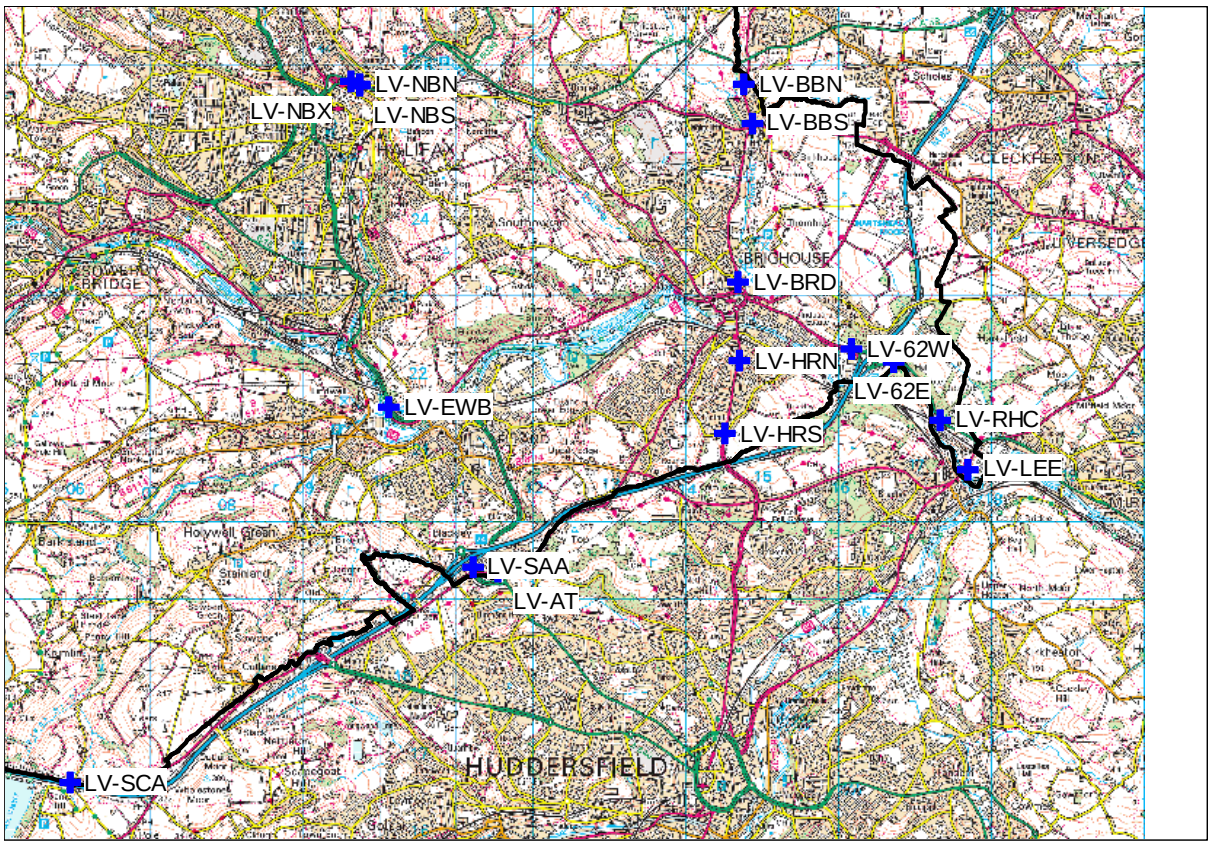


Figure D15: distribution of LV- series diffusion tubes across Calderdale

Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective[4]	
	Concentration	Measured as
Nitrogen Dioxide (NO_2)	200 µg/m^3 not to be exceeded more than 18 times a year	1-hour mean
	40 µg/m^3	Annual mean
Particulate Matter (PM_{10})	50 µg/m^3, not to be exceeded more than 35 times a year	24-hour mean
	40 µg/m^3	Annual mean
Sulphur Dioxide (SO_2)	350 µg/m^3, not to be exceeded more than 24 times a year	1-hour mean
	125 µg/m^3, not to be exceeded more than 3 times a year	24-hour mean
	266 µg/m^3, not to be exceeded more than 35 times a year	15-minute mean

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

Appendix F Working with local air quality data

The data collected by the Council is available to anyone who is interested for any purpose from the Dataworks website

https://dataworks.calderdale.gov.uk/

Once downloaded the data can be manipulated in a spreadsheet for basic analysis or loaded into a numerical software package that is designed to handle big datasets and time series.

