2021 Air Quality Annual Status Report (ASR)

In fulfilment of Part IV of the Environment Act 1995

Local Air Quality Management

Date: July 2021

Information	Forest of Dean District Council Details
Local Authority Officer	David Rudland
Department	Environmental & Regulatory Services
Address	Council Offices, High Street, Coleford, Gloucestershire, GL16 8HG
Telephone	01594 810000
E-mail	ers@fdean.gov.uk
Report Reference Number	FoD ASR 2021.1
Date	July 2021

Executive Summary: Air Quality in Our Area

Air Quality in the Forest of Dean

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

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

The monitoring reported within this 2021 Annual Status Report for Forest of Dean District Council took place during the whole of 2020. It does not indicate any additional areas of general concern with regard to air quality, but our designated Air Quality Management Area (AQMA) continues to experience elevated nitrogen dioxide levels. However, this year annual mean levels did not exceed the national objective of 40 µgm-3, which was set to protect health. This is most likely due to social restrictions placed on the UK as a result of the coronavirus pandemic which had the effect of reducing traffic volumes across much of the UK, particularly in the various national lockdowns during 2020 and into 2021.

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 nitrogen dioxide (NO_2) levels which exceeded the national air quality objectives at the time the AQMA was declared. The District's centralised national AQMA page is can be found here:

---

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

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

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

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

Forest of Dean AQMA details

Monitoring throughout 2020 has not identified any other exceedances of the national objectives within the Forest of Dean District. There were no proposed industrial developments within the District during 2020 with significant air pollution implications.

All residential development proposals were considered with regard to their potential to increase traffic pollution in the AQMAs and other areas. Of note this year is progress with a number of new housing and other developments, 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.

Two separate supermarket developments have been proposed, one on land adjoining the former JD Norman site to the south of Lydney and another in Newerne Street, to the east of the Town Centre. Of these, the former has been refused and the latter approved. New housing development is in progress on land south of Highfield Road, to the east of the Town Centre.

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.

Actions to Improve Air Quality

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

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

[5] Defra. Clean Air Strategy, 2019

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

Areas (AQMAs) are designated due to elevated concentrations heavily influenced by transport emissions.

The Council has produced air quality guidance for planners and developers. The Air Quality Technical Guidance document for the Forest of Dean District Council has been produced to provide a screening tool to assist planners and developers in deciding when air quality should be assessed as part of the development control process. It also provides guidance for air quality consultants undertaking air quality and emission mitigation assessments, in order to protect local air quality from any impacts arising from the development. It can be found here:

Forest of Dean Air Quality Guidance

Local cycling schemes have progressed during the year. Most recently the Wye Valley Greenway opened in April 2021 linking Chepstow with Tintern via Tidenham and predominantly within the District. Also progress with the Lydney cycleway schemes linking the town with outlying areas.

It is too soon to establish whether this has affected traffic patterns in the District, in the Lydney area in particular, which will be better assessed once the current pandemic is over.

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.

This has shown that air quality across the Forest of Dean District remains very good with measured levels of nitrogen dioxide (NO2) generally well below national limits.

This year was one of significantly reduced travel and thus traffic-derived pollution in the District - the nitrogen dioxide diffusion tube survey results were somewhat lower than those recorded last year. Our 2020 monitoring programme confirms that within the Lydney Air Quality Management Area (AQMA), the nitrogen dioxide annual mean objective of 40 µgm-3, which was set to protect health, was not exceeded and at all other monitoring locations continued to be comfortably met. This is most likely due to social restrictions placed on the UK as a result of the coronavirus pandemic which had the effect of reducing traffic volumes across much of the UK, particularly in the various national lockdowns during 2020 and into 2021.

During the year nitrogen dioxide levels appear to correspond with the imposition and relaxation of the various national lockdowns and travel restrictions due to Covid, providing further evidence that the elevated levels are due to volume of traffic.

Masked by this significant drop in nitrogen dioxide levels is a likely contribution from an increase in the proportion of newer, cleaner vehicles using the roads.

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 which is 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, but even then will have the benefit of encouraging leisure bike use as a positive activity which may then become a future commuting mode option.

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. Land will be protected for the establishment of a cycle route between these two locations. Similarly policy AP27 seeks to safeguard land between Christchurch and Berry Hill for the Christchurch to Coleford cycle route and policy AP29 for Sedbury and Tintern Bridge. The latter route opened in April 2021 as the Wye Valley Greenway.

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. Walking or cycling, or taking public transport or car sharing rather than driving an otherwise empty car, reduces 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 e mail on: ers@fdean.gov.uk

Table of Contents

Figures

Tables

1 Local Air Quality Management

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

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

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

2 Actions to Improve Air Quality

2.1 Air Quality Management Areas

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

The Forest of Dean District Council declared Lydney AQMA in July 2010. The details will be found in Table 2.1.

This AQMA was designated in relation to a likely breach of the nitrogen dioxide (annual mean) objective as specified in the Air Quality Standards Regulations 2007.

The outlined area on the map in Figure 2.1 shows the designated AQMA in Lydney, which incorporates roads affronting residential properties in High Street, Hill Street and Newerne Street from Temple Way junction (A) to Albert Street Junction (D); and Bream Road from High Street junction (B) to approximately 75m past the entrance to Lydney Church of England Primary School (F); and Forest Road from Hill Street (C) to just past 17 Forest Road (E). A more detailed plan showing the locations of monitoring points within the AQMA will be found in Appendix D.

Figure 2.1- Map of Lydney AQMA Boundaries

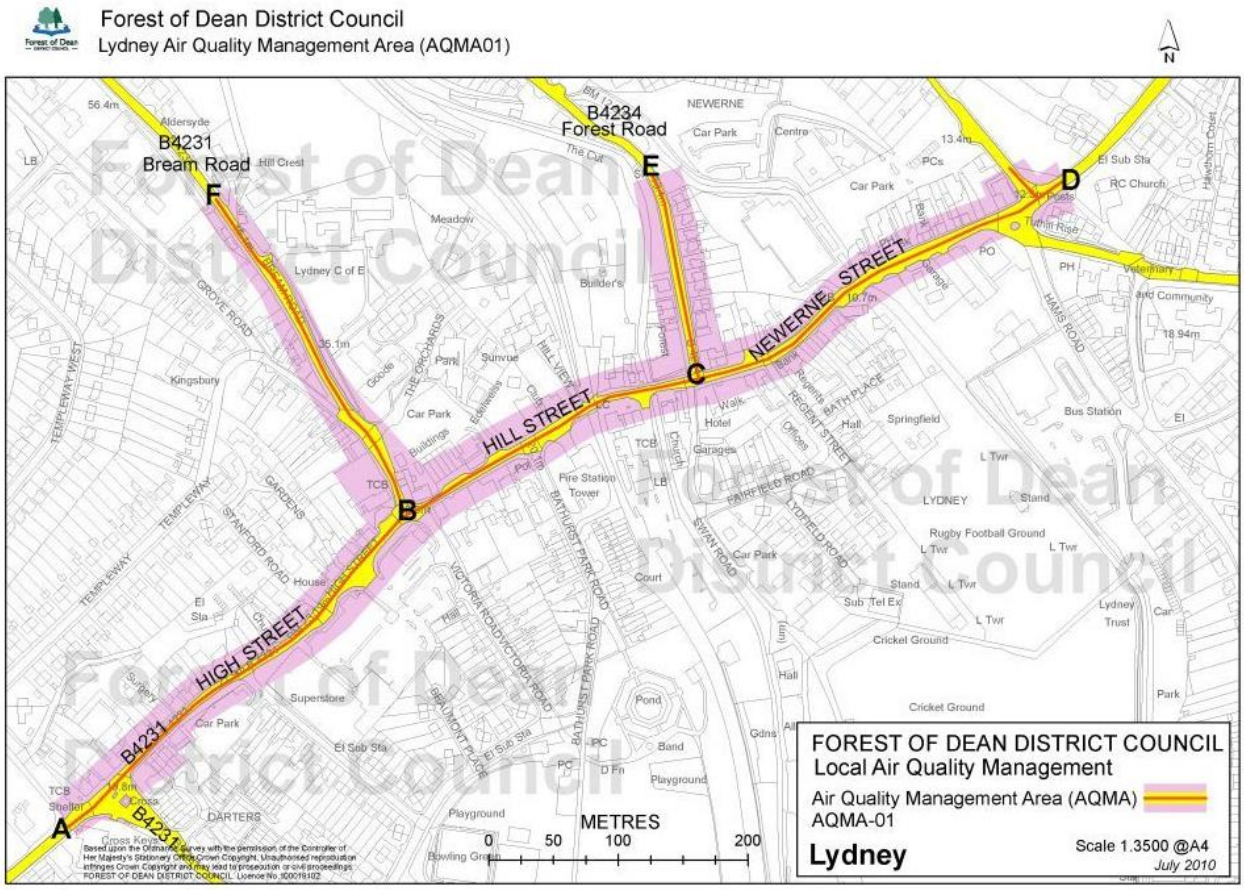


Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Date of Declaration	Pollutants and Air Quality Objectives	One Line Description	Is air quality in the AQMA influenced by roads controlled by Highways England?	Level of Exceedance: Declaration	Level of Exceedance: Current Year	Name and Date of AQAP Publication	Web Link to AQAP
Lydney AQMA	2010	NO2 Annual Mean	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	46.9	30.3 (not exceeding)	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 confirms the information on UK-Air regarding their AQMA is up to date.**

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

2.2.1 Measures from last year's ASR

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

1. The Council have provided a thorough report which contains the required content.
2. The presentation of trend graphs to show monitoring results within the Council's AQMA is an extremely useful visual aid, and the supporting discussion provides a robust indication of air quality within the District. This is encouraged in all future reports.
3. QA/QC is extremely thorough and follows the methodologies outlined in TG16. Supporting evidence and calculations are provided for all procedures applied, which is evident of good practice. This is encouraged in all future reports.
4. The Council are encouraged to undertake a review of their AQAP as it will soon be out of date (the current plan was adopted in 2015, and TG.16 recommends that they be reviewed and updated (if applicable) every 5 years). The consideration of additional actions which could be implemented to achieve compliance with the annual mean objective for NO_2 within the Lydney AQMA is also encouraged.
5. The inclusion of comments (and the Council's response to said comments) from the previous appraisal would be welcomed.
6. The Council have provided detailed maps of their monitoring sites, which provides the reader with a good overview of monitoring within the District.
7. The inclusion of more detailed discussion of progress on AQAP measures during the course of the reporting year is encouraged (this is discussed in the section below).

2.2.2 Specific Measures to improve air quality

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 score 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

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 those to station car parking and providing a cycle link from the town centre to the railway, with cycle parking at each end of the scheme.

Some of these measures have been completed during the current reporting year of 2020 and are expected to benefit local air quality. Details of measures completed, in progress or planned are set out in Table 2.2. Seven measures are included within Table 2.2, with the type of measure and the progress the Council and their partners have made up to and during the reporting year of 2020 presented. Where there have been, or continue to be, barriers restricting the implementation of the measure, these are also presented within Table 2.2.

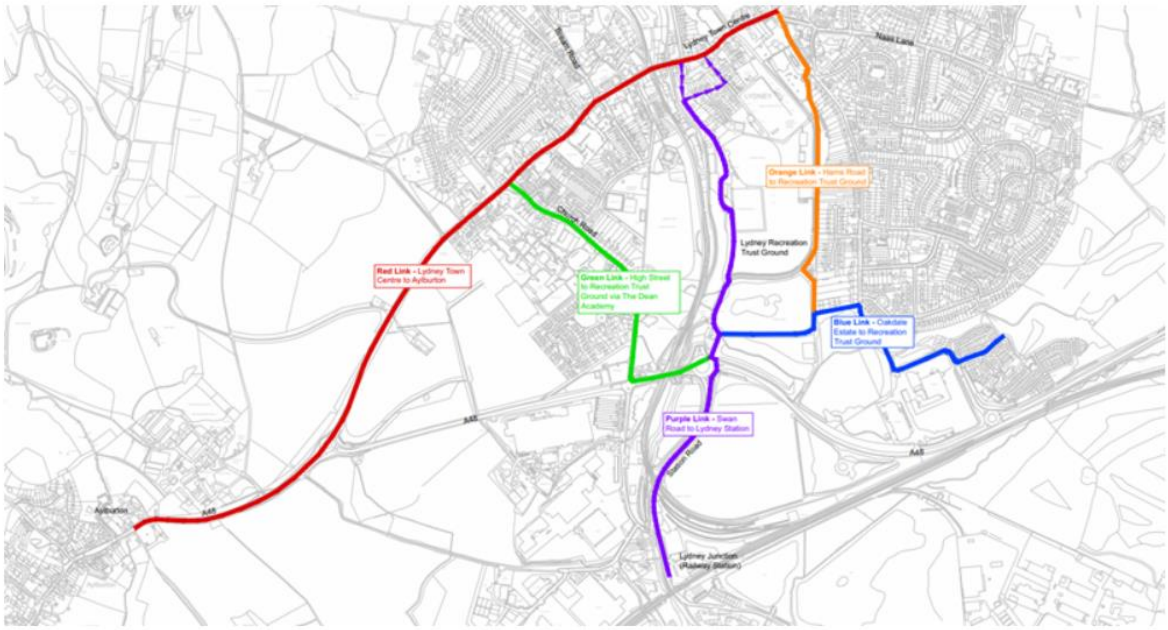
New cycling schemes

In relation to Options 14 and 15 above, cycleway improvements have already been commenced (see Table 2.2, Measure 2). During 2020 progress was made with construction of dedicated cycling routes as alternatives to car use.

