



2019 Air Quality Annual Status Report (ASR)

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

June 2019

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Executive Summary: Air Quality in Our Area

Air quality across the Forest of Dean District remains very good, with measured levels of nitrogen dioxide (NO₂) generally well within national limits.

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 (NO₂) levels which exceeded the national air quality objectives at the time the AQMA was declared.

Monitoring throughout 2018 has not identified any other exceedances in the Forest of Dean District.

This year the diffusion tube survey results were mostly marginally higher (about 1-2 ug^m⁻³) than those recorded last year. Within the AQMA, the results were again slightly higher than last year, close to and in one location just above (40.07ug/m³) the national air quality objective of 40ug/m³. These monitoring points within the AQMA were the only sites with nitrogen dioxide levels within 10 per cent of the annual average air quality objective (i.e. above 36ugm⁻³).

As pollutant concentrations may vary significantly from one year to the next, due to the influence of meteorological conditions, it is not desirable to revoke our AQMA whilst we have sites still measuring levels within 10% of the national objective level, set to protect health. Our monitoring survey around the District will continue, in conjunction with planning controls in accordance with national guidance, to try to ensure that pollution levels do not approach the national air quality objective and that those within our AQMA remain closely monitored.

Within Forest of Dean District Council's administrative area there are no point sources of pollution that give rise to concern in respect of air quality. No new or significantly changed sources have been identified within the district. All proposed residential and industrial developments are considered with regard to their potential to increase traffic pollution in the AQMA and other areas.

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

The annual health cost to society of the impacts of particulate matter alone in the UK is estimated to be around £16 billion¹.

In common with most local authority districts in England and Wales, the main pollutant of concern within Forest of Dean District is nitrogen dioxide from road traffic. Nationwide, levels of nitrogen dioxide have been steadily falling over the years.

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.

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

The nitrogen dioxide diffusion tube survey results were similar to those recorded last year albeit slightly increased in most areas. Our 2018 monitoring programme confirms that within the Lydney Air Quality Management Area (AQMA), the nitrogen dioxide annual mean objective is only exceeded at one location, (although 4 monitoring sites within the AQMA, including the site where we locate 3 tubes together for quality control purposes, recorded levels within 10% of the objective) and at all other monitoring locations it continues to be comfortably met.

The 2005 – 2018 Forest of Dean District Council Air Quality reports are available online at:

<https://www.fdean.gov.uk/residents/environment/environmental-health/air-quality/>

¹ Defra. Abatement cost guidance for valuing changes in air quality, May 2013

Actions to Improve Air Quality

Lydney Air Quality Management Area (AQMA) was declared in July 2010 and a subsequent “Further Assessment” was submitted to DEFRA in June 2011. It is thought that congestion at the T-junction which is in a “street canyon” (i.e. the buildings by the roadside are high compared to the width of the road, preventing exhaust emissions from dispersing easily) was the cause of the previously higher NO₂ levels.

Since the “Further Assessment”, there has been an investigation into options to improve air quality in the AQMA. The key change, that may have brought about the required improvement, is the introduction of a 20 mph speed limit in Lydney High Street; it is thought that this 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. Meteorological conditions are also known to impact upon pollution levels as they affect dispersion of polluting emissions.

Gloucestershire County Council is responsible for strategies relating to traffic management across the county. Further details of these strategies can be found at <http://www.gloucestershire.gov.uk/ltp3>

The Overarching Transport Strategy is supported by further policy documents relating to: Bus, Cycle, Freight, Highways, Rail and Think Travel.

Local Priorities and Challenges

The nitrogen dioxide diffusion tube monitoring programme will continue and we will review results on a monthly basis, as they are received. We will work with our Planning Department and the County Planning and Highways Departments to ensure that developers of agreed new developments consider potential air quality impacts from the outset, so as not to cause undue deterioration of air quality in the District. We will follow national guidance to ensure air quality impacts are assessed for proposed developments and that any potential adverse impacts are mitigated as necessary.

How to Get Involved

Copies of the latest Air Quality Report can be found on the Council's Website at:

<http://www.fdean.gov.uk/residents/environment/environmental-health/air-quality>

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.pollution@publicagroup.uk

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1 Local Air Quality Management

This report provides an overview of air quality in Forest of Dean District during 2018. 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 occurs or 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 Council to improve air quality and any progress that has been made.

The statutory air quality objectives applicable to LAQM in England can be found in Table E.1 in Appendix E.

2 Actions to Improve Air Quality

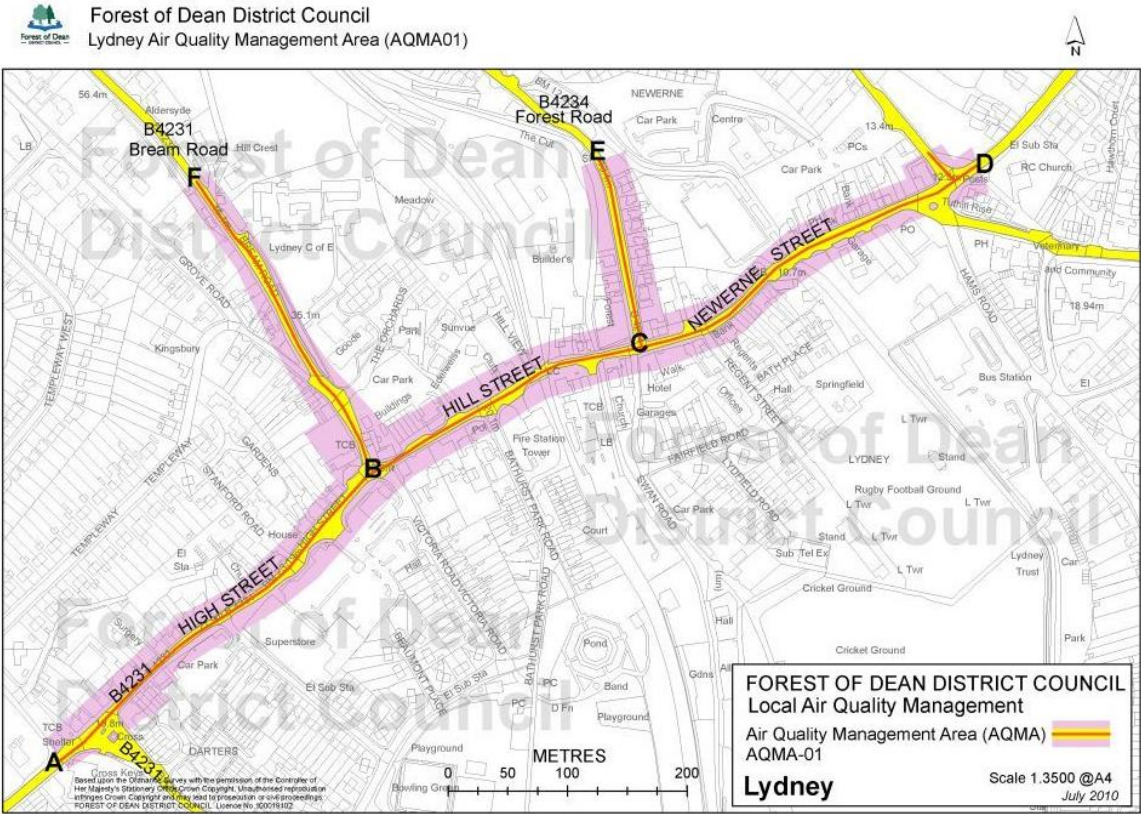
2.1 Air Quality Management Areas

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

The Forest of Dean District Council declared Lydney AQMA in July 2010.

