Herefordshire Council

2023 Air Quality Annual Status Report (ASR)

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

Date: September 2023

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1 Executive Summary: Air Quality in Our Area

Air quality in Herefordshire is improving and there have been no exceedances of the air quality standards set for the protection of human health since 2019. In 2020 and 2021 there was reduced traffic during the Covid-19 pandemic, which resulted in a reduction in pollution levels. Traffic levels have since increased although it is likely that they have not generally returned to the 2019 levels as travel patterns have changed since the pandemic. This combined with a cleaner vehicle fleet has reduced air pollution from 2021 to 2022 in most areas where it is measured.

In some locations, however, it has increased over the last year but at all sites where there has been an increase it remains well below the standards.

There are two air quality management areas in Herefordshire, declared due to high levels of nitrogen dioxide. In the Hereford air quality management area, at most of the measured locations, the concentrations of nitrogen dioxide were less than 75 per cent of the standard. At three locations the concentrations were between 75 per cent and 85 percent of the objective.

In the Bargates Road Junction air quality management area in Leominster the maximum measured concentration was 91 percent of the objective. The concentration at this location fell by 4% from 2021 to 2022, and 21 per cent since 2019.

The Council has been keeping a watching brief over air pollution in its district and will continue to do so in the future. It has invested in new monitoring equipment including updating the monitoring station in the Hereford air quality management area in 2022 and installing a new continuous monitoring station in the Bargates (Leominster) air quality management area in 2023.

If concentrations continue to remain below the nitrogen dioxide objective the Council will consider revoking its two air quality management areas. Update of the air quality action plans for these areas will also be kept under review.

Further information on the Council's air quality management areas is available on our website https://www.herefordshire.gov.uk/business-1/environment-pollution and Defra's website https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=126.

1.1 Air Quality in Herefordshire Council

Air pollution is associated with a number of adverse health impacts. It is recognised as a contributing factor in the onset of heart disease and cancer. Additionally, air pollution particularly affects the most vulnerable in society: children, the elderly, and those with existing heart and lung conditions. There is also often a strong correlation with 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 29,000 to 43,000 deaths at typical ages[3], with a total estimated healthcare cost to the NHS and social care of £157 million in 2017[4].

Herefordshire is located in the West Midlands region of England. It is bordered by five counties; Shropshire, Worcestershire, Gloucestershire, Powys and Monmouthshire. As of mid-2020, Herefordshire's resident population was estimated to be 193,615, which has increased by 1,340 since 2019. Herefordshire is one of the least densely populated areas of the United Kingdom, with residents scattered across 842 square miles.

The main pollutant of concern within Herefordshire is nitrogen dioxide (NO_2). The major source of this pollutant in Herefordshire is vehicle emissions, specifically the emissions from the A49 Road through Hereford, and from the A44 at the Bargates Road junction in Leominster.

Concentrations of NO_2 have decreased at all monitoring locations in Herefordshire since 2019 and these trends have continued from 2021 to 2022 at most locations. Measured NO_2 concentrations at 28 of the 45 monitoring sites in Herefordshire reduced in 2022 from 2021 levels. At three monitoring sites there was no change and at 14 monitoring sites concentrations increased (see Appendix A: Monitoring Results for more information). Although there have been some increases in NO_2 concentrations between 2021 and 2022, these locations all had concentrations below 30µg/m^3 in 2022, with many well below this level. There is considered to be little risk of these sites exceeding the national standards.

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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, January 2023

[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

In Herefordshire, there are two Air Quality Management Areas (AQMA's) declared due to levels of NO_2 exceeding national standards (40µg/m^3). The AQMAs cover parts of the A49 Road through Hereford and the Bargates Road junction in Leominster.

In 2022, the ratified continuous monitored NO_2 annual mean concentration was 31.0 µg/m^3 in the Hereford AQMA (site HRD1, in Victoria Street,). From 2021 to 2022 the nitrogen dioxide levels at this site decreased by 2 µg/m^3. NO_2 is also measured at 15 locations in the AQMA using passive diffusion tubes. This is an indicative method which is less accurate that the continuous monitor. The maximum concentration measured using diffusion tubes in the Hereford AQMA was 33.3 µg/m^3 (site 10, 7 Victoria St, Hereford).

NO_2 concentrations in the Bargates AQMA are monitored at five locations. The highest annual mean concentration in 2022 was 36.4µg/m^3 (site 61b, 35 Bargates, Leominster). From 2021 to 2022, the nitrogen dioxide levels at this site decreased by 1.4µg/m^3.

Further information related to Herefordshire's declared AQMAs can be found on our website https://www.herefordshire.gov.uk/business-1/environment-pollution and Defra's website https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=126.

1.2 Actions to Improve Air Quality

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

The Environmental Improvement Plan[5] sets out actions that will drive continued improvements to air quality and to meet the new national interim and long-term $PM_{2.5}$ targets. The National Air Quality Strategy[6] published in 2023, provides more information on local authorities' responsibilities to work towards these new targets and reduce $PM_{2.5}$ in

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

[6] Defra. Air Quality Strategy, April 2023

their areas, with further guidance due to be published soon. The Road to Zero[7] details the approach to reduce exhaust emissions from road transport through a number of mechanisms; this is extremely important given that the majority of Air Quality Management Areas (AQMAs) are designated due to elevated concentrations heavily influenced by transport emissions.

The Hereford Air Quality Action Plan (Herefordshire Council, 2008) was published in 2008. The action plan includes road improvements, traffic management, park and ride schemes, parking strategies, increased cycling routes and facilities, increased pedestrian enhancement, behavioural change and increased public awareness regarding the benefits of active travel.

When the action plan was agreed the maximum measured concentration of NO_2 in the AQMA was 47.0µg/m^3. In 2022, the maximum measured concentration within the AQMA was 33.3µg/m^3.

The Bargates Air Quality Action Plan (Herefordshire Council, 2014) was published in 2014. The main action was to improve the traffic light sequencing at the junction to reduce congestion, increase throughput, help disperse queues more effectively and therefore reduce emissions from idling vehicles at the traffic lights. NO_2 levels in the Bargates AQMA fell between 2017 when the work was completed and 2022 from 45.1µg/m^3 to 36.4µg/m^3. It is not, however, possible to identify if this reduction is a direct result of the junction improvements or due to other factors such as the vehicle fleet becoming cleaner.

The Council has been keeping a watching brief over air pollution in its district and will continue to do so in the future. It has invested in new monitoring equipment including updating the monitoring station in the Hereford air quality management area in 2022 and installing a new continuous monitoring station in the Bargates (Leominster) air quality management area in 2023.

If concentrations continue to remain below the nitrogen dioxide objective the Council will consider revoking its two air quality management areas. It will wait until there is sufficient monitoring data to be confident that in a poor meteorological year for air quality that the objective will not be exceeded.

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

It will also keep under review the need for an update of the air quality action plans for the two AQMAs.

Herefordshire Council is a Unitary Authority which enables close working between all relevant Council teams involved in managing air quality. These include the Energy and Environmental Management team, Transportation team and Public Health. There is also close working with the Environment Agency through various mechanisms including permit consultations and a formal liaison group.

1.3 Conclusions and Priorities

Herefordshire Council continue to monitor air quality throughout the county. The review of the concentrations measured indicates that the annual mean NO_2 objective was achieved in 2022 throughout Herefordshire including in both AQMAs.

There is currently no intention to revoke the AQMAs, but they will be reviewed when there is sufficient monitoring data post-pandemic to be certain that the objective will be achieved even during years with poor meteorological conditions for air quality.

A number of major housing developments have been identified to meet Herefordshire's housing need along with the need to ensure appropriate infrastructure such as the Hereford Relief Road and the Leominster Relief Road. The potential impact of these developments , both individually and cumulatively, on air quality will need to be considered during the planning application stages.

Other priorities for Herefordshire include:

- Identifying and review locations in Herefordshire that may benefit from additional monitoring including considering identified sites in the core strategy;
- Review the Air Quality Plans for Herefordshire;
- Comment on planning applications for major housing road schemes in relation to air quality; and
- Continue to inspect Local Authority permitted installations.

1.4 Local Engagement and How to get involved

The major source of air pollution in Herefordshire is from vehicle emissions.

Herefordshire is sparsely populated with over half the population living in rural areas which presents challenges for sustainable transport. However, over half of all car journeys in Hereford at peak time are less than two miles (Herefordshire Council, 2016).

Therefore, the best way for members of the public to help improve air quality is to adjust their normal travel patterns to more sustainable options where possible. This will improve air quality, public health and reduce congestion.

There is some scope to change how people travel, particularly in Hereford. By making short trips and journeys on foot or by bike instead of by car or using public transport. Car sharing with colleagues, or with other parents on the school run, are some other examples of ways to reduce traffic congestion.

Other examples include:

- Purchasing low-emission electric and/or hybrid vehicles.
- Upgrading boilers to newest and most efficient gas condensing boilers with lowest NOx (and carbon) emissions.

The Choose How You Move webpage: *https://www.herefordshire.gov.uk/info/200136/travel_and_transport/544/choose_how_you_move* is a good place to find information on ways to travel sustainably and help to reduce vehicle emissions.

1.5 Local Responsibilities and Commitment

This ASR was prepared by Air Pollution Services (part of KALACO Group Limited) and approved by Environmental Health Department of Herefordshire Council with the support and agreement of the following officers and departments:

This ASR has been approved by:

Name: Philippa Hargraves (Environmental Health Officer at Herefordshire Council)

This ASR has been approved by:

Name: Mark Averill (Service Director Environment and Highways at Herefordshire Council)

This ASR has been signed off by:

Name: Matthew Pearce (Director of Public Health at Herefordshire Council)

If you have any comments on this ASR, please send them to Abbie O'Sullivan at:

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1 Local Air Quality Management

This report provides an overview of air quality in Herefordshire during 2022. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) and amendments through the Environment Act 2021 along with 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 Herefordshire Council to improve air quality and progress that has been made.

The statutory air quality objectives applicable to LAQM in England are presented 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 should prepare an Air Quality Action Plan (AQAP) within 18 months. The AQAP should specify how air quality targets will be achieved and maintained and provide dates by which measures will be carried out.

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

- NO_2 Annual Mean.

Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Date of Declaration	Pollutants and Air Quality Objectives	One Line Description	Is air quality in the AQMA influenced by roads controlled by Highways England?	Level of Exceedance : Declaration	Level of Exceedance : Current Year	Number of Years Compliant with Air Quality Objective	Name and Date of AQAP Publication	Web Link to AQAP
AQMA Hereford	Declared 23/11/2001	NO_2 Annual Mean	The A49(T) corridor in Hereford, extending from Holmer Road in the north to Belmont Road in the south and extending	YES	47	33	5 years	Hereford Action Plan January 2008	http://aqma.defra.gov.uk/action-plans/HC%20AQAP%202008.pdf

AQMA Name	Date of Declaration	Pollutants and Air Quality Objectives	One Line Description	Is air quality in the AQMA influenced by roads controlled by Highways England?	Level of Exceedance : Declaration	Level of Exceedance : Current Year	Number of Years Compliant with Air Quality Objective	Name and Date of AQAP Publication	Web Link to AQAP
			east along New Market/Blue School Street and west along Eign Street as far as Barton Yard.						
AQMA Bargate	Declared 01/03/2006	NO_2 Annual	An area encompassing the junction	YES	61	36	4 years	Bargates Action Plan January	https://www.herefordshire.gov.uk/do

AQMA Name	Date of Declaration	Pollutants and Air Quality Objectives	One Line Description	Is air quality in the AQMA influenced by roads controlled by Highways England?	Level of Exceedance : Declaration	Level of Exceedance : Current Year	Number of Years Compliant with Air Quality Objective	Name and Date of AQAP Publication	Web Link to AQAP
s		Mean	between the A44 Bargates and B4361 Dishley Street/Cursneh Road in Leominster.					2014	wnload/downloads/id/4823/bargates_air_quality_draft_action_plan.pdf

Note: The NO_2 concentrations shown in the table above are from the monitoring sites, within the AQMAs, where the highest concentration was reported in the year of declaration and the current year.

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

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

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

Defra's appraisal of the 2020 ASR concluded that the next steps for Herefordshire Council are to:

- Action: Revise and update both the Hereford (Herefordshire Council, 2008) and the Bargates (Herefordshire Council, 2014) AQAPs. The Air Quality Action Plans will be reviewed before next year's ASR (2022).
  This action has yet to be completed by Herefordshire Council as it's reviewing the monitoring data after the Covid-19 pandemic before deciding on further actions.
- Action: The text within the QA/QC of Diffusion Tube Monitoring section had not been updated. This section has been updated in the ASR for 2020.
  The action Defra requested for the ASR has been considered and the new Defra ASR template has been used for the 2023 ASR.
- Action: Defra identified that the base maps provided in 2020 ASR were of low quality. These maps have been updated and the text at the base of the maps changed to a higher standard of quality.
  The action Defra requested for the ASR have been considered and the new Defra ASR template has been used for the 2023 ASR.
- Action: Defra asked that Herefordshire Council update the air quality measure table for Bargates action plan.
  This table has been updated accordingly.

Herefordshire Council has taken forward a number of direct measures during the current reporting year of 2023 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2 and Table 2.3. Where there have been, or continue to be, barriers restricting the implementation of the measure, these are also presented within Table 2.2 and Table 2.3.

More detail on these measures can be found in their respective Action Plans: Hereford Action Plan (Herefordshire Council, 2008) and Bargates Action Plan (Herefordshire Council, 2014). Key measures completed are:

- Review of air monitoring locations, consideration of the proposed development locations in the Core Strategy, and assessing potential air quality impact of any development.

- Review of poultry sites referenced in Defra Policy Guidance LAQM.TG22 (Defra, 2022).

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

- Continue to monitor and review both the Hereford and Leominster AQMAs.
- Identify and review other locations in Herefordshire that may benefit from additional monitoring considering identified sites in the core strategy.
- Review the Air Quality Action Plans for Herefordshire including setting emission reduction targets and providing more discussion on the progress of each measure.
- Comment on planning applications for major housing, road schemes and industrial installations in relation to air quality.
- Continue to inspect Local Authority Permitted installations.