Lydney Cycleway Scheme

The Lydney cycleway scheme has progressed to completion and provides cycle path links to various parts of the town and beyond to outlying villages. In particular the "Purple Link" provides an off-carriageway route from Lydney railway station to the Town Centre. A plan showing the scope of the completed scheme is shown below:

Figure 2.2 Lydney Cycleway scheme



Lydney Cycle Improvements Scheme Routes

Further details of the scheme can be found via these links below:

Gloucestershire Highways

Lydney Cycleway Scheme details

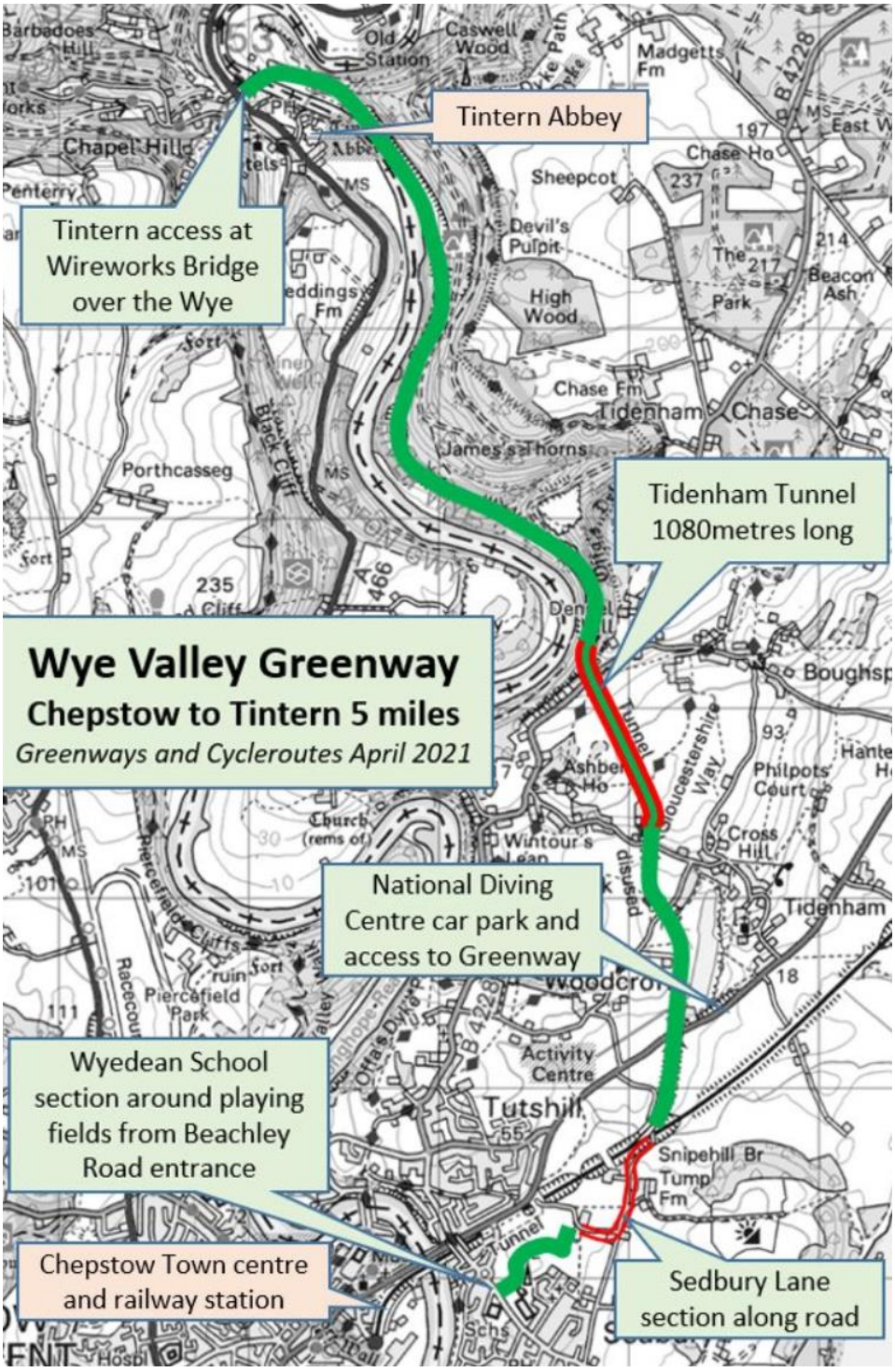
Wye Valley Greenway

The Wye Valley Greenway was opened in April 2021 and runs from Sedbury in the District to Tintern at the English/Welsh border. This provides an 8kms long (5 miles) traffic-free route from Wyedean School to the Wireworks Bridge at Tintern, within the District. It was created on the route of a former railway line after a Forest of

Dean District Council resolution AP29 was adopted in June 2018 to safeguard the railway route for recreational use.

More details will be found here: [Wye Valley Greenway information]

Figure 2.3 Route of Wye Valley Greenway



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. Land will be protected for the establishment of a cycle route between these two locations. Similarly policy AP27 seeks to safeguard land between Christchurch and Berry Hill for the Christchurch to Coleford cycle route.

Other measures having ongoing effect

The introduction of a 20 mph speed limit in Lydney High Street, already completed, is thought to have had the effect of relieving congestion at the T junction, as drivers on the main road more readily give way to exiting traffic when moving more slowly.

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.

Notably, two separate supermarket developments have been proposed for Lydney, one on land adjoining the JD Norman site to the south of Lydney and another in Newerne Street, to the east of the Town Centre. Of these, the former has been refused and the latter approved. New housing development is in progress on land south of Highfield Road, to the east of the Town Centre.

A £2.1M scheme is proposed for Lydney Harbour to improve access and ultimately to encourage tourism. The access for this will be directly from the A48 highway to the south of the town and would not necessarily have a direct effect on the air quality in the AQMA.

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

Table 2.2 – Progress on Measures to Improve Air Quality

Measure No.	Measure	Category	Classification	Year Measure Introduced	Estimated / Actual Completion Year	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
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 Link: Real Time Passenger Information System	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 2015-2031	Transport Planning and Infrastructure	Other	2015	2015	Gloucestershire County Council	Gloucestershire County Council	NO	Partially Funded	£10k - 50k	Implementation	Reduced vehicle emissions	Improvements to Lydney rail station, cycle networks at Lydney and park & ride study	Implementation on-going	Funding

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

2.3.1 General Approach

As detailed in Policy Guidance LAQM.PG16 (Chapter 7) (Reference D), 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.

Partnership working with the county-wide Gloucestershire Pollution Group has included liaison with Gloucestershire County to coordinate air quality policy.

2.3.2 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 is ranked 4 out of 15 areas in the South West of England. This equates to a percentage of 4.9% compared with the regional average of 4.4%.

For the Forest of Dean District, the estimated Fraction of Mortality attributable to particulate air pollution is ranked 11 out of 30 areas in the South West of England. This equates to a percentage of 4.4% compared with the regional average of 4.4%.

PM2.5 is the pollutant which has a significant impact on public health and on which the Public Health Outcomes Framework (PHOF) indicator D01[7] is based. Fine particulate matter data is available from Public Health England for 2019, which indicated an annual mean concentration of 7.6µg m^{-3} compared with the regional average of 7.3µg m^{-3}.

[7] Source: Background annual average PM2.5 concentrations for the year of interest are modelled on a 1km x 1km grid using an air dispersion model, and calibrated using measured concentrations taken from background sites in Defra's Automatic Urban and Rural Network (http://uk-air.defra.gov.uk/interactive-map.) Data on primary emissions from different sources and a combination of measurement data for secondary inorganic aerosol and models for sources not included in the emission inventory (including re-suspension of dusts) are used to estimate the anthropogenic (human-made) component of these concentrations. By approximating LA boundaries to the 1km by 1km grid, and using census population data, population weighted background PM2.5 concentrations for each lower tier LA are calculated. This work is completed under contract to Defra, as a small extension of its obligations under the Ambient Air Quality Directive (2008/50/EC). Concentrations of anthropogenic, rather than total, PM2.5 are used as the basis for this indicator, as burden estimates based on total PM2.5 might give a misleading impression of the scale of the potential influence of policy interventions (COMEAP, 2012).

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

This section sets out the monitoring undertaken within 2020 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 2016 and 2020 to allow monitoring trends to be identified and discussed.

The 2020 monitoring year was largely one of consolidation not least because the Coronavirus pandemic limited both staff availability and mobility around the District. During April 2020, due to staff being redeployed on to emergency duties, NO_2 diffusion tubes were not placed during that month. Over the year there have been no new roads or major changes that have affected traffic flows.

However for the rest of the year we continued monitoring at 29 locations. Measured concentrations of NO_2 are generally much lower this year compared to previous years. Further information will be found below.

3.1 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 2020. 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. **Error! Reference source not found.** 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.

Some changes were made to the locations of tubes during 2020. The monitoring site at 33 High Street Lydney (LYD03) was discontinued early in the year after the location was lost to construction work. A new location (LYD20) was set up outside 2 Cross Hands, Lydney, close to new housing development, to help assess the effect on air quality in the locality.

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.

There were at least 9 months data for all but 2 monitoring sites:

- At location LYD03 where just one month's data was collected. This was insufficient for the purposes of annualisation and the location has been discontinued as described in the previous section.
- At location LYD20 which was set up mid-year, with 6 months' data available.

3.2.1 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.1 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 2020 dataset of monthly mean values is provided in Appendix B. Note that the concentration data presented in Table B.1 includes distance corrected values, only where relevant

Overall NO_2 levels are somewhat lower across the District in comparison with past years. The results from the Covid lockdown periods in 2020 are not necessarily representative of pollution levels that might have been experienced around the District had traffic levels been "typical" of other years.

Trends

Figure 3.1 shows the trend of nitrogen dioxide levels at a representative selection of sites monitored around the district outside of our Lydney AQMA over the last 8 years to give a fuller picture of changes during the decade. During 2020 there was a significant drop in measured NO_2 concentrations in all areas.

Figure 3.2 shows the trend within the Lydney AQMA since 2012. A similar drop was noted, more pronounced in the areas of the AQMA where higher concentrations of NO_2 were measured. At the High Street annual concentrations recorded were below the national objective level in 2020.

Figure 3.3 illustrates the effect on local NO_2 concentrations in both of the District's AQMAs as the pandemic took hold. The graph shown is a comparison of corresponding monthly NO_2 concentrations between the years 2019 and 2020. In the first month of 2020 concentrations of NO_2 were comparable to those of the previous year. As the Covid pandemic developed and social mixing was first voluntarily curtailed then enforced by lockdown in March it can be seen that the 2020 NO_2 measurements are somewhat lower during February to May 2020, recovering somewhat in the summer of 2020 before dropping back again as the less severe social restrictions of the "Tier" structure were gradually introduced from late autumn of 2020. At the lowest point measured NO_2 was around a third of the 2019 levels. This readily demonstrates how elevated NO_2 at these locations is dominated by emissions generated from vehicular traffic.

There is no reason at this stage to assume these depressed concentrations will continue beyond the pandemic. Although there is much national debate about how travelling and commuting patterns will change post-pandemic, there are indications from this data that as social and economic mobility increase so do traffic and thus NO_2 levels, so it is to be expected that the District's AQMA will be maintained for the foreseeable future. It is also noted that no annual means, and since January 2020 no monthly means greater than 60µg/m3 were measured, which indicates that an exceedance of the 1-hour mean objective is unlikely at any sites for those months.

3.2.2 Particulate Matter (PM_{10})

Measurements of particulate matter were not made within the District.

The UK Government has produced a selection of statistics on annual emissions to air in the UK for the period 1970 to 2019. Whilst there has been a long-term decrease in the emissions of all of the air pollutants covered, burning of other solid fuels for domestic heating and industry has increased in recent years and this is having an adverse effect on the release of particulate matter. Decreases in emissions of particulates from many sources have been partially offset by increases in emissions from residential burning (domestic solid fuel heating; emissions of PM2.5 from this source increased by 28 per cent between 2009 and 2019). In fact domestic combustion using wood as a fuel accounted for 38 per cent of primary emissions of PM2.5 in 2019. This reflects the increasing popularity of solid fuel appliances in the home such as wood-burning stoves. Emissions of particulates from domestic burning is cumulatively now greater than that from road transport.

As a reflection of these concerns, new legislation has come into effect in England, controlling the sale of wood and coal for domestic heating. Under the Air Quality (Domestic Solid Fuels Standards) (England) Regulations 2020, 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.