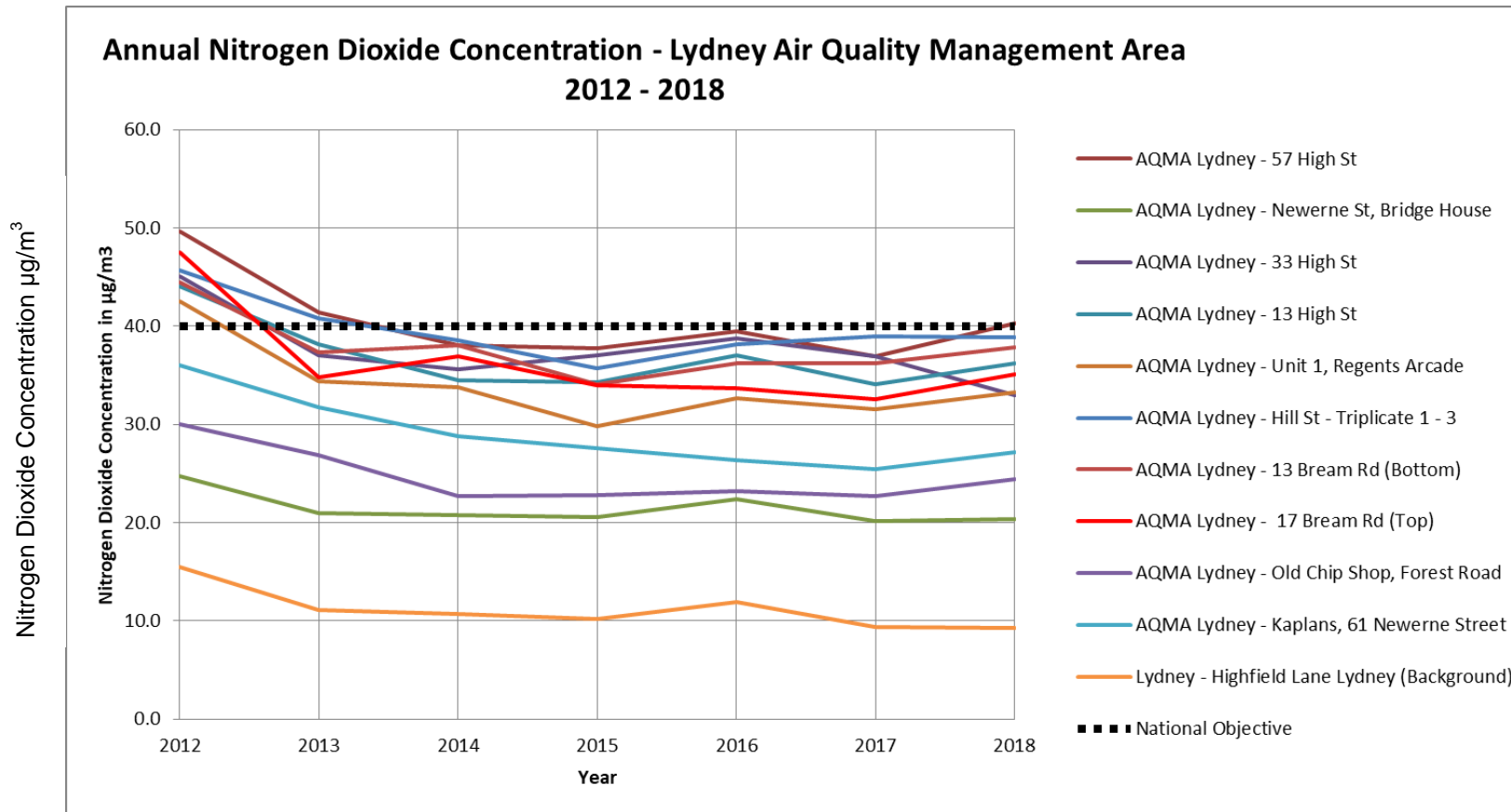
This AQMA was designated in relation to a likely breach of the nitrogen dioxide (annual mean) objective as specified in the Air Quality Standards Regulations 2007.

Figure 2.1- Map of Lydney AQMA Boundaries



The outlined area on the map above (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 C of E Primary School (F); and Forest Road from Hill Street (C) to just past 17 Forest Road (E).

Fig. 2.2 Graph showing the trend over the last 7 years of nitrogen dioxide levels within the Lydney AQMA



If we compare the nitrogen dioxide concentrations measured in our Lydney AQMA during the last three or four years with those of 2013 it can be seen that at the 4 sites where the readings were the highest in 2013 (around 40µg/m³ or above) there has been a decrease in levels, but that the levels have not changed much. This year, with the exception of location LYD01, at High Street Lydney, all measured levels within the AQMA are below the 40µg/m³ national objective (marked with a black line on the graph). At all the other sites, where the concentration did not exceed 40µg/m³ in 2013, the levels similarly have not changed significantly since that time.

Table 2.1 – Declared Air Quality Management Area

AQMA Name	Pollutants and Air Quality Objectives	City / Town	One Line Description	Action Plan
Lydney AQMA	NO ₂ annual mean	Lydney	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 C of E Primary School (F); and Forest Road from Hill Street (C) to just past 17 Forest Road (E).	<p>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.</p> <p>Since introduction of a 20mph speed limit at the junction the nitrogen dioxide levels have mostly fallen below the national air quality objective level (with the exception of the area around 57 High Street). As levels remain within 10% of the limit we have not revoked the AQMA.</p>

2.2 Action Plan Options and their Evaluation

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
- Option 2 - Bream Road – Signalisation
- Option 7 - Switch off engines at steam train 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 are being promoted by Gloucestershire County Council as part of the Lydney Highway Strategy 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. Funding is provisionally available for improving the railway station by providing a cycle link from the town centre to the railway, with cycle parking at each end of the scheme.

2.3 Progress and Impact of Measures to Address Air Quality in Forest of Dean District Council

Forest of Dean District Council has taken forward a number of measures during the current reporting year in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2. Forest of Dean District

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

- Continuation of nitrogen dioxide diffusion tube monitoring survey across the district
- Continuation of consultation with Forest of Dean District Planning Department as well as with Gloucestershire Highways and Planning Departments.
- Liaison with neighbouring authorities.

2.4 PM_{2.5} – Local Authority Approach to Reducing Emissions and or Concentrations

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

Other than the potential source from vehicles, no significant source of PM_{2.5} has been identified within the District. Forest of Dean District Council is working with Gloucestershire County Council to identify measures within the Local Transport Plan and the Health and Wellbeing Plan that will contribute towards a reduction in PM_{2.5}.

Table 2.2 – Progress on Measures to Improve Air Quality

Measure No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
1		Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	FOD Council	2014	2015	Approved policy in place and in use, with associated technical guidance available on FODDC website	Address potential increase in vehicular emissions due to vehicle usage associated with new residential and business developments	Policy approved and in use from 30 July 2015.	Completed	http://www.fdean.gov.uk/media/3428/air-quality-technical-planning-guidance.pdf
2	The Lydney Cycle Improvement Scheme	Promoting Travel Alternatives	Promotion of cycling	Gloucestershire County Council, with GFirst LEP Growth Deal	2018	2019-2020	The Scheme involves the construction of an integrated cycleway network incorporating 5 individual “links” throughout Lydney.	Provide alternatives for travel around Lydney, especially within the AQMA	A Public Share event was held on 4th Sept 2018 to discuss the proposals	Spring 2020	https://www.gloucestershire.gov.uk/highways/major-projects-list/lydney-cycling-improvements/
3		Promoting Travel Alternatives	Encourage / Facilitate home-working							Ongoing	

Measure No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
4		Promoting Travel Alternatives	Promotion of walking	FOD Council							
5		Public Information	Via the Internet	FOD Council							
6		Traffic Management	Reduction of speed limits, 20mph zones	Gloucestershire County Council			Improved traffic flow at peak hours in the Lydney Town Centre	Yes		Completed	Since introduction of 20mph speed limit at the key AQMA junction, nitrogen dioxide levels have fallen below the national objective level. As levels remain within 10% of the limit we have not revoked the AQMA.
7	Gloucestershire's Local Transport Plan 2015-2031	Traffic Management	Travel Planning	Gloucestershire County Council		2015-2031	Improvements to Lydney rail station, cycle networks at Lydney and park& ride study	Provide alternatives for travel around Lydney, especially within the AQMA		Ongoing	https://www.gloucestershire.gov.uk/media/2196/3_-_ltp_-_fod_cps-66791.pdf

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

3.1 Summary of Monitoring Undertaken

This section sets out what monitoring has taken place and how the results compare with the national objectives, set to protect health.

3.1.1 Non-Automatic Monitoring Sites

Forest of Dean District Council undertook non- automatic (passive) monitoring of NO₂ using diffusion tubes at 28 sites during 2018. We exposed 3 tubes at one site within the AQMA for Quality Control purposes, so we have 30 results each month. We average out the results of the triplicate tubes to provide one result for that location. Table A1 in Appendix A provides technical details of the diffusion tube monitoring sites.

Maps showing the location of the monitoring sites are provided in Appendix D.

3.2 Individual Pollutants

The air quality monitoring results presented in this section are, where relevant, adjusted for annualisation and bias. Further details on the bias adjustment are provided in Appendix C. There were sufficient results from each site in 2018 so annualisation was not required (ie >75% data collection at each monitoring site). Where this becomes necessary in the future, the Council would ensure that results for those areas where less than 9 months' data is available are annualised in accordance with the procedure outlined in the Defra Technical Guidance note (TG16).

3.2.1 Nitrogen Dioxide (NO₂)

Table A2 in Appendix A compares the bias adjusted monitored NO₂ annual mean concentrations for the past 5 years with the air quality objective of 40µg/m³.

The full 2018 dataset of monthly mean values is provided in Appendix B.

Fig. 3.1 Graph showing the trend over the last 7 years of nitrogen dioxide levels around the District (outside of our AQMA)