The principal challenges and barriers to implementation that Herefordshire Council anticipates are the potential impacts of major housing and infrastructure developments arising from the 2015 Core Strategy; these impacts will need to be considered during the planning application stages. The strategy identified a number of major housing developments required to meet Herefordshire's housing needs along with the need to ensure appropriate infrastructure such as the Hereford Relief Road and the Southern Relief Road.

Herefordshire Council anticipates that the measures stated above and in Table 2.2 and Table 2.3 will ensure continued compliance in Hereford and Leominster AQMAs.

Whilst the measures stated above and in Table 2.2 and Table 2.3 will help to contribute towards compliance, Herefordshire Council anticipates being able to revoke its AQMAs in two or three years, but will continue to identify measures that will further improve air quality within it's administrative area.

Table 2.2 – Progress on Measures to Improve Air Quality in the Hereford Air Quality Action Plan

Measure No.	Measure	Category	Classification	Year Measure Introduced in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date
1	Edgar Street Grid Redevel op-ment	Traffic Management	Reduction of speed limits, 20mph zones	2009	2025	Herefordshire Council & Advantage West Midlands formed ESG Herefordshire Ltd	Mostly developer funded, along with Hereford-shire Council	NO	Complete d	NO_2 levels at the city centre sites have been gradually reducing since 2007, although this cannot be attributed to the actual re-development.	Trends in diffusion tube results	"Old Market" retail area development completed 2015.
2	Improve ment of A4103 road west of Hereford shire	Transport Planning and Infrastructure	Other	2003	2008	Herefordshire Council - Highways and Transportation Service	Hereford-shire Council -- Highways and Transportat-ion Service	NO	Complete d	Since 2007 NO_2 levels along the Roman Road have been below the objective. Annual Average Daily Flow trends (AADT) along the Roman Road indicate a continuing increase of	Not Applicable	Road completed 2005.

Measure No.	Measure	Category	Classification	Year Measure Introduced in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date
										traffic since the completion of the improved road and an increase in HGVs until 2008 with a slight reduction in 2009.		
3	Rotherwas Access Road Link	Transport Planning and Infrastructure	Other	2003	2008	Herefordshire Council - Highways and Transportation Service	Hereford-shire Council - Highways and Transport-ation Service and Advantage West Midlands	NO	Completed	Annual Average Daily Flow trends (AADT) show a reduction in HGVs from 1045 in 2008 to 964 in 2009 however total motor vehicles has increased	Annual Average Daily Flow trends (AADT) and diffusion tubes	Completed June 2008.
4	City Link Road Hereford	Transport Planning and Infrastructure	Other	2008	Construction complete December 2017.	Herefordshire Council - Highways and Transportation	Hereford-shire Council	NO	Completed	NO_2 levels at the city centre sites have been gradually	Annual Average Daily Flow trends (AADT) and diffusion	Completed in 2017.

Measure No.	Measure	Category	Classification	Year Measure Introduced in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date
						Service				reducing since 2007	tubes	
5	New Outer Distributer road (3rd Link) Hereford Relief Road	Transport Planning and Infrastructure	Other	2006	Constructed by 2031	Herefordshire Council – Highways and Transportation Service	Hereford-shire Council	NO	Implementation	N/A	Annual Average Daily Flow trends (AADT) and diffusion tubes	Work ongoing.
6	Install and implement a new transport system on A49 and its feeder roads	Transport Planning and Infrastructure	Other	2005	Ongoing	Highway Agency and Herefordshire Council – Highways and Transportation Service	Hereford-shire Council	NO	Implementation	N/A	Annual Average Daily Flow trends (AADT) and diffusion tubes	Ongoing
7	Alteration of traffic management at the	Traffic Management	Other	2005	Complete	Highway Agency	s.106	NO	Completed	The diffusion tube measurements at this roundabout were showing	Diffusion tube at the roundabout	Completed in 2006. New signals are now fully integrated into the

Measure No.	Measure	Category	Classification	Year Measure Introduced in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date
	Belmont Roundabout									exceedances of the NO_2 objective in 2006 and 2007 although levels were falling. However, a noticeable reduction occurred in 2008 and 2009, to a level well below the objective level.		Council's SCOOT system and the infrastructure improvements have greatly improved traffic movements
8	"North & South" Park and ride Scheme in Hereford	Alternatives to private vehicle use	Bus based Park & Ride	2001	Not Applicable	Herefordshire Council – Highways and Transportation Service	Hereford-shire Council	NO	Aborted	N/A	Annual Average Daily Flow trends (AADT) and diffusion tubes	No longer being taken forward.
9	Parking Strategy in	Traffic Management	Other	2001	Not Applicable	Herefordshire Council – Highways and	Hereford-shire	NO	Aborted	N/A	Annual Average Daily Flow trends	No longer being taken forward.

Measure No.	Measure	Category	Classification	Year Measure Introduced in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date
	Hereford to reduce commuter parking					Transportation Service and Planning Services	Council				(AADT) and diffusion tubes	Alternative parking strategy in place.
10	Improve and increase number of cycle routes and facilities in Hereford	Transport Planning and Infrastructure	Cycle network	2004	Rotherwas Cycle Link currently in progress – Completed Dec 2013	Herefordshire Council – Highways and Transportation Service	Hereford-shire Council	NO	Completed	NO_2 levels at the city centre sites have been gradually reducing since 2007	Diffusion tubes	1.5km of the Great Western Way was completed in 2008 along with a cycle lane along Aylestone Hill. Connect 2 Rotherwas Cycle Link completed.
11	City Centre Pedestrian Enhancement in Hereford	Traffic Management	Strategic highway improvements, Re- prioritising road space away from cars, including Access management,	2005	Complete	Herefordshire Council - Highways and Transportation Service	Hereford-shire Council	NO	Completed	NO_2 levels at Site 6 (Broad Street) and site 59 (Widemarsh St) have remained at or below 75%	Diffusion tubes at Wide-marsh Street, Broad Street and Edgar Street sites	Completed in 2006.

Measure No.	Measure	Category	Classification	Year Measure Introduced in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date
			Selective vehicle priority, bus priority, high vehicle occupancy lane							of the objective for the last 5 year trend, following the introduction of the scheme. Sites 12, 13 and 14 (Edgar Street) are no longer monitored.		
12	Behavioural Change Program	Promoting Travel Alternatives	Workplace Travel Planning	2004	Ongoing	Herefordshire Council - Highways and Transportation Service	Hereford-shire Council	NO	Implementation	N/A	Diffusion tubes	Ongoing program of promotions and initiatives. Examples include Bike ability Training and the promotion of TwoShare, Destination Herefordshire.

Measure No.	Measure	Category	Classification	Year Measure Introduced in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date
13	Designation of a Traffic manager for network management Duties along the A49 in Hereford	Traffic Management	Other	2007	Complete	Highway Agency and Herefordshire Council	Hereford-shire Council	NO	Completed	NO_2 levels at the sites along the A49 have been gradually reducing since 2007.	Diffusion tubes along A49 corridor	Completed in 2008.
14	Continue to implement Vehicle Emission Testing in Hereford	Traffic Management	Testing Vehicle Emissions	2008	This project has been completed. No plans for further testing.	Herefordshire Council - Environmental Health and Trading Standards. Liaison with Vehicle and Operator Services Agency (VOSA)	Hereford-shire Council and VOSA	NO	Completed	A continual improvement in exhaust emissions with the Hereford AQMA noted each year. No failures in 2006 and 2007.	Review of project dependent upon number of vehicles failing.	Commenced in 2000 and was carried out every year until 2007. A dramatic continual improvement in exhaust emissions with the Hereford AQMA noted each year. No failures

Measure No.	Measure	Category	Classification	Year Measure Introduced in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date
												in 2006 and 2007.
15	Information and awareness raising	Public Information	Via the Internet	2008	Ongoing	Herefordshire Council - Environmental Health and Trading Standards. Liaison with Herefordshire PCT	Hereford-shire Council	NO	Implementation	N/A	Number of hits on the website.	Ongoing

Table 2.3 – Progress to Measures to Improve Air Quality in the Bargates Air Quality Action Plan

Measure No.	Measure	Category	Classification	Year Measure Introduced in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
1	Improvements to the traffic light sequencing at the A44/B4361 junction at Bargates	Transport Planning and Infrastructure	Other	2013	2016	Hereford-shire Council - Highways and Transport-ation Service	Hereford-shire Council, s.106	NO	-	-	Completed	No measure-able improve-ments	Reduction of NO_2 levels at diffusion tubes	Report commissioned reviewing the best options for the junction arrangement and works were completed in 2017	
2	Improvements to cycle facilities/ routes between Morrisons Store and the Town centre	Transport Planning and Infrastructure	Cycle network	2014	2014-2016	Hereford-shire Council - Highways and Transportation Service	Hereford-shire Council	NO	-	-	Completed	No measurable improvements	Reduction of NO_2 levels at diffusion tubes		
3	Improvements to the public	Transport Planning and	Other	2014	2016	Hereford-shire Council -	Hereford-shire Council, s.	NO	-	-	Completed	No measureable	Reduction of NO_2 levels at		

Measure No.	Measure	Category	Classification	Year Measure Introduced in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
	transport facilities between Morrisons Store and the Town centre	Infrastructure				Highways and Transport-ation Service	106					improvements	diffusion tubes		
4	Improve and increase number of pedestrian routes and facilities in Leominster	Transport Planning and Infrastructure	Other	2014	Not Applicable	Hereford-shire Council - Highways and Transport-ation Service	Herefordshire Council	NO	-	-	Implementation	N/A	Reduction of NO_2 levels at diffusion tubes	Awaiting S106 monies.	Awaiting S106 monies.
5	Behavioural Change Programme	Promoting Travel Alternatives	Promotion of walking	2014	Ongoing	Hereford-shire Council - Highways and Transport-ation Service	Hereford-shire Council	NO	-	-	Implementation	N/A	Reduction of NO_2 levels at diffusion tubes	Work ongoing.	
6	Behavioural Change	Promoting Travel Alternative	Promotion of cycling	2014	Ongoing	Hereford-shire Council –	Hereford-shire	NO	-	-	Implementation	N/A	Reduction of NO_2 levels at	Work ongoing.	

Measure No.	Measure	Category	Classification	Year Measure Introduced in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
	Programme	s				Environment-al Health and Trading Standards. Liaison with Public Health.	Council						diffusion tubes		
7	Develop-ment of the southern Relief Road	Transport Planning and Infra-structure	Other	2011	Not set	Hereford-shire Council	Hereford-shire Council	NO	-	-	Implementation	N/A	Reduction of NO_2 levels at diffusion tubes	Ongoing	

Table notes: The following columns ‘Funding Status’, ‘Estimated Cost of Measure Comments’ and ‘Barriers to Implementation’ have been deleted as there was no text in them to aid readability of the table.

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

As detailed in Policy Guidance LAQM.PG22 (Chapter 8), 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.

There are many different sources of $PM_{2.5}$ from natural and anthropogenic sources. Anthropogenic sources include industrial sources, road transport, off-road transport, residential sources (such as burning solid fuels and bonfires) and polluted air traveling from the continent (AQEG, 2012).

Concentrations of $PM_{2.5}$ in Herefordshire are low. Annualised $PM_{2.5}$ concentrations at the Victoria Street in Hereford monitoring site in 2022 was 9.5 µg/m^3. For further information on the annualisation calculations please refer to Appendix A.

Defra's background mapping of $PM_{2.5}$ estimates concentrations between 6.1µg/m^3 and 9.8µg/m^3 for 2022 in Herefordshire.

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

- Ensure $PM_{2.5}$ is considered at the planning application stage for relevant development.
- Inspection of Local Authority permitted installations.
- Review the AQAP's to include additional actions for $PM_{2.5}$.
- Consider the need for background monitoring of $PM_{2.5}$.

It should be noted that actions 1-6, 9-11, 13-15 of the Hereford AQAP, and Action points 1-7 of the Leominster AQAP also deal with $PM_{2.5}$ as well as NO_2.

The approach being taken in terms of $PM_{2.5}$ assessment and possible further monitoring has been considered together with the Council's Public Health team. Further work is to be undertaken in this area.

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

This section sets out the monitoring undertaken within 2022 by Herefordshire Council and how it compares with the relevant air quality objectives. In addition, monitoring results are presented for a five-year period between 2018 and 2022 to allow monitoring trends to be identified and discussed.

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

Herefordshire Council undertook automatic (continuous) monitoring at one site during 2022. Table A.1 in Appendix A shows the details of the automatic monitoring sites. NB. Local authorities do not have to report annually on the following pollutants: 1,3 butadiene, benzene, carbon monoxide and lead, unless local circumstances indicate there is a problem. The *https://uk-air.defra.gov.uk*[8] page presents automatic monitoring results for Herefordshire Council, with automatic monitoring results also available through the UK-Air website .

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

The 2022 annual mean NO_2 level was 7µg/m^3 (data capture 99%) and the annual mean O_3 concentration was 52µg/m^3 (data capture 95%). Maps showing the location of the monitoring sites within Hereford AQMA and local area are shown in Figure D.4, Figure D. 5 and Figure D.6 in Appendix D. Maps showing the location of monitoring sites within Leominster AQMA and local area are shown in Figure D. 8 and Figure D. 9 in Appendix D.

3.1.2 Non-Automatic Monitoring Sites

Herefordshire Council undertook non-automatic (i.e. passive) monitoring of NO_2 at 45 sites

8 https://uk-air.defra.gov.uk/networks/find-sites?site_name=&pollutant=9999&group_id=4&country_id=9999&region_id=187&location_type=9999&search=Search+Network&view=advanced&action=results

during 2022. Table A.2 in Appendix A presents the details of the non-automatic sites.

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

All monitoring site locations have been checked and adjusted accordingly using Google Streetview. Five monitors were not visible on Google Streetview (6, 54, 57, 93 and 100). For these five monitors, the Council's coordinates and distances have been used.

3.2 Individual Pollutants

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

3.2.1 Nitrogen Dioxide (NO_2)

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

For diffusion tubes, the full 2022 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. During 2022, the NO_2 hourly mean limit (200 µg/m^3) was not exceeded.