The Council uses R for air quality data analysis because of its range of functionality (there are packages devoted to time series, linear models and air quality data). R is free software widely used in academia, and can be downloaded from https://cran.r-project.org/. There are versions for Windows, Linux and Mac, and it can be installed on smartphones and credit-card sized microcomputers. R runs at the command line, which may be unfamiliar to some users, but there is a free product called R Studio that makes organising projects and visualising data much simpler. It comes with manuals and example datasets.

The air quality openair project is hosted at http://davidcarslaw.github.io/openair/. The openair packages can be installed in R by typing at the command prompt

```
>install.packages("openair")
```

The manual pages set out how to import, check and analyse data, with the emphasis on visualisation. Assuming that you have downloaded data as AirQualityStation.csv into C:/data the following commands will give some graphical output:

```
>library(openair)
>AQS<-
import("C:/data/AirQualityStation.csv",na.strings=c("NA","InVld","NoData","
#VALUE"))
>summaryPlot(AQS)
>calendarPlot(AQS,pollutant="no2")
```

A full account can be found on the openair reference pages and in the manual.

Other data analysis packages include pandas for Python. Although not specific to air quality the time series analysis tools can be used for plotting and manipulating data in much the same way as R. It is also possible to use Python with the NumPy and SciPy libraries to produce graphs and statistics.

Appendix G: examples of publicity and communications work

The images below are taken from Council initiatives to raise awareness of air quality and transport themes.

The first, Figure 14, is taken from a local publicity campaign, where the message to get out of the car and use more active travel was carried by one of the bus operators, as well as appearing on billboards.

Figure 15 shows the Clean Air Day 2018 stand being set up in a Council workplace. The stand was accompanied by leaflets and internal communications, and the themes included car sharing pledges, electric bicycle and vehicle tests and health advice. The Council was very active on social media on the day: a sample tweet is shown in Figure 16.

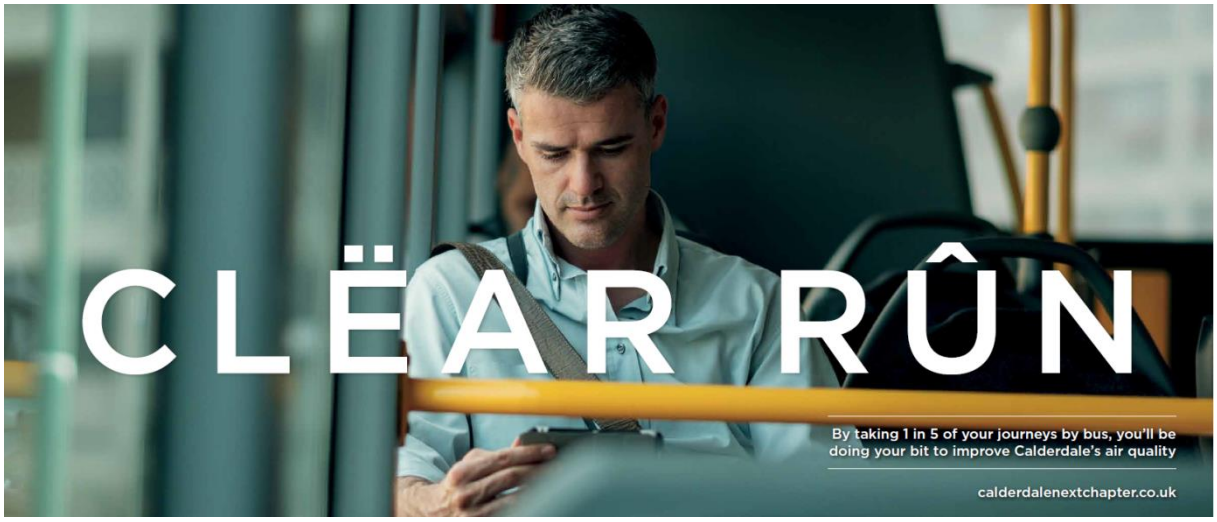


Figure 14: bus and poster campaign 2017

.

Figure 15: Clean Air Day 2018 stand being prepared

Figure 16 a tweet from Clean Air Day 2018

Appendix H: Action Plan delivery scheme

The Council's intention is to monitor progress with the Action Plan in a structured manner. To this end a delivery scheme has been drafted, and progress / performance is to be a standing item on the Steering Group agenda.

The table below, which should be read together with Table 2, sets out the actions and summarises key points. It is intended to update this table in future reports.

