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: June, 2023

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Executive Summary: Air Quality in Our Area

Air Quality in Forest of Dean District 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 343,000 deaths at typical ages[3], with a total estimated healthcare cost to the NHS and social care of £157 million in 2017[4].

The monitoring reported within this 2023 Annual Status Report for Forest of Dean District Council took place during the whole of 2022. It does not indicate any additional areas of general concern with regard to air quality. As with last year's results, this year's annual mean levels did not exceed the national objective of 40 µgm^{-3}, which was set to protect health. 2022 was the first year since the outbreak of Covid-19 in the UK in 2020, with no restrictions on travel. The expectation was an increase in traffic volumes and a corresponding increase in air pollution. However, contrary to expectations, a raise in nitrogen dioxide (NO_2) concentrations was not observed. Although some locations showed a slight increase on the previous two years, of the locations which were also monitored in 2021, 19 out of 26 locations showed a decrease in NO_2 concentrations compared with 2021, with 9 out of 25 showing a decrease compared with 2020.

We have one Air Quality Management Area (AQMA) in the District which is in Lydney and was declared in July 2010. It was identified that traffic congestion (at the T-junction between the High Street and the Bream Road) was the most likely cause of the NO_2 levels

[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

which exceeded the national air quality objectives at the time the AQMA was declared. The District's centralised national AQMA page can be found here: Link to Forest of Dean AQMA details

In our designated Air Quality Management Area (AQMA) in Lydney, the 2022 annual average results for LYD01 and LYD09 were 28.5 μgm^{-3} and 27.1 μgm^{-3} respectively which can be compared with last year when the concentrations were 31.5 μgm^{-3} and 28.9 μgm^{-3}.

The reasons for this decline are unclear, however they are likely to be a consequence of the uptake of low emission vehicles, improvements in engine efficiency and the popularity of working from home and virtual meetings.

All development proposals were considered with regard to their potential to increase traffic pollution in the AQMA and other areas. The Council has considered the air quality implications of each development proposal and worked closely with developers and other bodies, in particular Gloucestershire County Council highways officers and the Environment Agency where required.

2022 did not see planning applications for large housing or commercial developments. There has been approval of smaller developments across the district, none of which were shown to have an impact on air quality.

Redevelopment of Lydney Harbour is ongoing, however planning permission remains pending for the redevelopment of the former Pine End plywood manufacturing site. If approved, this will see the transformation of the currently derelict site into an eel fishery and smokery, which will include café and education/visitor centre.

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, due to be published in 2023, will provide more

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

information on local authorities' responsibilities to work towards these new targets and reduce $PM_{2.5}$ in their areas. The Road to Zero[6] 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 Local Transport Plan 2020-2041 includes a number of improvements within and around Lydney which will improve traffic flow, and make active travel and public transport more attractive. To date, many of these proposals are still in the scoping stage and awaiting funding. However, work has been completed on improving the pedestrian footpath route from Lydney train station to the harbour.

Local planning policy is encouraging further cycleway development. Planning policy AP27 of the Forest of Dean Allocations Plan 2006-2026 (adopted 2018) seeks to safeguard land for a future Lydney to Parkend Cycle Route (currently awaiting planning permission). Similarly policy AP28 seeks to safeguard land between Christchurch and Berry Hill for the Christchurch to Coleford cycle route.

Network Rail undertook a study into the current status of the Bristol to Birmingham rail corridor and how it could be improved. The report on the study was published in February 2022. The recommendations included routing services travelling to Birmingham from Cardiff, via Lydney. If this recommendation is taken forward, this would increase services stopping at Lydney, making train travel a more attractive option.

Gloucestershire County Council has recently introduced The Robin, which is a new on demand bus service operating in the Cotswolds and the Forest of Dean. The service has been designed specifically to provide transport links from close to people's homes to:

- locations for onward travel, or
- to services at times when there is no other transport option.

Forest of Dean District Council have published their Climate Emergency and Action Plan 2022-2025, which focuses on electric vehicle charging points, active travel and public transport. It is expected that there will be progress on these actions in the coming year.

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

Conclusions and Priorities

We deploy a number of diffusion tube monitors across the District, measuring nitrogen dioxide as part of an ongoing survey. These are collected and sent for analysis on a monthly basis.

2022 was the first year post Covid-19 pandemic where there were no restriction on travel, and yet air quality showed a general improvement across the district. However, despite the fall in NO_2 concentrations, it is too early to assume this will be the norm over the coming years. Consequently, the County Council, District Council, residents and businesses continue to have a part to play in reducing emissions and improving the quality of the air we breathe. It is important that Gloucestershire County Council Transport Department are kept informed of proposed developments and that developers are aware of the need for appropriate mitigation in respect of associated air pollution.

The AQMA has seen the annual mean for NO_2 concentrations below the national objective for three consecutive years. However, due to the unusual circumstances of 2020 & 2021, where trends in air quality are likely to be dominated by the pandemic effect on local traffic, we intend to keep this in place for now.

The 2005 – 2021 Forest of Dean District Council Air Quality reports are available online at: Forest of Dean District Council - Air Quality pages

Over the coming year it is anticipated that progress will be made with cycling schemes as an alternative to car use. Whereas travel due to bike rather than car will result in less emissions, it is recognised that some of these schemes are intended as much to promote tourism as well as bike use. However, the benefit of encouraging leisure bike use as a positive activity may then become a future commuting mode option.

Local Engagement and How to get Involved

As the air pollution of concern in the District is related to traffic emissions, we can all do our bit to reduce emissions by not using a car unless entirely necessary. More sustainable forms of transport include walking or cycling, taking public transport, and car sharing (rather than driving an otherwise empty car), all reduce our individual carbon footprint.

The solution to congestion-related pollution lies to a large extent in road traffic management and District authorities do not have the remit to manage this. Local interest

groups can however lobby County Councils directly to influence the content of Local Transport Plans (LTP).

Any queries about Air Quality should be directed to the Environmental Protection team within Forest of Dean District Council. This team can be contacted by email on: ers@fdean.gov.uk

Local Responsibilities and Commitment

This ASR was prepared by the Environmental Regulatory Services of Forest of Dean District Council with the support of Gloucestershire County Council.

If you have any comments on this ASR please send them to Senior Officer for Air Quality at:

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Tables

1 Local Air Quality Management

This report provides an overview of air quality in Forest of Dean District during 2022. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995), as amended by the Environment Act (2021), and the relevant Policy and Technical Guidance documents.

The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where an exceedance is considered likely the local authority must declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in order to achieve and maintain the objectives and the dates by which each measure will be carried out. This Annual Status Report (ASR) is an annual requirement showing the strategies employed by Forest of Dean District Council to improve air quality and any progress that has been made.

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

2 Actions to Improve Air Quality

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

- NO_2 annual mean

Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Date of Declaration	Pollutants and Air Quality Objectives	One Line Description	Is air quality in the AQMA influenced by roads controlled by Highways England?	Level of Exceedance: Declaration	Level of Exceedance: Current Year	Number of Years Compliant with Air Quality Objective	Name and Date of AQAP Publication	Web Link to AQAP
High Street Lydney	July 2010	Annual Mean NO_2; 40µg/m^3	High Street, Hill Street and Newerne Street from Temple Way junction to Albert Street Junction; and Bream Road from High Street junction to approximately 75m past the entrance to Lydney C of E Primary School; and Forest Road from Hill Street to just past 17 Forest Road.	NO	50µg/m^3	28.5µg/m3	3 years	A draft Lydney AQMA Action Plan dated January 2015 has been prepared with the assistance of a steering group and after local consultation with stakeholders.	

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

☒ **Forest of Dean District Council confirm that all current AQAPs have been submitted to Defra.**

Progress and Impact of Measures to address Air Quality in Forest of Dean District

Defra's appraisal of last year's ASR concluded that although '*The report is well structure, detailed, and provides the information specified in the Guidance.*' there was room for improvement. Suggested improvements are listed below, along with updates for the Council where applicable:

Comment	Action
The Council have included a detailed discussion of measures to improve air quality in the District and have completed a number of air quality improvement measures, particularly those that focus on new cycling schemes to encourage the uptake of active travel. The Council are encouraged to review and update their AQAP, as it is now over 5 years old, and consider additional measures to improve air quality in the AQMA.	Contrary to expectations, concentrations of NO_2 in the Lydney AQMA fell compared with 2021. There are currently no large developments expected within the area which may impact air quality. At time of writing, although raw 2022 data indicates no significant rise in concentrations of NO_2 within the AQMA, compared to 2021 data for comparable months, the data does indicate NO_2 concentrations have risen particularly within Lydney. With this in mind, we have made the decision to delay a revision of the AQAP, until we have a clear picture of the post-pandemic air status within the Lydney AQMA.
As with last year's ASR, NO_2 trends in the Lydney AQMA and across the District are presented, with a detailed discussion of the impacts of COVID-19 on air quality in the AQMA. The discussion goes into fine detail, outline and discussing observations in certain months, as well as the annual mean, for 2020 and 2021. It is encouraged that this level of detail is carried forward into future reports.	We have included as much detail as the available information allows.
5. The report includes clear figures that show monitoring locations and the AQMA boundary. The Council could consider including an additional figure to show all monitoring locations across the District to represent the distribution of monitoring.	Please refer to Appendix D

An Air Quality Action Plan (AQAP) was drafted in 2015 and consultations undertaken. Various options were assessed and assigned scores. Those options scoring 20 or more

were considered to be the most feasible and cost effective options for positive air quality impacts in the town centre.

There were 8 options which scored higher than 20, as detailed below:

- Option 1 - Action Schemes to encourage alternative transport
- Option 2 - Bream Road – Signalisation
- Option 7 - Switch off engines at heritage railway level crossing whilst idling
- Option 8 - Reduce parking near Lydney C of E School and encourage parking in car park at the bottom of Bream Road
- Option 10 - Promote regular HGV servicing and emission testing to ensure cleaner running vehicles
- Option 13 - Newerne Street Link
- Option 14 - Improve rail services and facilities
- Option 15 - Other public transport services

Some of these measures have been completed in recent years, with subsequent monitoring showing a general downward trend in NO_2 concentrations. Further information regarding these measures is provided below:

- Option 1 aligns with Gloucestershire County Council's LTP regarding 'smarter choices', their 'Active Together' scheme and their 'Connecting Places' proposals. It provides low cost methods to encourage mode shift from the private car.
- Options 2 and 13 have been promoted by the Council as part of the Forest of Dean District Council Infrastructure Delivery Plan (2015) Link to: Infrastructure Plan and funding is either provisionally available or is being actively sought.
- Options 7, 8 and 10 are not necessarily straightforward to implement.
- Options 14 and 15 involve other organisations, e.g. Network Rail, Great Western Trains, Transport for Wales, Stagecoach, Forest of Dean Community Transport Partnership, etc. Improvements put forward include station car parking and providing a cycle link from the town centre to the railway, with secure cycle storage at each end of the scheme.

Forest of Dean District Council and Gloucestershire County Council have taken forward a number of direct measures during the current reporting year of 2022 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2. Eleven measures are included within Table 2.2, with the type of measure and the progress Forest of Dean District Council have made during the reporting

year of 2022 presented. Any barriers which have been restricting or continue to restrict the implementation of some of the measures, are also presented within Table 2.2.

Forest of Dean District Council anticipates that the measures in Table 2.2 will achieve compliance in the Lydney AQMA.

In relation to Options 14 and 15 above, the Lydney Cycleway improvement scheme was completed in spring 2020. This has created a safe and accessible network of pathways within Lydney and the wider area, linking Aylburton, Lydney Town Centre, the Railway Station, Dean Academy, and residential developments. In addition, 2022 saw improvements to the footpath linking Lydney Train Station to Lydney Harbour, which included resurfacing and the installation of lighting.

Other Recent and Future Measures across the District

Planning permission is currently being sought for the Dean Forest Greenway, a 5.5km path following the Forest of Dean Railway, linking Parkend (Forest of Dean) and Lydney. Outlined in Planning Policy AP27, this path will offer an alternative, more sustainable mode of transport between the Forest of Dean and Lydney, and other settlements located near the route. Further details are available at the following link: Dean Forest Greenway.

Housing and Other Developments

A number of new housing and other developments are proposed or already occurring in the Lydney area and each of these have been assessed in relation to their potential to affect the AQMA at Lydney.

A planning application is currently under consideration for an eel farm and smokery at the former Pine End Works in Lydney Harbour. The development will include a visitor centre, restaurant /café, and market hall to attract visitors. Due to the location of the development, it is unlikely to impact the Lydney AQMA, however facilities to encourage low emission transport are included in the design, including electric vehicle charging and cycle storage.

Climate Change

Forest of Dean District Council declared a climate emergency in 2018 and since then has been working on a number of initiatives to address climate change. Some of these will have an impact on air quality. More details can be found here:

Link to: Climate action and what we are doing

In January 2023, the council launched its Climate Emergency Strategy and Action Plan 2022-25, which contains actions on renewable energy, built environment, natural environment, transport, economy and waste. Actions which will contribute to the improvement of air quality in and around Lydney, as well as across the district are related to transport, and include:

- the introduction of electric vehicle charging points;
- the preparation and implementation of an Active Travel Strategy;
- establishing planning policy for new developments to:
    - minimise the need to travel;
    - develop multi-model interchanges
- Active travel awareness campaigns
- Working with Gloucestershire County Council to improve rural public transport services.