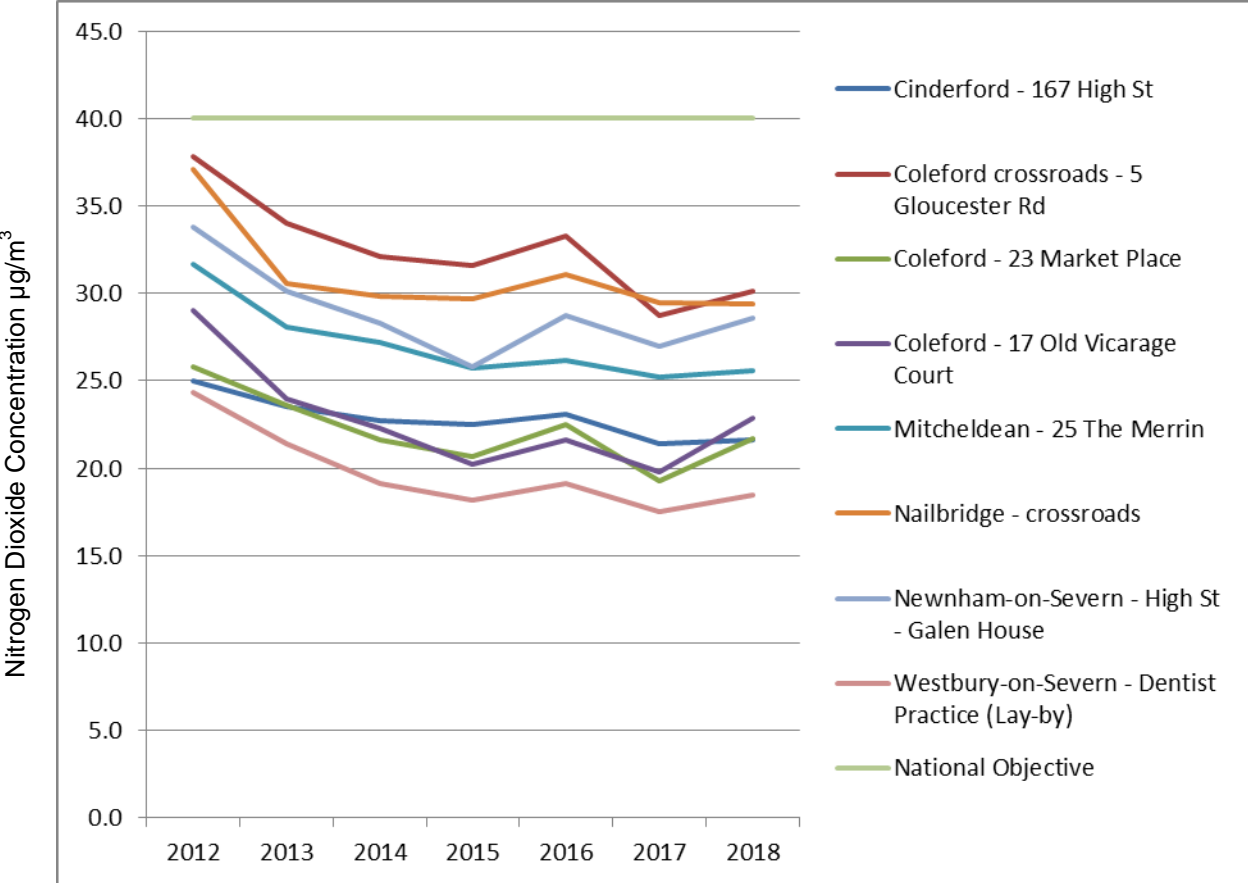


Figure 3.1 shows the trend of nitrogen dioxide levels monitored around the District (outside of our Lydney AQMA). If we compare current monitoring results with those from 2013, it can be seen that at the sites with the highest levels (>25 µg/m³) there has been a gradual decrease in nitrogen dioxide levels. Levels at most of the other sites have remained broadly similar. There has been a slight increase in levels this year compared with 2017. However it can be clearly seen that the nitrogen dioxide levels outside of the AQMA are well below the national standard of 40µg/m³ which is marked by a black line on the graph.

The results of monitoring within our Lydney AQMA demonstrated that away from the Bream junction with Hill Street and High Street, the levels are as expected near busy roads. They range from 20.3 – 35.1µg/m³. Other than at the crossroads at Coleford (30.1µg/m³) no other locations being monitored in the district experienced annual average levels above 30µg/m³ once bias adjustment had been carried out. There

were five locations within the AQMA, close to the junction, where the results lay within 10% of the national air quality objective. These were as follows:

Tube reference	Location	Nitrogen dioxide concentration ($\mu\text{g}/\text{m}^3$) (adjusted)
LYD 01	Top High Street	40.1
LYD 06	Hill Street	36.7
LYD 08	13 Bream Road	37.8
LYD 16	55 High Street	36.7
LYD 17,18 and 19 (triplicate)	Hill Street	36.2, 33.3, 37.4 Average 35.6

As these levels within our AQMA still lie above or within 10% of the national air quality objective, we have not rescinded the AQMA designation.

3.3 National Comparisons

Data on the health impacts of particulates is available from Public Health Outcomes Framework databases. 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*” (2017).

For Gloucestershire as a whole, the estimated *Fraction of mortality attributable to particulate air pollution* is ranked 6 out of 16 areas in the South West of England. This equates to a percentage of 4.7% 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 relatively low with the area ranked just 23 out of 37 areas in the South West of England. This equates to a percentage of 4.3% compared with the regional average of 4.4%.

(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>)).

Appendix A: Monitoring Results

Table A.1 Details of Non-Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Pollutants Monitored	In AQMA?	Relevant Exposure?	Distance to Kerb of Nearest Road (m)	Worst-Case Exposure?
AYL01 ^{NEW}	Aylburton, 26 High Street	Roadside	361828	201914	NO ₂	NO	Y	1	Yes
BLA01 ^{NEW}	Blakeney	Roadside	367182	207006	NO ₂	NO	Y	1.5	Yes
CIN03	Cinderford – Bottom High St	Suburban	365637	214732	NO ₂	NO	Y	0.85	Yes
CIN04*	Cinderford - 31 Market St (CANDI)	Suburban	365637	214012	NO ₂	NO	Y	1.25	Yes
CIN05 ^{NEW}	Cinderford - 108 St Whites Road	Suburban	365023	212627	NO ₂	NO	Y	1.5	Yes
COL01	Coleford –Gloucester Road	Roadside	357743	210600	NO ₂	NO	Y	3.1	Yes
COL02	Coleford - 23 Market Street	Roadside	357551	210756	NO ₂	NO	Y	3.2	Yes
COL03	Coleford – Old Vicarage Court	Roadside	357631	210785	NO ₂	NO	Y	1.5	Yes
HUN03*	Huntley – Frogmore Road	Urban Centre	372370	219678	NO ₂	NO	N	2.6	Yes
LYD01	Lydney – Top High St	Suburban	363147	203074	NO ₂	YES	Y	3.35	Yes
LYD02	Lydney – Newerne Street	Suburban	363527	203261	NO ₂	YES	Y	7	Yes
LYD03	Lydney – Mid High St	Urban Centre	363036	202972	NO ₂	YES	Y	1.85	Yes
LYD04	Lydney – Bottom High St	Roadside	362971	202915	NO ₂	YES	Y	1.95	Yes
LYD05	Lydney - Regents Arcade	Kerbside	363494	203238	NO ₂	YES	Y	1.4	Yes
LYD06	Lydney - Hill St - Inspirations Gallery	Roadside	363185	203111	NO ₂	YES	Y	1.8	
LYD08	Lydney – Mid Bream Road	Roadside	363109	203213	NO ₂	YES	Y	3.35	Yes
LYD09	Lydney – Top Bream Rd	Kerbside	363042	203322	NO ₂	YES	Y	0.95	Yes
LYD10	Lydney – Forest Road	Urban Centre	363408	203226	NO ₂	YES	Y	1.6	Yes
LYD12	Lydney –Newerne Street	Suburban	363607	203320	NO ₂	YES	Y	2.5	Yes
LYD15	Lydney - Highfield Lane (Background)	Urban Centre	364087	204138	NO ₂	No	N	>15	Yes
LYD16*	Lydney - 55 High Street Launderette	Urban Centre	363142	203069	NO ₂	YES	Y	1.6	Yes
LYD17*	Lydney - 61 High Street (Triplicate 1 of 3)	Urban Centre	363160	203088	NO ₂	YES	Y	1.4	Yes
LYD18*	Lydney - 61 High Street (Triplicate 2of 3)	Urban Centre	363160	203088	NO ₂	YES	Y	1.4	Yes
LYD19*	Lydney - 61 High Street (Triplicate 3of 3)	Roadside	363160	203088	NO ₂	YES	Y	1.35	Yes
MIT01	Mitcheldean –The Merrin	Roadside	364108	218274	NO ₂	YES	N	2.95	Yes
NAI01	Nailbridge - crossroads	Roadside	364566	216246	NO ₂	NO	N	1.1	Yes
NEW03*	Newent - 12 High Street	Roadside	372117	226049	NO ₂	NO	N	1.6	Yes
NOS02	Newnham-on-Severn - High St - Galen House	Roadside	369038	211590	NO ₂	NO	N	3.4	Yes
TUT01 ^{NEW}	Tutshill - Beachley Rd - Opposite Severn Lodge	Roadside	353926	194467	NO ₂	NO	N	1.3	Yes
WOS01	Westbury-on-Severn - Dentist Practice (Lay-by)	Roadside	371651	214042	NO ₂	NO	N	>12	