During 2022, the annual mean NO_2 levels at the Hereford automatic monitoring site (HRD1) were 31µg/m^3, which is below the air quality objective (40µg/m^3). In the last five years there has been one breach of the annual mean NO_2 objective (40µg/m^3) at site HRD1 in 2018. Since then concentrations have fallen. Herefordshire Council will continue

to review the monitoring data before making any decision to revoke the Hereford AQMA.

There are 16 non-automatic monitoring sites within Hereford AQMA (sites 9, 10, 22, 53, 57, 87, 88, 89, 90, 91, 94, 95, 96, 103 and 104). None of these sites have exceeded the objective since 2019.

The boundaries of the Hereford AQMA have been monitored to identify whether the AQMA needs to be extended (sites 65, 89, 97,101 and 102) (see Figure A. 2). In 2022 none of these monitoring sites exceeded the annual mean NO_2 air quality objective. Herefordshire Council therefore will not be extending the boundary of Hereford AQMA.

There are 24 monitoring sites which are located in Hereford but outside the AQMA and its immediate environment (sites 6, 74, 75, 79, 84, 85, 86, 92, 93, 100, 105, 106, 107 and 108). All of these locations were below the NO_2 annual mean objective in 2022 (see Figure A.2).

There are three monitoring sites in the Leominster AQMA (site 46, 61a and 61b). In 2022 all sites were below the annual mean NO_2 annual mean objective.2018 to 2022 trend data for the monitoring sites in the Leominster AQMA are shown in Figure A. 4. Site 61b recorded an annual mean NO_2 concentration of 46.0µg/m^3 in 2019, falling to 36.4µg/m^3 in 2022.

In Leominster, outside the AQMA, there are two monitoring sites (109 and 110). In 2022, the annual mean NO_2 levels at these sites were below the objective, as shown in Figure A. 5. The highest measured annual mean concentration in 2022 was at monitoring site 109 which measured 25 µg/m^3.

There are two monitoring sites located along the A40 corridor (sites 32 and 33). In 2022, the annual mean NO_2 concentration at site 32 was 21.3µg/m^3 and at site 33 was 20.7µg/m^3. Both of these sites will continue to be monitored in 2023.

Monitoring is no longer undertaken in Bromyard, Kington, Ledbury, Pembridge and Weobley. However, monitoring re-commenced in Cantilupe Street, Ross-on-Wye in May 2015 at site 82 due to concerns regarding bus emissions. In 2022, site 82 recorded annual mean NO_2 concentrations of 17.1µg/m^3, which is well below the air quality objective. This site will continue to be monitored in the coming years.

Four monitoring sites were distanced corrected as suggested by the Defra Diffusion Tube Processing Tool (sites 22, 32, 46 and 106).

3.2.2 Particulate Matter (PM_{10})

PM_{10} was previously measured by the Council at the automatic monitoring station at Edgar Street in Hereford. The site was decommissioned in 2011 due to redevelopment of the site where it was located. The monitor was repositioned in Victoria Street and PM_{10} concentrations for this site have been available since 2017.

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 gravimetric PM_{10} daily mean limit (50 µg/m^3) was exceeded on 2 days in 2022. The annual allowance for this limit value is 35 days, therefore this objective was not exceeded.

3.2.3 Particulate Matter ($PM_{2.5}$)

$PM_{2.5}$ is also measured by the Council at the automatic monitoring station in Victoria Street, Hereford (site HRD1).

Table A.8 in Appendix A presents the ratified and adjusted monitored $PM_{2.5}$ annual mean concentrations for the past five years with the air quality objective of 20 µg/m^3. As shown in Table A.8, the monitored $PM_{2.5}$ annual mean concentrations at Victoria Street in 2022 was 9µg/m^3.

3.2.4 Sulphur Dioxide (SO_2)

Sulphur Dioxide has not been monitored by Herefordshire County Council since January 2011. Results of monitoring previously undertaken by the Council are presented in previous annual reports submitted to Defra.

4 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)
HRD1	Victoria Street	Roadside	350271	239791	NO_2; PM_{10}	YES - Hereford	Chemiluminescent and PM_{10}	10	5	1.9

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) (3)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
6	Broad Street, Hereford	Urban Background	122	239994	NO_2	NO	1.47	0.78	NO	2.8
9	Bus Stop, Victoria Street, Hereford (A49)	Roadside	350688	239863	NO_2	YES - Hereford	1.1	2.8	NO	2.9
10	7 Victoria Street, Hereford (A49)	Roadside	350676	240018	NO_2	YES - Hereford	0	3.0	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) (3)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
22	Façade Edgar/ Mor St, Hfd (A49)	Roadside	350858	240610	NO_2	YES - Hereford	-0.7	2.3	NO	2.3
32	Weir End, Ross (A40)	Roadside	357724	223747	NO_2	NO	-1	5	NO	2
33	House façade, Wilton (A40)	Roadside	358494	224213	NO_2	NO	0.1	4.1	NO	1.9
46	Bengry's Lights, Leominster (A44)	Roadside	349400	259012	NO_2	YES – Bar-minster	-0.9	4.3	NO	2.1
53	Façade,	Roadside	350716	239163	NO_2	YES -	0	2.9	NO	2.1

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) (3)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
	Belmont Rd/Asda Junc Hfd					Hereford				
54	House façade, Holmer Rd Hfd (A49)	Urban Background	350600	241093	NO_2	NO	0	12.16	NO	1.7
57	Eign Street, Hereford (A438)	Urban Background	350512	240104	NO_2	YES - Hereford	1.4	0.86	NO	2.2
59	Façade, Widemarsh	Urban Centre	350986	240173	NO_2	NO	0	5.2	NO	2.4

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) (3)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
	St, Town Hfd									
61a	29 Bargates, Leominster (A44)	Roadside	349358	259016	NO_2	YES – Bar-minster	0	2.7	NO	2.2
61b	35 Bargates, Leominster (A44)	Roadside	349349	259016	NO_2	YES – Bar-minster	0	3.4	NO	2.2
65	96 Whitecross Road, Hfd (A438)	Urban Background	350085	240298	NO_2	NO	0	1.8	NO	2.2
74	140	Roadside	349984	240335	NO_2	NO	0	8.5	NO	2.1

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) (3)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
	Whitecross Rd, Hfd (A438)									
75	22 Barton Road, Hfd	Roadside	350651	239753	NO_2	NO	13.4	4	NO	2.4
79	76 Belmont Road, Hfd (A465)	Roadside	350478	239000	NO_2	NO	6.4	2	NO	2.3
82	Cantilupe Road 1 (Flats), Ross-on-Wye	Urban Background	360200	224176	NO_2	NO	1.6	1.6	NO	2.3

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) (3)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
84	Kings Acre Rd, Hfd (A438)	Suburban	347865	241237	NO_2	NO	4.4	5.6	NO	2.55
85	Huntington Lane, Hfd	Rural	348753	241942	NO_2	NO		3	NO	2.1
86	Three Elms Rd, Hfd (A4110)	Roadside	349065	241909	NO_2	NO	4.6	2.4	NO	1.7
87	Nr Cemetery, Victoria St, Hfd (A49)	Roadside	350693	239819	NO_2	YES - Hereford	1.2	2.6	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) (3)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
88	Adj 34 Victoria St, Hfd (A49)	Roadside	350683	239899	NO_2	YES - Hereford	0.6	2.9	NO	2.32
89	Edgar St/Blackfriars St Junc, Hfd (A49)	Roadside	350799	240443	NO_2	YES - Hereford	4.3	2.8	NO	2.1
90	Cross Street, Asda Traffic Island, Hfd	Roadside	350716	239163	NO_2	YES - Hereford	0	2.9	NO	2.12
91	Ross Road/Asda Traffic Island, Hfd	Roadside	350758	239125	NO_2	YES - Hereford	3.5	1.5	NO	2.23

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) (3)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
	(A49)									
92	Rotherwas Industrial Estate, Hfd	Urban Background	352916	237844	NO_2	NO	0	2.4	NO	2.3
93	Rotherwas Relief Road, Hereford (B4399)	Roadside	351881	239984	NO_2	NO	0	5.5	NO	2.15
94	Edgar St opp Nolan Rd, Hfd (A49)	Roadside	350932	240802	NO_2	YES - Hereford	0.4	2.5	NO	2.35
95	Edgar St. nr Prior St. Hfd	Roadside	350875	240674	NO_2	YES - Hereford	0.7	2.1	NO	1.65

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) (3)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
	(A49)									
96	Edgar St. nr Junc Newtown Rd (A49)	Roadside	350942	240861	NO_2	YES - Hereford	2.4	2.9	NO	2.2
97	Newtown Rd, nr Postbox, Hfd	Roadside	351017	240880	NO_2	NO	0	3.1	NO	2.4
98	Link Road A, Hereford	Urban Background	350945	240659	NO_2	NO	0	2.1	NO	1.75
99	Link Road B, Hereford	Urban Background	351036	240669	NO_2	NO	0	3.8	NO	2.36
100	Link Road C,	Urban	351448	240535	NO_2	NO	0	3.9	NO	3

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) (3)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
	Hereford	Background								
101	Widemarsh St, opp Garrick CP, Hfd	Roadside	351057	240299	NO_2	NO	0	2.6	NO	1.7
102	Widemarsh St. nr juct Link Road, Hfd	Roadside	351099	240642	NO_2	NO	0.1	2.1	NO	1.25
103	Bus stop, Newmarket street, Hfd (A438)	Roadside	350905	240229	NO_2	YES - Hereford	11.3	3.3	NO	3.4

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) (3)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
104	Wall Street, Hereford	Roadside	350984	240215	NO_2	YES - Hereford	0.8	2.9	NO	1.25
105	Aylestone Hill/Barscourt Road, Hfd	Roadside	351723	240444	NO_2	NO	0.7	2.1	NO	1.8
106	Commercial Road, Hfd	Roadside	351461	240313	NO_2	NO	-0.9	2.5	NO	2.9
107	St Mary's Church, Grandstand Rd, Hfd (A49)	Roadside	350410	241165	NO_2	NO	1.7	2.7	NO	1.47
108	Roman Road, Hereford (A4103)	Urban Background	350193	242175	NO_2	NO	5.1	2.9	NO	1.65
109	Bargates, opp Perservance Rd Leominster	Roadside	349173	259023	NO_2	NO	0	2.2	NO	0.95
110	56 Bargates, (HR6 8EY), Leominster (A44)	Roadside	349256	259034	NO_2	NO	0	2.0	NO	1.4

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) (3)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
111	Bargates Nursery, Leominster (A44)	Roadside	349228	259031	NO_2	NO	5.0	6.2	NO	1.2

Notes:

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

(2) N/A if not applicable.

(3) Distance presented is the relative difference between the relevant exposure to the kerb, and the monitor to the kerb.

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 2022 (%) (2)	2018	2019	2020	2021	2022 (3)
HRD1	350721	239791	Roadside	56.7	56.7	40	38	31	33	31.0

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

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

Notes:

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

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

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

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

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

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

(3) Section 1.19 of the LAQM TG.22 states that concentrations should be reported to one decimal place for the Local Air Quality

Management regime. LAQM TG.22 does not say that the instruments must be capable of measuring concentrations to one decimal place. The existing automatic monitor does not report concentrations to one decimal place.

Table A.4 – Annual Mean NO_2 Monitoring Results: Non-Automatic Monitoring (µg/m^3) (4) (5)

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 2022 (%) (2) (3)	2018	2019	2020	2021	2022
6	350889	239994	Urban Background	100	100	22.8	24.4	18.3	18.5	18.7
9	350688	239863	Roadside	100	100	32.6	34.4	27.1	30.0	29.3
10	350676	240018	Roadside	100	100	41.3	39.3	30.3	34.7	33.3
22	350858	240610	Roadside	100	100	27.6	27.7	21.4	24.0	23.1
32	357724	223747	Roadside	92	92	28.3	24.9	19.3	21.3	21.3
33	358494	224213	Roadside	100	100	28.1	25.0	18.5	20.4	20.7
46	349400	259012	Roadside	100	100	31.6	33.4	26.7	27.2	28.0
53	350716	239163	Roadside	92	92	30.7	30.5	24.5	26.5	24.3
54	350600	241093	Urban Background	100	100	23.7	23.1	17.0	20.4	21.2

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2022 (%) [2] [3]	2018	2019	2020	2021	2022
57	350512	240104	Urban Background	100	100	27.7	28.8	21.1	23.7	23.7
59	350986	240173	Urban Centre	100	100	20.3	19.7	14.1	15.1	16.7
61a	349358	259016	Roadside	100	100	40.2	39.8	34.4	35.6	34.7
61b	349349	259016	Roadside	100	100	43.5	46.0	35.4	37.8	36.4
65	350085	240298	Urban Background	100	100	32.3	30.9	22.9	26.1	24.5
74	349984	240335	Roadside	100	100	17.6	17.4	14.0	13.6	14.2
75	350651	239753	Roadside	100	100	24.3	22.3	18.3	20.5	18.3
79	350478	239000	Roadside	100	100	30.1	28.6	23.4	24.0	22.5
82	360200	224176	Urban Background	100	100	21.3	20.1	16.1	17.4	17.1

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 2022 (%) [2] [3]	2018	2019	2020	2021	2022
84	347865	241237	Suburban	92	92	13.0	10.5	8.5	9.2	8.9
85	348753	241942	Rural	100	100	9.3	8.0	6.2	6.7	6.7
86	349065	241909	Roadside	100	100	15.6	14.9	11.2	13.0	12.8
87	350693	239819	Roadside	100	100	30.1	29.8	25.6	27.2	24.5
88	350683	239899	Roadside	100	100	33.8	31.6	24.4	28.7	26.9
89	350799	240443	Roadside	100	100	36.2	36.9	29.3	30.3	29.7
90	350716	239163	Roadside	92	92	26.8	25.3	19.9	21.3	20.3
91	350758	239125	Roadside	100	100	40.9	38.7	27.6	30.7	30.3
92	352916	237844	Urban Background	100	100	13.9	13.5	9.8	10.6	10.2
93	351881	239984	Roadside	92	92	11.9	10.5	9.3	9.0	7.8

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 2022 (%) [2] [3]	2018	2019	2020	2021	2022
94	350932	240802	Roadside	100	100	30.8	29.4	24.7	24.9	25.7
95	350875	240674	Roadside	100	100	43.0	37.0	25.1	26.5	28.1
96	350942	240861	Roadside	100	100	31.7	36.9	32.5	35.5	32.9
97	351017	240880	Roadside	100	100	26.7	25.6	19.6	21.5	20.5
98	350945	240659	Urban Background	100	100	21.7	19.9	15.8	17.2	16.3
99	351036	240669	Urban Background	100	100	19.8	19.3	14.5	15.4	15.3
100	351448	240535	Urban Background	92	92	22.2	22.5	18.2	18.9	19.7
101	351057	240299	Roadside	100	100	32.4	32.4	24.5	25.6	26.0
102	351099	240642	Roadside	100	100	27.6	25.9	19.3	21.7	21.2

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2022 (%) [2] [3]	2018	2019	2020	2021	2022
103	350905	240229	Roadside	100	100	40.1	33.4	26.2	27.8	27.5
104	350984	240215	Roadside	100	100	33.6	31.9	24.3	25.6	26.7
105	351723	240444	Roadside	92	92	27.3	28.0	21.5	22.5	22.9
106	351461	240313	Roadside	92	92	34.2	31.1	25.6	29.1	28.7
107	350410	241165	Roadside	100	100	25.3	24.7	18.4	18.8	19.4
108	350193	242175	Urban Background	92	92	22.5	22.6	16.9	17.3	16.7
109	349173	259023	Roadside	100	100	41.6	32.4	24.9	25.4	25.1
110	349256	259034	Roadside	92	92	29.2	22.9	15.2	17.4	17.8
111	349228	259031	Roadside	80	0	32.0	25.9	16.2	17.3	n/a [5]

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

☒ Diffusion tube data has been bias adjusted.