As this is a relatively new document, many of these actions are either at the very early stages or have yet to be instigated. However, Gloucestershire District Council are planning to install 1,000 electric vehicle charging points across the county in the next three years, although how many of these will be located within Lydney is yet to be decided. Link to: Climate Emergency Strategy and Action Plan 2022-25

Table 2.2 – Progress on Measures to Improve Air Quality

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	Air Quality Technical Guidance for Forest of Dean District Council 2015	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	2015	2015	District Council	Local Authority, Funding: Defra Air Quality Grant	NO	Funded	< £10k	Completed	Address potential increase in vehicular emissions due to vehicle usage associated with new residential and business developments	Approved policy in place and in use, with associated technical guidance available on FODDC website	Policy approved and in use from 30 July 2015	Air quality guidance available on FoDDC website
2	The Lydney Cycle Improvement Scheme	Promoting Travel Alternatives	Promotion of cycling	2020	2021	Gloucestershire County Council, with GFirst LEP Growth Deal	Gloucestershire County Council	NO	Funded	£500k - £1 million	Completed	Provides alternatives for travel around Lydney, especially within the AQMA	The Scheme involves the construction of an integrated cycleway network incorporating 5 individual “links” throughout Lydney.	Completed	None
3	Travel Alternatives	Promoting Travel Alternatives	Encourage / Facilitate home-working	2020	2021	Gloucestershire County Council & FODD Council	Gloucestershire County Council	NO	Funded	< £10k	Implementation	Reduced vehicle emissions	n/a	Implementation on-going	None
4	Travel Alternatives	Promoting Travel Alternatives	Promotion of walking	2020	2021	Gloucestershire County Council & FODD Council	Gloucestershire County Council	NO	Funded	< £10k	Implementation	Reduced vehicle emissions	n/a	Implementation on-going	None
5	Public Transport Information	Public Information	Via the Internet	2020	2021	Gloucestershire County Council	Gloucestershire County Council	NO	Funded	£10k - 50k	Implementation	Reduced vehicle emissions	n/a	Implementation on-going	None
6	Targeted speed limit reductions	Traffic Management	Reduction of speed limits, 20mph zones	2018	2018	Gloucestershire County Council	Gloucestershire County Council	NO	Funded	£100k - £500k	Completed	Reduced vehicle emissions	Improved traffic flow at peak hours in the Lydney Town Centre	Completed	None
7	Gloucestershire’s Local Transport Plan 2020-2041	Transport Planning and Infrastructure	Other	2021	2021	Gloucestershire County Council	Gloucestershire County Council	NO	Partially Funded	£10k - 50k	Implementation	Reduced vehicle emissions	Improvements to: Lydney rail station and services; walking/cycle networks; bus services; key road junctions. Also introduction of	Implementation on-going	Funding

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 interchange hubs.		
8	Dean Forest Greenway	Promoting Travel Alternatives	Promotion of cycling	2022	Not confirmed	West Dean Parish Council	West Dean Parish Council, Lydney Town Council, Forestry England, Dean Forest Railway and Lydney Park Estate	NO	Funded	Not known	Planning	Reduced vehicle emissions	Provision of a traffic free walking & cycling route Parkend to Lydney, as an alternative to driving.	Awaiting approval	Planning approval
9	The Robin	Transport Planning and Infrastructure	Bus route improvements	2022	Ongoing	Gloucestershire County Council & Lydney Dial-a-Ride	Gloucestershire County Council	No	Funded	Not known	Pilot Trial ongoing	Reduce number of private cars on the road, and consequently emissions	Uptake of the service	Pilot Trial	Ongoing funding and uptake of the service
10	Climate Emergency Strategy and Action Plan 2022-25	Policy Guidance and Development Control	Other policy	2023	2025	Gloucestershire County Council & FODD Council	Gloucestershire County Council & FODD Council	No	Partially funded	Not known	Adopted January 2023	Reduced vehicle emissions, Reduced number of vehicles on the road.	Number of actions successfully implemented	Recently adopted, most actions yet to be implemented	Funding
11	Installation of electric vehicle charging points	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging	2022	2025	Gloucestershire County Council & FODD Council	Gloucestershire County Council	No	Partially funded	Not known	Scoping	Reduced vehicle emissions	Frequency of use	Preliminary Stage	Funding

$PM_{2.5}$ – 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.

Other than the potential source from vehicles, no other significant source of $PM_{2.5}$ has been identified within the District. Therefore the control at this stage is aligned with the measures designed to achieve a reduction in vehicular emissions. The Forest of Dean does not have any smoke control areas.

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

This section sets out the monitoring undertaken within 2022 by Forest of Dean District 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.

Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

Forest of Dean District Council does not currently operate any automatic monitors within its area.

3.1.2 Non-Automatic Monitoring Sites

Forest of Dean District Council undertook non-automatic (passive) monitoring of NO_2 at 29 sites during 2022. We exposed 3 tubes at one site (61 High Street, Lydney) within the AQMA for Quality Control purposes, so we have 31 results each month. Table A.1 in Appendix A shows the details of the sites.

Maps showing the location of these 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.

Most sample locations remain the same as the previous year, however the following locations have either been discontinued or are new for 2022 (please refer to Appendix D for exact position of new locations):

Discontinued	New
COL01 – Coleford	COL04 - Coleford
HUN03 - Huntley	COL05 - Coleford
LON01 - Longhope	NEW04 - Newent

TUT01 - Tutshill	NEW05 - Newent
WOS01 – Westbury-on-Severn	NEW06 - Newent
	TUT03 - Tutshill

Due to recurring issues with the tube at COL02 being removed during the exposure period, this location was discontinued and a new location, COL05 set up in its place.

Changes to some monitoring point positions have been made for the 2023 monitoring year. These include new locations in Mitcheldean and Cinderford. The outcome will be reported in the 2024 annual report.

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.

3.1.3 Nitrogen Dioxide (NO_2)

The focus of our monitoring has been measurement of concentrations of nitrogen dioxide. The locations of individual monitoring points are set out in Table A.1.

Table A.2 in Appendix A compares the ratified and adjusted monitored NO_2 annual mean concentrations for the past 5 years (where available), for comparison 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.

Overall NO_2 levels are somewhat lower across the District in comparison with 2021 data. This was unexpected in the first year following the Covid-19 pandemic, where no travel

restrictions were in place. This is thought to be a result in the increase in the number of people working from home, coupled with improvements in engine technology and the uptake of hybrid and fully electric vehicles. It is too early to say if this is the 'new norm', however we will be watching the data of the next 2-3 years to see if this trend continues.

Trends

The trend of nitrogen dioxide levels, at a representative selection of sites monitored of our Lydney AQMA, over the last 9 years are presented in Appendix A, Figure A.1. The graph illustrates the fall in NO_2 concentration during 2022 compared with 2021. A similar trend can be seen in Figure A.2, which presents changes in NO_2 concentration at locations outside Lydney. It is notable that NO_2 concentrations remained below the national objective of 40µg/m^3 across the district. In addition, during 2022 no annual mean was greater than 60µg/m^3, which indicates that an exceedance of the 1-hour mean objective was unlikely at any of the locations.

The results from 2022 are positive and indicate a general improvement in the air quality within the Lydney AQMA. With the implementation of the measures described in Section 2.2, we hope to see this trend continue, with a view of revoking the AQMA in the near future. Forest of Dean District Council will continue to work with the county and town councils to implement measures to tackle air pollution in the AQMA.

Table A.2 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. 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.

3.1.4 Particulate Matter (PM_{10} & $PM_{2.5}$)

Measurements of particulate matter were not made within the District during 2022.

Particulate matter can enter the respiratory system and have consequential health implications. Particulates which are routinely monitored in the UK are PM_{10} and $PM_{2.5}$. PM_{10} are particles that have a diameter of 10µm or less, and can pass through the upper

respiratory system and travel deep into the lungs. $PM_{2.5}$ particles have a diameter of 2.5µm or less, and can pass into the deepest parts of the lungs, and potentially through the lung walls into the blood stream. These particles have been strongly connected with respiratory problems such as asthma, chronic obstructive pulmonary disease and cardiovascular disease.

The Environment Act 2021 required the Secretary of State to set $PM_{2.5}$ objectives for the UK, which were laid out in The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023. The targets set within the 2023 Regulations are:

- *The annual mean concentration target is that by the end of 31st December 2040 the annual mean level of $PM_{2.5}$ in ambient air must be equal to or less than 10 µg/m³*
- *The population exposure reduction target is that there is at least a 35% reduction in population exposure by the end of 31st December 2040, as compared with the average population exposure in the three-year period from 1st January 2016 to 31st December 2018.*

To monitor progress in meeting these objectives, new monitors are expected to be installed across the country to provide concentration data for fine particles in the air. These will predominantly be in urban areas.

Trends in $PM_{2.5}$ in the UK between 2009 and 2022 have been published by DEFRA. Annual average concentration of the fine particles peaked in 2011, and have since shown a steady decline. Despite a decline, data from 2020 to 2022 have shown a small increase.

The data for 2022 showed temporal changes in $PM_{2.5}$, with concentrations peaking during the winter and spring months. This is thought to be attributed to elevated airborne nitrates from European agricultural activities being transported to the UK, and the increase in the use of solid fuel stoves and open air fires both in Europe and the UK. The contribution of solid fuel stoves is further reflected in the average hourly concentrations, which show the highest emissions of $PM_{2.5}$ occurred mid to late evening. Link to: Particulate matter (PM_{10}/ $PM_{2.5}$).

The impact of solid fuel stoves and open fires demonstrates the importance of the Air Quality (Domestic Solid Fuels Standards) (England) Regulations 2020, which stipulates that wet wood (that is, wood having a moisture content of more than 20%) cannot be sold in units of less than $2m^3$. The same legislation outlaws sale of bags of coal for domestic fireplaces. This is intended to encourage use of approved kiln-dried logs which produce much less smoke and thus particulates.

3.1.5 Public Health Outcomes Framework

Public Health England publishes various information related to public health.

The importance of the effect of air pollution on public health is reflected by the inclusion of an indicator of mortality associated with air pollution in the Public Health Outcomes Framework. This is a series of “indicators” prepared by Central Government as a measure of public health in various categories and across the regions of the UK. One category of data is “D01 - Fraction of mortality attributable to particulate air pollution” (2018).

For Gloucestershire as a whole, the estimated Fraction of Mortality attributable to particulate air pollution (April 2021 update) is ranked 5th highest out of 15 areas in the South West of England. This equates to a percentage of 5.3% compared with the regional average of 5.1%.

For the Forest of Dean District, the estimated Fraction of Mortality attributable to particulate air pollution is ranked 15 out of 27 areas in the South West of England. This equates to a percentage of 5.0% compared with the regional average of 5.1%.

Appendix A: Monitoring Results

Table A.1 – Details of Non-Automatic Monitoring Sites

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
CIN03	Cinderford: 167 High Street	Roadside	365290	214733	NO_2		0.2	0.9	No	3.0
CIN04	Cinderford: Candi, 31 Market Street	Roadside	365637	214012	NO_2		0.3	1.3	No	2.9
CIN06	Cinderford: zebra crossing, opposite side to Factory shop	Roadside	365659	214171	NO_2		1.2	1.8	No	2.9
COL02	Coleford: 23 Market Street - moved to 29 (from July 2022 - COL05)	Roadside	357551	210756	NO_2		0.2	3.7	No	2.9
COL03	Coleford: 17 Old Vicarage Court (closer to 11)	Roadside	357741	210598	NO_2		3.6	1.2	No	2.9
COL04	Coleford: crossroads by former King's Head Hotel (new 05/01/2022)	Roadside	357609	210774	NO_2		0.4	3.9	No	2.7
COL05	Coleford - 29, Market Place	Roadside	357559	210740	NO_2		0.9	3.2	No	3.1

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)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
LYD01	Lydney: 57 High Street	Roadside	363147	203074	NO_2	Lydney AQMQ	0.1	3.7	No	2.9
LYD02	Lydney: Tucker, Bridge House, Newerne Street	Roadside	363527	203261	NO_2	Lydney AQMQ	0.1	7.7	No	2.8
LYD04	Lydney: 13 High Street	Roadside	362954	202898	NO_2	Lydney AQMQ	0.1	3.6	No	2.9
LYD05	Lydney: Unit 1, Regents Arcade, Newerne Street	Roadside	363439	203207	NO_2	Lydney AQMQ	0.6	1.5	No	2.8
LYD06	Lydney: Inspirations Gallery, Hill Street	Roadside	363185	203111	NO_2	Lydney AQMQ	0.4	1.5	No	2.9
LYD08	Lydney: 13 Bream Road (bottom)	Roadside	363109	203213	NO_2	Lydney AQMQ	0.1	3.8	No	2.9
LYD09	Lydney: 17 Bream Road (top)	Roadside	363042	203322	NO_2	Lydney AQMQ	0.3	1.0	No	2.8
LYD10	Lydney: Forest Road, opposite Forest Parade (former chip shop)	Roadside	363408	203226	NO_2	Lydney AQMQ	0.1	2.2	No	2.7
LYD12	Lydney: Kaplans, 61 Newerne Street	Roadside	363607	203320	NO_2	Lydney AQMQ	0.1	1.6	No	2.9
LYD15	Lydney: Tegfan, Highfield Lane	Roadside	364042	204125	NO_2		0.1	>15	No	2.0
LYD16	Lydney: Lydney Laundrette, 55 High Street	Roadside	363142	203069	NO_2	Lydney AQMQ	0.1	2.3	No	2.2

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
LYD17, LYD18, LYD19	Lydney: 61 High Street (3 of 3)	Roadside	363160	203088	NO_2	Lydney AQMQ	0.1	2.1	No	2.9
LYD20	Lydney: 2 Cross Hands, Highfield Road	Roadside	364301	203968	NO_2		2.5	1.5	No	2.5
MIT01	Mitcheldean: 25 The Merrin	Roadside	364108	218274	NO_2		3.0	3.0	No	3.0
NAI01	Nailbridge: pedestrian crossing (location amended 05/01/2022)	Roadside	364566	216246	NO_2		0.3	3.3	No	2.8
NEW03	Newent: 12 High Street	Roadside	372117	226049	NO_2		0.6	1.6	No	2.9
NEW04	Newent: Foley Road (new 05/01/2022)	Roadside	372854	225785	NO_2		3.5	2.9	No	2.7
NEW05	Newent: 3 Ross Road (05/01/2022)	Roadside	371943	226212	NO_2		2.0	1.7	No	2.7
NEW06	Newent: Picklenash Junior School, Ross Road (new 05/01/2022)	Roadside	371675	226149	NO_2		3.0	1.5	No	2.7
NOS02	Newnham-on-Severn: Galen House, High Street (location	Roadside	369038	211595	NO_2		2.9	1.9	No	2.7