Fig. 3.1 Graph showing the trend over the last 8 years of nitrogen dioxide levels around the district (outside of our AQMA)

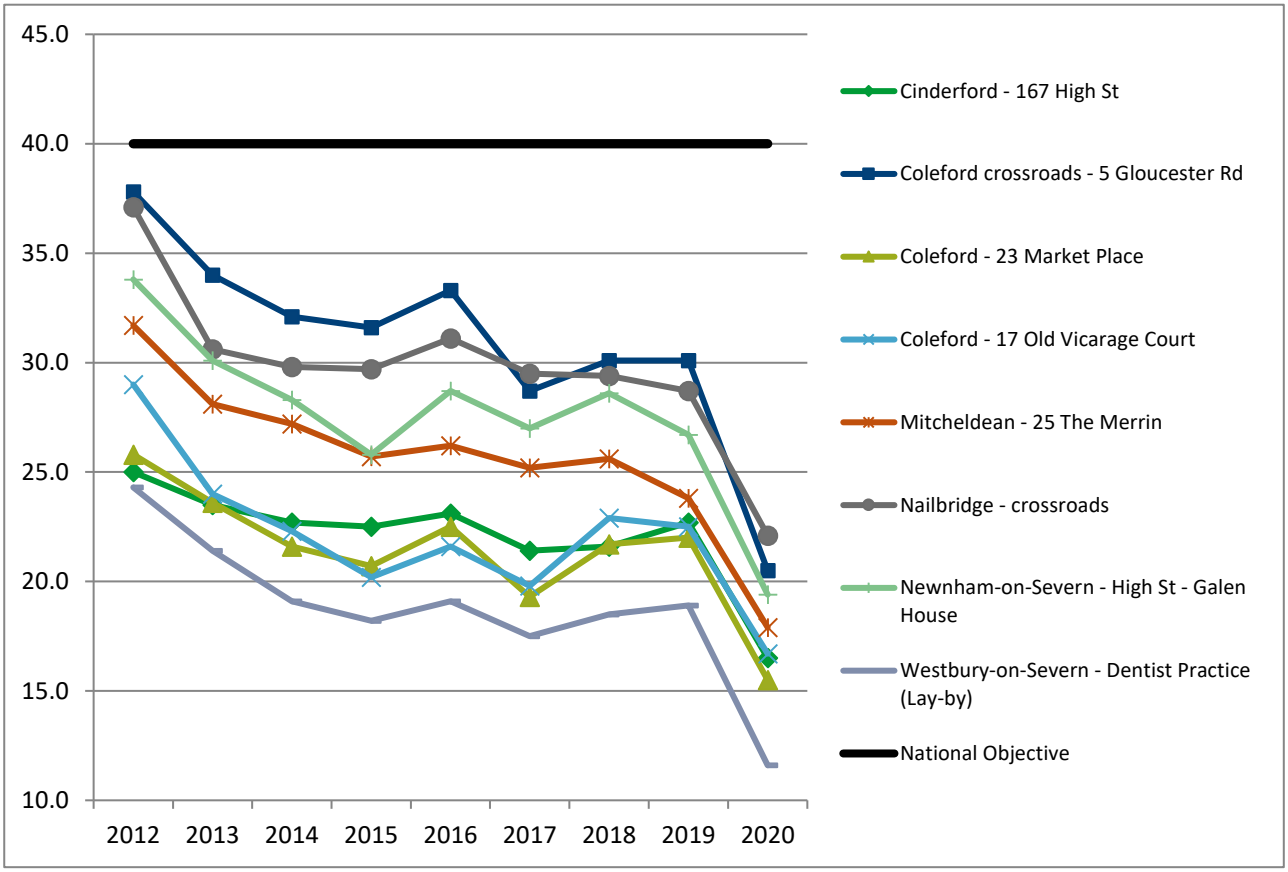


Figure 3.2 Graph showing the trend over the last 8 years of nitrogen dioxide levels within our Lydney AQMA

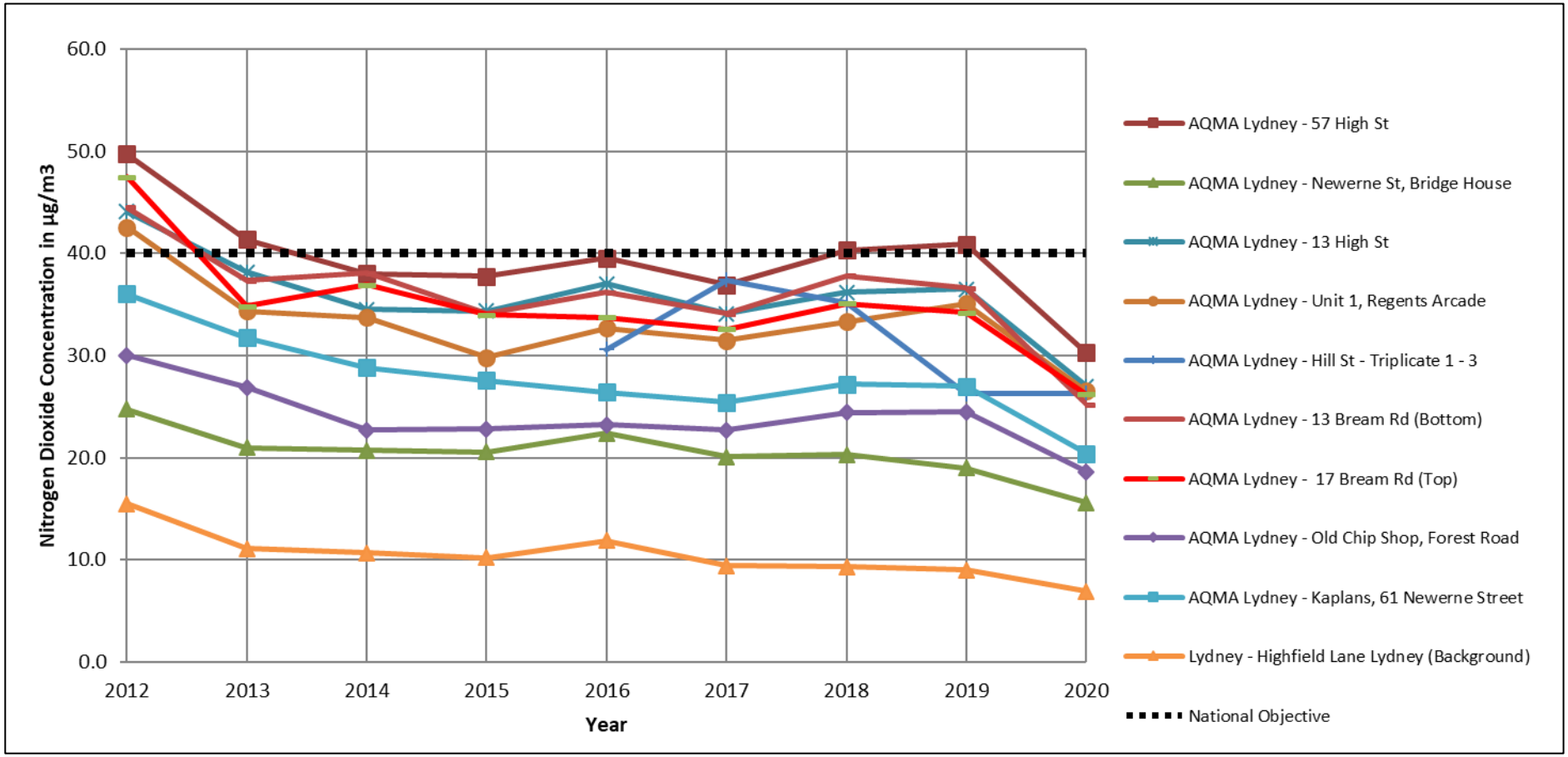
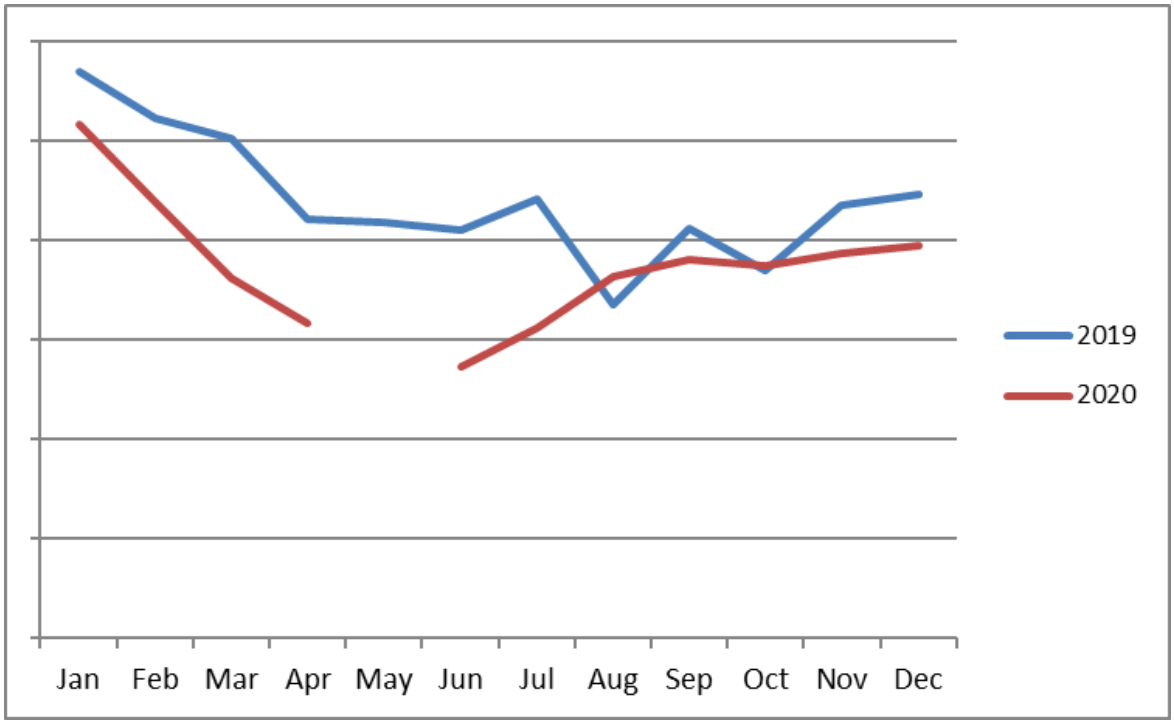


Figure 3.3 at 57 High Street, Lydney - relative NO_2 concentrations 2019 and 2020



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 St	Roadside	365637	214732	NO2	None	0.0	0.9	No	3.0
CIN04	Cinderford - 31 Market St (CANDI)	Roadside	365637	214012	NO2	None	0.0	1.3	No	2.8
CIN06	Cinderford - High Street, Zebra Crossing (Top, nr Factory Shop)	Roadside	365659	214171	NO2	None	1.2	1.5	No	2.9
COL01	Coleford crossroads - 5 Gloucester Rd	Roadside	357743	210600	NO2	None	0.0	3.1	No	2.7
COL02	Coleford - 23 Market Street	Roadside	357551	210756	NO2	None	0.0	3.2	No	3.1
COL03	Coleford - 17 Old Vicarage Court	Roadside	357631	210785	NO2	None	3.7	1.5	No	2.8
HUN03	Huntley - opposite 9 Frogmore Road	Roadside	372370	219678	NO2	None	>10	2.6	No	2.9
LON01	Longhope, Knapp House, Monmouth Road	Roadside	369176	218673	NO2	None	9.0	4.1	No	3.2
LYD01	Lydney - 57 High St	Roadside	363147	203074	NO2	Lydney AQMA	0.1	3.4	No	3.1
LYD02	Lydney - Newerne St, Bridge House - Tucker	Roadside	363527	203261	NO2	Lydney AQMA	0.0	7.0	No	2.9
LYD03	Lydney - 33 High St / Tube Gone	Roadside	363036	202972	NO2	Lydney AQMA	0.4	1.9	No	2.9
LYD04	Lydney - 13 High St	Roadside	362971	202915	NO2	Lydney AQMA	0.7	2.0	No	2.9

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)
LYD05	Lydney - Unit 1, Regents Arcade	Roadside	363494	203238	NO2	Lydney AQMA	0.2	1.4	No	3.0
LYD06	Lydney - Hill St - Inspirations Gallery	Roadside	363185	203111	NO2	Lydney AQMA	0.7	1.8	No	2.9
LYD08	Lydney - 13 Bream Rd (Bottom)	Roadside	363109	203213	NO2	Lydney AQMA	0.0	3.4	No	2.9
LYD09	Lydney - 17 Bream Rd (Top)	Roadside	363042	203322	NO2	Lydney AQMA	0.3	1.0	No	3.0
LYD10	Lydney - Old Chip Shop, Forest Road	Roadside	363408	203226	NO2	Lydney AQMA	0.0	1.6	No	3.0
LYD12	Lydney - Kaplans, 61 Newerne Street	Roadside	363607	203320	NO2	Lydney AQMA	0.0	2.5	No	2.8
LYD15	Lydney - Highfield Lane (Background)	Roadside	364087	204138	NO2	None	0.0	>15	No	2.3
LYD16	Lydney - 55 High Street Launderette	Roadside	363142	203069	NO2	Lydney AQMA	0.1	1.6	No	3.1
LYD17, LYD18, LYD19	Lydney - 61 High Street (Triplicate 3 of 3)	Roadside	363160	203088	NO2	Lydney AQMA	0.0	1.4	No	3.1
LYD20	Lydney - 2 Cross Hands, Highfield Road	Roadside	364196	203874	NO2	None	2.2	1.5	No	2.7
MIT01	Mitcheldean - 25 The Merrin	Roadside	364108	218274	NO2	None	3.8	3.0	No	3.1
NAI01	Nailbridge – crossroads	Roadside	364566	216246	NO2	None	0.6	1.1	No	2.9
NEW03	Newent - 12 High Street	Roadside	372117	226049	NO2	None	0.5	1.6	No	3.0
NOS02	Newnham-on-Severn - High St - Galen House	Roadside	369038	211590	NO2	None	0.0	3.4	No	2.6
TUT01	Tutshill - Beachley Rd - Opp Severn Lodge	Roadside	353926	194467	NO2	None	>10	1.3	No	3.0

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
TUT02	Tutshill - Beachley Rd - Wyedean School	Roadside	354268	193950	NO2	None	>10	2.3	No	2.9
WOS01	Westbury-on-Severn - Dentist Practice (Lay-by)	Roadside	371651	214042	NO2	None	0.0	>12	No	3.0
CIN03	Cinderford - 167 High St	Roadside	365637	214732	NO2	None	0.0	0.9	No	3.0