Table A.2 – Annual Mean NO₂ Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2018 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ⁽³⁾					
					2013	2014	2015	2016	2017	2018
AYL01 ^{NEW}	Aylburton, 26 High Street	Diffusion Tube	n/a	100	*	*	*	*	*	21.8
BLA01 ^{NEW}	Blakeney	Diffusion Tube	n/a	100	*	*	*	*	*	14.4
CIN03	Cinderford – Bottom High St	Diffusion Tube	n/a	100	23.5	22.7	22.5	23.1	21.4	21.6
CIN04*	Cinderford - 31 Market St (CANDI)	Diffusion Tube	n/a	92	*	*	*	*	22.9	23.9
CIN05 ^{NEW}	Cinderford - 108 St Whites Road	Diffusion Tube	n/a	83	*	*	*	*	*	26.2
COL01	Coleford –Gloucester Road	Diffusion Tube	n/a	100	34.0	32.1	31.6	33.3	28.7	30.1
COL02	Coleford - 23 Market Street	Diffusion Tube	n/a	100	23.6	21.6	20.7	22.5	19.3	21.7
COL03	Coleford – Old Vicarage Court	Diffusion Tube	n/a	100	24.0	22.3	20.2	21.6	19.8	22.9
HUN03*	Huntley – Frogmore Road	Diffusion Tube	n/a	100	*	*	*	*	9.5	9.4
LYD01	Lydney – Top High St	Diffusion Tube	n/a	100	41.4	38.0	37.7	39.5	36.9	40.3
LYD02	Lydney – Newerne Street	Diffusion Tube	n/a	100	21.0	20.7	20.5	22.4	20.1	20.3
LYD03	Lydney – Mid High St	Diffusion Tube	n/a	100	37.1	35.6	37.0	38.8	36.9	33.0
LYD04	Lydney – Bottom High St	Diffusion Tube	n/a	92	38.2	34.5	34.3	37.0	34.1	36.2
LYD05	Lydney - Regents Arcade	Diffusion Tube	n/a	100	34.3	33.7	29.8	32.7	31.5	33.3
LYD06	Lydney - Hill St - Inspirations Gallery	Diffusion Tube	n/a	100	40.1	38.6	35.7	38.2	38.7	38.9
LYD08	Lydney – Mid Bream Road	Diffusion Tube	n/a	100	37.3	38.1	34.1	36.2	34.1	37.8
LYD09	Lydney – Top Bream Rd	Diffusion Tube	n/a	92	34.8	36.9	34.0	33.7	32.6	35.1
LYD10	Lydney – Forest Road	Diffusion Tube	n/a	92	26.9	22.7	22.8	23.2	22.7	24.4

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2018 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ⁽³⁾					
					2013	2014	2015	2016	2017	2018
LYD12	Lydney –Newerne Street	Diffusion Tube	n/a	100	31.7	28.8	27.6	29.2	25.4	27.2
LYD15	Lydney – Highfield Lane	Diffusion Tube	n/a	100	11.1	10.7	10.2	11.9	9.4	9.3
LYD16*	Lydney - 55 High Street Laundrette	Diffusion Tube	n/a	100	*	*	*	*	36.9	37.0
LYD17*	Lydney - 61 High Street (Triplicate 1 of 3)	Diffusion Tube	n/a	100	*	*	*	*	30.9	36.2
LYD18*	Lydney - 61 High Street (Triplicate 2of 3)	Diffusion Tube	n/a	100	*	*	*	*	30.5	33.3
LYD19*	Lydney - 61 High Street (Triplicate 3of 3)	Diffusion Tube	n/a	100	*	*	*	*	30.6	37.4
MIT01	Mitcheldean –The Merrin	Diffusion Tube	n/a	100	28.1	27.2	25.7	26.5	25.2	25.6
NAI01	Nailbridge – Crossroads	Diffusion Tube	n/a	100	30.6	29.8	29.7	31.1	29.5	29.4
NEW03*	Newent - High Street	Diffusion Tube	n/a	100	*	*	*	*	26.2	28.6
NOS02	Newnham-on-Severn - High St	Diffusion Tube	n/a	100	30.1	28.3	25.8	28.7	24.0	28.2
TUT01 ^{NEW}	Tutshill - Beachley Rd - Opposite Severn Lodge	Diffusion Tube	n/a	100	*	*	*	*	*	18.5
WOS01	Westbury-on-Severn - Dentist Practice (Lay-by)	Diffusion Tube	n/a	100	21.4	19.1	18.2	19.1	17.5	18.5

Notes: Exceedances of the NO₂ annual mean objective of 40µg/m³ are shown in **bold**.

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

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

(3) Means for diffusion tubes have been corrected for bias. All means have been “annualised” as per Technical Guidance LAQMTG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

^{NEW} New Sites for 2018

Appendix B: Full Monthly Diffusion Tube Results for 2018

Table B.1 – NO₂ Monthly Diffusion Tube Results – 2018

2018 Ref	AIR QUALITY DIFFUSION TUBE RESULTS -2017	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18	2018 Mean	2018 Bias Adjusted x0.92*and adjusted for location (1)
		NO ₂ µg/m ³	NO ₂ µg/m ³	NO ₂ µg/m ³	NO ₂ µg/m ³	NO ₂ µg/m ³	NO ₂ µg/m ³	NO ₂ µg/m ³	NO ₂ µg/m ³	NO ₂ µg/m ³	NO ₂ µg/m ³	NO ₂ µg/m ³	NO ₂ µg/m ³	Unadjusted	
AYL01 ^{NEW}	Aylburton, 26 High Street	29.9	24.4	23.9	24.6	22.2	19.4	18.4	21.1	22.8	22.8	28.6	26.3	23.7	21.8
BLA01 ^{NEW}	Blakeney	19.8	19.8	15.9	16.5	15.1	13.5	13.7	12.7	14.1	16.9	20.7	9.5	15.7	14.4
CIN03	Cinderford - 167 High St	27.5	10.9	23.5	26.6	27.2	20.5	22.3	19.5	20.2	30.9	31.0	22.0	23.5	21.6
CIN04	Cinderford - 31 Market St (CANDI)	28.2	26.6	23.0	25.6	23.8		26.2	23.6	25.7	29.3	25.4	28.4	26.0	23.9
CIN05 ^{NEW}	Cinderford - 108 St Whites Road	29.3			29.4	28.1	24.9	32.0	27.2	27.5	25.6	31.5	29.5	28.5	26.2
COL01	Coleford crossroads - 5 Gloucester Rd	36.4	34.1	29.3	33.0	35.2	35.9	34.5	29.9	28.1	32.3	32.6	31.3	32.7	30.1
COL02	Coleford - 23 Market Street	28.3	24.7	23.1	22.1	21.8	20.9	20.6	18.6	20.4	26.0	27.8	28.5	23.6	21.7
COL03	Coleford - 17 Old Vicarage Court	27.3	27.8	21.7	25.0	24.6	22.8	23.2	22.5	22.7	29.6	26.1	24.9	24.9	22.9
HUN03	Huntley - opposite 9 Frogmore Road	14.1	13.1	12.4	10.0	7.9	6.2	7.4	7.6	8.5	11.8	16.4	7.7	10.3	9.4
LYD01	Lydney - 57 High St	50.1	44.2	35.3	42.4	43.2	42.8	46.4	43.5	47.2	38.9	45.2	46.8	43.8	40.1
LYD02	Lydney - Newerne St, Bridge House - Tucker	28.1	23.2	20.7	20.9	18.1	16.5	21.1	20.9	21.1	21.3	26.8	26.2	22.1	20.3
LYD03	Lydney - 33 High St	40.9	38.7	28.0	36.6	34.7	31.2	33.0	33.4	37.4	37.8	38.8	40.3	35.9	33.0
LYD04	Lydney - 13 High St	46.1	43.0	35.1	40.4	38.7	39.9	38.9	36.1		34.9	39.5	39.7	39.3	34.1
LYD05	Lydney - Unit 1, Regents Arcade	44.9	33.7	31.8	38.1	32.6	30.9	38.1	34.8	34.6	32.6	38.9	42.7	36.1	33.3
LYD06	Lydney - Hill St - Inspirations Gallery	45.7	42.7	38.0	45.6	41.1	45.0	42.5	36.4	39.5	43.2	43.1	45.2	42.3	38.6
LYD08	Lydney - 13 Bream Rd (Bottom)	43.9	37.0	39.1	41.3	38.2	39.8	43.6	42.3	41.1	41.2	42.8	42.2	41.0	37.8
LYD09	Lydney - 17 Bream Rd (Top)	42.1	33.2	32.6	40.4		33.6	41.0	35.6	38.9	39.0	45.3	38.3	38.2	35.1
LYD10	Lydney - Old Chip Shop, Forest Road	28.6	26.4	25.7	29.7	24.2		24.1	21.8	23.9	27.9	28.8	31.1	26.6	24.4
LYD12	Lydney - Kaplans, 61 Newerne Street	35.3	29.6	29.7	32.1	29.1	31.6	27.4	22.9	26.3	25.2	31.7	33.3	29.5	27.2
LYD15	Lydney - Highfield Lane (Background)	14.7	10.9	12.5	10.6	7.1	6.5	6.9	7.5	8.8	5.7	16.8	13.4	10.1	9.3
LYD16 ^{NEW}	Lydney - 55 High Street Launderette	49.2	40.9	37.2	40.8	29.5	39.5	40.3	40.0	44.0	36.0	39.8	45.6	40.2	36.2
LYD17 ^{NEW}	Lydney - 61 High Street (Triplicate 1 of 3)	44.8	32.0	36.0	40.2	34.8	36.7	44.6	39.1	39.7	36.3	46.2	41.6	39.3	33.3
LYD18 ^{NEW}	Lydney - 61 High Street (Triplicate 2 of 3)	48.1	34.2	31.2	39.2	33.7	32.2	40.2	32.7	35.7	30.8	37.2	38.9	36.2	37.4

LYD19 ^{NEW}	Lydney - 61 High Street (TriPLICATE 3of 3)	49.0	35.7	36.9	39.9	36.9	36.3	42.0	40.2	43.5	33.9	44.6	49.5	40.7	37.4
MIT01	Mitcheldean - 25 The Merrin	31.6	26.7	26.6	29.1	28.3	23.9	27.0	24.9	25.5	30.8	29.7	30.2	27.9	25.6
NAI01	Nailbridge - crossroads	40.2	34.7	29.6	35.5	32.8	32.8	37.3	30.2	32.1	12.1	32.6	33.8	32.0	29.4
NEW03	Newent - 12 High Street	34.8	28.5	26.9	35.7	34.3	30.0	31.4	23.6	26.1	36.5	29.3	36.4	31.1	28.6
NOS02	Newnham-on-Severn - High St - Galen House	32.8	27.0	31.5	34.6	30.7	31.2	30.0	25.7	28.1	32.9	34.8	28.0	30.6	28.2
TUT01 ^{NEW}	Tutshill - Beachley Rd - Opposite Severn Lodge	19.2	18.8	18.2	16.1	6.4	12.1	10.3	9.3	11.7	15.9	20.8	18.7	14.8	13.6
WOS01	Westbury-on-Severn - Dentist Practice (Lay-by)	24.8	22.3	21.2	17.1	17.7	15.5	20.0	17.0	19.4	21.4	24.5	20.8	20.1	18.5

(1) See Appendix C for details on falloff with distance, annualisation and bias adjustment

NB: The average annualised result for the triplicate set of diffusion tubes sited at 61, High Street Lydney was **35.6** after bias adjustment, up from **30.7** in 2017.