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
	amended Dec 2021)									
TUT02	Tutshill: Beachley Road (near Wyedean School)	Roadside	354269	193951	NO_2		17.0	2.3	No	2.9
TUT03	Tutshill: Victoria Cottage, Gloucester Road (new 05/01/2022)	Roadside	353988	194695	NO_2		4.2	1.2	No	2.7

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

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2022 (%) (2)	2018	2019	2020	2021	2022
CIN03	365290	214733	Roadside	100	100.0	21.6	22.7	16.5	19.2	18.2
CIN04	365637	214012	Roadside	100	100.0	23.9	24.2	18.7	20.9	19.7
CIN06	365659	214171	Roadside	100	100.0	-	27.3	23.4	27.5	26.1
COL02	357551	210756	Roadside	50	23.1	21.7	22.0	15.5	16.8	15.3
COL03	357741	210598	Roadside	100	100.0	22.9	22.5	16.7	19.4	18.6
COL04	357609	210774	Roadside	100	100.0	-	-	-	-	22.2
COL05	357559	210740	Roadside	100	50.0	-	-	-	-	15.4
LYD01	363147	203074	Roadside	100	100.0	**40.3**	**40.9**	30.3	31.5	28.5
LYD02	363527	203261	Roadside	100	100.0	20.3	19.0	15.6	15.4	14.8
LYD04	362954	202898	Roadside	100	100.0	36.2	36.5	27.0	29.1	27.1
LYD05	363439	203207	Roadside	100	100.0	33.3	35.1	26.5	28.7	26.0
LYD06	363185	203111	Roadside	100	100.0	38.9	37.5	27.5	31.1	26.3
LYD08	363109	203213	Roadside	100	100.0	37.8	36.6	25.2	31.2	28.4

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]	2018	2019	2020	2021	2022
LYD09	363042	203322	Roadside	100	100.0	35.1	34.2	26.2	28.9	27.1
LYD10	363408	203226	Roadside	100	100.0	24.4	24.5	18.6	20.3	19.4
LYD12	363607	203320	Roadside	100	100.0	27.2	27.0	20.4	22.2	19.8
LYD15	364042	204125	Roadside	100	100.0	9.3	9.0	6.9	7.1	7.0
LYD16	363142	203069	Roadside	100	100.0	37.0	37.9	28.4	30.0	27.4
LYD17, LYD18, LYD19	363160	203088	Roadside	100	100.0	37.4	35.1	26.3	28.2	25.3
LYD20	364301	203968	Roadside	100	100.0	-	-	18.5	22.1	21.4
MIT01	364108	218274	Roadside	100	100.0	25.6	23.8	17.9	19.6	19.1
NAI01	364566	216246	Roadside	100	100.0	29.4	28.7	22.1	23.2	27.1
NEW03	372117	226049	Roadside	100	100.0	28.6	28.1	20.1	23.1	20.9
NEW04	372854	225785	Roadside	100	100.0	-	-	-	-	9.8
NEW05	371943	226212	Roadside	100	100.0	-	-	-	-	16.6
NEW06	371675	226149	Roadside	100	100.0	-	-	-	-	18.1
NOS02	369038	211595	Roadside	100	100.0	28.2	26.7	19.4	21.0	21.9

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2022 (%) (2)	2018	2019	2020	2021	2022
TUT02	354269	193951	Roadside	100	100.0	-	15.8	12.6	11.2	11.4
TUT03	353988	194695	Roadside	100	100.0	-	-	-	-	11.5

☒ **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%).

Figure A.1 – Trends in Annual Mean NO_2 Concentrations in Lydney AQMA

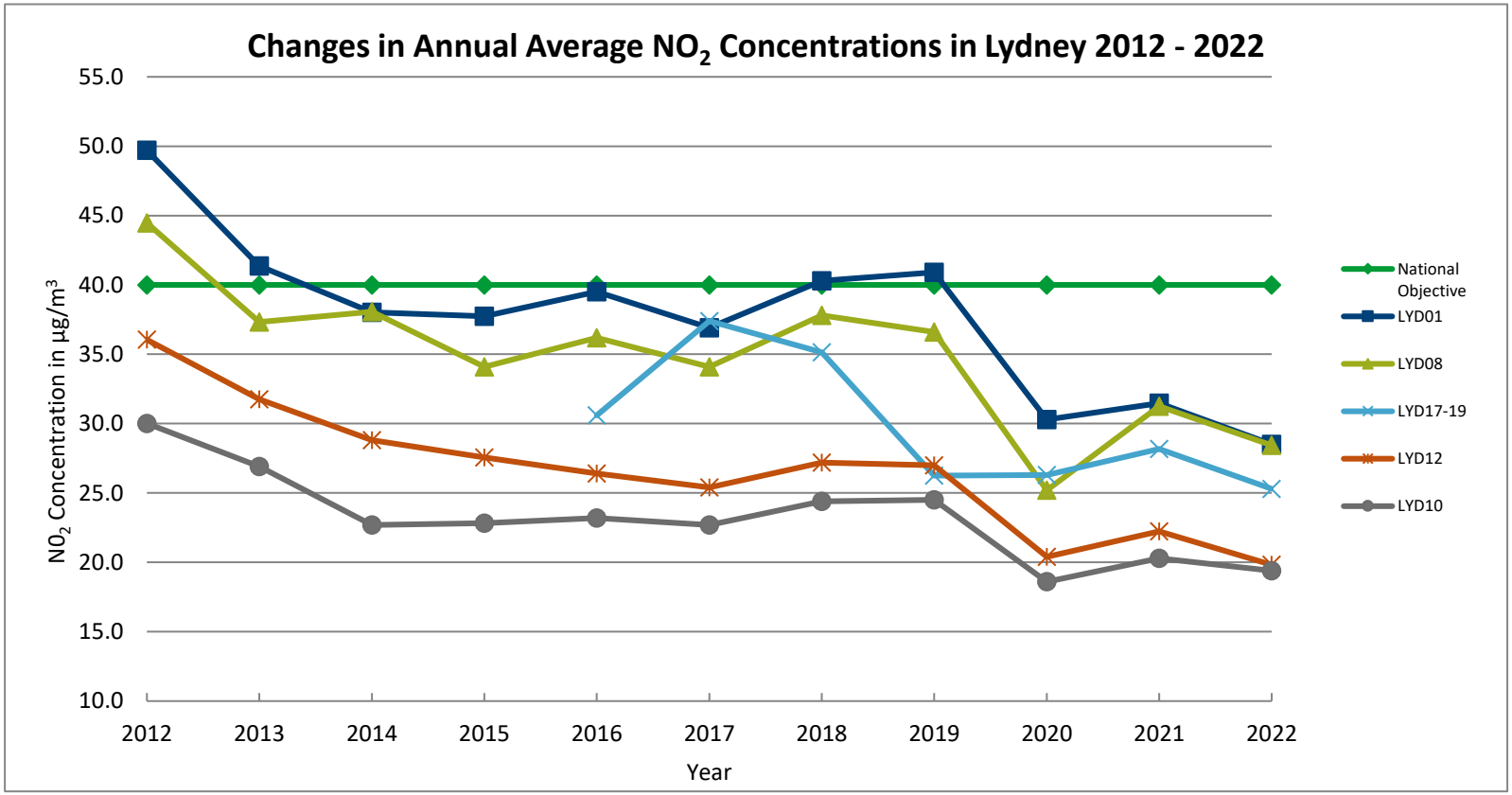
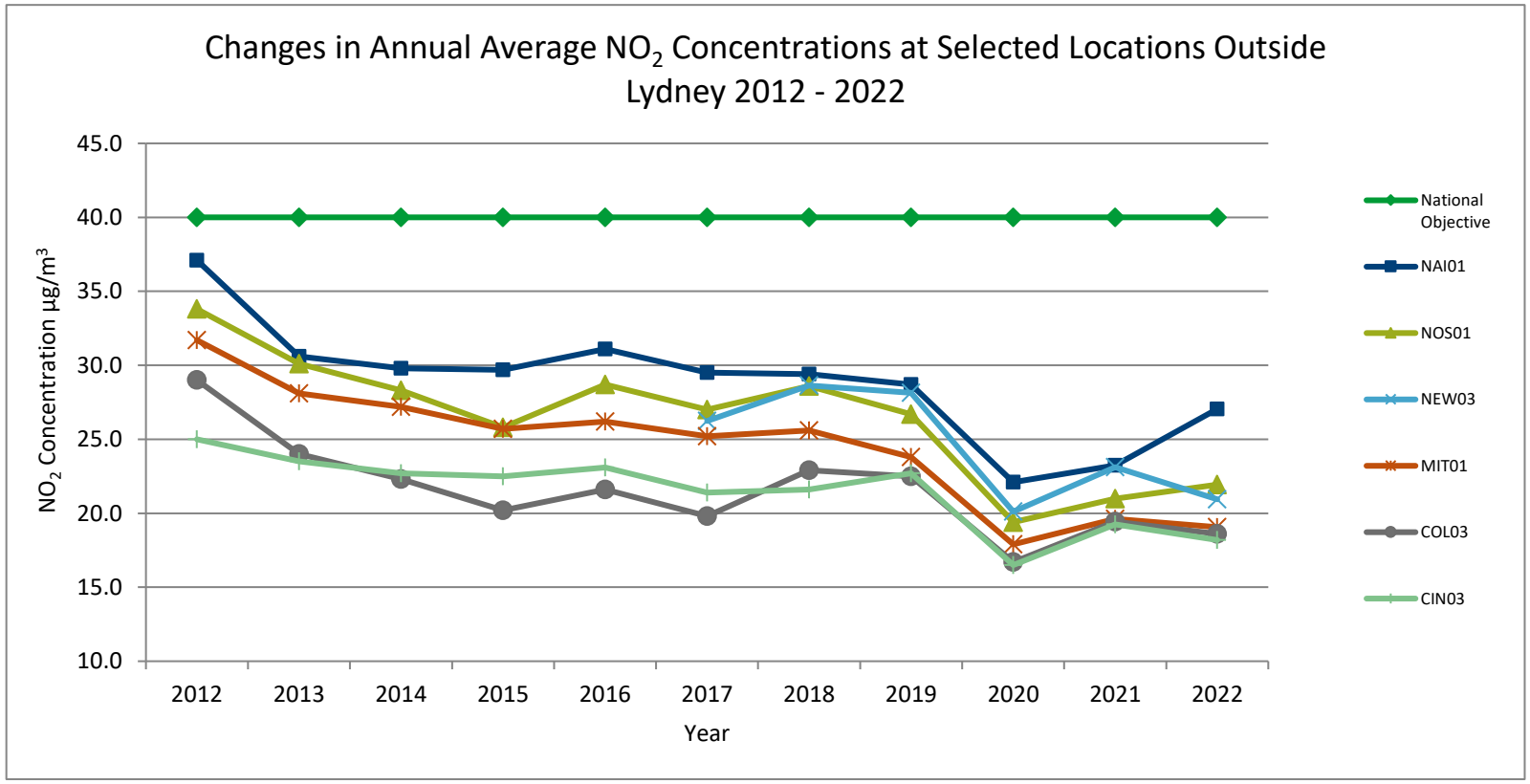


Figure A.2 – Trends in Annual Mean NO_2 Concentrations at Locations Outside of Lydney



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 <(0.83)>	Annual Mean: Distance Corrected to Nearest Exposure	Comment
CIN03	365290	214733	32.3	18.9	22.7	22.4	16.9	18.4	19.6	21.6	20.0	19.7	24.2	26.6	21.9	18.2	-	
CIN04	365637	214012	37.0	19.3	23.2	23.3	20.0	17.0	21.6	20.4	24.3	21.2	25.3	32.2	23.7	19.7	-	
CIN06	365659	214171	43.8	21.3	35.3	34.8	25.3	23.7	29.7	32.6	30.0	30.8	34.2	35.6	31.4	26.1	-	
COL02	357551	210756	29.5	17.6	missing	missing	15.8	missing	-	-	-	-	-	-	20.9	15.3	-	
COL03	357741	210598	32.6	17.6	23.2	22.1	18.3	15.7	21.3	20.6	29.3	26.2	16.8	25.3	22.4	18.6	-	
COL04	357609	210774	35.5	23.3	29.5	29.6	24.4	20.3	27.2	29.3	27.5	19.7	24.4	29.7	26.7	22.2	-	
COL05	357559	210740	-	-	-	-	-	-	13.1	14.2	14.4	21.6	20.7	24.0	18.0	15.4	-	
LYD01	363147	203074	44.3	36.3	30.6	33.5	37.2	28.0	32.5	31.6	28.5	31.0	38.0	40.7	34.4	28.5	-	
LYD02	363527	203261	24.1	21.5	17.6	18.7	17.8	12.5	14.7	12.1	11.9	17.8	20.9	24.9	17.9	14.8	-	
LYD04	362954	202898	45.8	30.9	33.0	34.5	31.0	25.1	29.5	29.9	27.6	27.1	37.0	40.9	32.7	27.1	-	
LYD05	363439	203207	37.4	35.3	29.5	31.2	32.9	27.6	29.1	23.4	21.8	35.1	33.2	39.0	31.3	26.0	-	
LYD06	363185	203111	42.4	27.5	30.4	34.3	29.1	25.9	31.1	33.2	28.2	29.0	29.3	40.3	31.7	26.3	-	
LYD08	363109	203213	39.3	31.5	29.8	33.6	32.5	27.5	38.3	37.8	38.9	31.1	33.2	37.7	34.3	28.4	-	
LYD09	363042	203322	43.3	32.3	31.7	29.5	30.4	25.0	30.1	29.7	33.7	32.9	34.9	38.1	32.6	27.1	-	
LYD10	363408	203226	30.5	23.1	26.5	25.1	20.4	17.7	19.4	25.2	15.7	23.5	24.4	29.0	23.4	19.4	-	
LYD12	363607	203320	29.4	23.5	26.6	31.0	22.0	18.5	18.7	19.5	19.7	22.0	26.3	29.4	23.9	19.8	-	
LYD15	364042	204125	14.6	8.5	8.1	7.3	5.6	5.1	5.9	6.0	5.8	9.0	10.8	14.4	8.4	7.0	-	
LYD16	363142	203069	42.9	35.7	31.4	34.1	32.4	26.2	29.8	31.1	29.0	30.0	34.7	38.7	33.0	27.4	-	