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 2020 (%) (2)	2016	2017	2018	2019	2020
CIN03	365637	214732	Roadside	100	80.8	23.1	21.4	21.6	22.7	16.5
CIN04	365637	214012	Roadside	100	90.4	*	22.9	23.9	24.2	18.7
CIN06	365659	214171	Roadside	100	90.4	*	*	*	27.3	23.4
COL01	357743	210600	Roadside	100	90.4	33.3	28.7	30.1	30.1	20.5
COL02	357551	210756	Roadside	100	75.0	22.5	19.3	21.7	22.0	15.5
COL03	357631	210785	Roadside	100	90.4	21.6	19.8	22.9	22.5	16.7
HUN03	372370	219678	Roadside	100	90.4	*	9.5	9.4	8.7	7.3
LON01	369176	218673	Roadside	100	73.1	*	*	*	18.1	17.0
LYD01	363147	203074	Roadside	100	90.4	39.5	36.9	**40.3**	**40.9**	30.3
LYD02	363527	203261	Roadside	100	90.4	22.4	20.1	20.3	19.0	15.6
LYD03	363036	202972	Roadside	100	7.7	38.8	36.9	33.0	33.5	-
LYD04	362971	202915	Roadside	100	90.4	37.0	34.1	36.2	36.5	27.0
LYD05	363494	203238	Roadside	100	90.4	32.7	31.5	33.3	35.1	26.5
LYD06	363185	203111	Roadside	100	90.4	38.2	38.7	38.9	37.5	27.5
LYD08	363109	203213	Roadside	100	90.4	36.2	34.1	37.8	36.6	25.2
LYD09	363042	203322	Roadside	100	90.4	33.7	32.6	35.1	34.2	26.2
LYD10	363408	203226	Roadside	100	90.4	23.2	22.7	24.4	24.5	18.6
LYD12	363607	203320	Roadside	100	82.7	29.2	25.4	27.2	27.0	20.4
LYD15	364087	204138	Roadside	100	90.4	11.9	9.4	9.3	9.0	6.9
LYD16	363142	203069	Roadside	100	90.4	*	36.9	37.0	37.9	28.4
LYD17, LYD18, LYD19	363160	203088	Roadside	100	90.4	*	30.6	37.4	35.1	26.3
LYD20	364196	203874	Roadside	100	51.9	*	*	*	*	18.5
MIT01	364108	218274	Roadside	100	80.8	26.5	25.2	25.6	23.8	17.9
NAI01	364566	216246	Roadside	100	90.4	31.1	29.5	29.4	28.7	22.1
NEW03	372117	226049	Roadside	100	90.4	*	26.2	28.6	28.1	20.1

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 2020 (%) (2)	2016	2017	2018	2019	2020
NOS02	369038	211590	Roadside	100	90.4	28.7	27.0	28.2	26.7	19.4
TUT01	353926	194467	Roadside	100	90.4	*	*	13.6	13.7	9.5
TUT02	354268	193950	Roadside	100	80.8	*	*	*	15.8	12.6
WOS01	371651	214042	Roadside	100	90.4	19.1	17.5	18.5	18.9	11.6
CIN03	365637	214732	Roadside	100	80.8	23.1	21.4	21.6	22.7	16.5
CIN04	365637	214012	Roadside	100	90.4	*	22.9	23.9	24.2	18.7
CIN06	365659	214171	Roadside	100	90.4	*	*	*	27.3	23.4

Notes:

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

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

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

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

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

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

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

Appendix B: Full Monthly Diffusion Tube Results for 2020

Table B.1 – NO_2 2020 Diffusion Tube Results ($\mu g/m^3$)

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Easting)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted (0.81)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
CIN03	365637	214732	24.8	17.8	19.6	17.4		15.9	14.0	18.8	22.3	21.6	31.0		20.3	16.5		
CIN04	365637	214012	32.4	22.4	21.5	17.6		14.5	18.7	21.7	24.7	21.1	30.3	29.7	23.1	18.7		
CIN06	365659	214171	39.2	22.9	28.9	28.8		19.3	18.5	30.0	33.9	27.3	34.1	35.4	28.9	23.4		
COL01	357743	210600	29.8	29.6	27.7	21.6		19.2	25.0	27.9	30.0	30.5	29.3	8.2	25.4	20.5		
COL02	357551	210756	28.4	21.7	20.6	14.4		13.1	12.9	16.6	Missing	20.9		23.4	19.1	15.5		
COL03	357631	210785	25.9	19.7	20.1	14.4		13.6	16.7	19.7	23.3	23.0	25.4	24.8	20.6	16.7		
HUN03	372370	219678	13.0	8.5	9.2	6.7		5.7	4.4	6.1	9.7	8.9	14.4	12.6	9.0	7.3		
LON01	369176	218673	25.4	missing	20.4	21.6		14.6	16.4	20.2	22.9	Missing	24.8	22.7	21.0	17.0		
LYD01	363147	203074	51.6	43.9	36.2	31.7		27.3	31.1	36.3	38.1	37.3	38.7	39.4	37.4	30.3		
LYD02	363527	203261	30.5	25.4	19.9	11.0		11.8	14.3	16.1	17.6	19.7	24.4	21.4	19.3	15.6		
LYD03	363036	202972	49.6	missing	missing	missing									-	-		
LYD04	362971	202915	47.4	39.1	34.1	28.8		19.4	24.8	30.1	33.0	35.1	37.0	37.2	33.3	27.0		
LYD05	363494	203238	48.8	39.2	30.7	21.2		22.7	25.2	30.7	33.0	36.0	37.4	34.8	32.7	26.5		
LYD06	363185	203111	44.7	34.4	35.1	28.2		23.8	26.5	32.9	34.5	35.3	39.0	38.9	33.9	27.5		
LYD08	363109	203213	44.6	35.5	30.9	26.3		22.3	4.0	37.4	36.7	33.0	36.9	35.4	31.2	25.2		
LYD09	363042	203322	46.5	36.2	29.1	21.7		22.7	27.3	32.4	33.0	34.7	38.8	33.7	32.4	26.2		
LYD10	363408	203226	32.2	23.6	21.8	17.1		17.1	16.7	22.6	24.9	23.5	26.6	26.1	22.9	18.6		
LYD12	363607	203320	31.8	27.5	26.9	23.3		16.9	missing	23.1	25.7	24.1	26.7	26.3	25.2	20.4		
LYD15	364087	204138	14.0	9.1	9.1	6.5		5.5	5.3	6.3	5.2	8.4	12.7	11.8	8.5	6.9		
LYD16	363142	203069	47.3	44.3	35.7	26.6		25.6	29.0	33.6	34.6	35.4	36.8	36.1	35.0	28.4		
LYD17	363160	203088	45.0	44.0	34.8	22.9		19.5	23.6	29.0	29.9	31.7	38.0	33.9	-	-		Triplicate Site with LYD17, LYD18 and LYD19 - Annual data provided for LYD19 only
LYD18	363160	203088	51.1	45.9	33.8	22.7		18.1	26.5	30.7	33.1	32.5	38.2	36.5	-	-		Triplicate Site with LYD17, LYD18 and LYD19 - Annual data provided for LYD19 only
LYD19	363160	203088	52.6	24.4	32.0	22.2		20.2	27.3	31.8	34.4	32.6	39.7	31.6	32.4	26.3		Triplicate Site with LYD17, LYD18 and LYD19 - Annual data provided for LYD19 only
LYD20	364196	203874							20.0	21.1	23.5	26.6	24.4	26.2	23.6	18.5		
MIT01	364108	218274	28.2	23.1	21.5	16.8		17.9	17.4	20.2	24.5	23.8	27.4		22.1	17.9		
NAI01	364566	216246	32.9	29.6	25.7	19.6		23.1	24.4	26.0	29.5	28.9	30.8	30.0	27.3	22.1		
NEW03	372117	226049	30.8	19.7	25.1	23.6		17.0	15.7	24.5	28.1	23.3	32.5	32.9	24.8	20.1		
NOS02	369038	211590	33.9	21.7	26.5	19.8		18.6	16.0	22.7	27.1	24.9	27.7	24.5	23.9	19.4		
TUT01	353926	194467	19.6	11.1	12.2	9.5		7.6	5.7	8.2	9.3	12.4	17.7	15.6	11.7	9.5		
TUT02	354268	193950	22.2	14.4	18.0	10.8		11.8	8.5	missing	17.3	15.2	18.3	19.2	15.6	12.6		
WOS01	371651	214042	23.2	15.2	14.2	4.6		9.2	10.1	12.1	15.1	15.7	19.3	19.0	14.3	11.6		
CIN03	365637	214732	24.8	17.8	19.6	17.4		15.9	14.0	18.8	22.3	21.6	31.0		20.3	16.5		

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Easting)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted (0.81)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
CIN04	365637	214012	32.4	22.4	21.5	17.6		14.5	18.7	21.7	24.7	21.1	30.3	29.7	23.1	18.7		
CIN06	365659	214171	39.2	22.9	28.9	28.8		19.3	18.5	30.0	33.9	27.3	34.1	35.4	28.9	23.4		
COL01	357743	210600	29.8	29.6	27.7	21.6		19.2	25.0	27.9	30.0	30.5	29.3	8.2	25.4	20.5		
COL02	357551	210756	28.4	21.7	20.6	14.4		13.1	12.9	16.6	Missing	20.9		23.4	19.1	15.5		
COL03	357631	210785	25.9	19.7	20.1	14.4		13.6	16.7	19.7	23.3	23.0	25.4	24.8	20.6	16.7		
HUN03	372370	219678	13.0	8.5	9.2	6.7		5.7	4.4	6.1	9.7	8.9	14.4	12.6	9.0	7.3		
LON01	369176	218673	25.4	missing	20.4	21.6		14.6	16.4	20.2	22.9	Missing	24.8	22.7	21.0	17.0		
LYD01	363147	203074	51.6	43.9	36.2	31.7		27.3	31.1	36.3	38.1	37.3	38.7	39.4	37.4	30.3		

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

C.1 New or Changed Sources Identified Within Forest of Dean District During 2020

Forest of Dean District Council has not identified any new sources relating to air quality within the reporting year of 2020.

C.2 Additional Air Quality Works Undertaken by Forest of Dean District Council During 2020

Forest of Dean District Council has not completed any additional works within the reporting year of 2020.

C.3 QA/QC of Diffusion Tube Monitoring

Diffusion Tube Bias Adjustment Factors

The diffusion tube data presented within the 2020 ASR have been corrected for bias using an adjustment factor.

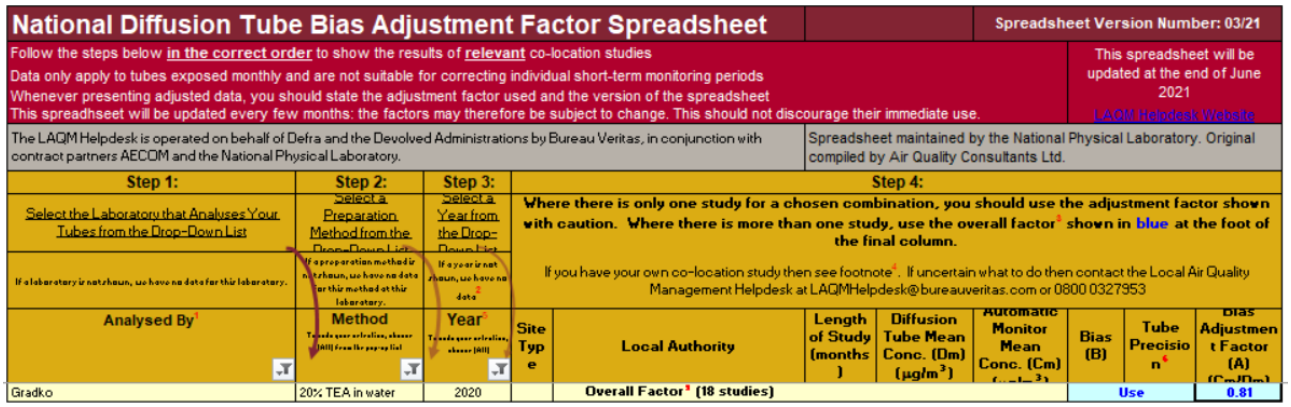
Bias represents the overall tendency of the diffusion tubes to under or over-read relative to the reference chemiluminescence analyser. LAQM.TG16 provides guidance with regard to the application of a bias adjustment factor to correct diffusion tube monitoring. Triplicate co-location studies can be used to determine a local bias factor based on the comparison of diffusion tube results with data taken from NO_x/NO_2 continuous analysers. Alternatively, the national database of diffusion tube co-location surveys provides bias factors for the relevant laboratory and preparation method.

The diffusion tubes (20% TEA in water) were supplied and analysed by Gradko. The tubes at all locations have a monthly exposure period. A bias adjustment factor of 0.81, based upon 27 studies, was obtained via the national bias spreadsheet, and this was applied to all diffusion tubes. This spreadsheet is available at:

http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html

The details are given in Table C.1 below.

Table C.1 – National Bias Adjustment Spreadsheet



National Diffusion Tube Bias Adjustment Factor Spreadsheet — Spreadsheet Version Number: 03/21

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 spreadsheet 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 2021
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:	Step 2:	Step 3:	Step 4:								
Select the Laboratory that Analyses Your Tubes from the Drop-Down List	Select a Preparation Method from the Drop-Down List	Select a Year from the Drop-Down List	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 a laboratory is not shown, we have no data for this laboratory.	If a preparation method is not shown, we have no data for this method at this laboratory.	If a year is not shown, we have no data[2]	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	Year[2]	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)
Gradko	20% TEA in water	2020		Overall Factor[3] (18 studies)				Use		0.81

A summary of bias adjustment factors used by Forest of Dean District Council over the past five years is presented in 2.

Table C.2 – Bias Adjustment Factor

Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2020	National	03/21 (27 studies)	0.81
2019	National	03/20 (27 studies)	0.93
2018	National	03/19 (39 studies)	0.92
2017	National	06/18 (39 studies)	0.87
2016	National	09/17 (32 studies)	0.92

Effects of Pandemic on Diffusion Tube Placement

It should be noted that the diffusion tubes were not placed around the District during April 2020 (for the period April-May 2020). This was due to the Covid pandemic and specifically because of the availability of staff due to emergency duties. The monitoring was resumed the following month.

Diffusion Tube Annualisation

Where monitoring has been completed for less than 75% of the year, annualisation techniques can be used to estimate an annual average from a part year average. For annualisation to be completed there must be 3 months of monitoring data available.

In 2020, all but 2 diffusion tube monitoring locations within Forest of Dean District recorded data capture of 75%. Of the 2 sites, one was location LYD03 which, because the data capture was below 25% (LYD03) did not require annualisation. The other site was location LYD20. This was a new site set up in July 2020 and thus there was just 6 months' worth of data available.

A measured mean concentration for the period of exposure is available for this location. However it will be necessary to estimate the annual mean for comparison with the annual target concentration, because of less than 75% availability for this area.