Action	AQAP no/measure	Progress to date	lead	KPI
Action Plan development				
Review air quality steering group members and agree terms of reference and format of action plan		Terms of reference and action plan format to be agreed at steering group meeting 18 June 2018	Named	
Establish low emissions/air quality delivery group		Steering group to agree the make up of the delivery group and how the action plan should be monitored.	Steering group	
Review feedback from consultation on strategy and action plan		Consultation extended to end June	Named	
Monitoring and measurement				
Measure air quality at key sites and routes		Ongoing - tubes and measuring sites. Also need information from major projects around monitoring of air quality. Need to investigate whether and how we make live air quality data available.	Named	Data collection
Measure roadside emissions from different vehicle types		Work has been done on this by Leeds in previous years but no report done. Need to agree whether further analysis required.	TBC	Data collection and raising awareness
Traffic Management				
Signalling strategies to be developed and improved		Proposal through WYTF to link all district signals to one system and join services together in Leeds. Need to work with Highways England to ensure shared understanding of roads. Need to understand usefulness of UTMC for different routes	TBC	Improved traffic flows
Need to have better understanding on MOVA type technology to ensure we are up to date with most effective solution. Make sure that we use Leeds UTC in all signalling and junction projects.		MOVA has been used at Stump Cross and Hipperholme. Resource/skill development needed to undertake understanding of use of smart technology in UTMC	Named	Improved traffic flows and queue lengths at key sites

Improve real time messaging to drivers using VMS.		VMS sites displaying route messages established. A629 to have new messages added. Further locations to be developed - ongoing and part of LTP scheme. Potential strategy document to be developed which links to west yorkshire key route network board	Named	Improved traffic flows
Development of parking strategy		Assess feasibility of technology to assist strategy development eg VMS signage. Parking standards incorporated within the local plan.	Named	Improved traffic flows
Improve traffic flow by improving signals needed to allow for interaction with freight/van in cab technology		Kirklees is piloting in cab technology to give link between cab and signals. Learning from this to be shared when available. Signals will need upgrading - plan needed for funding source, timeline and strategy for contact and agreement with freight owners	Named	Improved traffic flows
Traffic Planning and Infrastructure				
Develop package of works to alleviate congestion. Corridor Improvement Programme -- A646 and A58/A672 corridor resilience; A629 corridor improvements		Sowerby Bridge outline proposal complete - outline business case only. Hebden Bridge and Luddenden Foot same stage. A629 corridor improvements are a range of active delivery projects (phases a1, 1b, 2, 3, 4 and 5) being delivered as part of the WY+TF.	Named	Improved traffic flows
Develop NE Calderdale Transformational Project Package to alleviate congestion on A58 Hipperholme and A6036 Stump Cross		Package may include works in the wider NE Calderdale network. Only funded pre feasibility.	Named	Improved traffic flows
Improve A641 corridor Brighouse		Being delivered as part of WY+TF	Named	Improved traffic flows
Creation of new junction (24a M62)		Led by Kirklees - a WY+TF scheme - important as should improve impacts on the network	Named	Improved traffic flows
Make A644 Cooper Bridge air quality compliant		Feasibility study parts 1 and 2 completed, part 3 submitted. Bring forward compliance on air quality for the Calderdale section of Cooper Bridge. Trialling Defra low emissions factor toolkit on this area.	Named	% decrease giving measured concentration of xx

Develop action plan from cycling strategy		Plan to be developed	Named	Increase in cyclist numbers
Develop cycling signage strategy		Plan to be developed	Named	Increase in cyclist numbers
Assess cycle route feasibility		Feasibility schemes at various levels of completion	Named	Increase in cyclist numbers
Upgrade of Upper Valley towpath		Programme funded for works between S Bridge and H Bridge - active bids in place to fund further works in phase 2 to Todmorden	Named	
Improve lighting of key cycle routes		No funding yet identified	Named	Increase in cyclist numbers
Improve cycle parking in town centre		Demand led - case by case.		
Incorporate air quality into planning considerations for new developments		Developing a planning policy document to include the production of travel plans within the development management process	Named	Policies applied to all developments
Development of cycling and walking strategy and programme		Walking and cycling infrastructure plan to be developed. LCWIP to be used in development.	TBC	Increased numbers walking and cycling
Improve access to Halifax station		Halifax station gateway improvements WY+TF scheme linked with halifax town centre improvements	Named	Improved transport integration
Improve calder valley rail line		Development of station at elland including access and parking. Delivery expected 2022. WYCA to start work on new base plan and production schedules being developed.	Named	Improved transport integration
Develop strategy for total transport/mobility hubs		Strategy and plan to be developed around integration of services in one hub. Potential for a demand responsive service and incorporation of links to signposting or apps relating to walking and cycling routes.	Named	Improved transport integration
Investigate feasibility and scope of a non charging clean air zone		Scope needs to assess most suitable area for introduction and barriers to overcome	Named	