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

Diffusion Tube Bias Adjustment Factors

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 0.92, based upon 39 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 bias adjustment factor for 2018 data analysed by Gradko (20% TEA in water method), based upon 40 studies is 0.92 (Sept 2019), as highlighted in the table below.

National Diffusion Tube Bias Adjustment Factor Spreadsheet (Spreadsheet Version Number: 09/19)

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.

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

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

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

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 shown in blue at the foot of the final column.

Analysed By	Method	Year	Site Type	Local Authority	Facebook	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m ³)	Automatic Monitor Mean Conc. (Cm) (µg/m ³)	Bias (B)	Tube Precision	Bias Adjustment Factor (A) (Cm/Dm)
Gradko	20% TEA in water	2018	UC	Belfast City Council		12	32	27	16.4%	G	0.86
Gradko	20% TEA in water	2018	R	City of Lincoln Council		12	44	34	32.1%	G	0.76
Gradko	20% TEA in water	2018	R	Lancaster City Council		11	39	35	12.4%	G	0.89
Gradko	20% TEA in water	2018	R	Lancaster City Council		11	31	34	-8.5%	G	1.09
Gradko	20% TEA in water	2018	LIB	Liverpool City Council		12	20	18	11.0%	G	0.90
Gradko	20% TEA in water	2018	R	Blackburn with Darwen Borough Council		12	26	20	28.8%	G	0.78
Gradko	20% TEA in water	2018	R	Darford Borough Council		11	50	48	4.3%	G	0.96
Gradko	20% TEA in water	2018	LIB	Dudley MBC		11	24	19	29.3%	G	0.77
Gradko	20% TEA in water	2018	R	Dudley MBC		12	37	35	3.8%	G	0.97
Gradko	20% TEA in water	2018	R	Dudley MBC		11	47	48	1.3%	G	0.98
Overall Factor* (40 studies)											0.92

Ready 41 of 2863 records found | Average: 355.352558 | Count: 486 | Sum: 85995.31849 | 90% | 14:41 18/09/2019

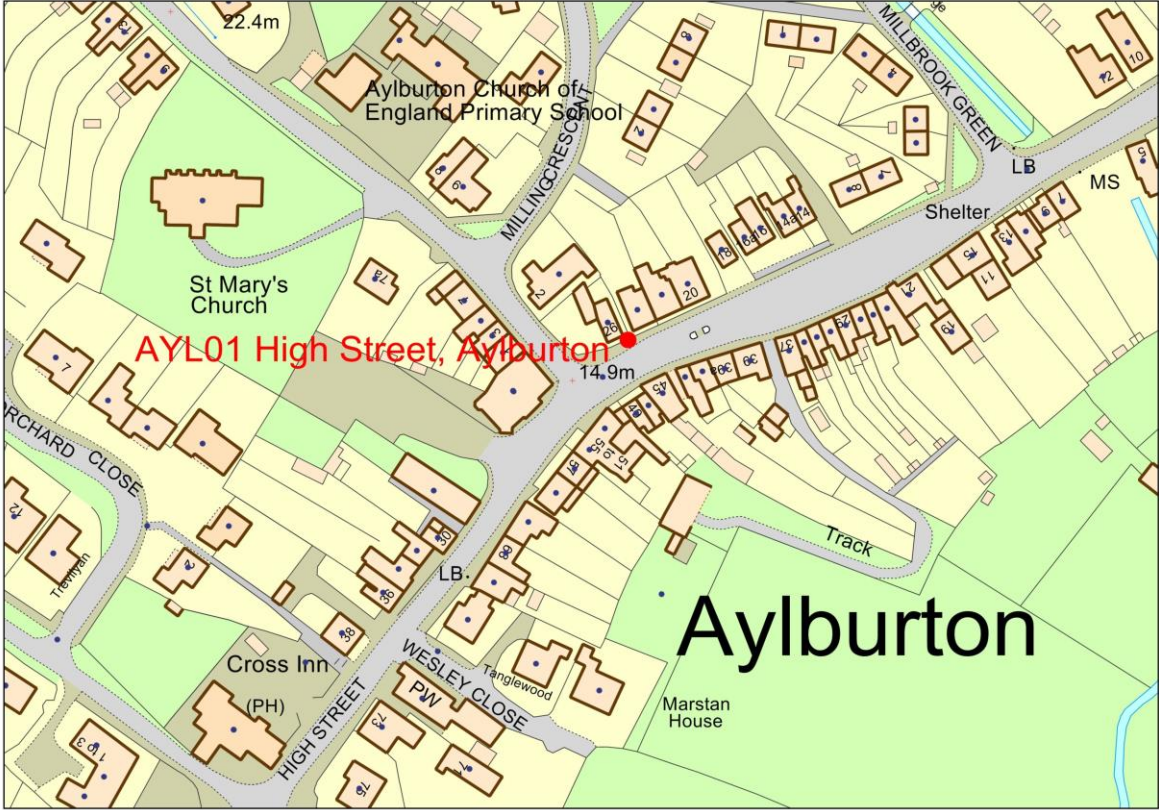
Distance Corrections

Corrections for distance have been made that allow for the distance the diffusion tubes are from the roadside. The data to feed into this calculation, that is distance of measurement/receptor from kerb, the mean NO₂ are to be found in Table A1 and B1 respectively.

In most cases the correction has made only minor difference to the estimated receptor concentration because in most cases the diffusion tube monitors are close to both the roadside and to the nearest relevant receptor (residential building).

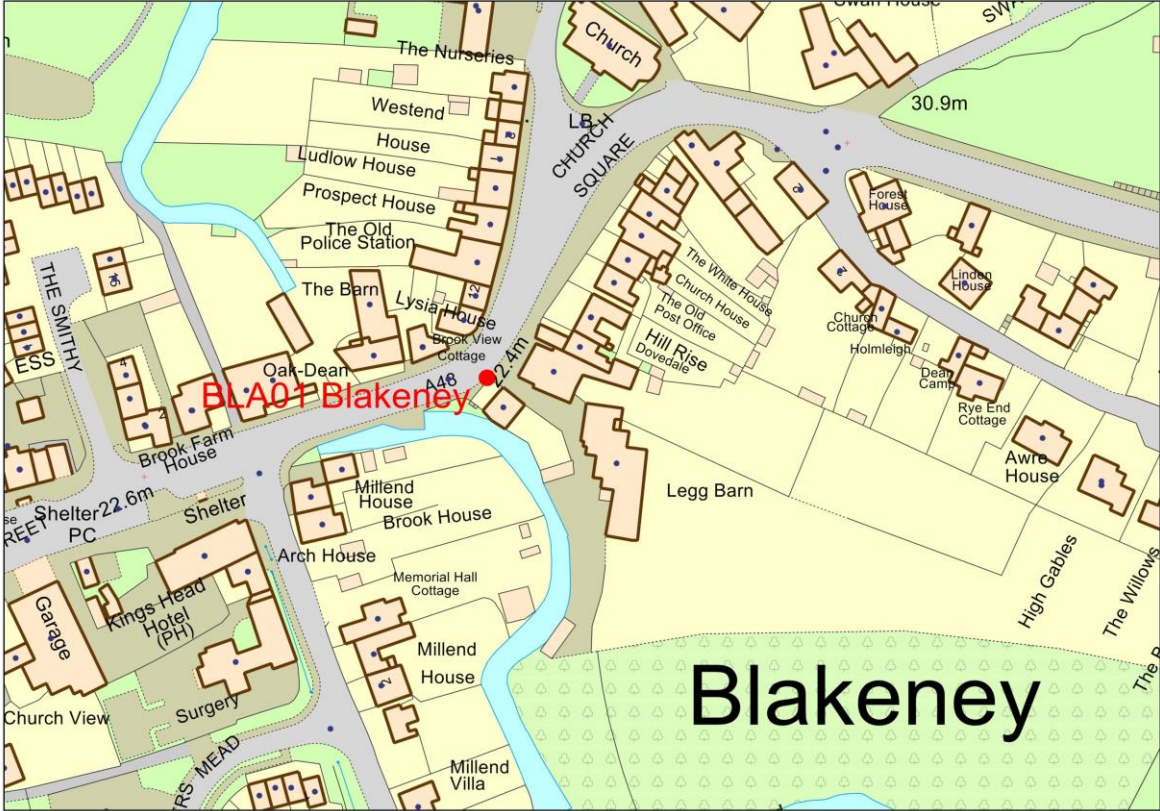
Appendix D: Maps of Monitoring Locations