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

Notes:

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

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

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

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

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

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

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

(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.TG22 if valid data capture for the full calendar year is less than 75% and above 25%. See Appendix C for details.

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

(5) Monitoring site 111 had a low capture rate for 2022 and could not be annualised against automatic monitoring that measure NO_2 concentrations in the local area.

Figure A.1 – Trends in Annual Mean NO_2 Concentrations for Herefordshire Council

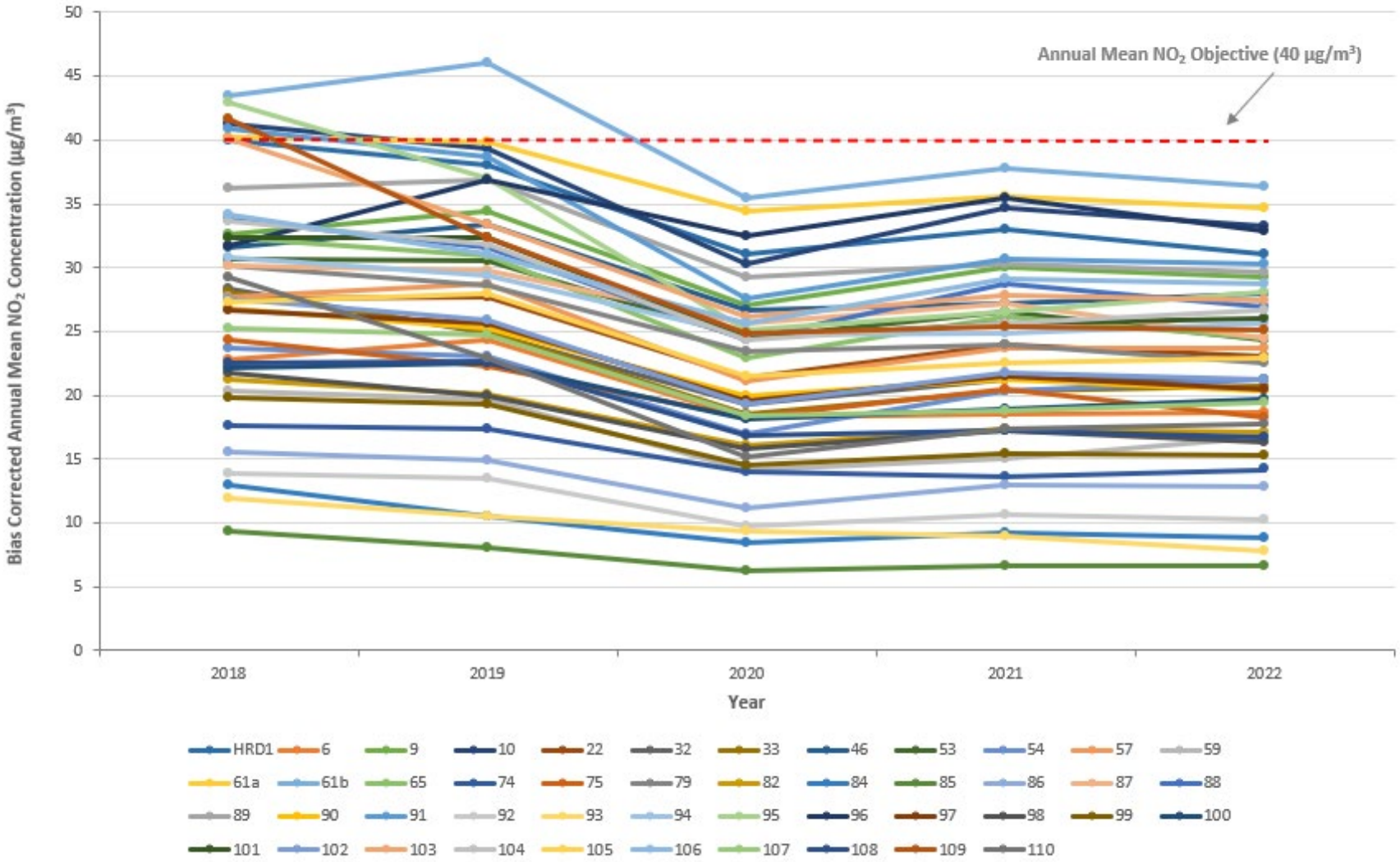


Figure A.2 – Trends in Annual Mean NO_2 Concentrations Inside Hereford AQMA

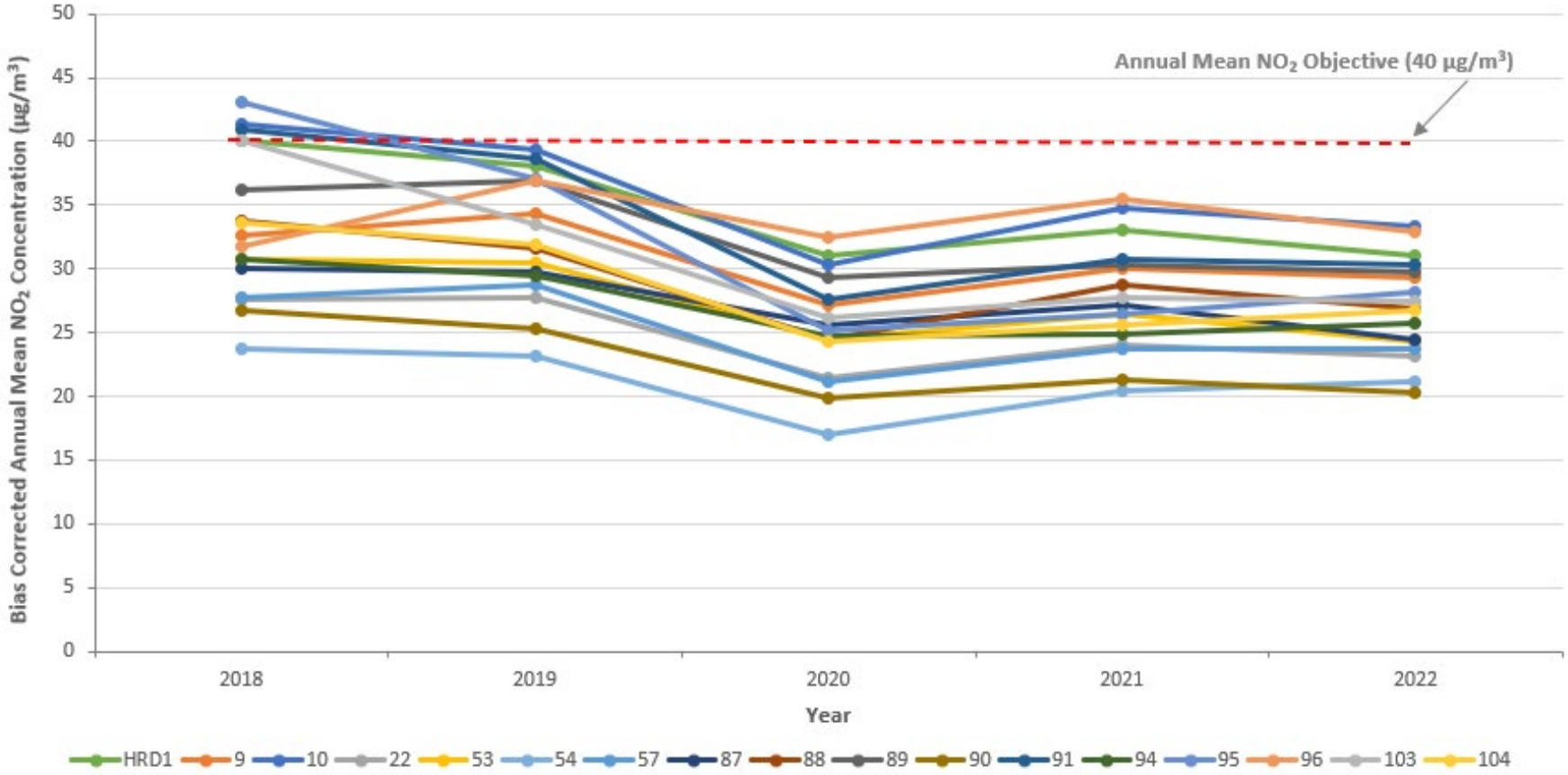


Figure A.3 – Trends in Annual Mean NO_2 Concentrations In the Local Area of Hereford AQMA

