2018 Air Quality Annual Status Report (ASR)

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

August 2018

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Executive Summary: Air Quality in Our Area

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

The annual health cost to society of the impacts of particulate matter alone in the UK is estimated to be around £16 billion[3].

The Council has a duty to review and assess air quality within its district under the Part IV of the Environment Act 1995 and this Annual Status Report has been prepared to fulfil this requirement.

Air pollutants can arise from a variety of sources, including transport and industry. Pollutant levels are assessed against health-based national air quality objectives. Where the objectives are not met, Air Quality Management Areas (AQMAs) must be declared and an Action Plan put in place to improve the air quality in these areas.

Air Quality in South Gloucestershire

South Gloucestershire lies to the north and east of the city of Bristol with the River Severn forming the western boundary. The area is a diverse mix of urban and rural areas, including major residential, industrial and commercial developments. The road network within South Gloucestershire contains the major junction of the M4 and M5 motorways. The 2017 mid-year population estimate for South Gloucestershire is 279,027[4] and has grown by 13.6% on the number recorded in the 2001 census (245,600). The population is projected to continue to rise, meaning that managing future development and providing vital transport infrastructure is a key challenge.

The main air pollutant of concern locally is nitrogen dioxide (NO_2), which originates primarily from road traffic emissions.

[1] Environmental equity, air quality, socioeconomic status and respiratory health, 2010
[2] Air quality and social deprivation in the UK: an environmental inequalities analysis, 2006
[3] Defra. Abatement cost guidance for valuing changes in air quality, May 2013
[4] Source: Office for National Statistics (ONS) Mid-year estimates 2017 (published 28 June 2018)

The air quality in South Gloucestershire is generally good. However, the air quality does not meet the annual mean objective for nitrogen dioxide (40 µg/m^3) in some parts of South Gloucestershire. This is mainly in areas where people are in close proximity to busy, congested roads. The volume and type of traffic and the topography of the area, for example, if the area is open or enclosed such as in a "street canyon", which impacts on the ability of pollutants to disperse, also play an important part.

Air Quality Management Areas

There are three AQMAs currently declared in South Gloucestershire in relation to the annual mean objective for nitrogen dioxide:

- Staple Hill – in the centre around the Broad Street/ High Street/ Soundwell Road/ Victoria Street crossroads
- Kingswood – Warmley – from the Bristol/ South Gloucestershire boundary in Kingswood along the A420 to the junction with Goldney Avenue in Warmley.
- Cribbs Causeway – adjacent to the M5 Junction 17 roundabout (however revocation of this AQMA is proposed)

Full details of these AQMAs are included in Table 2.1 of this report and maps are available in Appendix E. Further information on the AQMAs are available on the Council website at www.southglos.gov.uk/airquality and on the Defra website at https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=238.

Trends in monitored concentrations

In 2017, decreases in monitored nitrogen dioxide concentrations were observed as a general trend across the majority of the monitoring sites in South Gloucestershire, including at the Yate automatic station and in the Kingswood – Warmley and Staple Hill AQMAs.

The overall trends in nitrogen dioxide concentrations in the Kingswood – Warmley and Staple Hill AQMAs have been relatively stable over the past decade with a slight downward trend in recent years, although there was an upward trend in 2016, mirroring that generally seen across South Gloucestershire as a whole. However, in 2017, concentrations fell at all sites in the AQMAs, apart from the two exceeding sites 139 and 146 in the Kingswood – Warmley AQMA. It is difficult to determine

exactly why concentrations would have increased at these two sites when concentrations decreased at the majority of other sites. However overall, the number of monitoring sites in the AQMAs exceeding the annual mean objective fell from eleven in 2016 to three in 2017. Pollutant concentrations can vary significantly from year to year due to a number of factors, in particular the meteorological conditions, which can affect pollutant dispersion.

The Yate automatic monitoring site shows the annual mean nitrogen dioxide concentrations have generally been stable and in 2017, there was a slight decrease from 24 µg/m^3 in 2016 to 23 µg/m^3. The monitored concentrations remain well below the annual mean and 24-hour mean objectives at this site.