AYL 01 Aylburton, 26 High Street



Site	Annual mean concentrations ($\mu\text{g}/\text{m}^3$) Bias Adjusted				
	2014	2015	2016	2017	2018
AYL01	-	-		-	21.8

BLA01 A48, Blakeney, Brook House



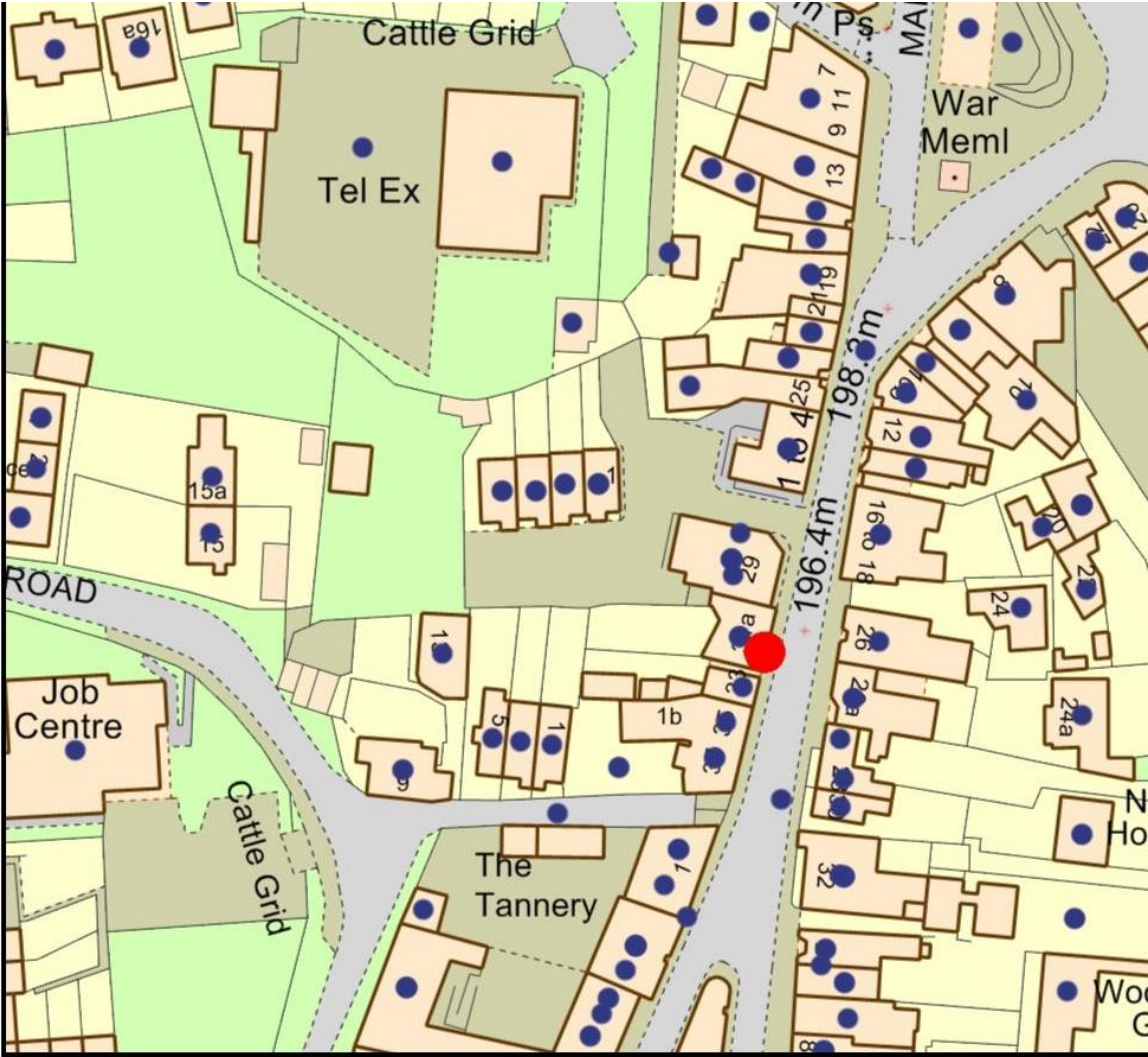
Site	Annual mean concentrations ($\mu\text{g}/\text{m}^3$) Bias				
	2014	2015	2016	2017	2018
BLA01	-	-		-	14.4

CIN03 - Bottom High Street, Cinderford



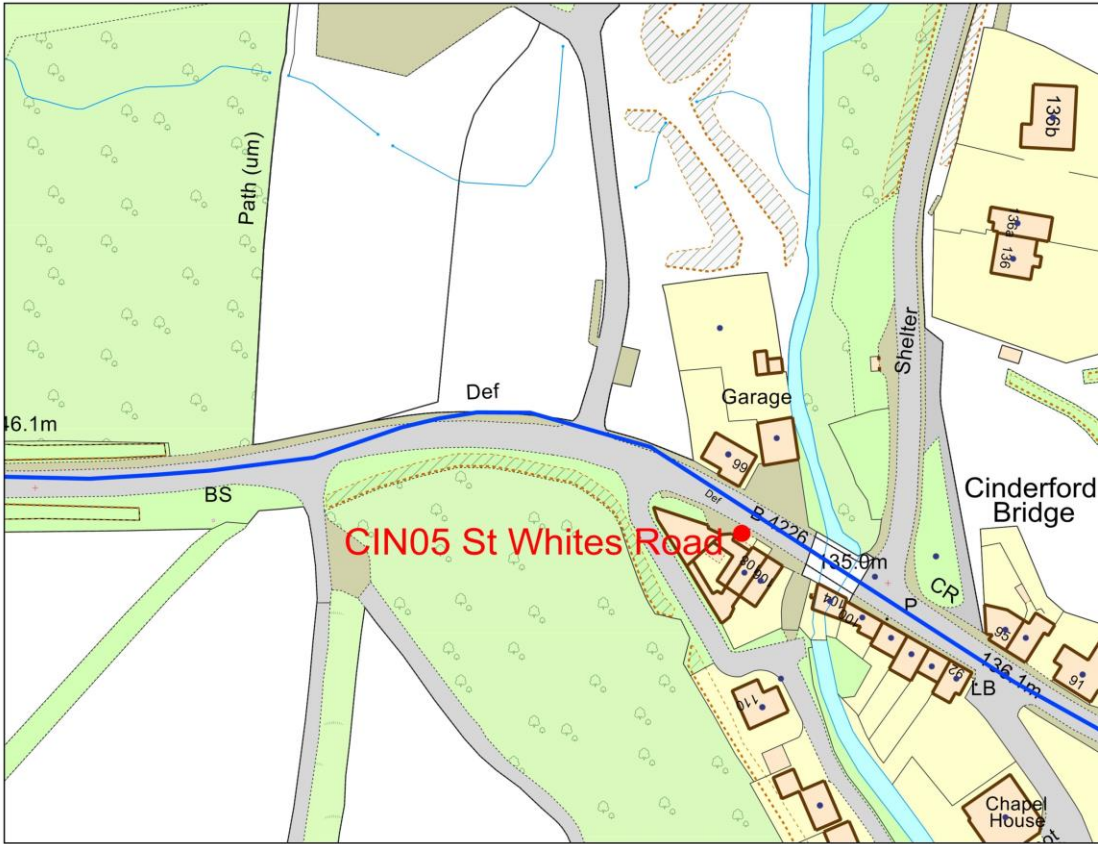
Site	Annual mean concentrations ($\mu\text{g}/\text{m}^3$) Bias Adjusted				
	2014	2015	2016	2017	2018
CIN03	22.7	22.5	23.1	21.4	21.6

CIN04 - Market Street, Cinderford



Site	Annual mean concentrations ($\mu\text{g}/\text{m}^3$) Bias Adjusted				
	2014	2015	2016	2017	2018
CIN04	-	-	-	22.9	23.9

CIN05 Cinderford - 108 St Whites Road



Site	Annual mean concentrations ($\mu\text{g}/\text{m}^3$) Bias Adjusted				
	2014	2015	2016	2017	2018
CIN05	-	-		-	26.2