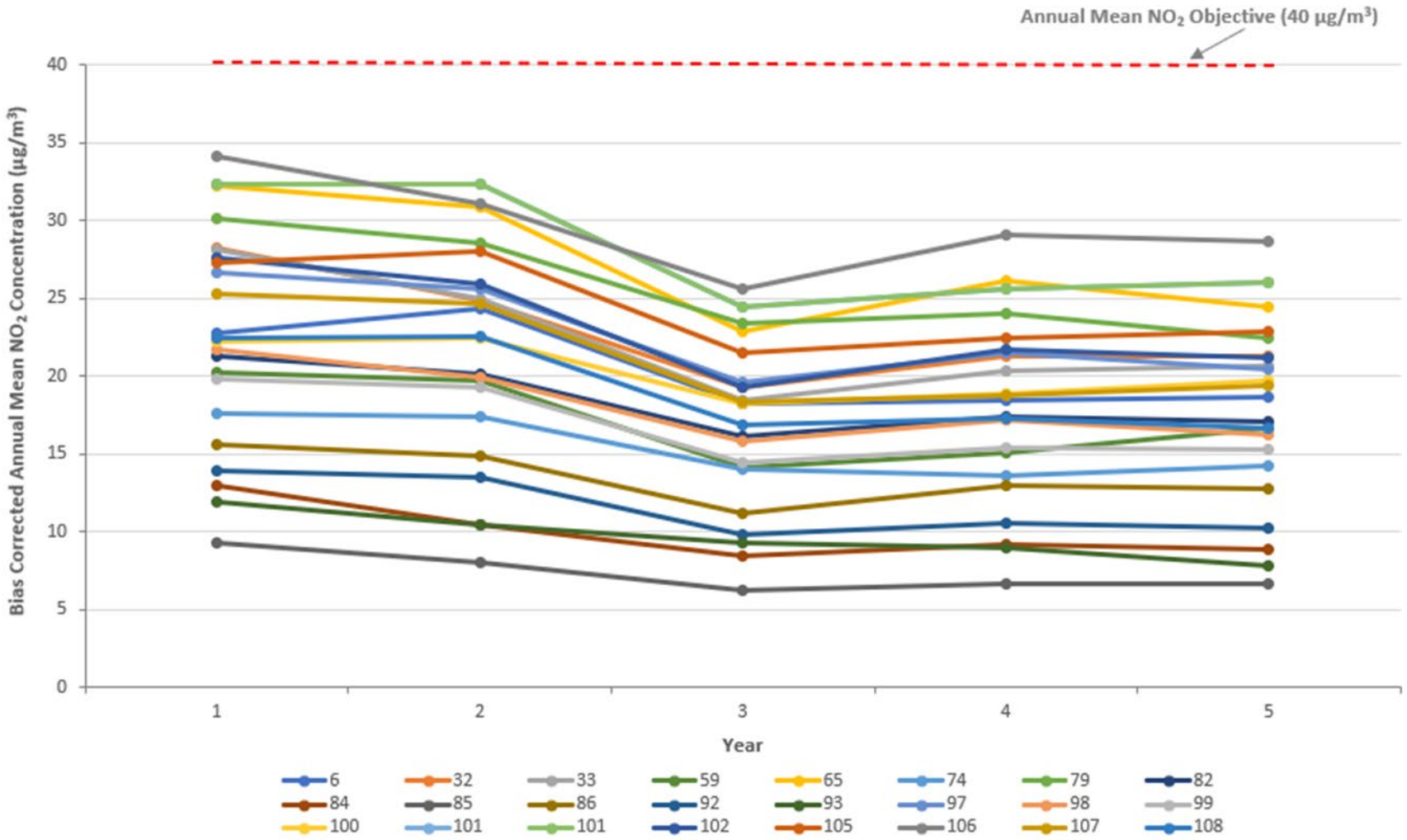


Figure A.4 – Trends in Annual Mean NO_2 Concentrations Inside Leominster AQMA

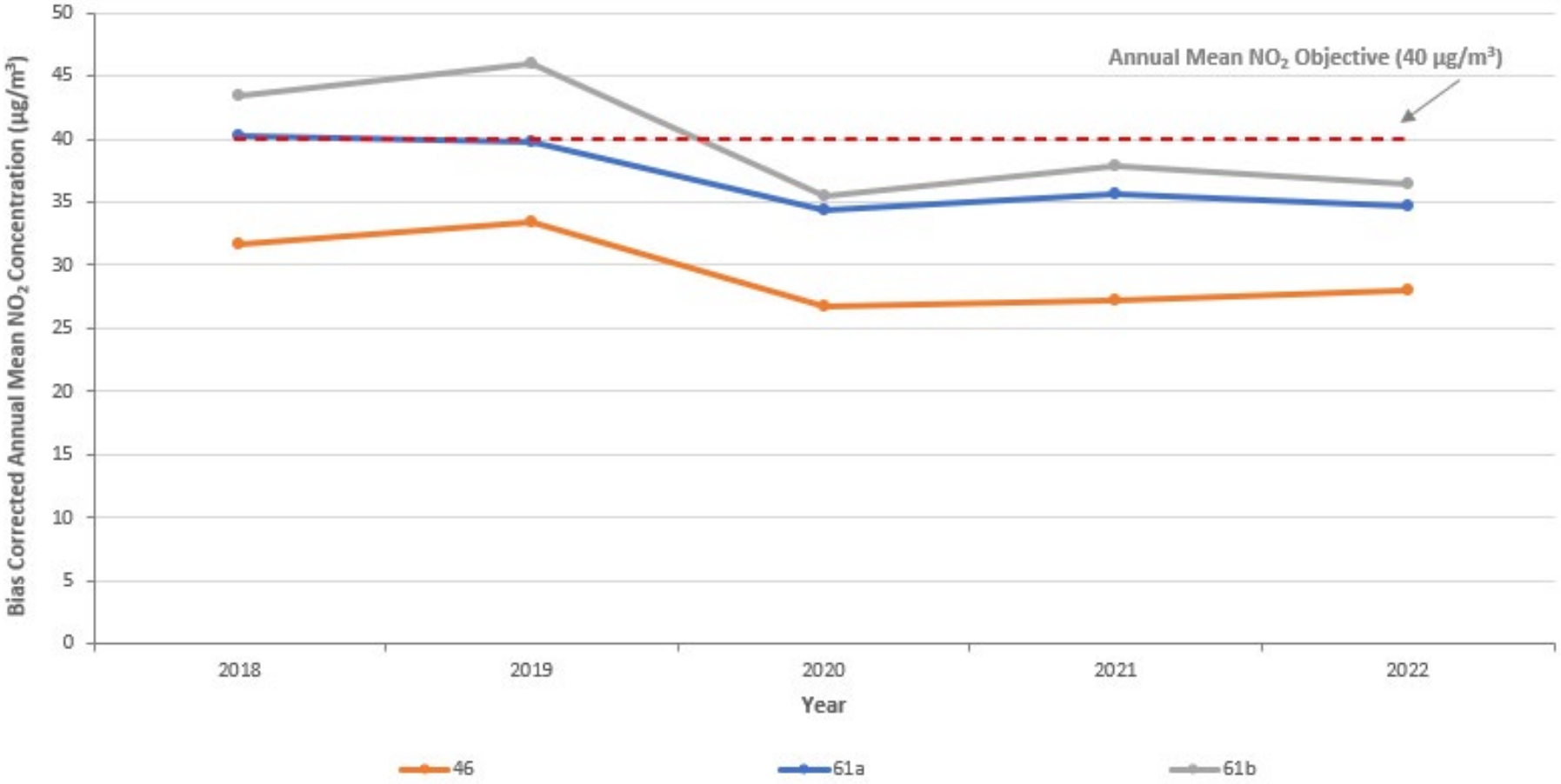


Figure A.5 – Trends in Annual Mean NO_2 Concentrations In the Local area of Leominster AQMA

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

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2022 (%) (2)	2018	2019	2020	2021	2022
HRD1	350271	239791	Roadside	56.7	56.7	0	1	0	0	0 (103)

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

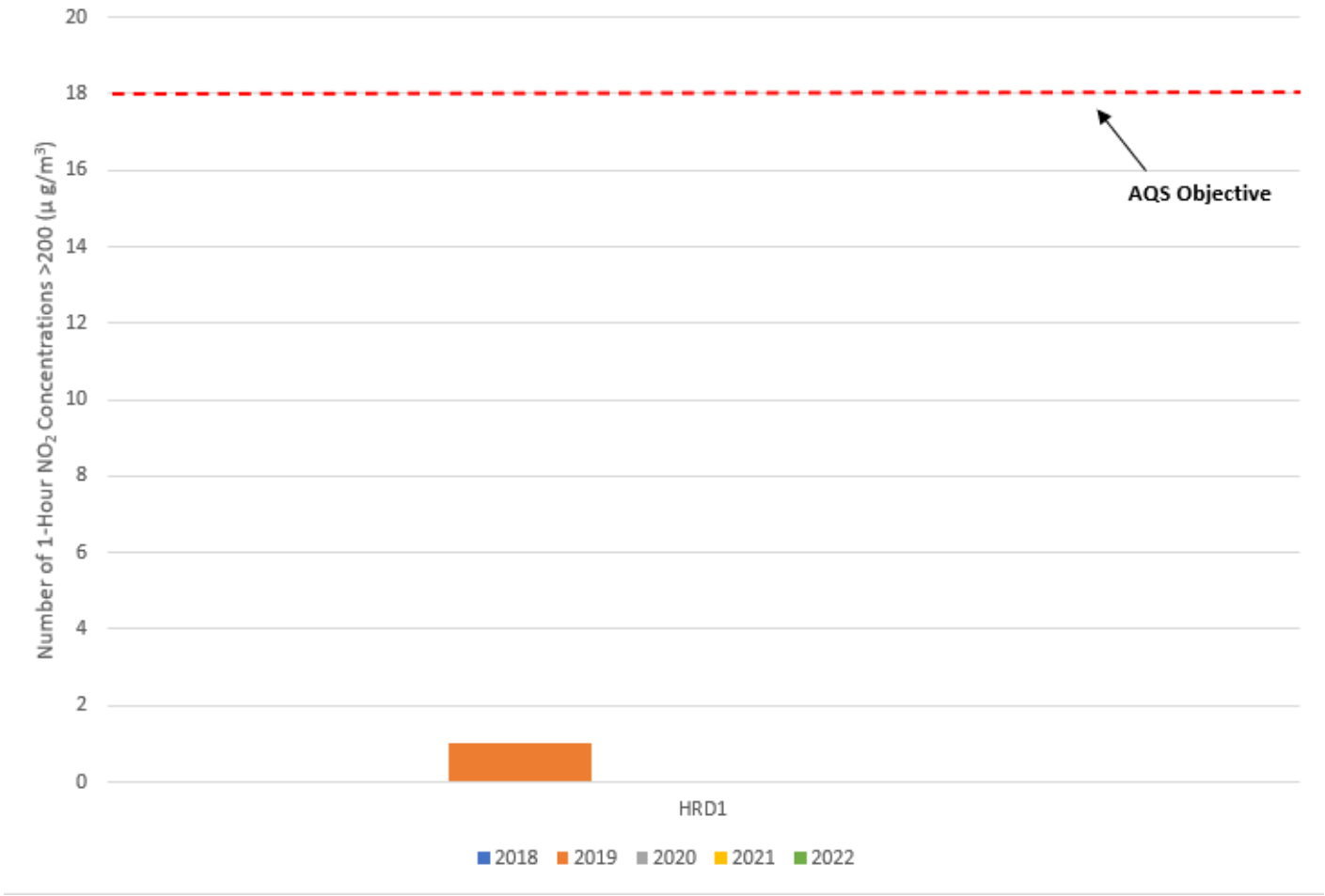


Table A.6 – Annual Mean PM_{10} Monitoring Results ($\mu g/m^3$)

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2022 (%) (2)	2018	2019	2020	2021	2022
HRD1	350271	239791	Roadside	62.2	62.2	24	21	22	22	18

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

Notes:

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

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

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

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

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

Figure A.7 – Trends in Annual Mean PM_{10} Concentrations

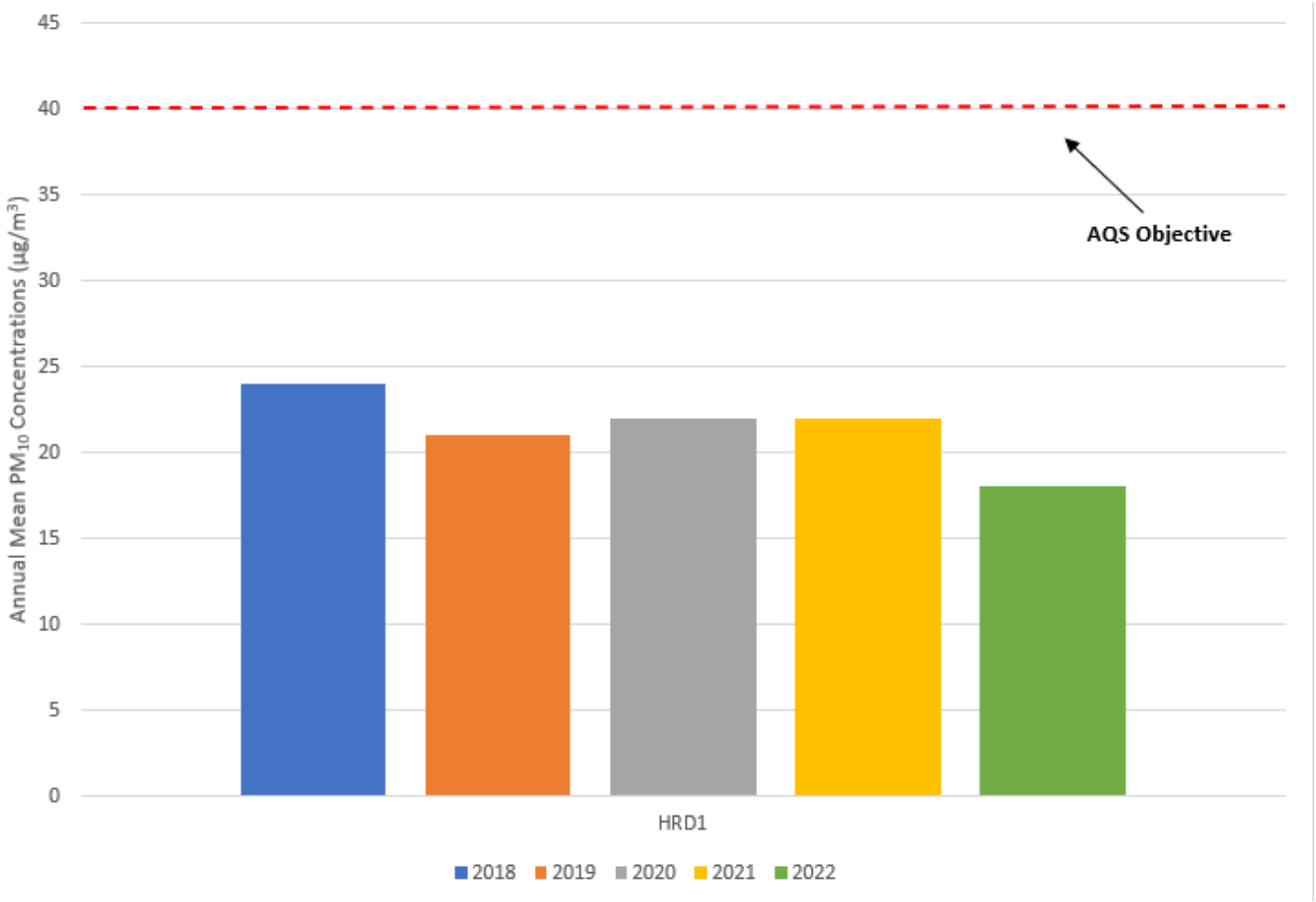


Table A.7 – 24-Hour Mean PM_{10} Monitoring Results, Number of PM_{10} 24-Hour Means > 50µg/m^3

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2022 (%) (2)	2018	2019	2020	2021	2022
HRD1	350271	239791	Roadside	62.2	62.2	2	(7)	-	2 (31)	2

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

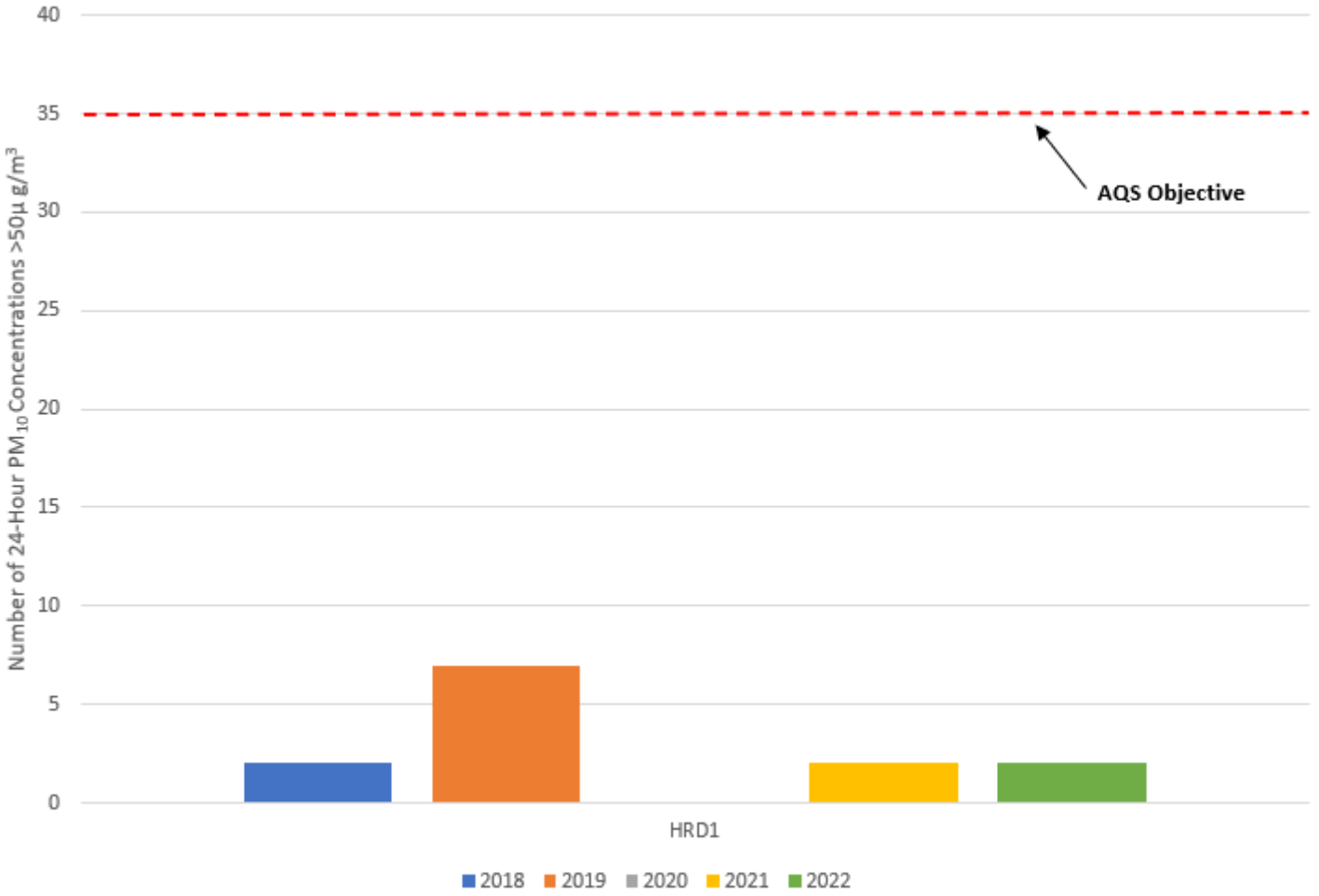


Table A.8 – Annual Mean $PM_{2.5}$ Monitoring Results ($\mu g/m^3$)