The procedure involves the following steps:

1. Identification of two to four nearby, long-term, continuous monitoring sites, ideally those forming part of the national network. The data capture for each of these sites should ideally be at least 85%. These sites should be background (Urban Background, Suburban or Rural) sites to avoid any very local effects that may occur at Urban Centre, Roadside or Kerbside sites, and should, wherever possible lie within a radius of about 50 miles. If no background sites are available, and the site to be annualised is itself a Urban Centre, Roadside or Kerbside site, then it is permissible to annualise using roadside or kerbside sites rather than background sites.

   The nearest sites that have characteristics similar to the areas requiring annualisation are the two AURN sites located in Bristol (St Pauls) and Chepstow, respectively. Both are located in surburban rather than major urban settings, to approximate to the situation for comparison in Lydney:

   - Bristol St Pauls: the monitoring station is located within the car park of a day nursery. The monitoring station is approximately 30 metres south east of Wilder Street, a lightly trafficked urban back street. The surrounding area is primarily residential, with some commercial premises in the immediate vicinity.
   - Chepstow: the monitoring station is located on the north side of the A48 Newport Road at the junction with Hardwick Hill Lane. The surrounding area is open with residential dwellings.
2. Obtain the annual means, 'Am', for the calendar year for these sites.
3. Work out the period means, 'Pm', for the period of interest, in this case Jul-Dec 2020.

4. Calculate the ratio, 'R', of the annual mean to the period mean ('Am/Pm') for each of the sites.
5. Calculate the average of these ratios, 'Ra'. This is then the annualisation factor.
6. Multiply the measured period mean concentration 'M' by this annualisation factor Ra to give the estimate of the annual mean for 2020.

This calculation is performed via the Diffusion Tube Data Processing Tool, supplied by DEFRA. The output from the annualisation calculation is shown below:

Diffusion Tube ID	Annualisation Factor AURN St Pauls Bristol	Annualisation Factor AURN Chepstow	Average Annualisation Factor	Raw Data Simple Annual Mean (µg/m3)	Annualised Data Simple Annual Mean (µg/m3)	Comments
LYD20	0.9549	0.9719	0.9634	23.6	22.8	

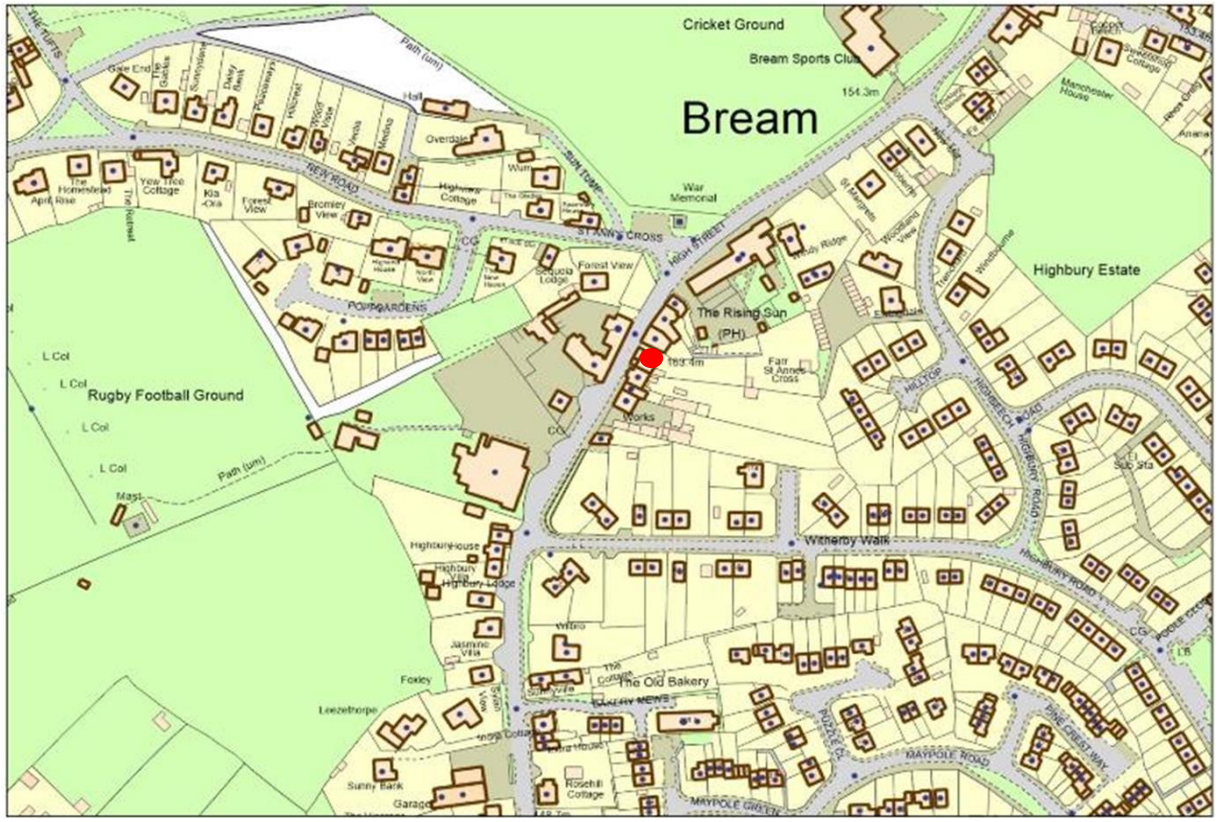
NO_2 Fall-off with Distance from the Road

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

In 2020 no adjustments for fall-off with distance from the road needed to be made.

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

Figure D.1 – Maps of Monitoring Locations



Legend

Diffusion Tube Locations

AQMA Boundary

Location:

BRE01 Bream

Title

Diffusion Tube Location

Date	**Figure No.**
June 2021	D1

Legend

Diffusion Tube Locations

AQMA Boundary

Location:

CIN03 - Bottom High Street, Cinderford

Title

Diffusion Tube Location

Date	**Figure No.**
Jun 2021	D2

Legend

Diffusion Tube Locations

AQMA Boundary

Location:

CIN04 - Market Street, Cinderford

Title

Diffusion Tube Locations

Date	**Figure No.**
June 2021	D3

Legend

Diffusion Tube Locations

AQMA Boundary

Location:

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

Title

Diffusion Tube Locations

Date	**Figure No.**
June 2021	D4

Legend

Diffusion Tube Locations

AQMA Boundary

Location:

COL01 - Gloucester Road, Coleford

COL02 – Market Place, Coleford

Title

Diffusion Tube Locations

Date	**Figure No.**
June 2021	D5

Legend

Diffusion Tube Locations

AQMA Boundary

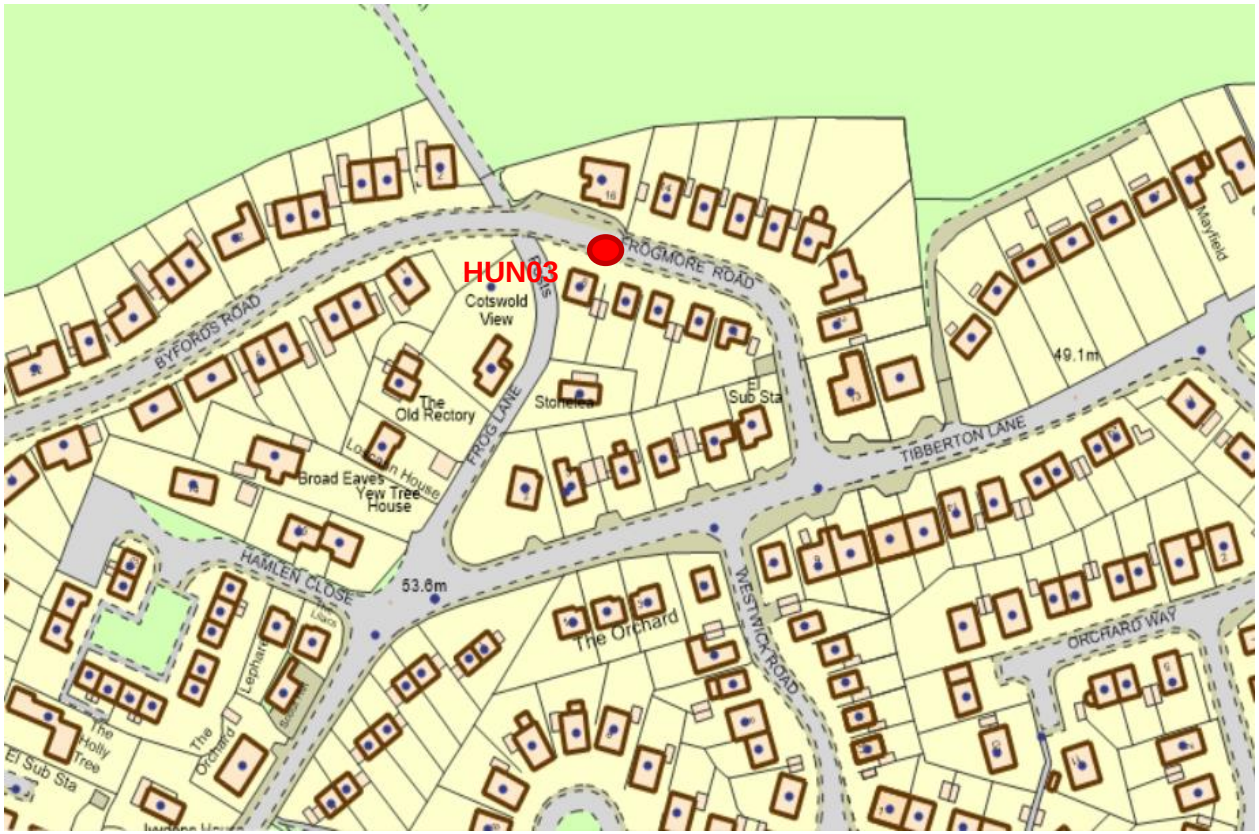
Location:

COL03 – Old Vicarage Court, Coleford

Title

Diffusion Tube Locations

Date June 2021	**Figure No.** D6



Legend

Diffusion Tube Locations

AQMA Boundary

Location:

HUN03 Huntley - opposite 9 Frogmore Road

Title

Diffusion Tube Locations

Date	**Figure No.**
June 2021	D7

Legend

Diffusion Tube Locations

AQMA Boundary

Contains Ordnance Survey Data Crown Copyright and Database Right [2021]

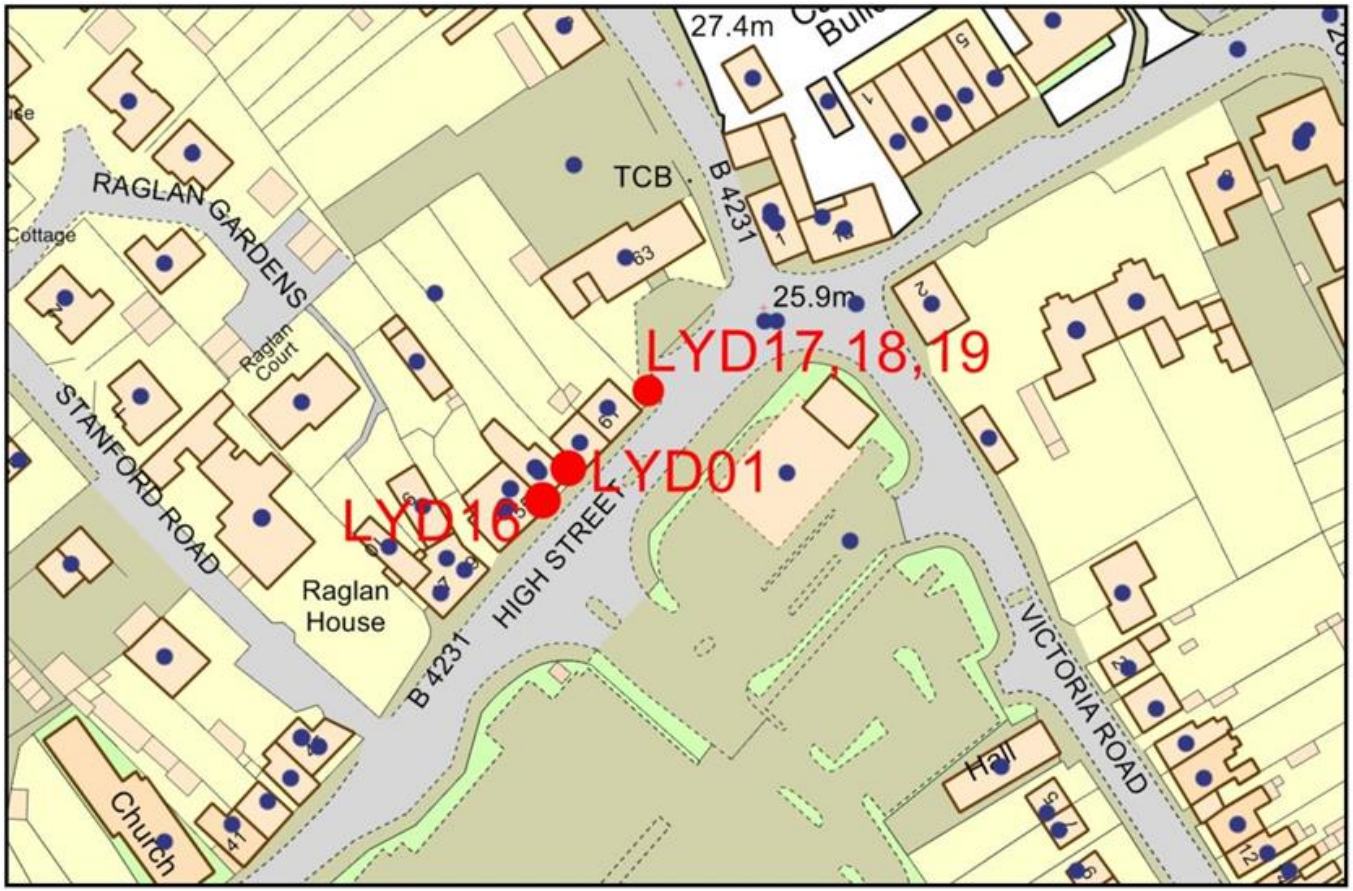
Location:

LON01 Longhope

Title

Diffusion Tube Locations

Date	**Figure No.**
June 2021	D8



Legend

Diffusion Tube Locations

AQMA Boundary

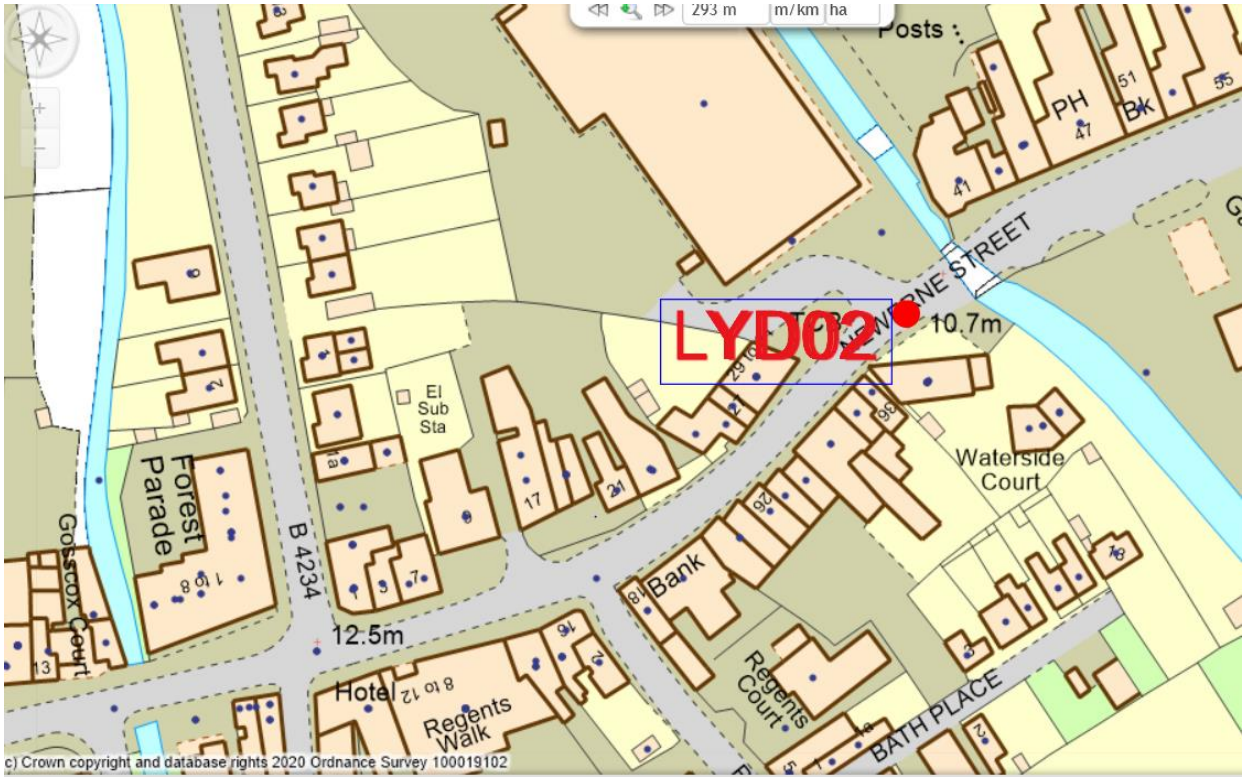
Location:

LYD01, LYD16,17,18,19 – Top High Street, Lydney

Title

Diffusion Tube Locations

Date	**Figure No.**
June 2021	D9



Legend

Diffusion Tube Locations

AQMA Boundary

Contains Ordnance Survey Data Crown Copyright and Database Right [2021]

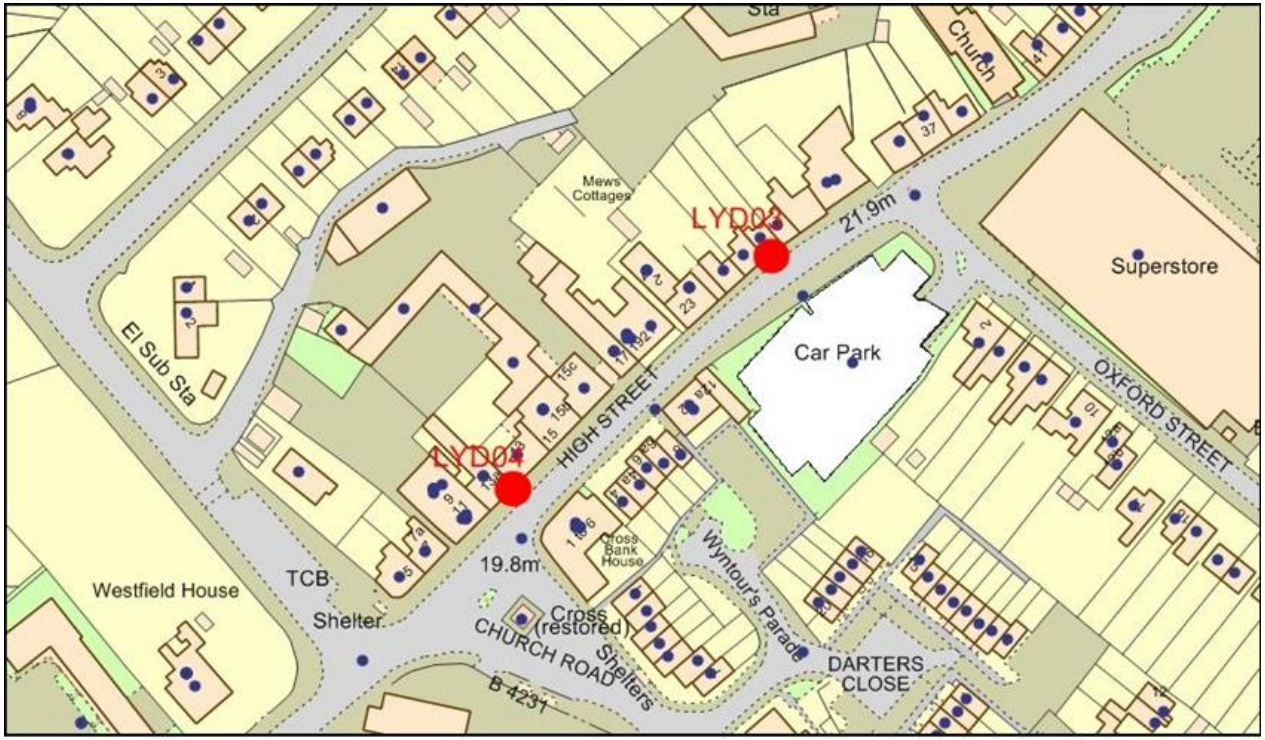
Location:

LYD02 – Newerne St, Bridge House, Lydney

Title

Diffusion Tube Locations

Date	**Figure No.**
June 2021	D10



Legend

Diffusion Tube Locations

AQMA Boundary

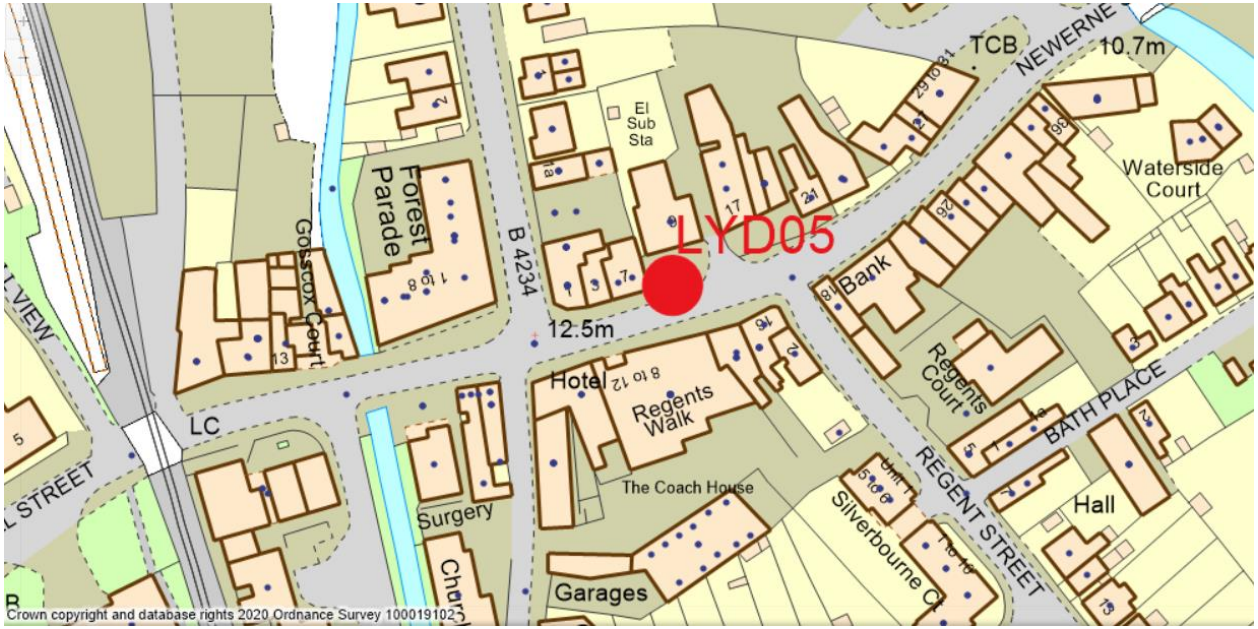
Location:

LYD03 - 33 High Street Lydney, LYD04 - 13 High Street, Lydney

Title

Diffusion Tube Locations

Date	**Figure No.**
June 2021	D11



Legend

Diffusion Tube Locations

AQMA Boundary

Contains Ordnance Survey Data Crown Copyright and Database Right [2021]

Location:

LYD05 Unit 1, Regents Arcade, Lydney

Title

Diffusion Tube Locations

Date	**Figure No.**
June 2021	D12

Legend

Diffusion Tube Locations

AQMA Boundary

Contains Ordnance Survey Data Crown Copyright and Database Right [2021]

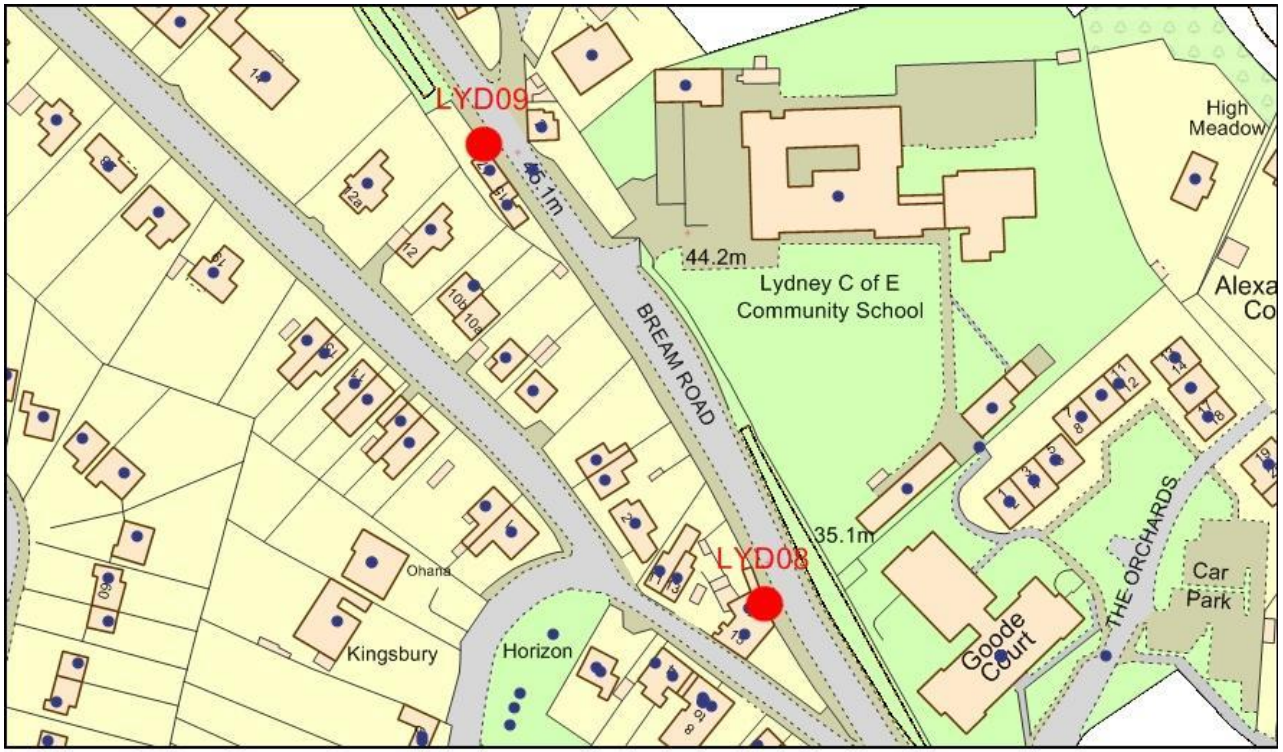
Location:

LYD06 Unit 1, Regents Arcade, Lydney

Title

Diffusion Tube Locations

Date	**Figure No.**
June 2021	D13



Legend

Diffusion Tube Locations

AQMA Boundary

Location:

LYD08 13 Bream Road, Lydney

LYD09 17 Bream Road, Lydney

Title

Diffusion Tube Locations

Date	**Figure No.**
June 2021	D14

Legend

Diffusion Tube Locations

AQMA Boundary

Contains Ordnance Survey Data Crown Copyright and Database Right [2021]

Location:

LYD10 Old Chip Shop, Forest Road, Lydney

LYD12 Kaplans, 61 Newerne Street, Lydney

Title

Diffusion Tube Locations

Date	**Figure No.**
June 2021	D15

Legend

Diffusion Tube Locations

AQMA Boundary

Contains Ordnance Survey Data Crown Copyright and Database Right [2021]