Create 'Healthy Streets' with aim of more attractive, accessible and people friendly streets		Public Health England is taking a lead to scope what a Healthy Streets approach might look like in West Yorkshire and which organisations it could involve - starting with an investigation of related local transport and other strategy and policy. PHE has provided set of questions based on TfL's Healthy Streets indicators to scope interest in, and the suitability of, a Healthy Streets approach.	Named	Policies applied to all developments
Low Emission Strategy and Transport				
Install charging facilities for taxis and for public use		Installation of EV charging points - grant allocation from west yorkshire. Leaders briefing/cabinet paper done. One Uber electric taxi now available.	Named	Number of EV charging points
Procure ULEVs within Calderdale fleet where practical		ULEV not suitable for Calderdale fleet within existing infrastructure and the fleet has been/and is being replaced by LEV euro 6 engines. ULEV is considered within the procurement process for all vehicles. One handyman van is now ULEV. Steering group needs to input on process for future procurement	Named	Reduced vehicle emissions
Promote usage of electric charging facilities		Supplier will promote location and usage	Named	Usage of EV charging points
Promote uptake and usage of electric vehicles		West Yorkshire Electric Vehicle strategy in development	TBC	Uptake of vehicles
Install on street electric car charging using OLEV funding of £100k		Business improvement identifying areas using MOSAIC to help prioritise locations.	Named	Usage of EV charging points
Identify budget and funding opportunities to deliver low emissions strategy objectives		To be put on steering group agenda	TBC	
Investigate ECO stars scheme		ECO stars already committed to and funded by WYCA. Calderdale to investigate scheme and develop contact strategy with business owners to encourage take up	TBC	number of partners signed up

Improve bus fleet quality		In partnership with WYCA and bus operators. Dependent upon specific bid opportunities emerging. WYCA asking for expressions of interest.	Named	Reduced vehicle emissions
Respond to Defra draft clean air consultation		Consultation closes 14 August 2018	Named	
Public Awareness of air quality				
Measure air quality in local communities and raise awareness of issue		Explore use of carbon box monitor to raise awareness in communities eg clean up days	Named	Data collection and raising awareness
Develop communications campaign including engagement, web pages and social media		Link in with active calderdale and love our streets. Requirements and communications brief to be agreed.	TBC	Improved awareness of air quality issues
Engage with local communities to raise awareness of AQ impacts		Hebden Bridge days of action end June have air quality included. In addition, Road Safety Partnership delivery group have air quality on the agenda and safer greener team attend these meetings.	TBC	Improved awareness of air quality issues
Capitalise on national events to raise awareness		Clean Air day is 22 June and will be promoted internally but needs to be factored into wider communications plan.	TYBC	Improved awareness of air quality issues
Promoting Travel Alternatives				
Increase car sharing and alternative transport		Promotion of car sharing internally at CMBC ongoing. Further promotion with external companies required via workplace health. Promotion of car clubs eg Enterprise	Named	Increased numbers using sustainable modes of transport
Promote public transport as alternative to car		Needs to be coordinated with work undertaken by WYCA/Metro. Free first bus ticket incorporated in council tax statements 2018.	TBC	Increased numbers using sustainable modes of transport
Promote LEV for taxis		Bid to ULEV for charging facilities for low emission taxis. West Yorkshire money available for 2 charging points across the district. The supplier chosen to install will help to advertise these.	Named	Uptake of vehicles
Promote bikeability and bike library		Programme continues and is promoted by all services	Named	Take up of schemes
Promotion of alternative transport to Calderdale staff		Promotion of metro cards, electric bikes, discounted travel card, bike and go integrated cycle scheme continues.	Named	Take up of schemes