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted <(0.83)>	Annual Mean: Distance Corrected to Nearest Exposure	Comment
LYD17	363160	203088	40.7	34.0	27.8	30.9	31.7	27.0	28.1	27.5	23.8	32.7	36.7	38.3	-	-	-	Triplicate Site with LYD17, LYD18 and LYD19 - Annual data provided for LYD19 only
LYD18	363160	203088	42.3	33.2	30.7	30.6	32.2	26.2	28.8	26.3	22.8	32.6	32.0	38.2	-	-	-	Triplicate Site with LYD17, LYD18 and LYD19 - Annual data provided for LYD19 only
LYD19	363160	203088	35.6	28.6	27.7	26.2	28.7	24.0	28.3	26.1	21.7	29.4	33.1	34.2	30.5	25.3	-	Triplicate Site with LYD17, LYD18 and LYD19 - Annual data provided for LYD19 only
LYD20	364301	203968	35.4	23.9	20.5	24.0	26.4	21.0	25.3	21.8	23.7	28.3	28.8	30.4	25.8	21.4	-	
MIT01	364108	218274	33.3	18.6	19.9	22.9	20.5	18.0	22.0	22.5	23.8	22.4	25.5	26.4	23.0	19.1	-	
NAI01	364566	216246	41.5	28.4	33.8	34.9	29.1	25.2	32.1	34.9	31.2	30.1	33.5	36.4	32.6	27.1	-	
NEW03	372117	226049	34.9	17.7	30.7	27.9	18.7	20.1	23.5	24.8	24.6	24.2	29.5	26.3	25.2	20.9	-	
NEW04	372854	225785	18.7	8.8	13.2	10.2	6.8	7.3	10.2	10.4	11.1	11.8	14.6	18.8	11.8	9.8	-	
NEW05	371943	226212	23.8	17.1	18.3	17.6	15.5	16.5	19.0	20.1	18.9	24.2	24.9	24.5	20.0	16.6	-	
NEW06	371675	226149	28.0	17.1	22.1	21.4	17.6	18.7	20.4	22.3	20.8	24.2	20.6	27.8	21.8	18.1	-	
NOS02	369038	211595	33.2	21.9	25.7	26.7	21.6	21.2	23.2	24.5	22.6	32.3	30.5	33.9	26.4	21.9	-	
TUT02	354269	193951	23.5	11.7	18.0	14.3	9.0	8.9	10.4	9.8	11.0	13.0	16.7	19.0	13.8	11.4	-	
TUT03	353988	194695	22.9	11.7	15.5	13.3	10.3	9.1	12.2	11.2	13.9	15.0	15.0	15.8	13.8	11.5	-	

☒ **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.**

☒ **Forest of Dean District 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.

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

New or Changed Sources Identified Within Forest of Dean District During 2022

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

Additional Air Quality Works Undertaken by Forest of Dean District During 2022

Forest of Dean District Council has not completed any additional works within the reporting year of 2022.

QA/QC of Diffusion Tube Monitoring

Diffusion Tube Annualisation

Annualisation was required for locations COL02 and COL05. Tubes were exposed at COL02 from January to June of 2022. However, the tubes which were exposed during March, April and June were missing at the end of the exposure period, which resulted in only 3 months of data for this location (25% capture). Due to the ongoing issue of missing tubes at COL02, the tube was relocated at an alternative position, COL05, in July. Consequently, only 6 months of data is available for this location (50% capture).

Annualisation for both these locations was carried out using the Diffusion Tube Processing Tool, with the results shown in Table C.1 below.

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

Site ID	Annualisation Factor <Site 1 Name>	Annualisation Factor <Site 2 Name>	Annualisation Factor <Site 3 Name>	Annualisation Factor <Site 4 Name>	Average Annualisation Factor	Raw Data Annual Mean	Annualised Annual Mean
COL02	0.9219	0.8388			0.8803	20.9	18.4
COL05	1.0078	1.0529			1.0303	18.0	18.5

Diffusion Tube Bias Adjustment Factors

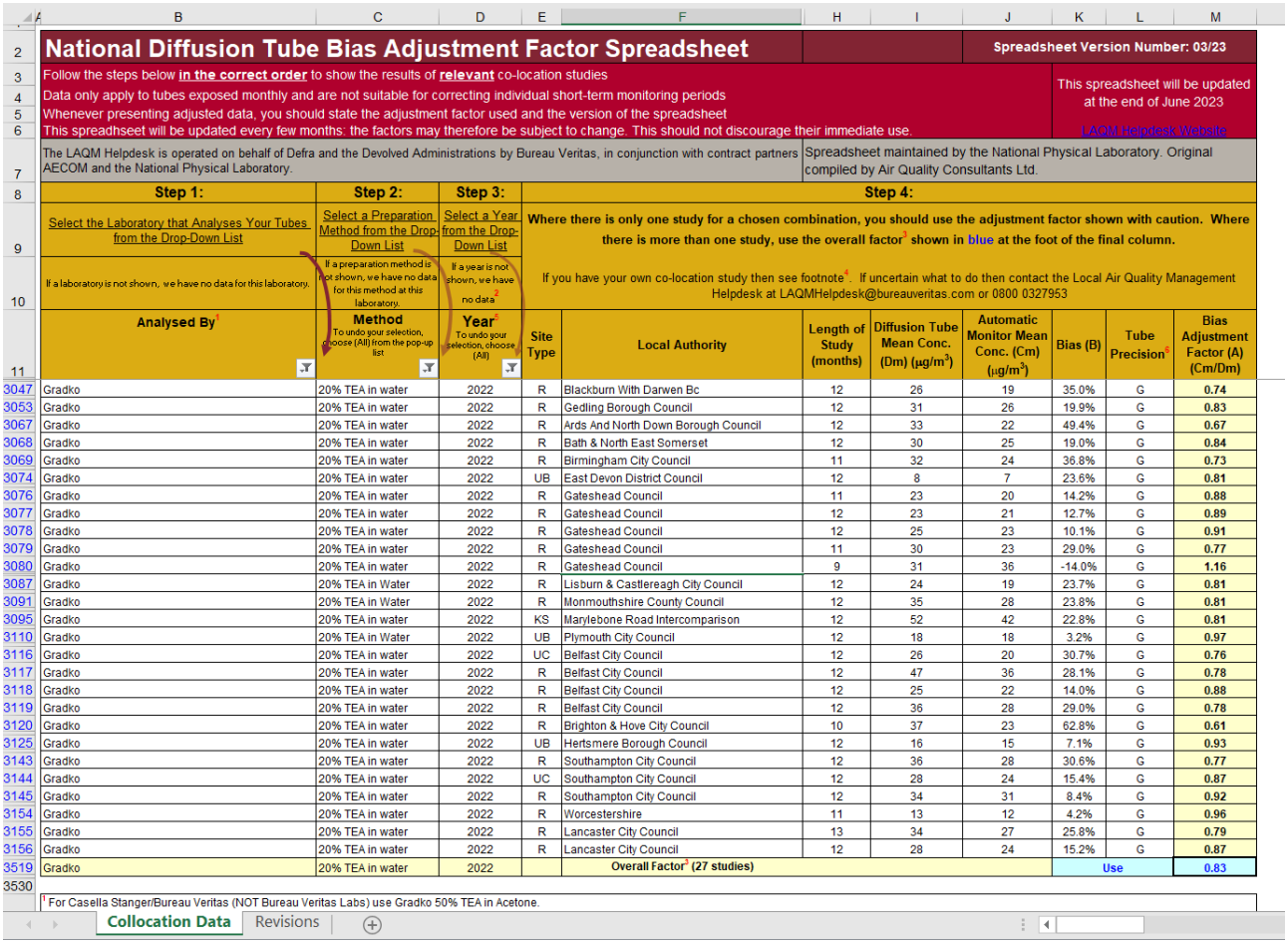
The diffusion tube data presented within the 2023 ASR have been corrected for bias using an adjustment factor. Bias represents the overall tendency of the diffusion tubes to under or over-read relative to the reference chemiluminescence analyser. LAQM.TG22 provides guidance with regard to the application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

Forest of Dean District Council have applied a national bias adjustment factor of 0.83 to the 2022 monitoring data. A summary of bias adjustment factors used by Forest of Dean District Council over the past five years is presented in Table C.2.

Table C.2 – Bias Adjustment Factor

Monitoring Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2022	National	03/23	0.83
2021	National	03/22	0.84
2020	National	09/19	0.81
2019	National	06/18	0.93
2018	National	09/17	0.92

A copy of the National Diffusion Tube Bias Adjustment Factor Spreadsheet is provided below.



National Diffusion Tube Bias Adjustment Factor Spreadsheet — Spreadsheet Version Number: 03/23

Follow the steps below **in the correct order** to show the results of **relevant** co-location studies
Data only apply to tubes exposed monthly and are not suitable for correcting individual short-term monitoring periods
Whenever presenting adjusted data, you should state the adjustment factor used and the version of the spreadsheet
This spreadhseet will be updated every few months: the factors may therefore be subject to change. This should not discourage their immediate use.

This spreadsheet will be updated at the end of June 2023

LAQM Helpdesk Website

The LAQM Helpdesk is operated on behalf of Defra and the Devolved Administrations by Bureau Veritas, in conjunction with contract partners AECOM and the National Physical Laboratory.

Spreadsheet maintained by the National Physical Laboratory. Original compiled by Air Quality Consultants Ltd.

Step 1: Select the Laboratory that Analyses Your Tubes from the Drop-Down List

If a laboratory is not shown, we have no data for this laboratory.

Step 2: Select a Preparation Method from the Drop-Down List

If a preparation method is not shown, we have no data for this method at this laboratory.

Step 3: Select a Year from the Drop-Down List

If a year is not shown, we have no data[2]

Step 4:

Where there is only one study for a chosen combination, you should use the adjustment factor shown with caution. Where there is more than one study, use the overall factor[3] shown in blue at the foot of the final column.

If you have your own co-location study then see footnote[4]. If uncertain what to do then contact the Local Air Quality Management Helpdesk at LAQMHelpdesk@bureauveritas.com or 0800 0327953

	Analysed By[1]	Method (To undo your selection, choose (All) from the pop-up list)	Year[2] (To undo your selection, choose (All))	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m³)	Automatic Monitor Mean Conc. (Cm) (µg/m³)	Bias (B)	Tube Precision[4]	Bias Adjustment Factor (A) (Cm/Dm)
3047	Gradko	20% TEA in water	2022	R	Blackburn With Darwen Bc	12	26	19	35.0%	G	0.74
3053	Gradko	20% TEA in water	2022	R	Gedling Borough Council	12	31	26	19.9%	G	0.83
3067	Gradko	20% TEA in water	2022	R	Ards And North Down Borough Council	12	33	22	49.4%	G	0.67
3068	Gradko	20% TEA in water	2022	R	Bath & North East Somerset	12	30	25	19.0%	G	0.84
3069	Gradko	20% TEA in water	2022	R	Birmingham City Council	11	32	24	36.8%	G	0.73
3074	Gradko	20% TEA in water	2022	UB	East Devon District Council	12	8	7	23.6%	G	0.81
3076	Gradko	20% TEA in water	2022	R	Gateshead Council	11	23	20	14.2%	G	0.88
3077	Gradko	20% TEA in water	2022	R	Gateshead Council	12	23	21	12.7%	G	0.89
3078	Gradko	20% TEA in water	2022	R	Gateshead Council	12	25	23	10.1%	G	0.91
3079	Gradko	20% TEA in water	2022	R	Gateshead Council	11	30	23	29.0%	G	0.77
3080	Gradko	20% TEA in water	2022	R	Gateshead Council	9	31	36	-14.0%	G	1.16
3087	Gradko	20% TEA in Water	2022	R	Lisburn & Castlereagh City Council	12	24	19	23.7%	G	0.81
3091	Gradko	20% TEA in Water	2022	R	Monmouthshire County Council	12	35	28	23.8%	G	0.81
3095	Gradko	20% TEA in water	2022	KS	Marylebone Road Intercomparison	12	52	42	22.8%	G	0.81
3110	Gradko	20% TEA in Water	2022	UB	Plymouth City Council	12	18	18	3.2%	G	0.97
3116	Gradko	20% TEA in water	2022	UC	Belfast City Council	12	26	20	30.7%	G	0.76
3117	Gradko	20% TEA in water	2022	R	Belfast City Council	12	47	36	28.1%	G	0.78
3118	Gradko	20% TEA in water	2022	R	Belfast City Council	12	25	22	14.0%	G	0.88
3119	Gradko	20% TEA in water	2022	R	Belfast City Council	12	36	28	29.0%	G	0.78
3120	Gradko	20% TEA in water	2022	R	Brighton & Hove City Council	10	37	23	62.8%	G	0.61
3125	Gradko	20% TEA in water	2022	UB	Hertsmere Borough Council	12	16	15	7.1%	G	0.93
3143	Gradko	20% TEA in water	2022	R	Southampton City Council	12	36	28	30.6%	G	0.77
3144	Gradko	20% TEA in water	2022	UC	Southampton City Council	12	28	24	15.4%	G	0.87
3145	Gradko	20% TEA in water	2022	R	Southampton City Council	12	34	31	8.4%	G	0.92
3154	Gradko	20% TEA in water	2022	R	Worcestershire	11	13	12	4.2%	G	0.96
3155	Gradko	20% TEA in water	2022	R	Lancaster City Council	13	34	27	25.8%	G	0.79
3156	Gradko	20% TEA in water	2022	R	Lancaster City Council	12	28	24	15.2%	G	0.87
3519	Gradko	20% TEA in water	2022		Overall Factor[3] (27 studies)				Use		0.83

[1] For Casella Stanger/Bureau Veritas (NOT Bureau Veritas Labs) use Gradko 50% TEA in Acetone.