Location:

LYD15, Highfield Lane, Lydney (background)

Title

Diffusion Tube Locations

Date	**Figure No.**
June 2021	D16

Legend

Diffusion Tube Locations

AQMA Boundary

Location:

LYD20 - 2 Cross Hands, Highfield Road, Lydney

Title

Diffusion Tube Locations

Date	**Figure No.**
June 2021	D17

Legend

Diffusion Tube Locations

AQMA Boundary

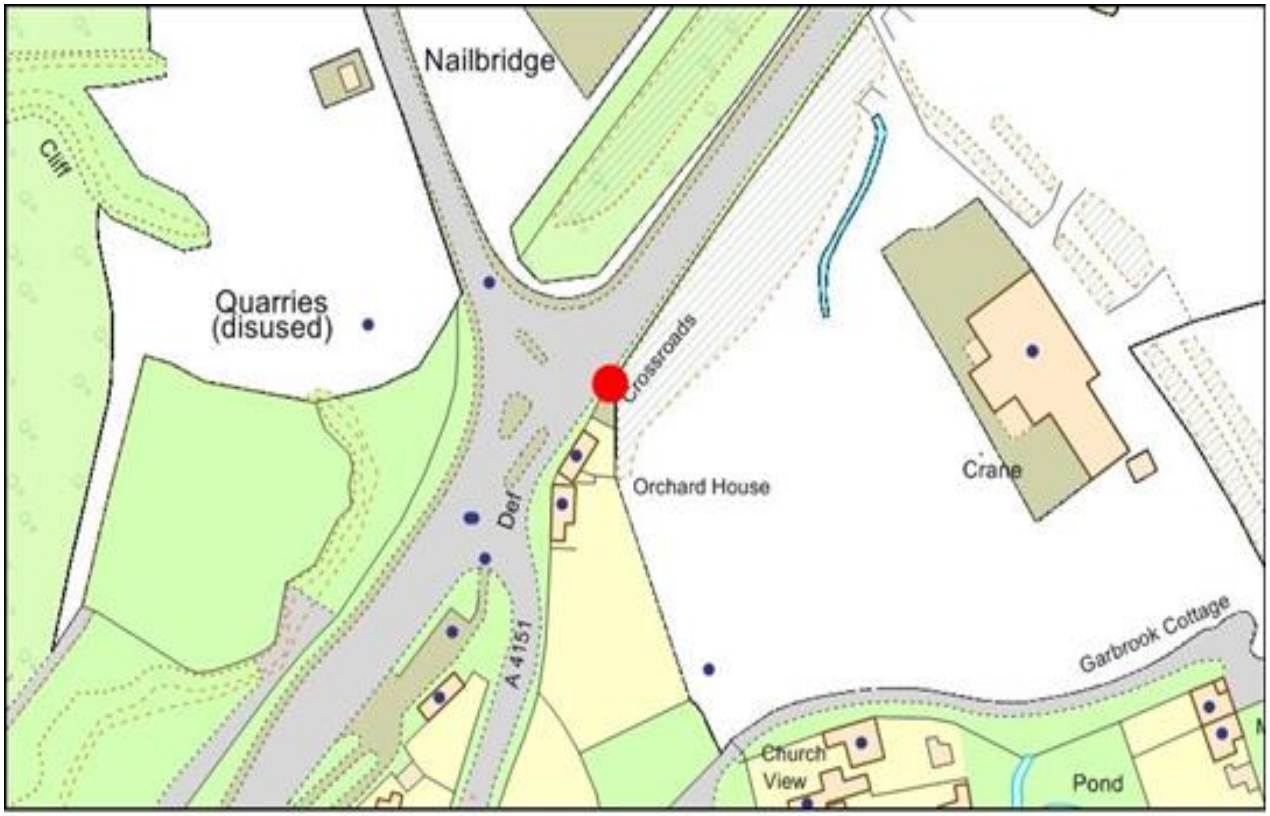
Location:

MIT01 - 25 The Merrin, Mitcheldean

Title

Diffusion Tube Locations

Date	**Figure No.**
June 2021	D18



Legend

Diffusion Tube Locations

AQMA Boundary

Contains Ordnance Survey Data Crown Copyright and Database Right [2021]

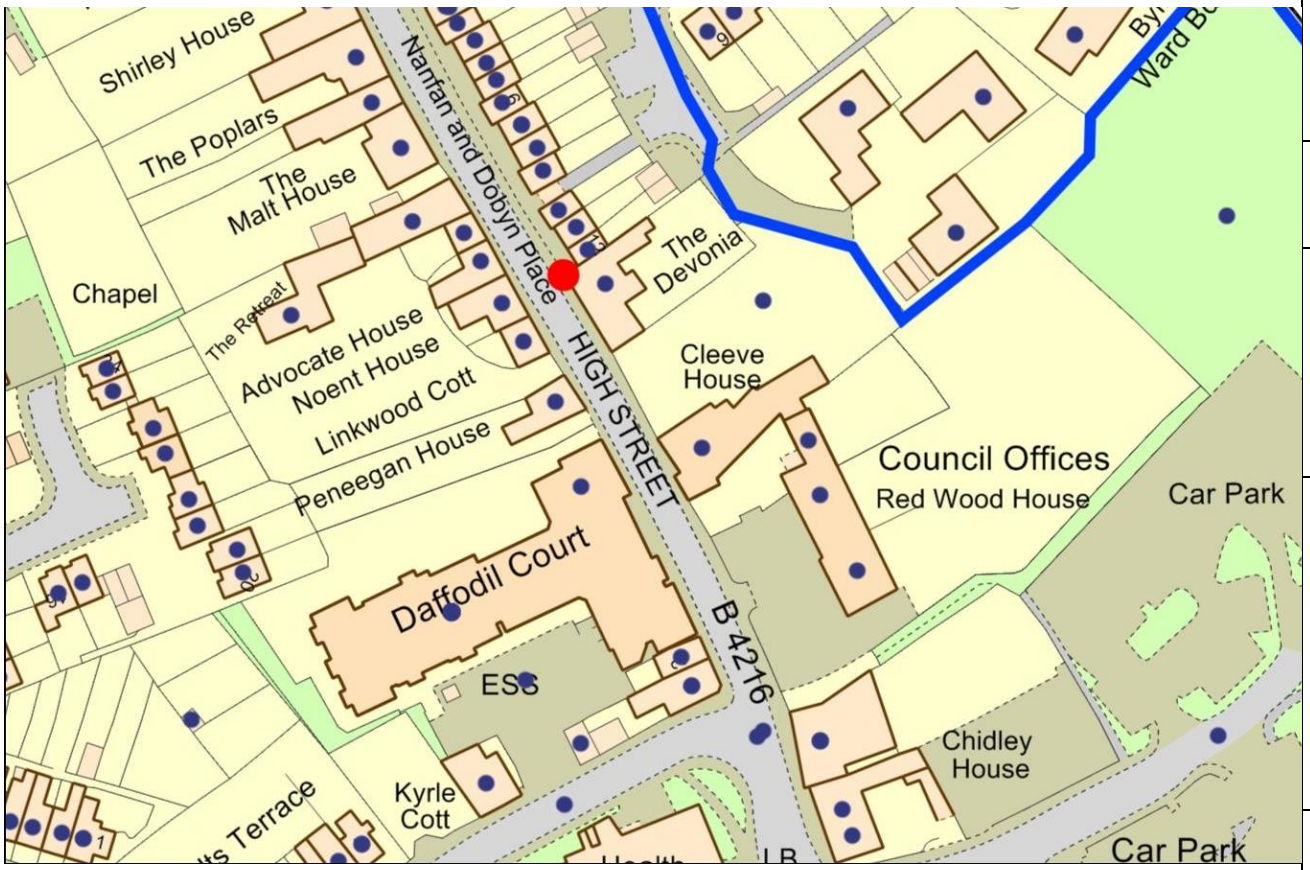
Location:

NAI01 Crossroads, Nailbridge

Title

Diffusion Tube Locations

Date	**Figure No.**
June 2021	D19



Legend

Diffusion Tube Locations

AQMA Boundary

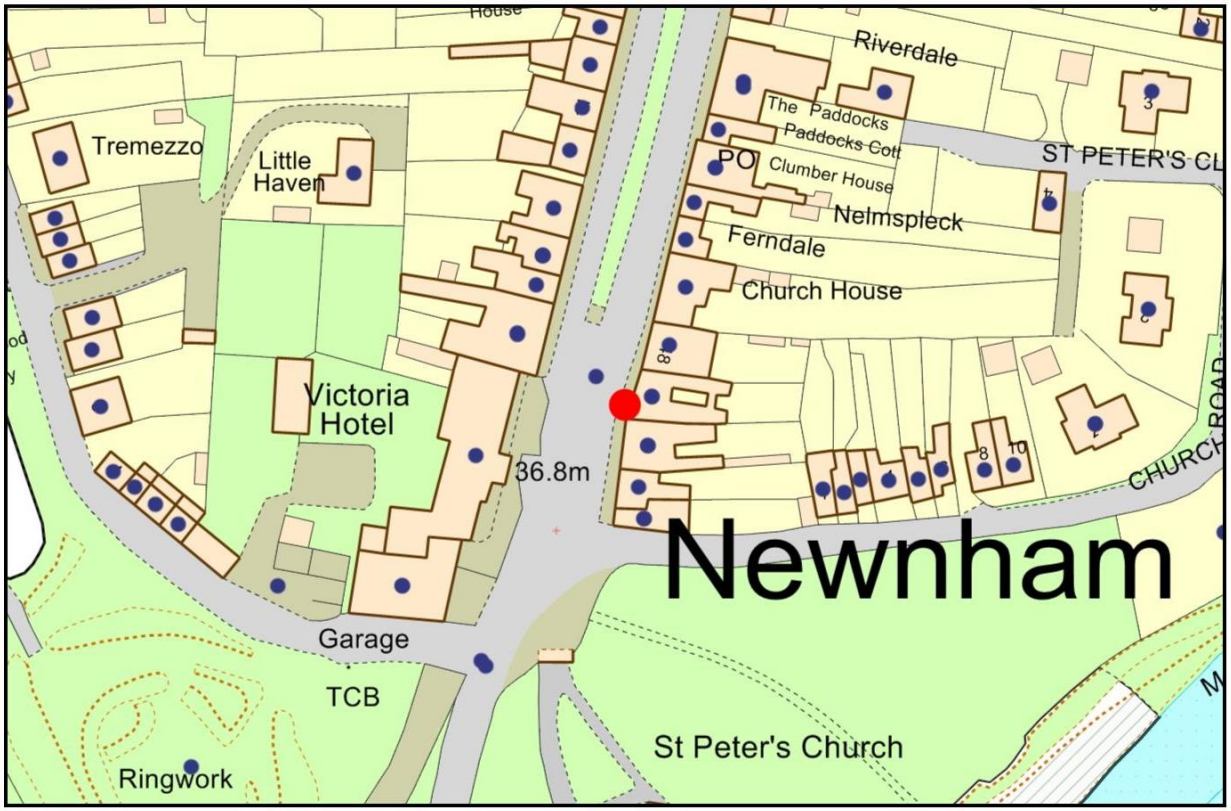
Location:

NEW03 High Street, Newent

Title

Diffusion Tube Locations

Date	**Figure No.**
June 2021	D20



Legend

Diffusion Tube Locations

AQMA Boundary

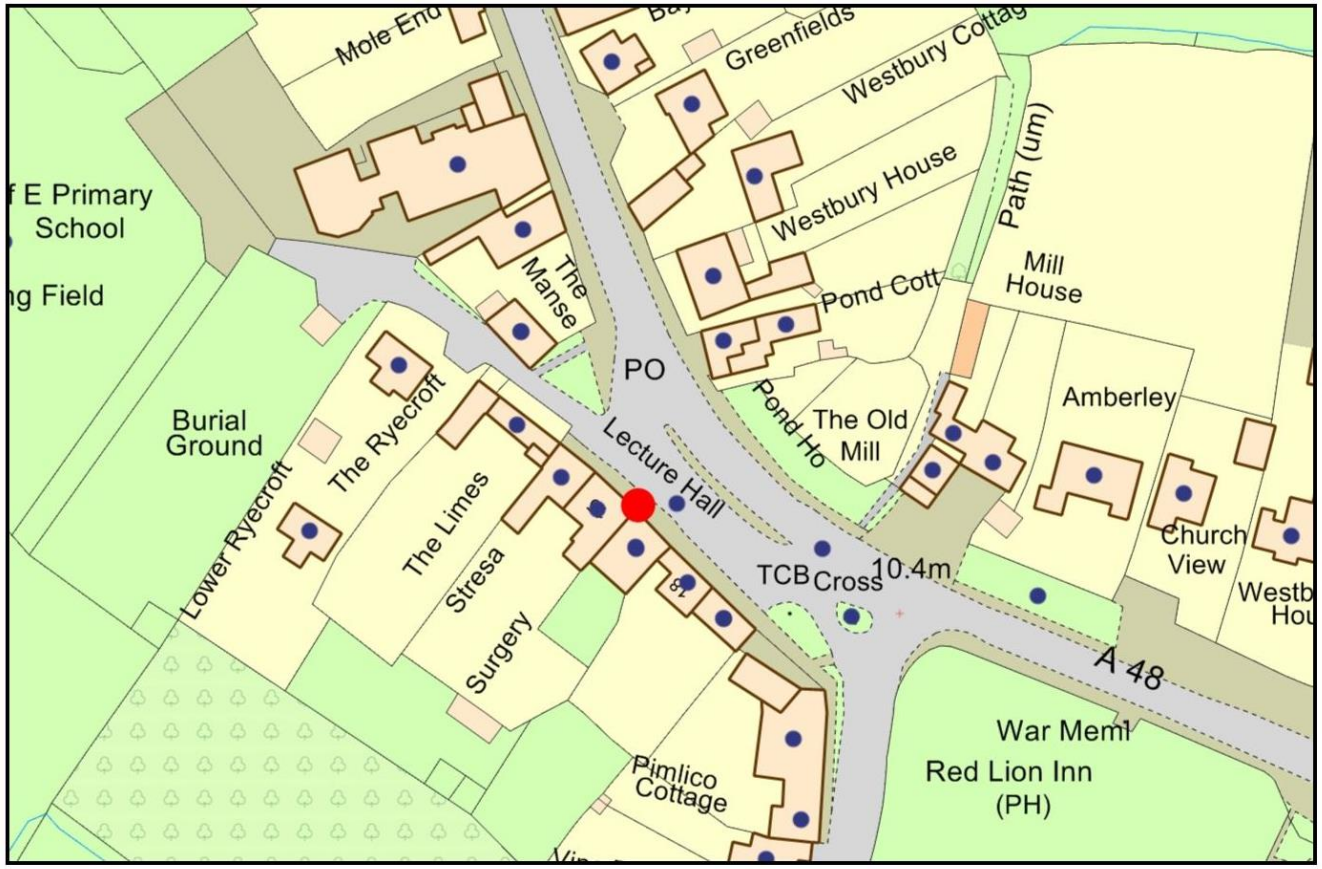
Location:

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

Title

Diffusion Tube Locations

Date	**Figure No.**
June 2021	D21



Legend

Diffusion Tube Locations

AQMA Boundary

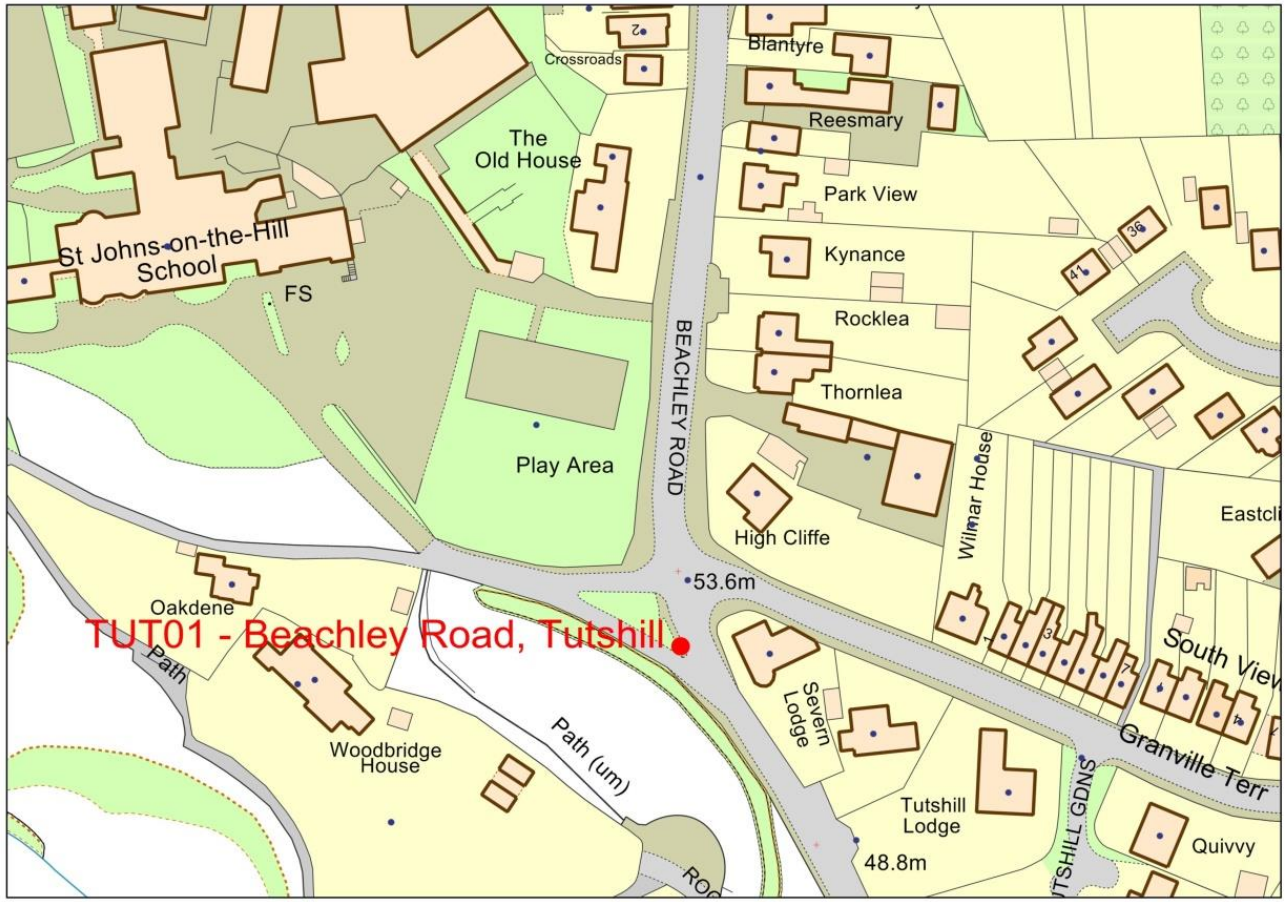
Location:

WOS01 Westbury-on-Severn - Dentist Practice (Lay-by)

Title

Diffusion Tube Locations

Date	**Figure No.**
June 2021	D22



Legend

Diffusion Tube Locations

AQMA Boundary

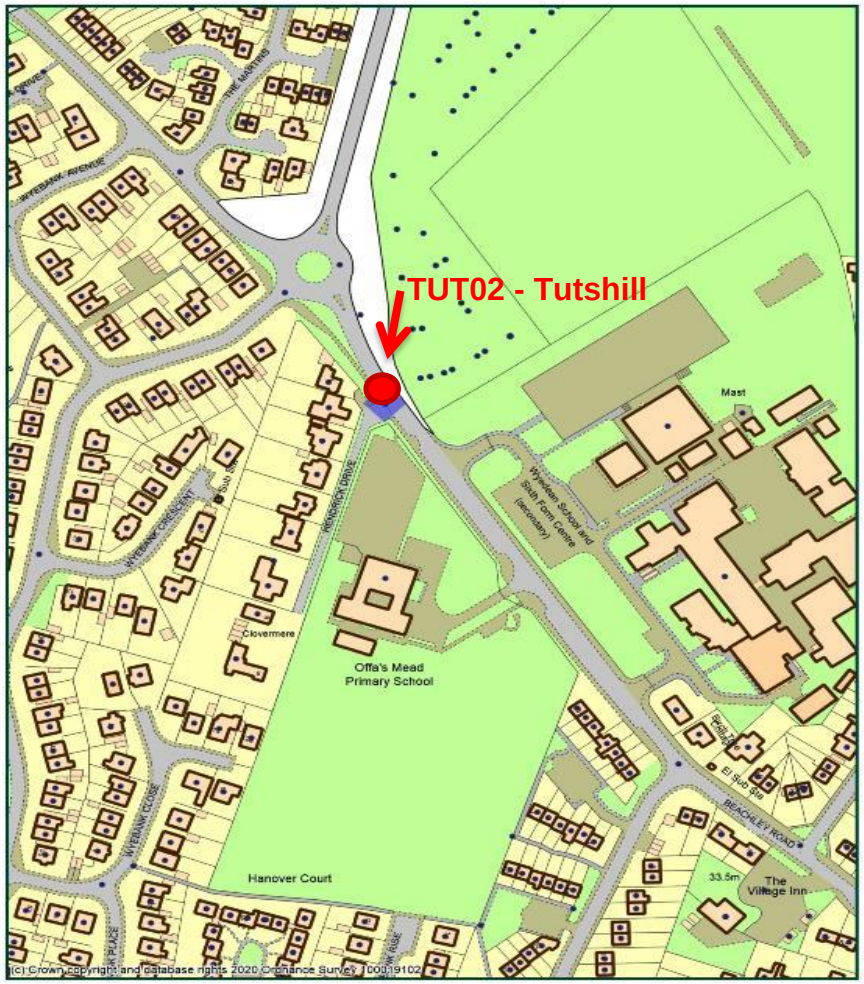
Location:

TUT01 Beachley Road, Tutshill

Title

Diffusion Tube Locations

Date	**Figure No.**
June 2021	D23



Forest of Dean

Scale: 1:2000

20 May 2020

(c) Crown copyright and database rights 2019 Ordnance Survey 100019102

Legend

Diffusion Tube Locations

AQMA Boundary

Contains Ordnance Survey Data Crown Copyright and Database Right [2021]

Location:

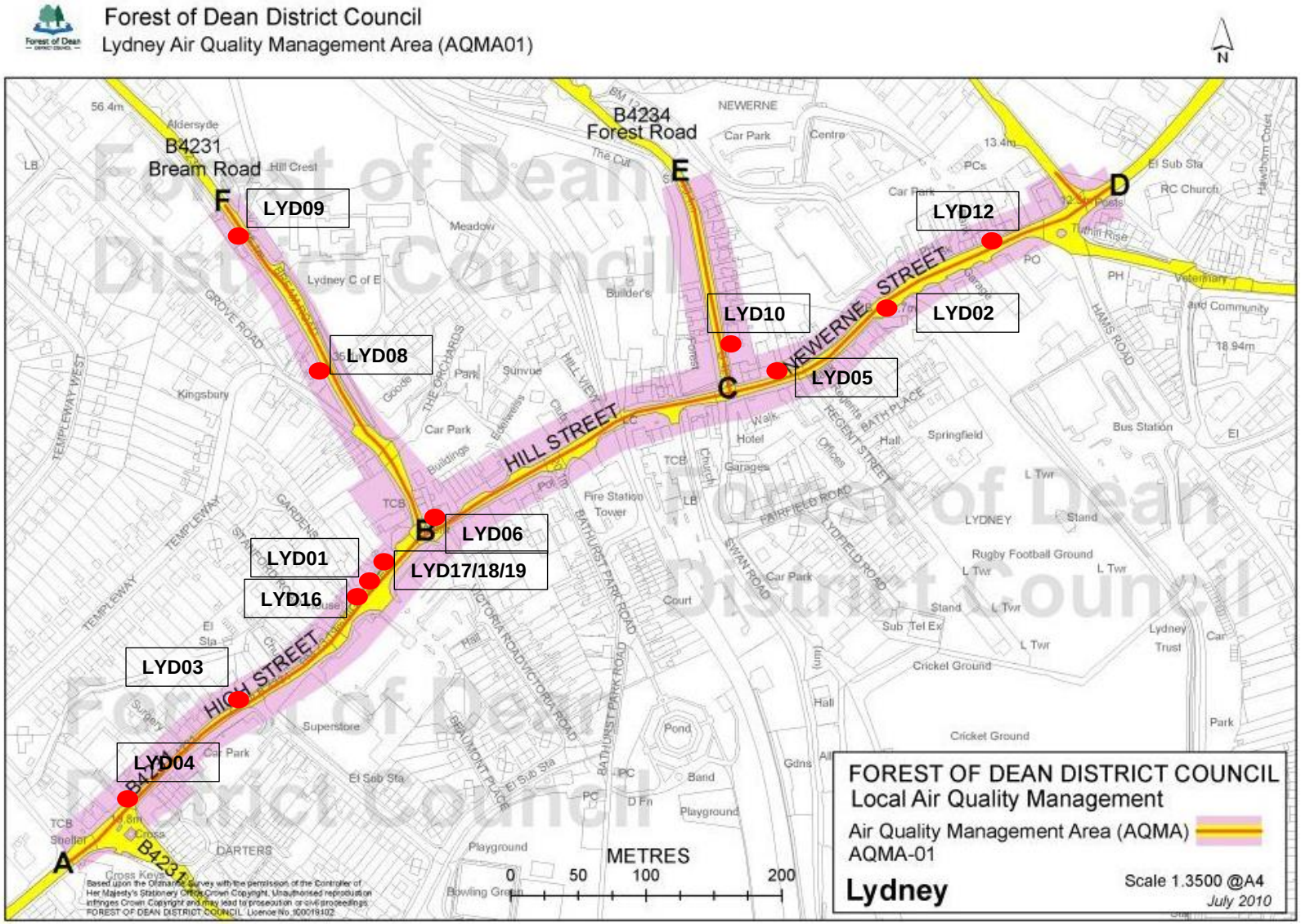
TUT02 Tutshill - Beachley Rd - Wyedean School

Title

Diffusion Tube Locations

Date	**Figure No.**
June 2021	D24

Figure D25 Lydney AQMA Boundary Plan with diffusion tube positions



Appendix E: Summary of Air Quality Objectives in England

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

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

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

Appendix F: Impact of COVID-19 upon LAQM

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

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

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

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

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

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

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

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

Impacts of COVID-19 on Air Quality within Forest of Dean District

The reduction in NO_2 concentrations compared to pre-pandemic levels and their subsequent recovery as 2020 progressed are covered in Chapter 3 above. In both of our AQMAs the reduction in raw NO_2 concentrations in May 2020 was as much as 30-40% at Lydney AQMA. By September when many restrictions on social movement had been lifted NO_2 levels returned to near pre-pandemic levels. This is further evidence, if it were needed, that reducing traffic volumes in our streets has a positive impact on air quality.

Opportunities Presented by COVID-19 upon LAQM within Forest of Dean District

It is considered that the pandemic has provided incentive for outdoor activities in particular cycling. The Forest of Dean District is well placed for this and new cycleway schemes have either been completed or are in the pipeline to support this activity.

Challenges and Constraints Imposed by COVID-19 upon LAQM within Forest of Dean District

The main challenges and constraints that have been experienced in relation to local air quality management within 2020 that can be attributed to the pandemic were in relation to staff availability. At the initial stages of the pandemic, staff were diverted to emergency

duties and unavailable for tube placement and collection. However, this affected just one month and usual service was resumed after April.

Glossary of Terms

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

References

- Local Air Quality Management Technical Guidance LAQM.TG16. April 2021. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.
- Local Air Quality Management Policy Guidance LAQM.PG16. May 2016. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.