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2022 (%) (2)	2018	2019	2020	2021	2022
HRD1	350721	239791	Roadside	37.7	37.7	-	-	-	-	9.5

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

Notes:

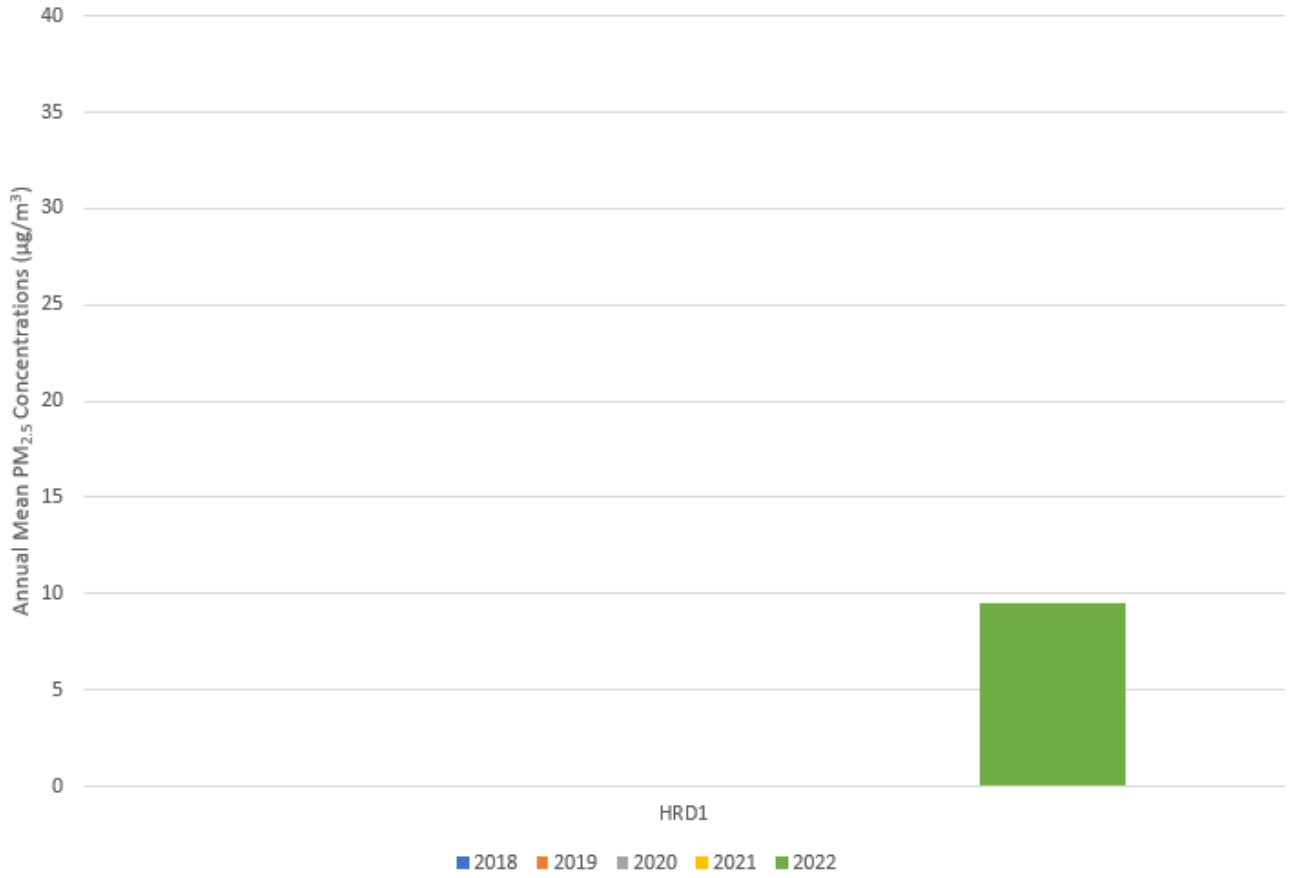
The annual mean concentrations are presented as $\mu g/m^3$.

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

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

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

Figure A.9 – Trends in Annual Mean $PM_{2.5}$ Concentrations



5 Appendix B: Full Monthly Diffusion Tube Results for 2022

Table B.1 – NO_2 2022 Diffusion Tube Results ($\mu g/m^3$)

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted (x.84)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
6	350889	239994	29.2	21.2	25.0	19.3	15.8	17.1	17.2	19.1	20.0	23.8	28.4	30.5	22.2	18.7	n/a	
9	350688	239863	43.6	30.1	47.7	32.5	21.8	26.8	30.4	39.8	34.8	32.3	37.5	42.0	34.9	29.4	n/a	
10	350676	240018	48.3	37.0	42.8	36.6	30.3	34.0	37.9	45.1	32.3	39.9	46.7	45.2	39.7	33.3	n/a	
22	350858	240610	30.3	21.1	36.3	27.7	19.0	21.1	22.8	29.9	26.2	27.3	32.7	36.2	27.7	23.1	24.0	
32	357724	223747	30.8	13.9	23.5	n/d	21.7	23.8	26.5	31.1	25.4	25.0	26.2	31.1	25.4	21.3	22.3	
33	358494	224213	30.2	17.0	28.4	23.1	18.6	22.6	23.4	29.2	24.1	26.0	26.8	26.3	24.6	20.7	n/a	
46	349400	259012	43.7	30.5	34.6	27.2	29.1	28.7	32.6	32.7	30.9	33.9	37.0	38.8	33.3	28.0	29.5	
53	350716	239163	35.1	23.4	31.8	27.0	23.7	27.0	n/d	23.0	29.4	29.2	31.3	36.9	28.9	24.3	n/a	
54	350600	241093	33.1	20.1	30.2	22.7	19.4	21.1	23.7	26.7	25.4	23.0	28.7	29.0	25.3	21.2	n/a	
57	350512	240104	35.7	23.6	34.2	27.5	18.3	22.2	24.6	30.7	29.5	25.7	31.6	34.8	28.2	23.7	n/a	
59	350986	240173	29.4	15.4	23.6	16.1	12.2	12.6	14.1	32.5	17.4	17.2	21.0	27.3	19.9	16.7	n/a	
61a	349358	259016	47.7	43.3	41.8	35.8	38.8	39.0	39.1	45.9	36.9	41.6	44.1	42.5	41.4	34.8	30.6	
61b	349349	259016	46.5	41.5	44.4	37.9	38.8	40.5	39.9	45.4	40.9	45.1	51.6	48.1	43.4	36.4	n/a	
65	350085	240298	36.8	21.1	34.3	30.0	19.8	24.1	26.5	35.0	32.5	24.6	30.5	34.8	29.2	24.5	n/a	
74	349984	240335	24.4	14.0	22.2	13.9	12.1	11.5	11.8	15.0	16.6	16.6	21.5	23.1	16.9	14.2	n/a	

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 (x.84)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
75	350651	239753	26.1	14.3	28.6	22.3	16.3	16.9	17.3	24.1	21.5	21.0	26.2	26.2	21.7	18.3	n/a	
79	350478	239000	32.8	22.4	32.0	26.5	21.0	21.8	22.2	27.2	26.8	26.1	29.9	33.1	26.8	22.5	n/a	
82	360200	224176	27.8	23.8	25.3	19.3	12.6	14.7	14.3	21.3	19.6	17.6	21.5	26.1	33.1	17.1	n/a	
84	347865	241237	16.3	7.1	15.5	n/d	7.0	6.8	7.7	11.5	10.3	8.3	10.1	15.7	10.6	8.9	n/a	
85	348753	241942	13.4	4.9	11.6	7.2	4.1	4.0	5.2	7.7	7.8	6.9	9.8	12.8	7.9	6.7	n/a	
86	349065	241909	22.8	8.7	19.6	13.9	8.2	9.8	10.7	15.5	13.5	16.5	20.8	22.1	15.2	12.7	n/a	
87	350693	239819	36.3	32.3	42.0	26.9	20.2	26.0	27.9	18.8	31.5	30.5	30.4	36.9	29.2	25.2	n/a	
88	350683	239899	42.4	24.6	41.6	30.0	20.1	26.8	30.1	34.6	34.5	30.5	32.4	36.6	32.0	26.9	n/a	
89	350799	240443	45.0	33.0	40.0	31.7	25.6	29.5	30.2	37.0	34.7	36.7	41.2	40.4	35.4	29.8	n/a	
90	350716	239163	29.5	20.9	28.6	24.9	18.8	20.1	21.6	29.6	26.5	22.4	23.3	n/d	24.2	20.3	n/a	
91	350758	239125	48.0	38.3	36.2	32.6	29.7	32.3	34.3	36.7	35.8	33.6	35.9	39.7	36.1	30.3	n/a	
92	352916	237844	21.9	7.6	17.4	11.2	7.9	7.9	9.3	10.1	12.2	10.6	10.3	18.9	12.1	10.2	n/a	
93	351881	239984	n/d	10.3	13.1	10.9	6.5	7.1	7.7	10.4	9.5	7.4	6.6	12.8	9.3	7.8	n/a	
94	350932	240802	38.2	27.2	32.4	26.0	20.5	28.5	26.3	20.0	28.3	32.0	40.3	37.7	30.6	25.0	n/a	
95	350875	240674	40.9	30.1	35.2	25.1	21.6	24.8	21.7	41.1	38.9	40.4	32.6	49.1	33.5	28.1	n/a	
96	350942	240861	57.9	43.2	40.9	36.8	32.6	35.3	38.2	28.9	28.8	35.6	49.7	41.9	39.2	32.9	n/a	
97	351017	240880	33.6	18.7	31.1	24.5	16.4	17.8	20.0	26.6	24.9	22.4	27.1	29.9	24.4	20.5	n/a	
98	350945	240659	22.7	16.3	25.3	19.0	14.3	13.9	13.4	18.5	18.3	19.0	23.8	28.8	19.4	16.3	n/a	

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 (x.84)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
99	351036	240669	28.7	16.1	26.7	16.7	11.8	10.6	11.8	14.7	15.0	17.4	22.4	26.8	19.4	15.3	n/a	
100	351448	240535	33.5	18.7	29.3	20.1	15.1	14.7	n/d	22.8	21.9	23.5	27.4	31.3	23.5	19.7	n/a	
101	351057	240299	36.2	30.1	35.3	29.0	24.0	25.0	27.6	31.1	28.0	31.3	36.0	27.3	30.9	25.3	n/a	
102	351099	240642	31.6	18.4	33.1	26.0	16.5	19.2	22.1	28.5	25.2	23.4	26.9	32.5	25.3	21.2	n/a	
103	350905	240229	44.3	27.8	26.4	30.6	25.0	27.8	30.7	38.4	36.7	27.3	31.6	36.5	32.7	26.8	n/a	
104	350984	240215	38.1	26.1	40.6	28.8	21.9	26.6	27.7	30.5	29.2	33.3	29.6	38.5	31.7	26.0	n/a	
105	351723	240444	36.0	22.2	30.0	23.8	n/d	22.2	23.6	26.7	26.4	26.3	30.2	32.0	27.2	22.9	n/a	
106	351461	240313	42.1	28.2	31.2	29.5	25.3	56.2	n/d	33.7	32.1	28.4	33.6	36.1	34.2	28.7	30.7	
107	350410	241165	32.3	22.3	28.1	20.8	14.4	15.1	17.0	23.6	20.0	22.4	29.3	31.5	23.1	19.4	n/a	
108	350193	242175	30.2	15.5	22.9	19.0	n/d	6.4	14.7	19.9	19.3	19.4	23.5	27.5	19.8	16.7	n/a	
109	349173	259023	38.0	28.7	31.5	26.1	22.9	26.3	28.2	29.6	28.1	31.2	33.4	33.8	29.8	25.0	n/a	
110	349256	259034	30.8	15.3	23.7	20.3	n/d	14.3	18.8	23.6	22.8	16.9	21.3	25.6	21.2	17.8	n/a	

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

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

☒ Local bias adjustment factor used.

☒ National bias adjustment factor used.

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

☒ Herefordshire Council confirm that all 2022 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.

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

6.1.1 New or Changed Sources Identified Within Herefordshire Council During 2022

Herefordshire Council has not identified any new sources relating to air quality within the reporting year of 2022.

6.1.2 Additional Air Quality Works Undertaken by Herefordshire Council During 2022

Herefordshire Council has not completed any additional works within the reporting year of 2022.