Collocation Data | Revisions

NO_2 Fall-off with Distance from the Road

Wherever possible, monitoring locations are representative of exposure. However, where this is not possible, the NO_2 concentration at the nearest location relevant for exposure has been estimated using the Diffusion Tube Data Processing Tool/NO_2 fall-off with distance calculator available on the LAQM Support website. Where appropriate, non-automatic annual mean NO_2 concentrations corrected for distance are presented in Table B.1.

No diffusion tube NO_2 monitoring locations within Forest of Dean District Council required distance correction during 2022.

Other QA/QC Information

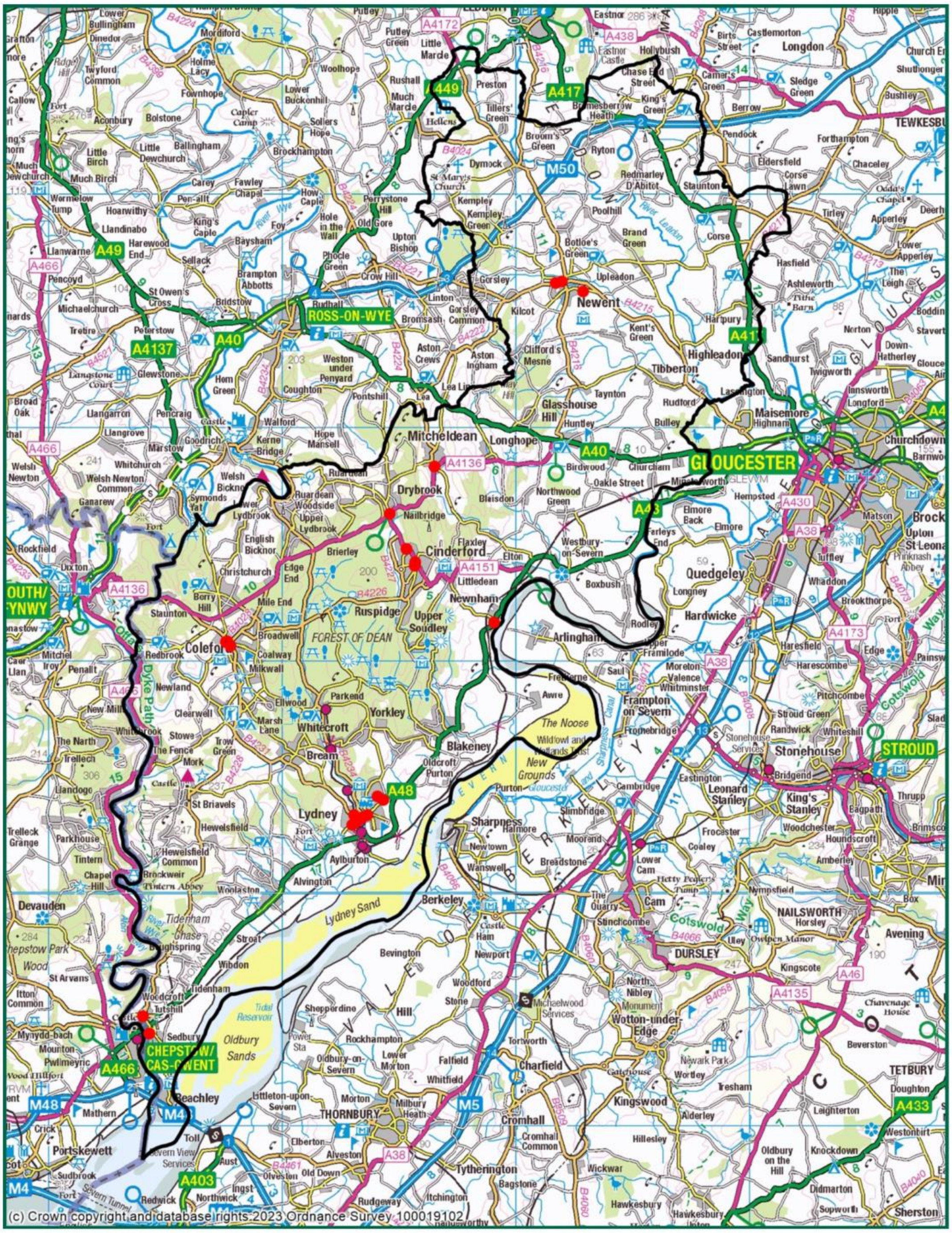
Gradko International laboratories participate in the AIR NO_2 Proficiency Scheme, which assesses the analytical performance of laboratories analysing NO_2 diffusion tubes. In the nine rounds of proficiency testing carried out between July 2021 and August 2023 (rounds 45 – 58), Gradko International scored 100% in each round, which provides confidence in

the diffusion tube analysis for the district. The full results for this period of testing can be found at https://laqm.defra.gov.uk/wp-content/uploads/2023/10/LAQM-NO2-Performance-data_Up-to-Aug-2023_V1.pdf.

DEFRA recommend the dates when the diffusion tubes are exchanged, and local authorities are expected to adhere to these dates +/- 2 days wherever possible. Due to other commitments five of the exchanges were carried out outside the recommended exchange period. However, all tubes were exposed for the recommended period of four to five weeks. The exception was the October tubes, which were exchanged after three weeks and five days. This slightly shorter exposure period did not affect the results, which were in keeping with the expected concentrations for each location.

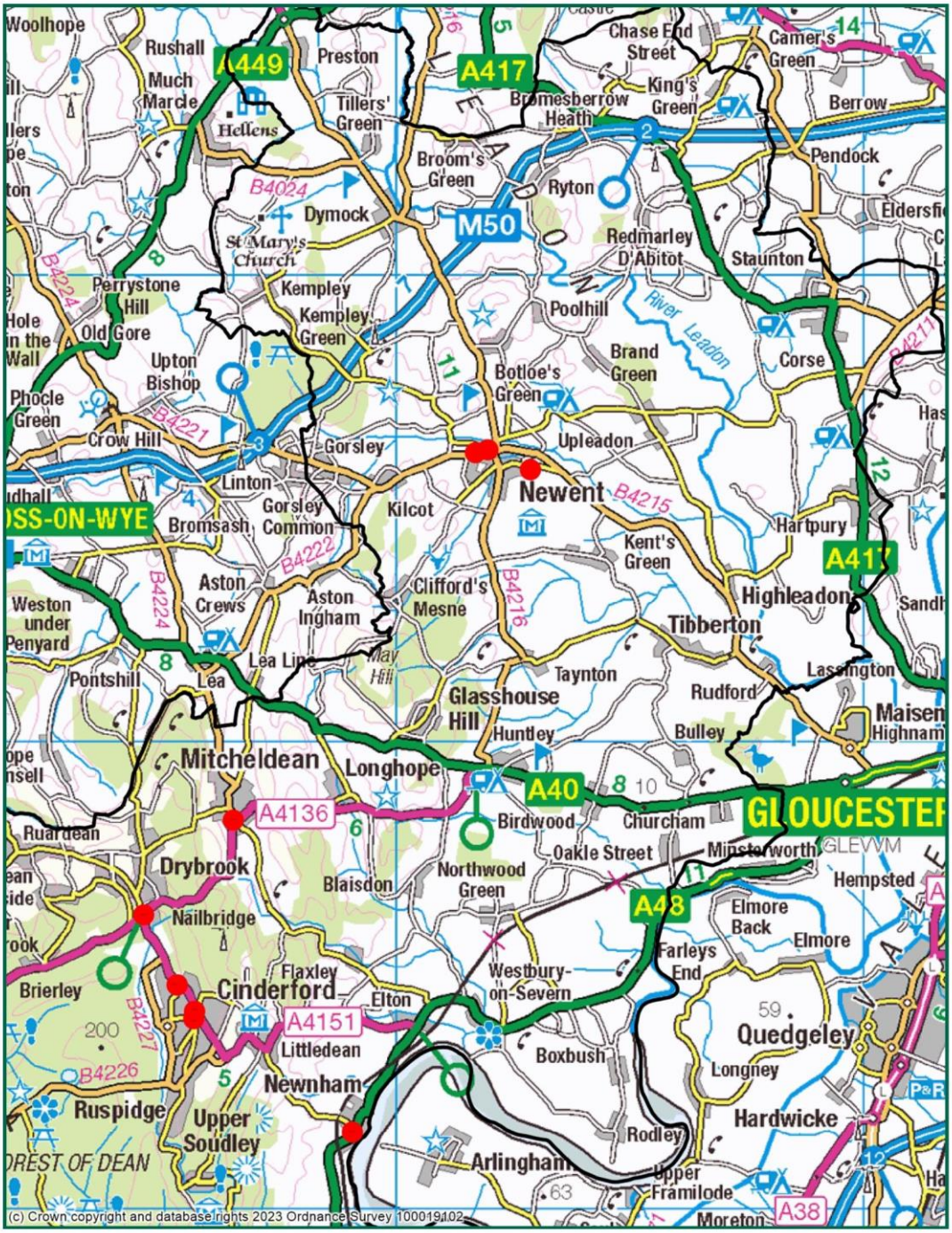
Appendix D: Map(s) of Monitoring Locations and AQMAs

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



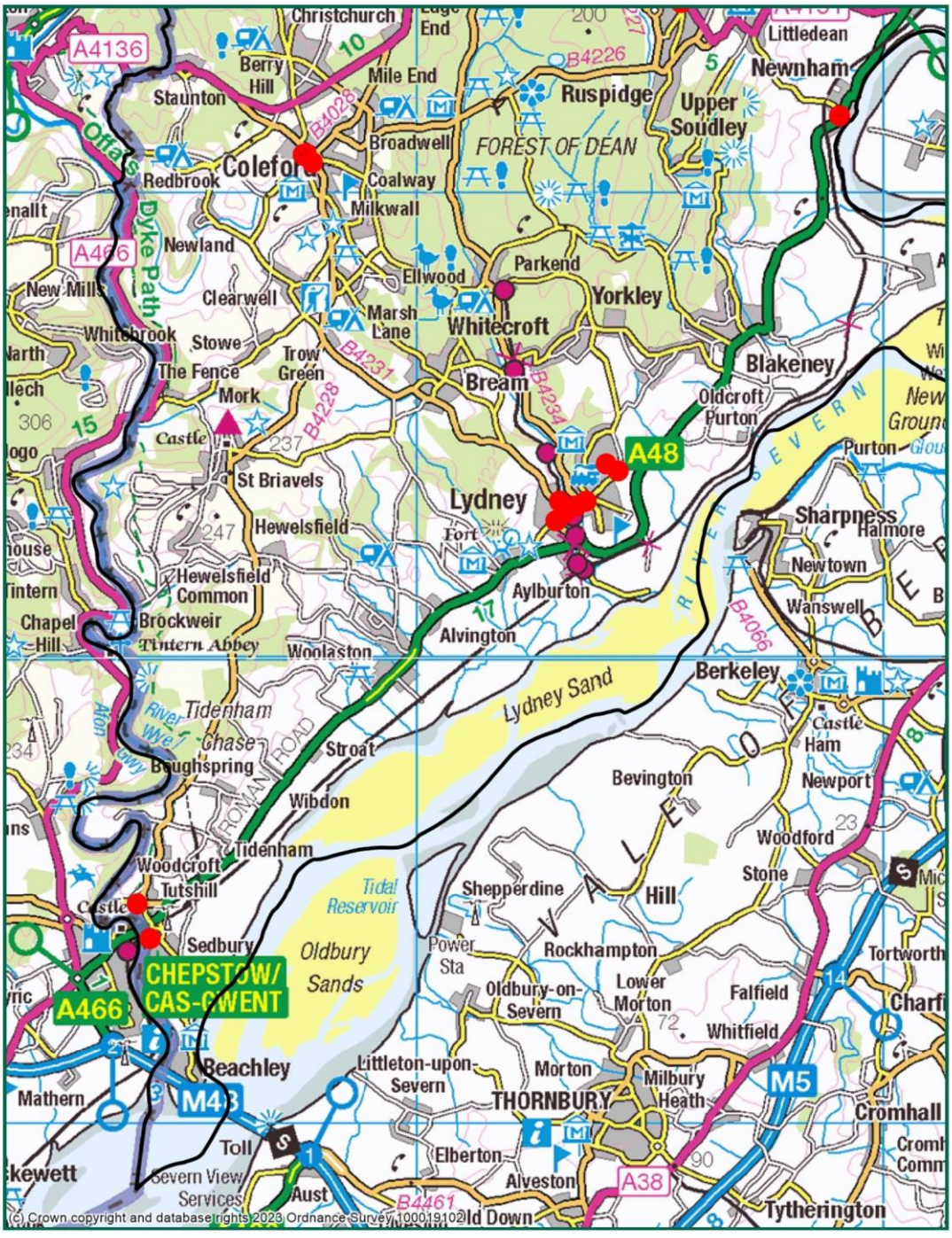
Title **Diffusion Tube Locations**	**Legend:** ● NO_2 Monitoring Location ── District Boundary	
Location: **Forest of Dean District**	**Date** June 2023	**Figure No.** D1
Contains Ordnance Survey Data Crown Copyright and Database Right [2023]		

Figure D.2 – Map of Non-Automatic Monitoring Site North



Title **Diffusion Tube Location**	**Legend:** NO_2 Monitoring Location District Boundary	
Location: **Forest of Dean District - North**	**Date** June 2023	**Figure No.** D2
Contains Ordnance Survey Data Crown Copyright and Database Right [2023]		