COL01 - Gloucester Road, Coleford, COL02 – Market Place, Coleford



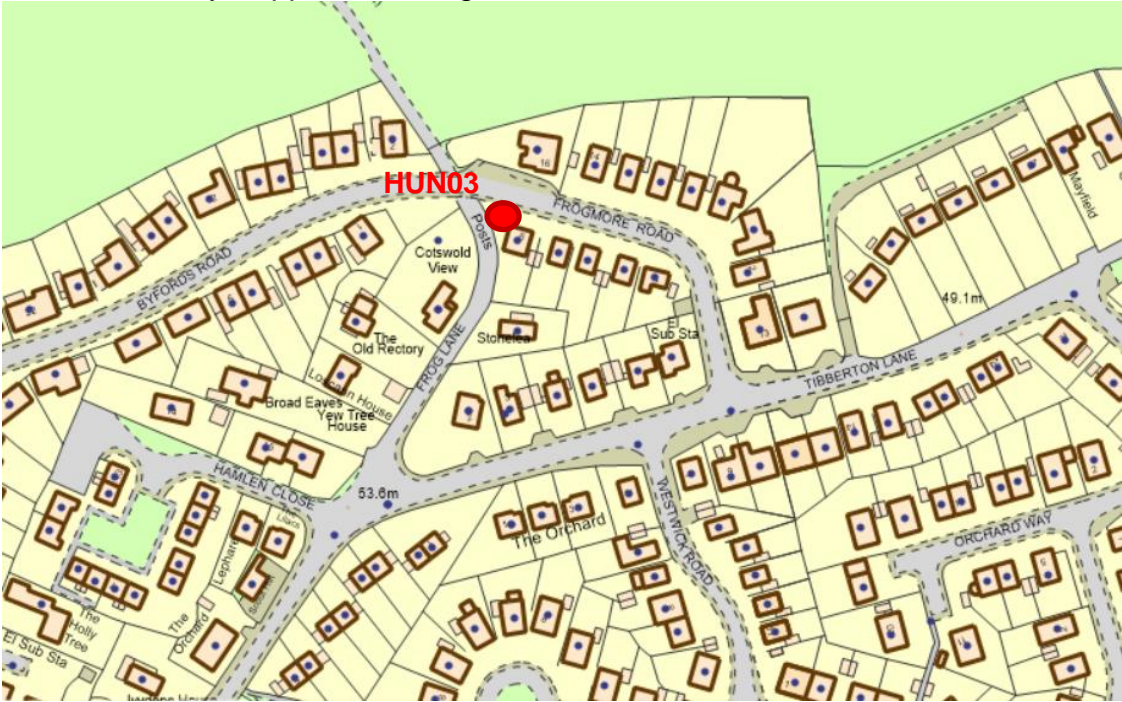
Site	Annual mean concentrations ($\mu\text{g}/\text{m}^3$) Bias Adjusted				
	2014	2015	2016	2017	2018
COL01	32.1	31.6	33.3	28.7	30.1
COL02	21.6	20.7	22.5	19.3	21.7

COL03 – Old Vicarage Court, Coleford



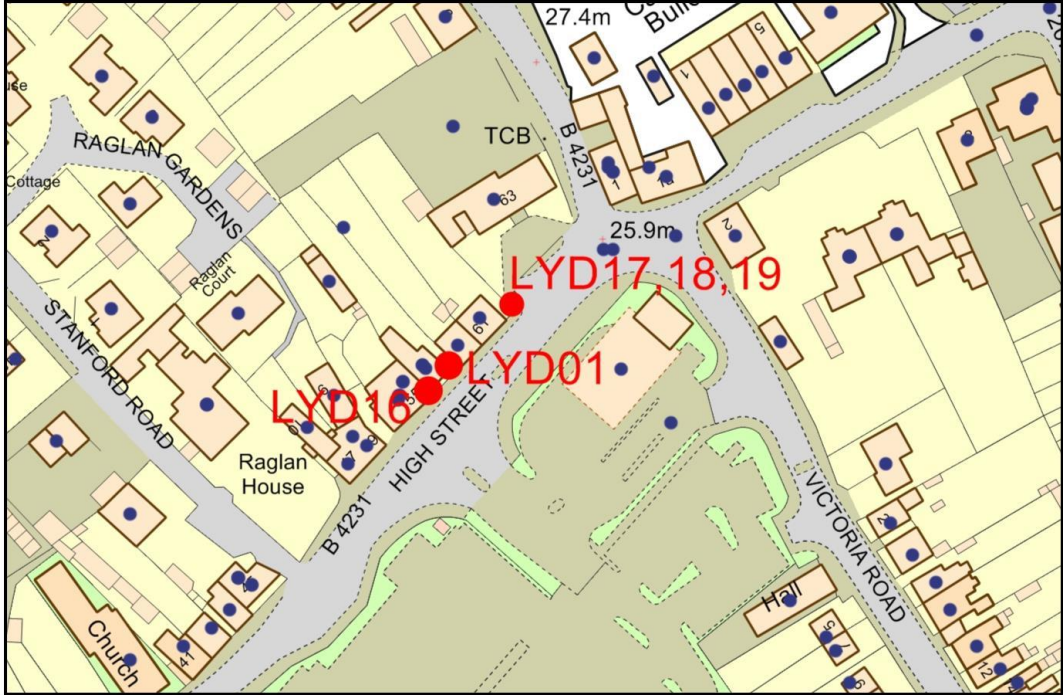
Site	Annual mean concentrations ($\mu\text{g}/\text{m}^3$) Bias Adjusted				
	2014	2015	2016	2017	2018
COL03	22.3	20.2	21.6	19.8	22.9

HUN03 Huntley - opposite 9 Frogmore Road



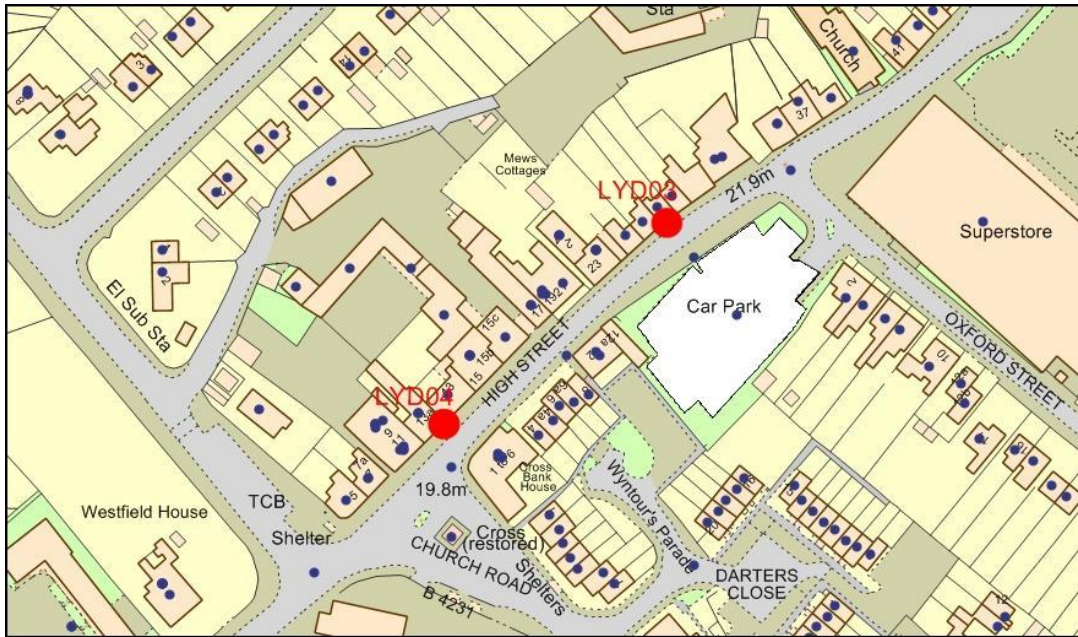
Site	Annual mean concentrations ($\mu\text{g}/\text{m}^3$) Bias Adjusted				
	2014	2015	2016	2017	2018
HUN03	-	-	-	9.5	9.4

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



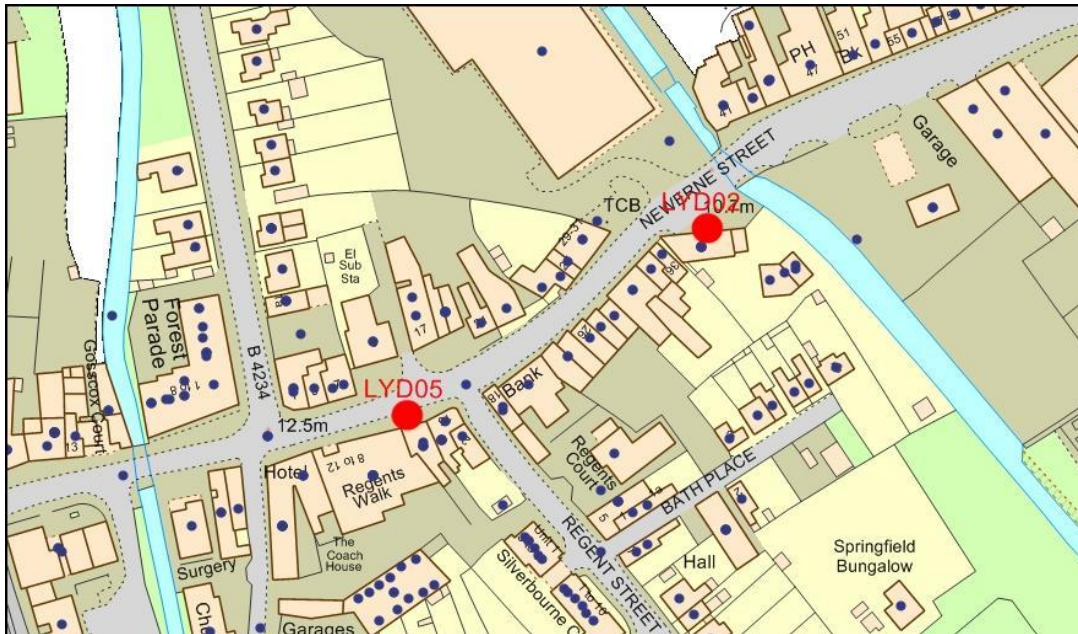
Site	Annual mean concentrations ($\mu\text{g}/\text{m}^3$) Bias Adjusted				
	2014	2015	2016	2017	2018
LYD01	38.0	37.7	39.5	36.9	40.3
LYD16	-	-	-	36.9	37.0
LYD17	-	-	-	30.9	36.2
LYD18	-	-	-	30.5	33.3
LYD19	-	-	-	30.6	37.4