6.1.3 QA/QC of Diffusion Tube Monitoring

The diffusion tubes used by Herefordshire Council during 2022 were supplied and analysed by Gradko International Ltd. The analysis procedures are compliant with the Diffusion Tubes for Ambient NO_2 Monitoring: Practical Guidance for users and laboratories (Defra, 2008).

The laboratory is UKAS accredited and participates in the AIR-PT Scheme, a continuation of the Workplace Analysis Scheme for Proficiency (WASP) for NO_2 tube analysis and the Annual Field Inter-Comparison Exercise. These provide strict performance criteria for participating laboratories to meet, thereby ensuring NO_2 concentrations are reported to a high level of accuracy. The lab follows the procedures set out in the Harmonisation Practical Guidance. For the periods of January 2022 to February 2022, May to June 2022, July to August 2022 and September to October 2022 the percentage of results submitted by Gradko International Ltd to the AIR PT scheme that were deemed to be satisfactory was 100% for rounds AR042 and AR043, and 75% for rounds AR045 and AR046, respectively. Further information is available here:

https://laqm.defra.gov.uk/wp-content/uploads/2022/07/LAQM-NO2-Performance-data_Up-to-June-2022_V2.1.pdf

Monitoring has been completed in close adherence with the 2022 Diffusion Tube Monitoring Calendar.

6.1.4 Diffusion Tube Annualisation

No monitoring sites within Herefordshire Council were required to be annualised during 2022.

6.1.5 Diffusion Tube Bias Adjustment Factors

The diffusion tube data presented within the 2022 ASR have been corrected for bias using an adjustment factor. Bias represents the overall tendency of the diffusion tubes to under or over-read relative to the reference chemiluminescence analyser. LAQM.TG22 provides guidance 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.

Herefordshire Council have applied a national bias adjustment factor of 0.84 to the 2022 monitoring data. A summary of bias adjustment factors used by Herefordshire Council over the past five years is presented in Table C.1.

Herefordshire Council does not undertake any reference equivalent automatic monitoring and is thus unable to calculate a local bias adjustment factor. The national bias adjustment factor of 0.84 has therefore been used.

The bias adjustment factors for previous years were 0.93 in 2018, 0.93 in 2019, 0.81 in 2020, and 0.84 in 2021.

Table C.1 – Bias Adjustment Factor

Monitoring Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2022	National	03/23	0.84
2021	National	03/22	0.84
2020	National	03/21	0.81
2019	National	09/20	0.93

Monitoring Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2018	National	06/19	0.93

6.1.6 Distance Correction

Where monitoring sites are not representative of public exposure it is important to consider concentrations at locations of relevant exposure, e.g. if monitoring is located at roadside or kerbside, the concentrations at the façade of nearest properties set back further from the road should be considered.

Distance correction has been carried out using Defra's NO_2 fall off with distance calculator, following the approach set out in Paragraphs 7.82-7.85 of LAQM.TG22.

Local annual mean background NO_2 concentrations have been derived from Defra's latest national pollution maps which cover the whole country on a 1x1 km grid for each year from 2018 to 2030. Concentrations for 2022 have been used to coincide with the monitoring results considered in this report.

The distance corrected annual mean concentrations for relevant monitoring sites are presented in Table C.3. Where monitoring sites were within approximately 1 m of relevant exposure, it was considered that they were representative of likely human exposure. As such, distance correction has not been undertaken for these sites.

Table C.9 – Distance Correction of Annual Mean NO_2 Concentrations (1)

Diffusion Tube ID	Distance from Monitor to Kerb of Nearest Road (m)	Distance from Relevant Exposure to Kerb of Nearest Road (m)	Relative Distance from Monitor to Relevant Exposure (m)	Measured Annual Mean (µg/m^3)	Background Annual Mean (µg/m^3)	Distance Corrected Annual Mean (µg/m^3)
22	2.3	1.6	-0.7	23.1	13.1	24.0
32	5.0	4.0	-1.0	21.3	5.9	22.3
46	4.3	3.4	-0.9	28.0	5.7	29.5

Diffusion Tube ID	Distance from Monitor to Kerb of Nearest Road (m)	Distance from Relevant Exposure to Kerb of Nearest Road (m)	Relative Distance from Monitor to Relevant Exposure (m)	Measured Annual Mean (µg/m^3)	Background Annual Mean (µg/m^3)	Distance Corrected Annual Mean (µg/m^3)
106	2.5	1.7	-0.9	28.7	9.7	30.7

(1) Distance correction has been carried out using Defra's Diffusion Tube Processing Tool v3.0. This tool only provides distance correction for monitoring sites where there is relevant exposure closer to the kerb of the nearest road than the monitoring site. Where monitoring sites are not representative of relevant exposure, but relevant exposure exists further away from the road than the monitor, no distance correction has been carried out.

6.1.7 QA/QC of Automatic Monitoring

The data for the automatic monitoring site within Herefordshire Council is managed and operated by Air Quality Data Management (AQDM). The automatic sites are calibrated and serviced in line with the instrument's requirements, as required in LAQM TG.22.

The air quality monitoring data has been ratified before being presented within the ASR. Historical data for the automatic monitor is available through the Herefordshire website[9].

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

A specific correction factor has been applied to the PM_{10} and $PM_{2.5}$ monitoring data for Victoria Street in 2022. The specific correction value of 0.833 was applied to data from 1st January to 15th august 2022 and 1.035 from 16th august to 31st December 2022. The change in specific correction value was the change instrument from BAM to smart heated BAM instrument.

6.1.9 Automatic Monitoring Annualisation

LAQM.TG22 states that for automatic monitoring sites for with data capture less than 75%

9 https://www.herefordshire.gov.uk/downloads/download/67/air_quality_documents

but greater than 25% require to be annualisation. The automatic monitoring site Victoria Street (HRD1) in Hereford had capture rate of 62.2% and 37.7% for PM_{10} and $PM_{2.5}$ in 2022. Therefore, PM_{10} and $PM_{2.5}$ monitoring data for Victoria Street in 2022 have been annualised following the methodology set out in LAQM.TG22. The annualisation of PM_{10} and $PM_{2.5}$ monitoring data for Victoria Street in 2022 is provided in Table C.3.

Table C. 3 Annualisation Summary for PM_{10} and $PM_{2.5}$ Concentrations

Site ID	Annualisation Factor Bristol St Pauls	Annualisation Factor Cardiff Centre	Annualisation Factor Newport	Average Annualisation Factor	Raw Data Annual Mean	Annualised Annual Mean
HRD1 (PM_{10})	1.02	0.99	0.99	0.99	18	18
HRD1 ($PM_{2.5}$)	1.07	1.00	1.08	1.05	9	9.5

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

Figure D.1 – Maps of Herefordshire Transport Network and Major Settlements and Location of Herefordshire

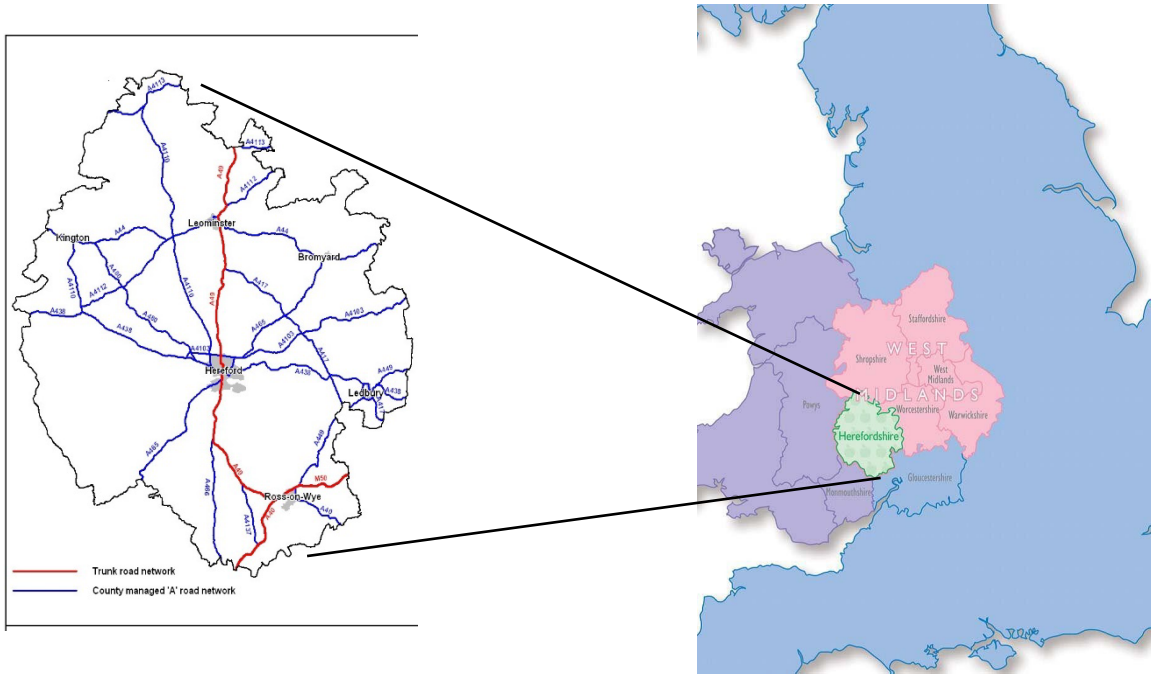
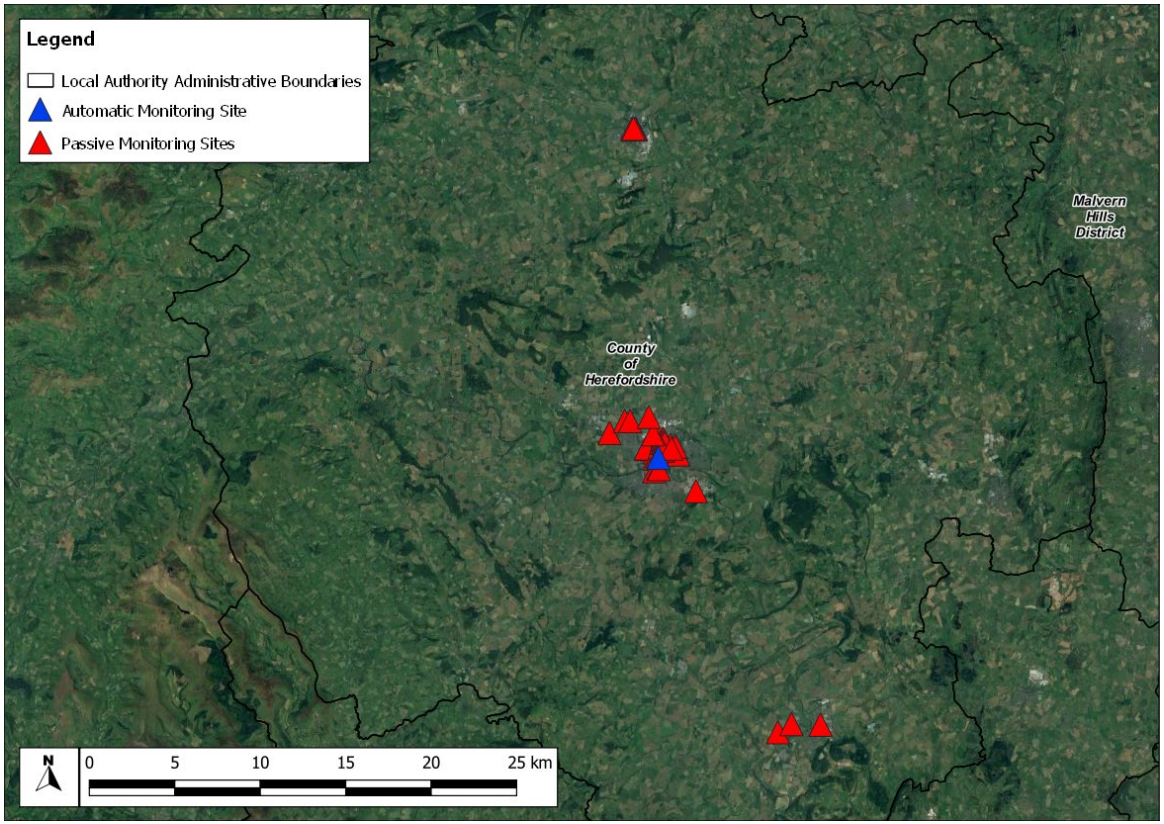


Figure D.2 – Map of Monitoring Locations within Herefordshire District



Imagery © 2023 Google, Map data © 2023.