Figure D.3 – Map of Non-Automatic Monitoring Sites - South



Title **Diffusion Tube Location**	**Legend:** NO_2 Monitoring Location District Boundary	
Location: **Forest of Dean District - South**	**Date** June 2023	**Figure No.** D3
Contains Ordnance Survey Data Crown Copyright and Database Right [2023]		

Figure D.4 – Map of Non-Automatic Monitoring Site - CIN03

Legend

Diffusion Tube Locations

AQMA Boundary

Contains Ordnance Survey Data Crown Copyright and Database Right [2022]

Location:

CIN03 - Bottom High Street, Cinderford

Title

Diffusion Tube Location

Date	**Figure No.**
Jun 2023	D4

Figure D.5 – Map of Non-Automatic Monitoring Site - CIN04

Legend

Diffusion Tube Locations

AQMA Boundary

Location:

CIN04 - Market Street, Cinderford

Title

Diffusion Tube Locations

Date	**Figure No.**
June 2023	D5

Figure D.6 – Map of Non-Automatic Monitoring Site - CIN06

Legend

Diffusion Tube Locations

AQMA Boundary

Contains Ordnance Survey Data Crown Copyright and Database Right [2022]

Location:

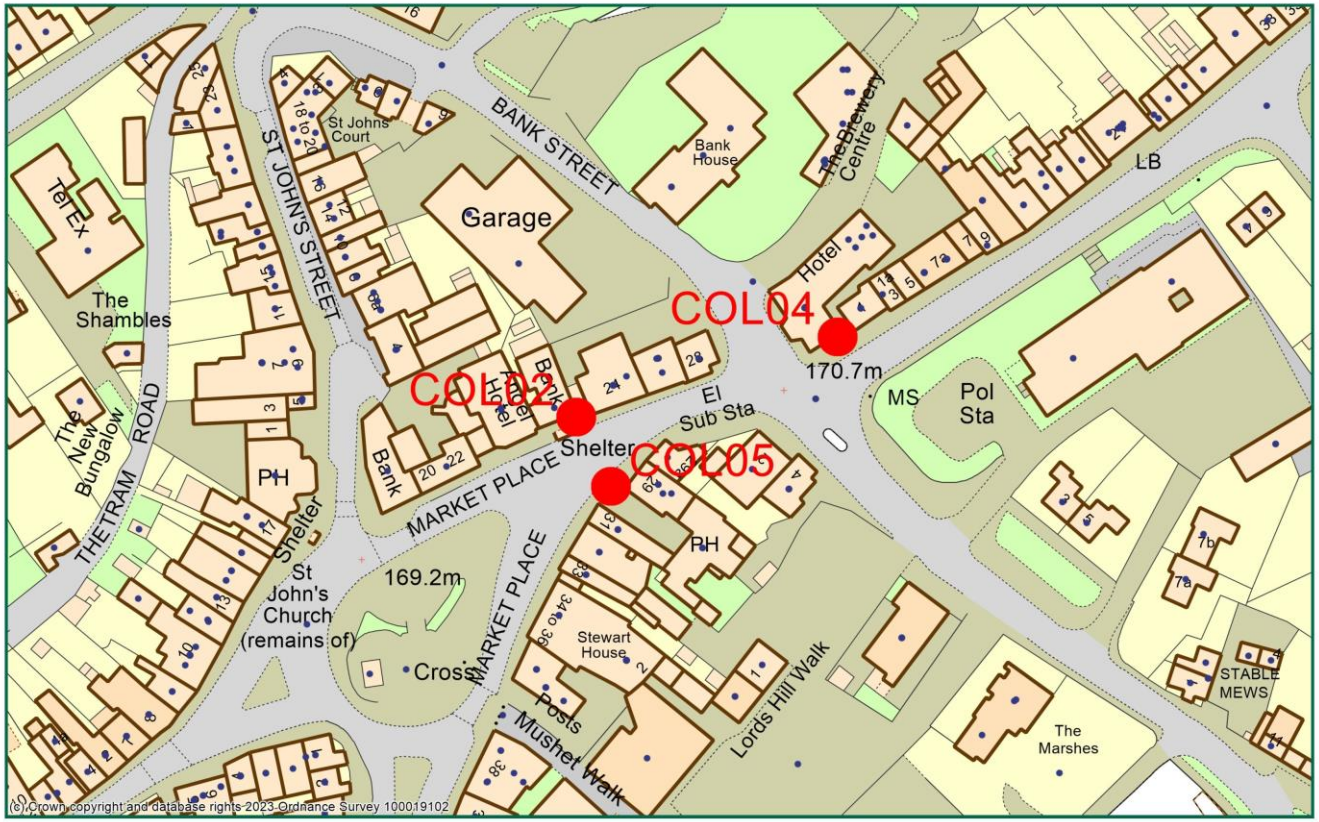
CIN06 High Street, Cinderford, Zebra Crossing (Top, near Factory Shop)

Title

Diffusion Tube Locations

Date	**Figure No.**
June 2023	D6

Figure D.7 – Map of Non-Automatic Monitoring Site - COL02, COL04 & COL05



Legend

Diffusion Tube Locations

AQMA Boundary

Contains Ordnance Survey Data Crown Copyright and Database Right [2022]

Location:

COL02 – Market Place, Coleford

COL04 – Gloucester Road, Coleford

COL05 – Market Place, Coleford

Title

Diffusion Tube Locations

Date	**Figure No.**
June 2023	D7

Figure D.8 – Map of Non-Automatic Monitoring Site - COL03

Legend

Diffusion Tube Locations

AQMA Boundary

Location:

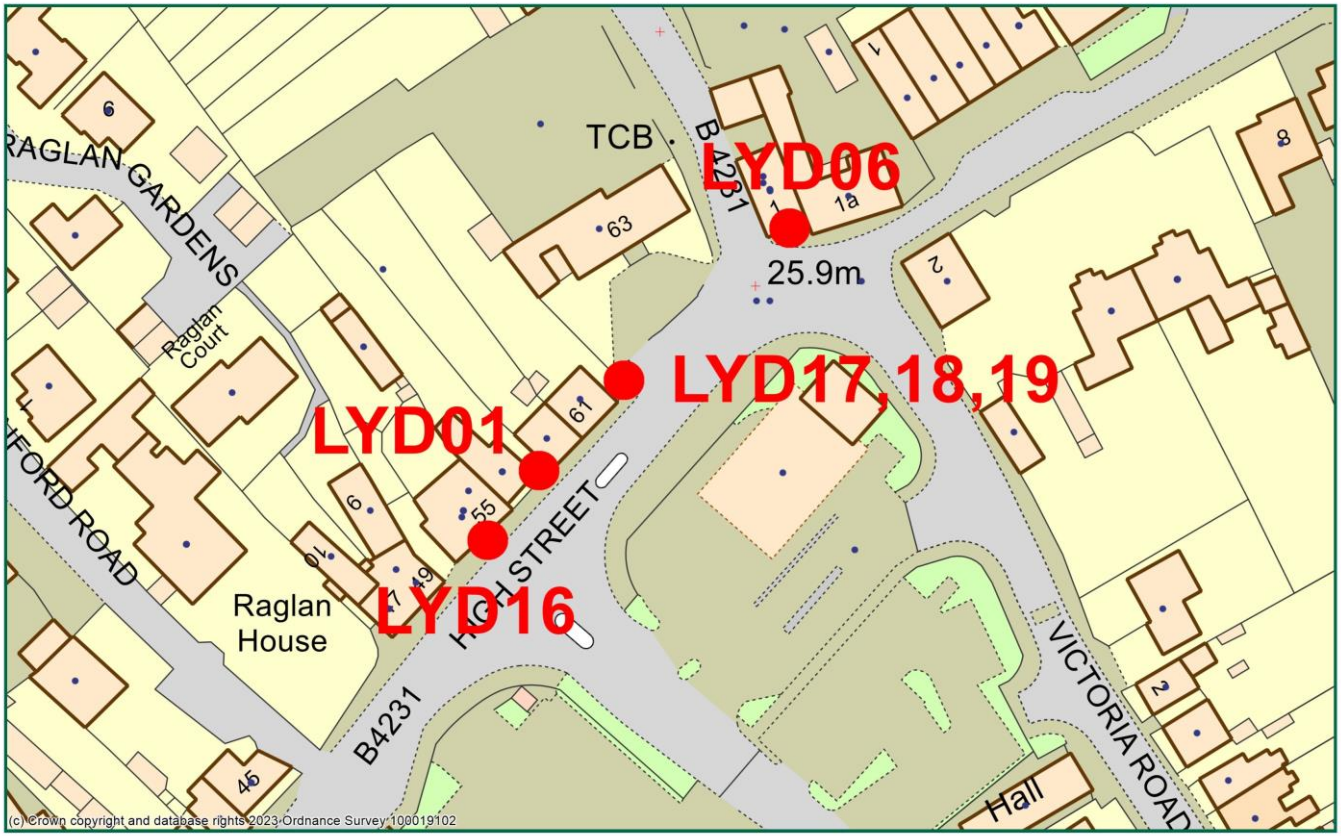
COL03 – Old Vicarage Court, Coleford

Title

Diffusion Tube Locations

Date June 2023	**Figure No.** D8

Figure D.9 – Map of Non-Automatic Monitoring Site - LYD01, LYD06, LYD16 & LYD17 - 19



Legend

Diffusion Tube Locations

AQMA Boundary

Location:

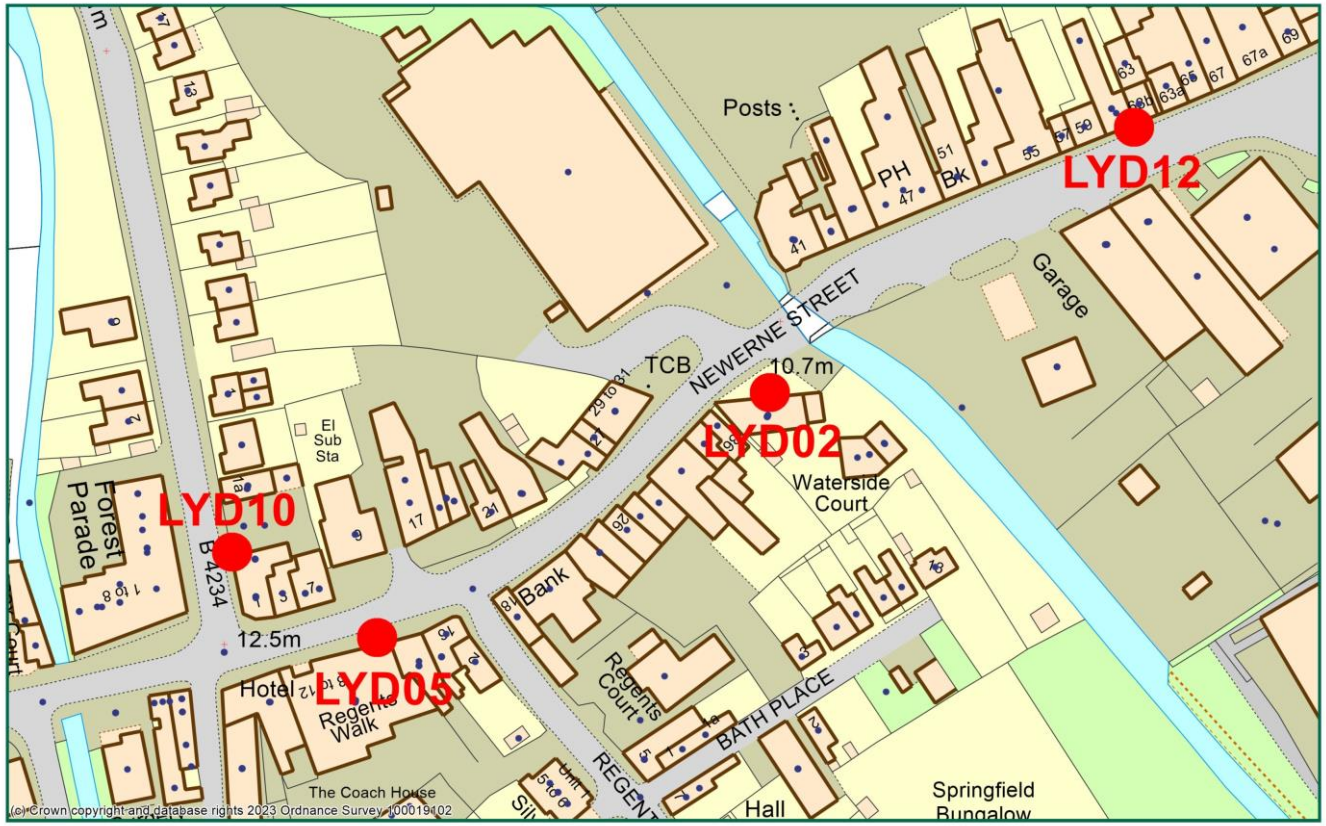
LYD01, LYD06, LYD16, LYD17,18,19 – High Street, Lydney

Title

Diffusion Tube Locations

Date	**Figure No.**
June 2023	D9

Figure D.10 – Map of Non-Automatic Monitoring Site - LYD02, LYD05, LYD10 & LYD12



Legend

Diffusion Tube Locations

AQMA Boundary

Contains Ordnance Survey Data Crown Copyright and Database Right [2022]

Location:

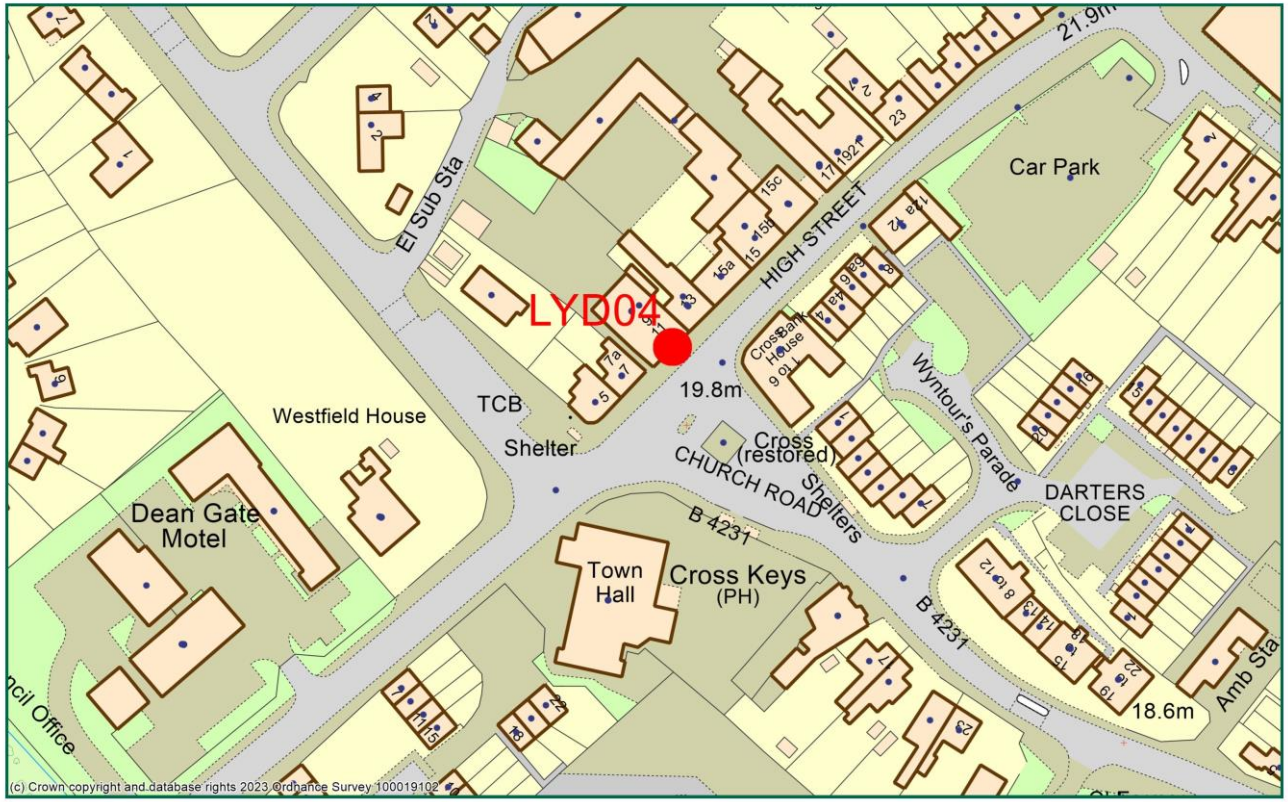
LYD02, LYD05, LYD10 & LYD12 – Newerne St, Lydney

Title

Diffusion Tube Locations

Date	**Figure No.**
June 2023	D10

Figure D.11 – Map of Non-Automatic Monitoring Site - LYD04



Legend

Diffusion Tube Locations

AQMA Boundary

Contains Ordnance Survey Data Crown Copyright and Database Right [2022]

Location:

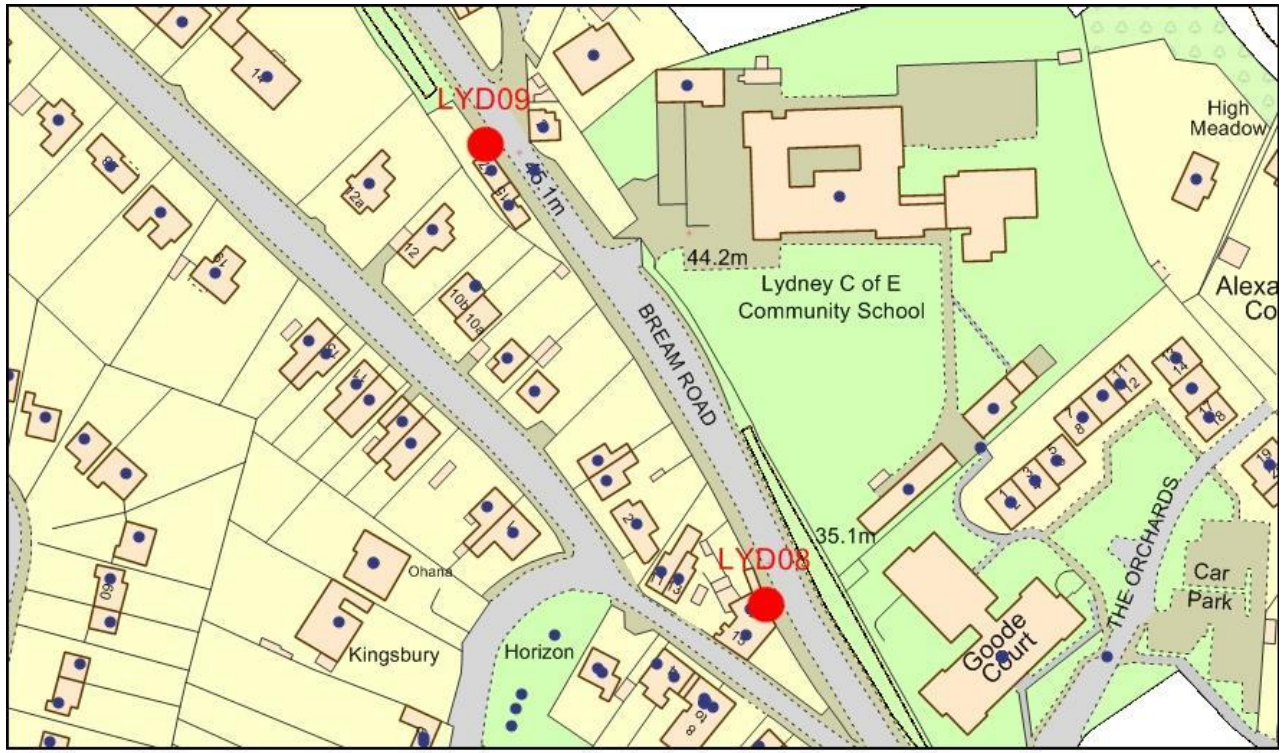
LYD04 - 13 High Street, Lydney

Title

Diffusion Tube Locations

Date	**Figure No.**
June 2023	D11

Figure D.12 – Map of Non-Automatic Monitoring Site - LYD08 & LYD09



Legend

Diffusion Tube Locations

AQMA Boundary

Location:

LYD08 & LYD09 Bream Road, Lydney

Title

Diffusion Tube Locations

Date	**Figure No.**
June 2023	D12

Figure D.13 – Map of Non-Automatic Monitoring Site - LYD15 & LYD20

Legend

Diffusion Tube Locations

AQMA Boundary

Contains Ordnance Survey Data Crown Copyright and Database Right [2022]

Location:

LYD15 & LYD20, Highfield Lane & Highfield Road, Lydney (background)

Title

Diffusion Tube Locations

Date	**Figure No.**
June 2023	D13

Figure D.14 – Map of Non-Automatic Monitoring Site - MIT01

Legend

Diffusion Tube Locations

AQMA Boundary

Location:

MIT01 - 25 The Merrin, Mitcheldean

Title

Diffusion Tube Locations

Date	**Figure No.**
June 2023	D14

Figure D.15 – Map of Non-Automatic Monitoring Site - NAI01

Legend

Diffusion Tube Locations

AQMA Boundary

Location:

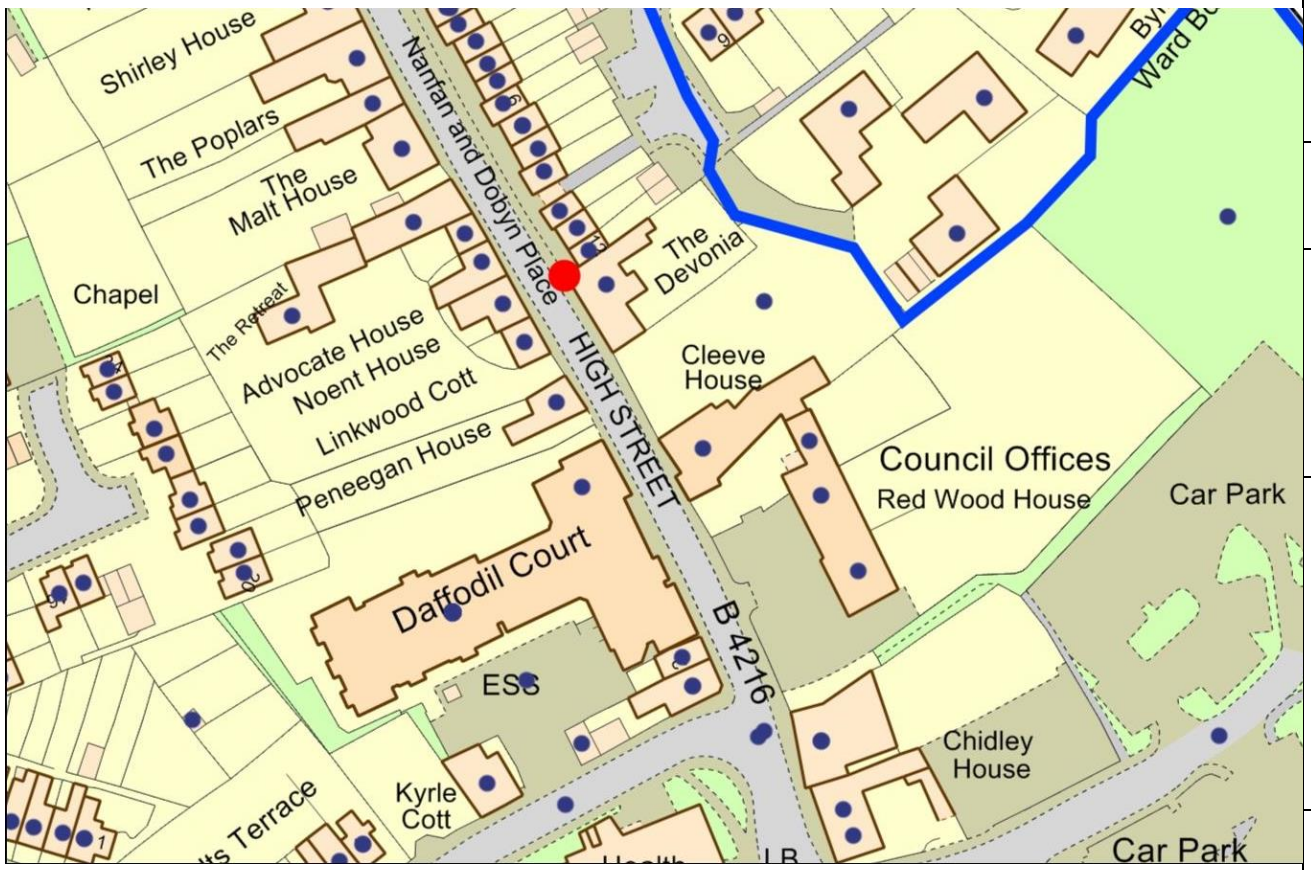
NAI01 Crossroads, Nailbridge

Title

Diffusion Tube Locations

Date	**Figure No.**
June 2023	D15

Figure D.16 – Map of Non-Automatic Monitoring Site - NEW03



Legend

Diffusion Tube Locations

AQMA Boundary

Contains Ordnance Survey Data Crown Copyright and Database Right [2022]

Location:

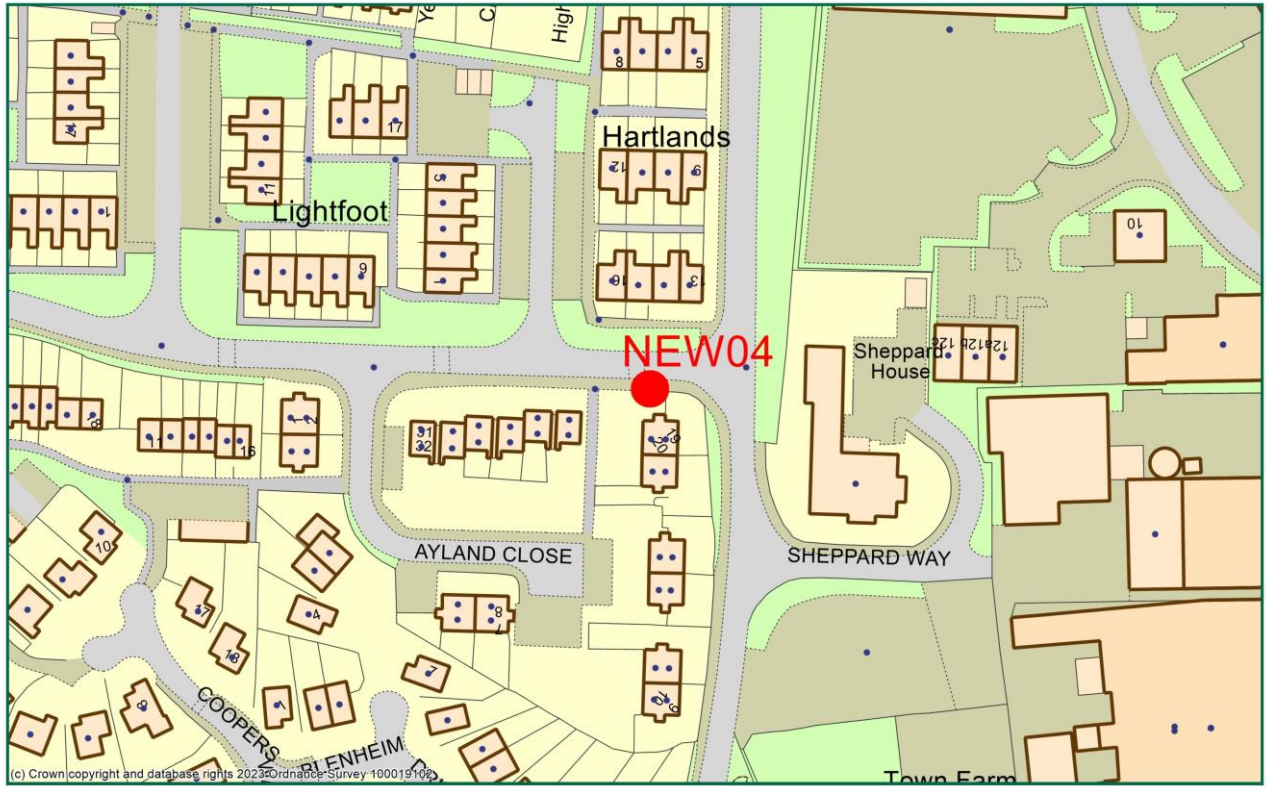
NEW03 High Street, Newent

Title

Diffusion Tube Locations

Date	**Figure No.**
June 2023	D16

Figure D.17 – Map of Non-Automatic Monitoring Site - NEW04



Legend

Diffusion Tube Locations

AQMA Boundary

Contains Ordnance Survey Data Crown Copyright and Database Right [2022]