Develop schools active and safe travel strategy - linked to reducing obesity and road safety		Obesity workshop up and running led by Public Health	Named	Increased numbers walking and cycling
Park and ride expansion at rail stations		Funded improvement schemes are being progressed at Mytholmroyd and Hebden Bridge stations	Named	Improved transport integration
Ensure that Calderdale's needs are included within Northern Powerhouse Rail and HS2 connectivity and integration		Reported at WYCA Transport committee	Named	Improved transport integration
Bus Partnership agreement to be established		Bus 18 is established at West Yorkshire level. A voluntary agreement and partnership to get commitment on operating standards, information, new technology development	Named	Number of partners taking part
Rights of Way Improvement Plan to be developed		Plan needs to identify ways to promote and raise awareness of the routes	Named	Increased numbers walking and cycling
Promotion of alternative transport to school		Safe travel SAFE (Sustainable, Active, Fun, Environmental) cup competition run in schools each year by independent travel team. Schools develop campaigns about travelling to school in healthier and safer ways.	Named	Increased numbers walking and cycling
Compatibility with other programmes				
Carbon savings and improved energy performance of homes and businesses		Feasibility of Halifax district heat network in Halifax centre for businesses and council portfolio. An air quality impact assessment is likely to be needed.	Named	
Promote energy saving and renewable energy schemes		Calderdale Community energy webpages established and projects undertaken with schools	Named	
Support businesses to manage energy consumption and save money		6c working with businesses, schools and colleges	Named	
Review environmental permits for all types of units/installations		Inspection programme is in place	Named	
Terminology				
WYTF = West Yorkshire Transport Fund		WYCA (West Yorkshire Combined Authority)		
MOVA = Microprocessor Optimised Vehicle Actuation UTMC= Urban Traffic Management Control		VMS = Variable Message Sign		
LCWIP = (department for transport) Local Cycling and Walking Infrastructure Plan		UTMC = Urban Traffic Management Control		

LTP = Local Transport Plan	ULEV = ultra low emission vehicle

Table 3 Action Plan Delivery Scheme

Glossary of Terms

Abbreviation	Description
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the local authority intends to achieve air quality limit values'
AQMA	Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives
ASR	Air quality Annual Status Report
BAM	Beta Attenuation Monitor (for measuring particulate matter)
CAZ	Clean Air Zone (can be charging or non-charging)
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England
EFT	Emissions Factor Toolkit (spreadsheet based tool for estimating road traffic emissions)
EU	European Union
EV	Electric vehicle
LAQM	Local Air Quality Management
LEV	Low Emissions Vehicle
NO_2	Nitrogen dioxide
NO_x	Nitrogen oxides (essentially NO and NO_2 together, usually expressed as NO_2)
PM_{10}	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less
$PM_{2.5}$	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO_2	Sulphur Dioxide

WYLES	West Yorkshire Low Emissions Strategy
WY+TF	West Yorkshire Plus Transport Fund

References

[ASR17] Calderdale MBC Annual Status Report 2017

[AQEG12] Fine Particulate Matter (PM2.5) in the United Kingdom, Air Quality Expert Group 2012

[AQPWY] Air Quality Plan for the achievement of EU air quality limit value for nitrogen dioxide (NO_2) in West Yorkshire Urban Area (UK0004)

[AQPYH] Air Quality Plan for the achievement of EU air quality limit value for nitrogen dioxide (NO_2) in Yorkshire and Humberside (UK0034)

Dataworks Calderdale Data Works at https://dataworks.calderdale.gov.uk/ - an open data site including air quality data [last accessed 30th May 2018]

[CMBC17] Calderdale Council'sTransport Strategy https://www.calderdale.gov.uk/v2/residents/transport-and-streets/transport-improvements-and-initiatives/transport-strategy [last accessed 28th July 2017]

[CR12] Carslaw D C and Ropkins K, openair --- an R package for air quality data analysis. Environmental Modelling & Software. Volume 27-28, 52-61, 2012

[CR16] Carslaw D C and Ropkins K, openair: Open-source tools for the analysis of air pollution data. R package version 2.0.0, 2016

[CR18] Carslaw DC, Openair Manual, University of York and Ricardo Energy & Environment, 21st March 2018

[DE16] Air Pollution in the UK 2015, DEFRA 2016

[DE17] UK plan for tackling roadside nitrogen dioxide concentrations Detailed plan, July 2017

[DE18] Clean Air Strategy (consultation document), May 2018

[PG16] Local Air Quality management Policy Guidance LAQM.PG(16), DEFRA 2016

[R17] R Core Team (2017). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org/

[TG16] Local Air Quality management Technical Guidance LAQM.TG(16), DEFRA 2016

[TGB08] Technical Guidance: Screening assessment for biomass boilers, AEA 2008