Figure D.3 – Hereford AQMA Boundary

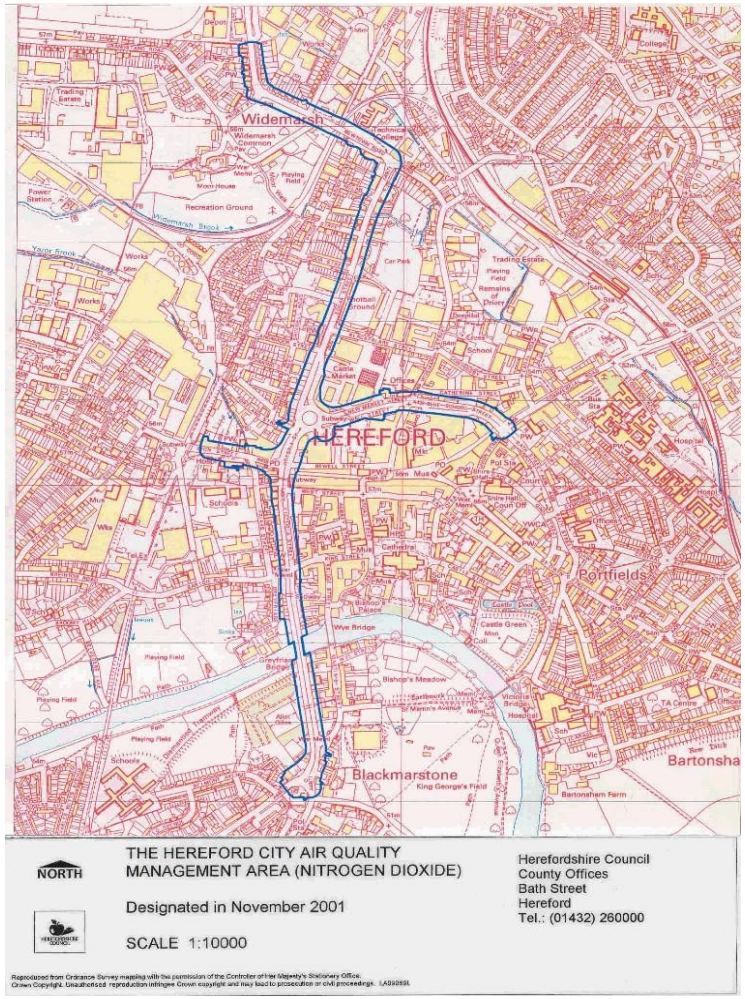
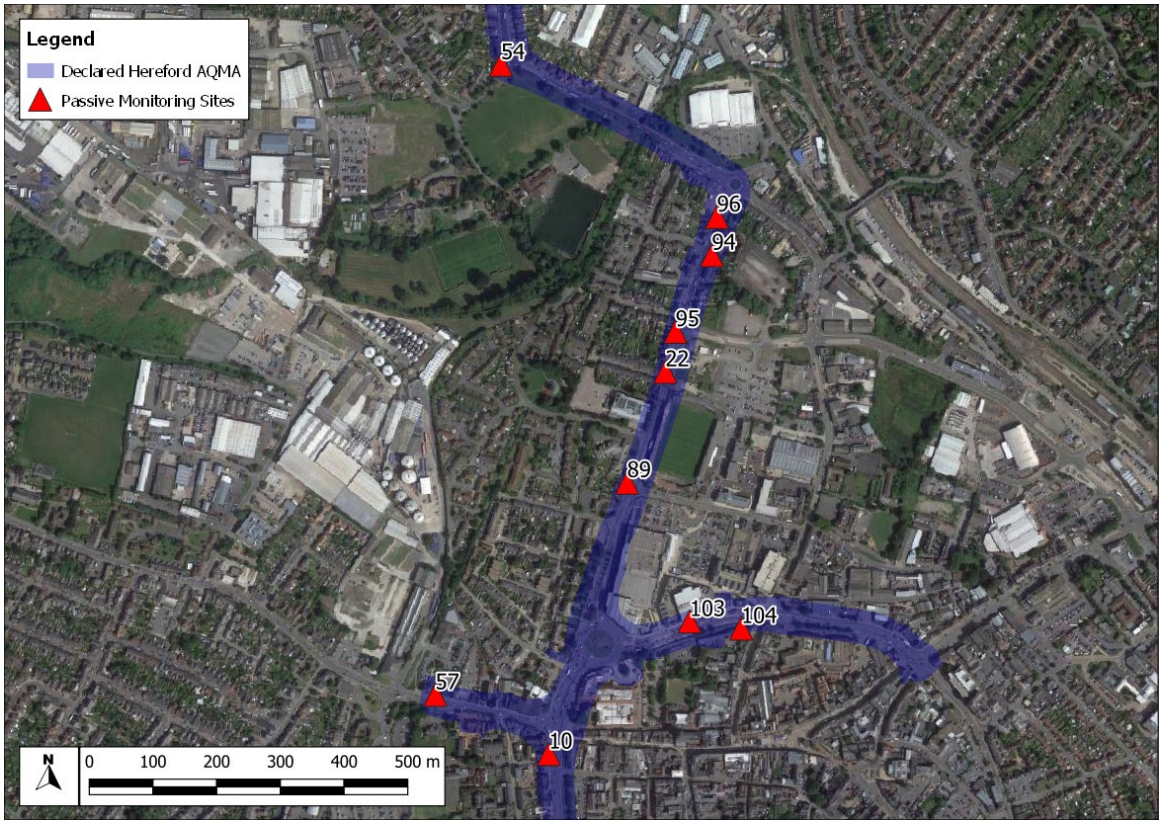


Figure D.4 – Map of Monitoring Locations within Hereford AQMA Boundary



Imagery © 2023 Google, Map data © 2023.

Figure D.5 – Map of Monitoring Locations within Hereford AQMA Boundary

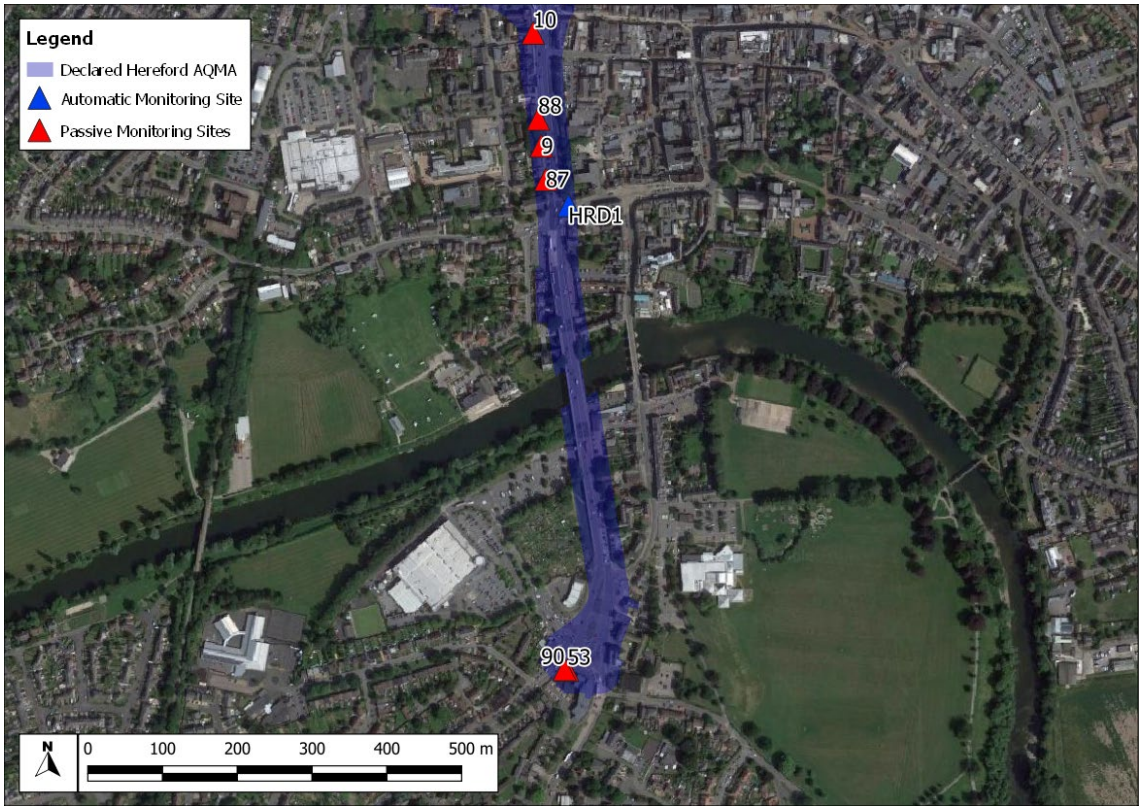


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Figure D.6 – Map of Monitoring Locations in the Local area of Hereford AQMA

Imagery © 2023 Google, Map data © 2023.

Figure D.7 – Map of Monitoring Locations in the Local area of Hereford AQMA

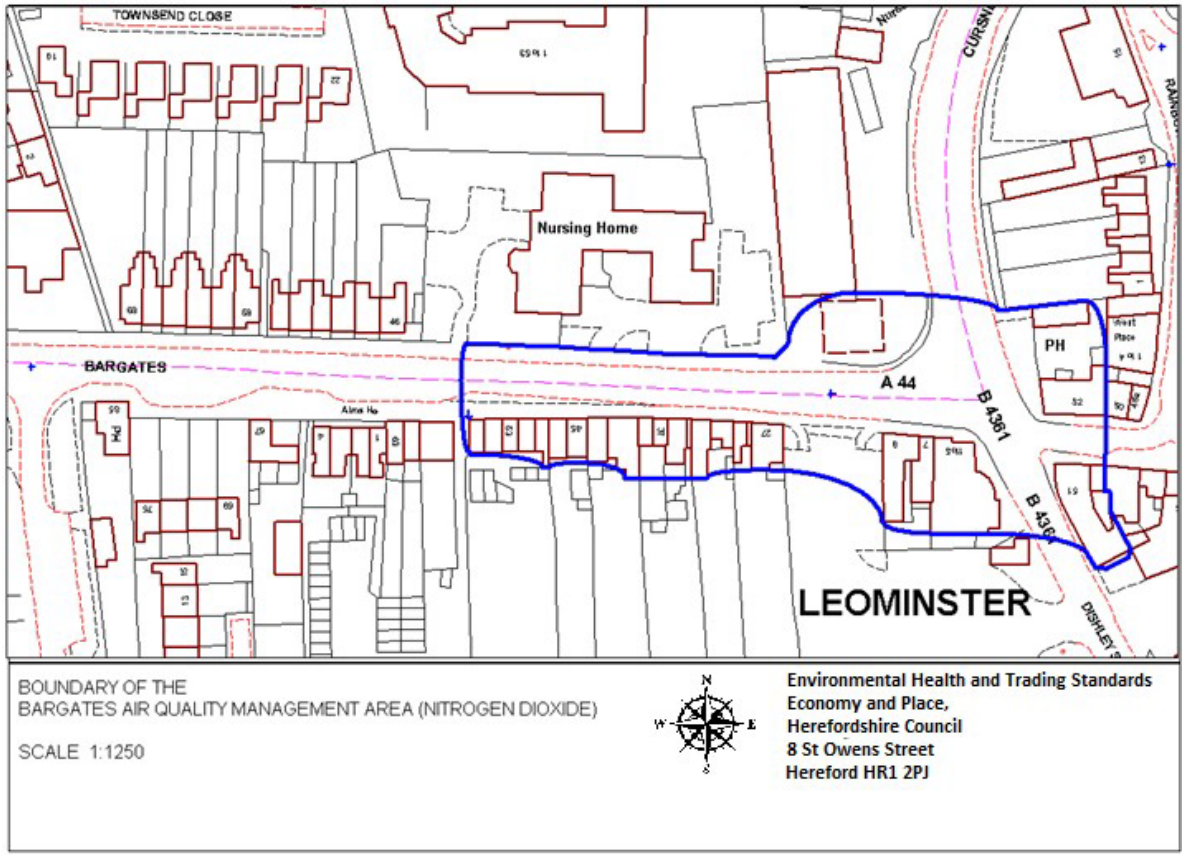

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Figure D.8 – Map of Monitoring Locations in the Local area of Hereford AQMA

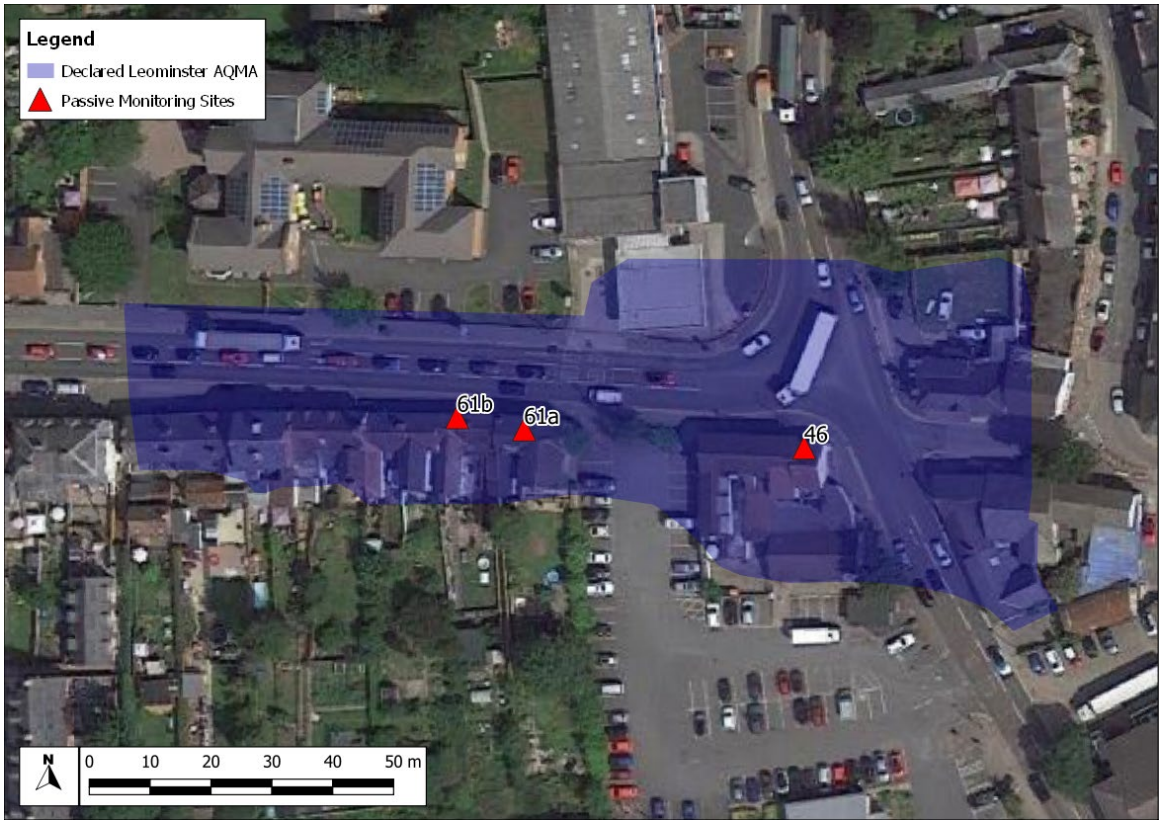

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Figure D.9 – Map of Monitoring Locations in the Local area of Hereford AQMA

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8 Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England[10]

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

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

9 Glossary of Terms

Abbreviation	Description
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the local authority intends to achieve air quality limit values'
AQMA	Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives
ASR	Annual Status Report
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by National Highways
EU	European Union
FDMS	Filter Dynamics Measurement System
HC	Herefordshire Council
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

Abbreviation	Description
QA/QC	Quality Assurance and Quality Control
SO_2	Sulphur Dioxide

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