Location:

NEW04 Foley Road, Newent

Title

Diffusion Tube Locations

Date	**Figure No.**
June 2023	D17

Figure D.18 – Map of Non-Automatic Monitoring Site NEW05 & NEW06

Legend

Diffusion Tube Locations

AQMA Boundary

Contains Ordnance Survey Data Crown Copyright and Database Right [2022]

Location:

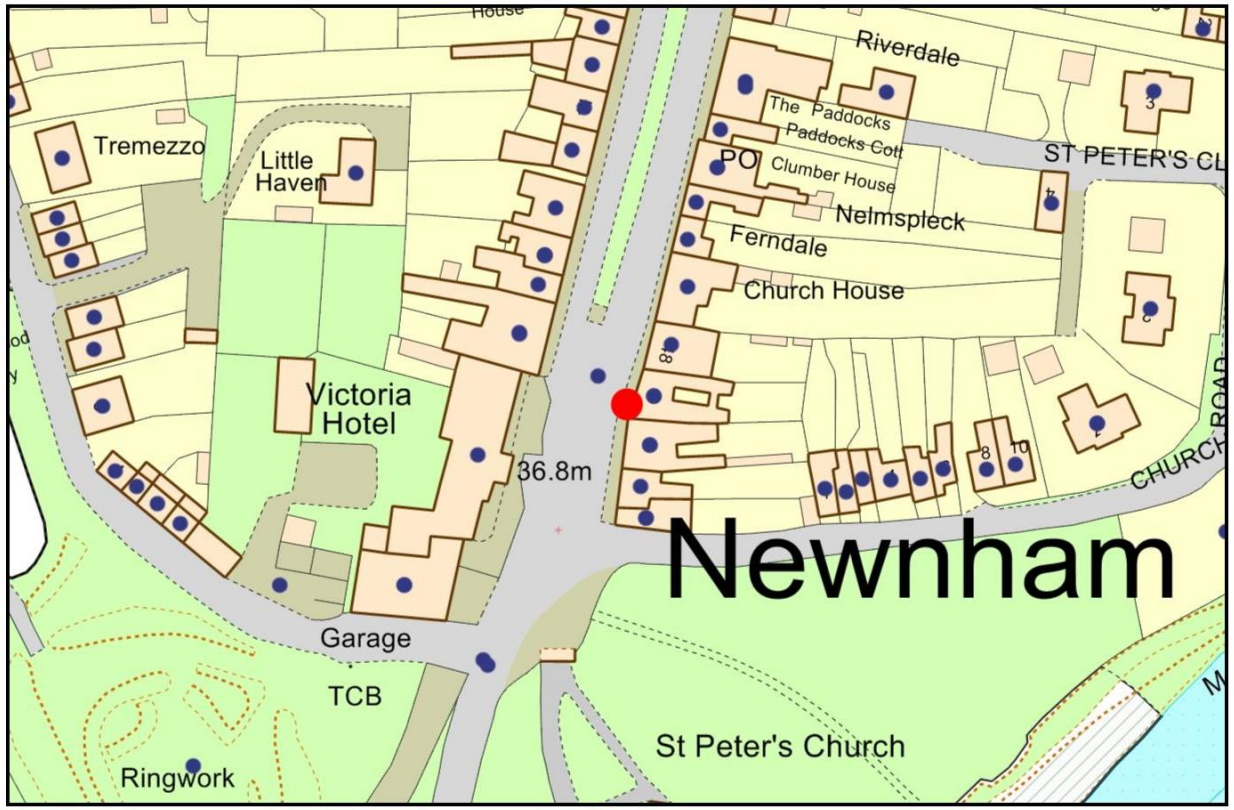
NEW05 & NEW06 - Ross Road

Title

Diffusion Tube Locations

Date	**Figure No.**
June 2023	D18

Figure D.19 – Map of Non-Automatic Monitoring Site NOS02



Legend

Diffusion Tube Locations

AQMA Boundary

Contains Ordnance Survey Data Crown Copyright and Database Right [202]

Location:

NOS02 - High St - Galen House, Newnham-on-Severn

Title

Diffusion Tube Locations

Date	**Figure No.**
June 2023	D19

Figure D.20 – Map of Non-Automatic Monitoring Site - TUT01

Legend

Diffusion Tube Locations

AQMA Boundary

Contains Ordnance Survey Data Crown Copyright and Database Right [2022]

Location:

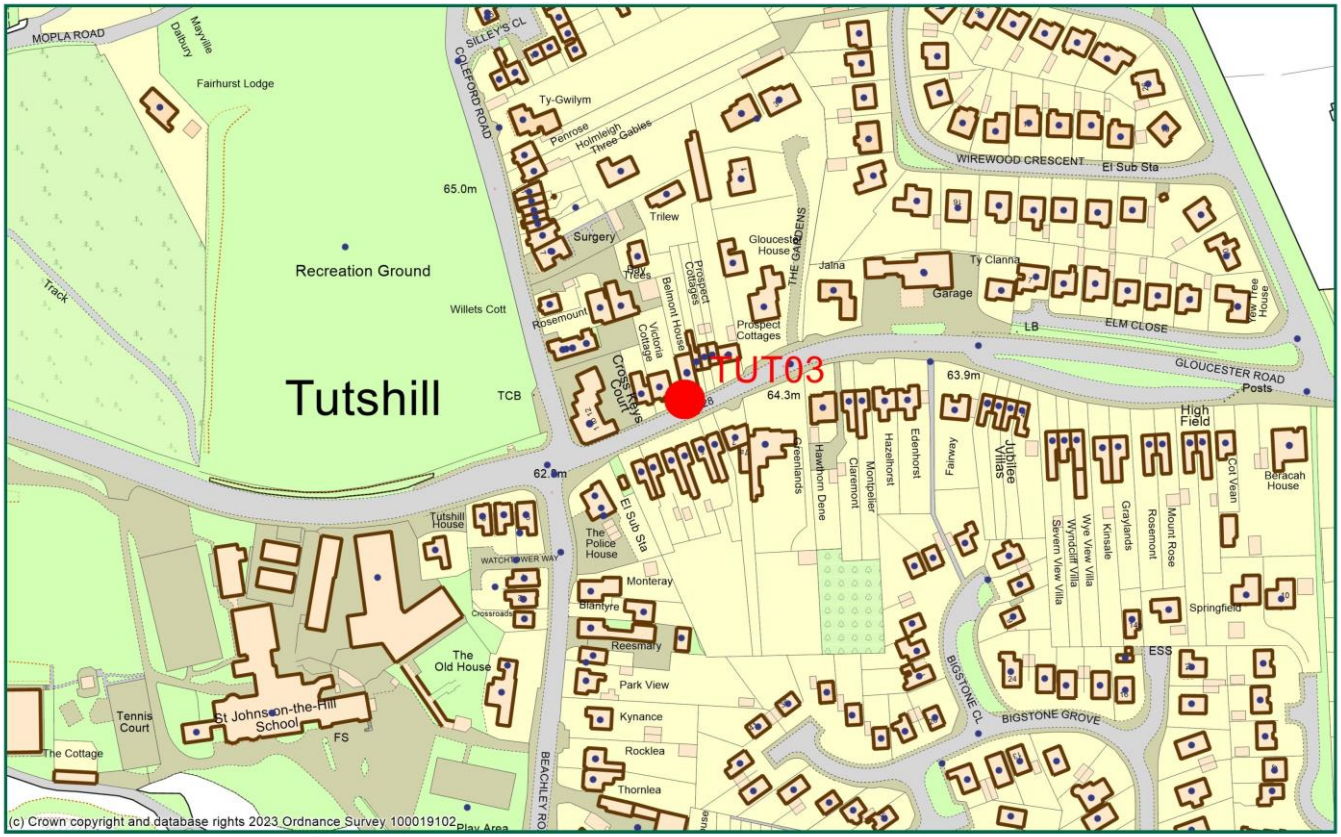
TUT02 Tutshill - Beachley Rd - Wyedean School

Title

Diffusion Tube Locations

Date	**Figure No.**
June 2023	D20

Figure D.21 – Map of Non-Automatic Monitoring Site - TUT03



Legend

Diffusion Tube Locations

AQMA Boundary

Contains Ordnance Survey Data Crown Copyright and Database Right [2022]

Location:

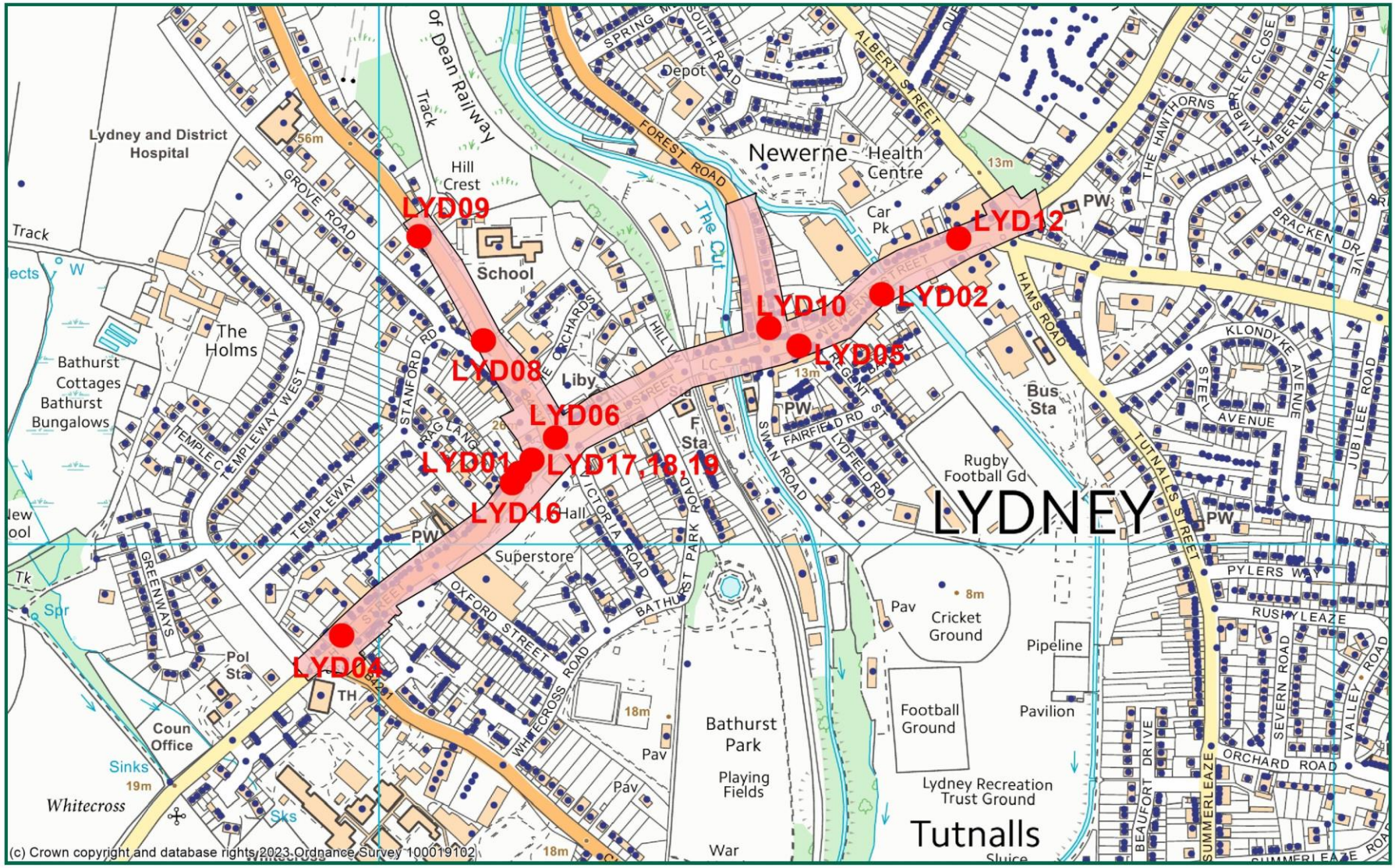
TUT03 Gloucester Road

Title

Diffusion Tube Locations

Date	**Figure No.**
June 2023	D21

Figure D.22 – Map of Lydney AQMA Showing Monitoring Locations



Appendix E: Summary of Air Quality Objectives in England

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

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

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

Glossary of Terms

Abbreviation	Description
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the local authority intends to achieve air quality limit values'
AQMA	Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives
ASR	Annual Status Report
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by National Highways
EU	European Union
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
PM_{10}	Airborne particulate matter with an aerodynamic diameter of 10µm or less
$PM_{2.5}$	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO_2	Sulphur Dioxide

References

- Local Air Quality Management Technical Guidance LAQM.TG22. August 2022. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.
- Local Air Quality Management Policy Guidance LAQM.PG22. August 2022. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.