LYD03 - 29 High Street Lydney, LYD04 - 13 High Street, Lydney



Site	Annual mean concentrations ($\mu\text{g}/\text{m}^3$) Bias Adjusted				
	2014	2015	2016	2017	2018
LYD03	35.6	37.0	38.8	36.9	33.0
LYD04	34.5	34.3	37.0	34.1	36.2

LYD02 - Bridge House, Newerne Street Lydney, LYD05 – Regents Arcade, Lydney



Site	Annual mean concentrations ($\mu\text{g}/\text{m}^3$) Bias Adjusted				
	2014	2015	2016	2017	2018
LYD02	20.7	20.5	22.4	20.1	20.3
LYD05	33.7	31.7	32.7	31.5	33.3

LYD06 Hill St - Inspirations Gallery, Lydney



Site	Annual mean concentrations ($\mu\text{g}/\text{m}^3$) Bias Adjusted				
	2014	2015	2016	2017	2018
LYD06	38.6	39.2	38.2	38.7	42.3

LYD08 13 Bream Road, Lydney, LYD09 17 Bream Road, Lydney



Site	Annual mean concentrations ($\mu\text{g}/\text{m}^3$) Bias Adjusted				
	2014	2015	2016	2017	2018
LYD08	38.1	34.1	36.2	34.0	37.8
LYD09	36.9	34.0	33.7	32.6	35.1

LYD10 Old Chip Shop, Forest Road, LYD12 Kaplans, 61 Newerne Street, Lydney



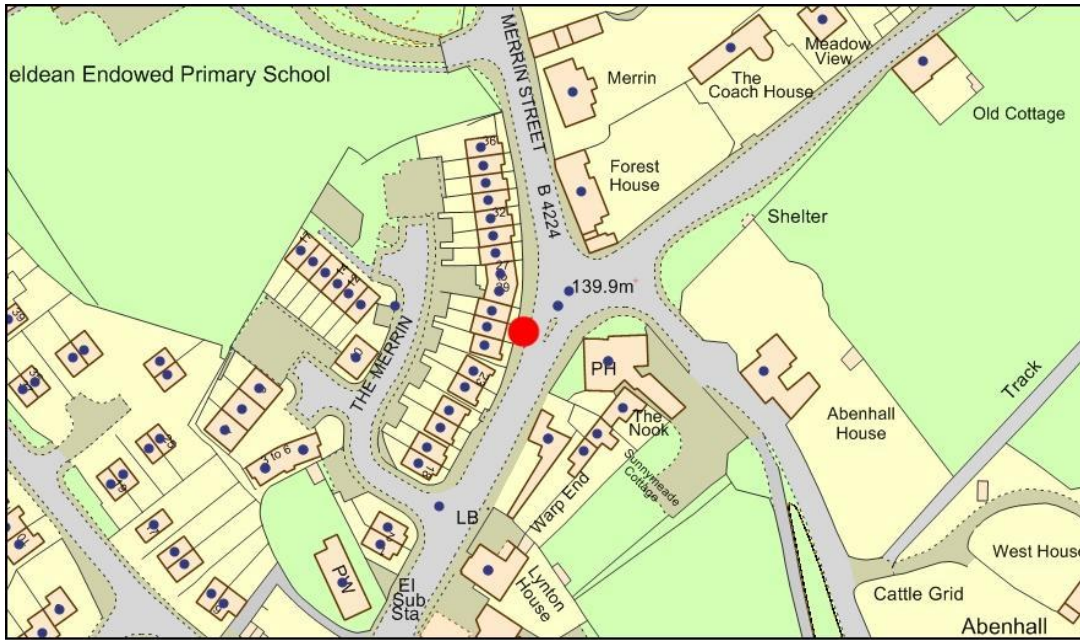
Site	Annual mean concentrations ($\mu\text{g}/\text{m}^3$) Bias Adjusted				
	2014	2015	2016	2017	2018
LYD10	22.7	22.8	23.2	22.7	24.4
LYD12	28.8	27.6	29.2	25.4	27.2

LYD15 Highfield Lane, Lydney (Background)



Site	Annual mean concentrations ($\mu\text{g}/\text{m}^3$) Bias Adjusted				
	2014	2015	2016	2017	2018
LYD15	10.7	10.2	11.9	9.4	9.3

MIT01 The Merrin, Mitcheldean



Site	Annual mean concentrations ($\mu\text{g}/\text{m}^3$) Bias Adjusted				
	2014	2015	2016	2017	2018
MIT01	27.2	25.7	26.5	25.2	25.6

NAI01 Crossroads, Nailbridge



Site	Annual mean concentrations ($\mu\text{g}/\text{m}^3$) Bias Adjusted				
	2014	2015	2016	2017	2018
NAI01	29.8	29.7	30.7	29.5	29.4

NEW03 High Street, Newent



Site	Annual mean concentrations ($\mu\text{g}/\text{m}^3$) Bias Adjusted				
	2014	2015	2016	2017	2018
NEW03	-	-	-	26.2	28.6

NOS02 High Street, Newnham



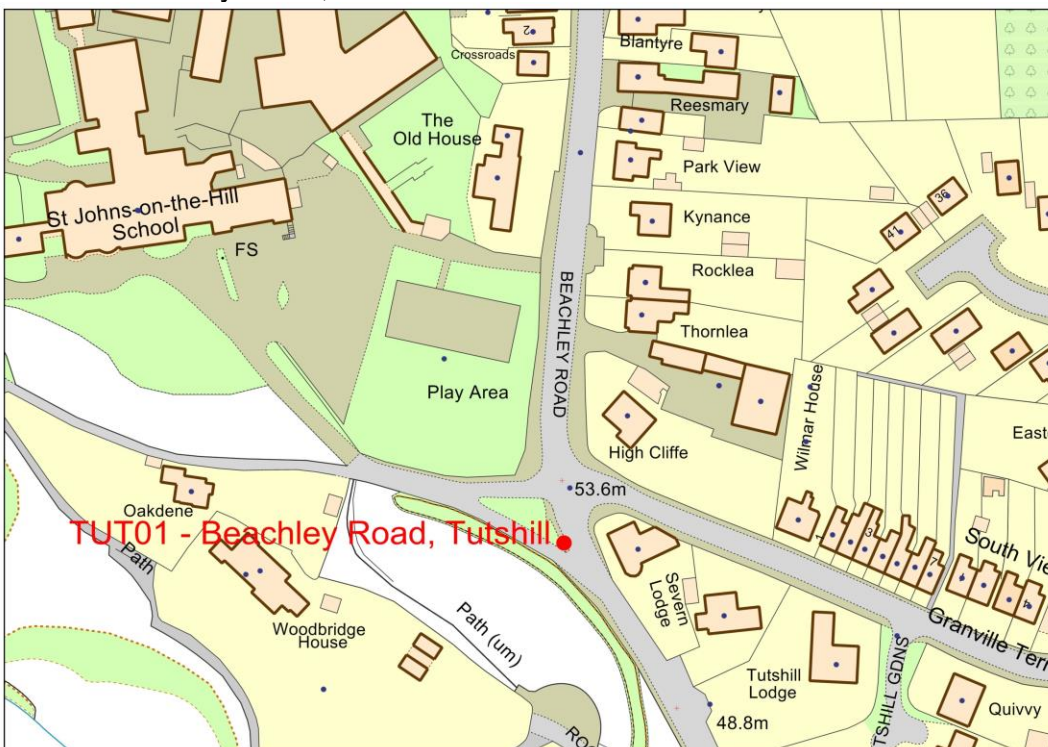
Site	Annual mean concentrations ($\mu\text{g}/\text{m}^3$) Bias Adjusted				
	2014	2015	2016	2017	2018
NOS02	28.3	25.8	28.7	27.0	28.2

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



Site	Annual mean concentrations ($\mu\text{g}/\text{m}^3$) Bias Adjusted				
	2014	2015	2016	2017	2018
WOS01	19.1	18.2	19.1	17.5	18.5

TUT01 Beachley Road, Tutshill



Site	Annual mean concentrations ($\mu\text{g}/\text{m}^3$) Bias Adjusted				
	2014	2015	2016	2017	2018
TUT01	-	-	-	-	13.6

Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

Defra have a page describing all the objectives that apply across the UK, and when they should be met, here: https://uk-air.defra.gov.uk/assets/documents/Air_Quality_Objectives_Update.pdf

The following table provides a brief description of the objectives in England:

Pollutant	Air Quality Objective ²	
	Concentration	Measured as
Nitrogen Dioxide (NO ₂)	200 µg/m ³ not to be exceeded more than 18 times a year	1-hour mean
	40 µg/m ³	Annual mean
Particulate Matter (PM ₁₀)	50 µg/m ³ , not to be exceeded more than 35 times a year	24-hour mean
	40 µg/m ³	Annual mean
Sulphur Dioxide (SO ₂)	350 µg/m ³ , not to be exceeded more than 24 times a year	1-hour mean
	125 µg/m ³ , not to be exceeded more than 3 times a year	24-hour mean
	266 µg/m ³ , not to be exceeded more than 35 times a year	15-minute mean

² The units are in microgrammes of pollutant per cubic metre of air (µg/m³).

Glossary of Terms

Abbreviation	Description
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the local authority intends to achieve air quality limit values'
AQMA	Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives
ASR	Air quality Annual Status Report
Defra	Department for Environment, Food and Rural Affairs
EU	European Union
LAQM	Local Air Quality Management
NO ₂	Nitrogen Dioxide
NO _x	Nitrogen Oxides
PM ₁₀	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less
PM _{2.5}	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control