Particulate matter is also a pollutant of concern with recent research indicating that there are no safe levels of this pollutant[5]. Particulate matter (PM_{10}) is also monitored at the Yate Automatic Monitoring site and in 2017, the annual mean PM_{10} concentration was 14 µg/m^3; the same as in 2016. The trend in PM_{10} concentrations shows the annual mean concentrations have overall been slowly declining since 2010 at Yate and remain well below the annual mean and 24-hour mean objectives.

The trends in the data from the Yate Automatic Monitoring station and within the AQMAs are discussed fully in Chapter 3 of the report and trend graphs are available in Appendix A.

Pollutant sources

The following pollutant sources were considered as part of the review of air quality for this report, as detailed in the Defra LAQM Technical Guidance (LAQM.TG16)[6].

- Road Traffic Sources
- Non-Road transport Sources
- Industrial Sources
- Commercial and Domestic Sources
- Fugitive and Uncontrolled Sources

No new major sources of emissions were identified. Full details are provided in Appendix D of the report.

[5] https://laqm.defra.gov.uk/assets/63091defraairqualityguide9web.pdf
[6] http://laqm.defra.gov.uk/technical-guidance/

How the Council works to manage local air quality

South Gloucestershire Council is a unitary authority and Planning, Transport and Environmental Health are all within the same Directorate (Environment and Community Services) enabling close working between these teams. This has particularly allowed close working between Environmental Health, with their responsibilities for local air quality management and the Strategic Transport and Environment Policy Team, who currently lead on air quality action plan development and implementation. Furthermore, there is a close working relationship with the Public Health Team, and their work on the built environment recognises the importance of aligning spatial planning and transport work with its associated impacts on air quality and health.

The Council is continuing to develop a more holistic approach across the Council to address air quality issues through the establishment of an 'air quality expert reference panel' bringing together relevant professionals within the council who have an interest in air quality, either directly, such as environmental health, public health and transport; or indirectly, where there is opportunity for impact, such as planning policy, major development sites, development control and transport assets and maintenance.

South Gloucestershire works closely with other neighbouring authorities in the West of England (Bath and North East Somerset, Bristol City and North Somerset Councils), particularly with regard to regional strategic work areas such as transport and planning, for example on the Joint Spatial Plan[7], which sets set out a prospectus for sustainable growth to help the Region meet its housing and transport needs in future years until 2036.

The West of England Combined Authority (WECA) was established in February 2017, with its constituent councils being Bath and North East Somerset, Bristol and South Gloucestershire. Through the Combined Authority, more decisions will be made locally on areas such as transport, housing and skills, and crucially more funding will be available to improve transport infrastructure, create new jobs and improve adult education and skills. WECA will continue to also work closely with North Somerset.

[7] https://www.jointplanningwofe.org.uk/consult.ti?

Actions to Improve Air Quality

Key completed measures to improve air quality are:

- A second successful Clean Bus Technology Fund (CBTF) bid was confirmed for the West of England in February 2018 and will be used to upgrade 81 Euro IV buses to Euro VI standard to reduce NOx emissions. 13 of these vehicles will operate in the AQMAs in South Gloucestershire.
- This follows the Clean Bus Technology Funding awarded in December 2015 following a joint bid by Bristol, South Gloucestershire and Bath and North East Somerset Councils. The funding was used to upgrade 35 of the most polluting Euro II and III local buses by retrofitting Selective Catalytic Reduction Technology (SCRT) to achieve Euro Standard V/VI, thereby reducing tailpipe NOx emissions on those services, all of which operate in the Bristol, Bath and South Gloucestershire AQMAs. The retrofitting was completed in 2017.
- A £4.79m Office for Low Emission Vehicles (OLEV) funding grant was awarded to the four West of England local authorities and First Bus in August 2017. This funding will help unlock a £28m investment by First, to potentially transform a significant part of their fleet (up to 110 vehicles) into bio-methane powered buses. The new buses, which could start running by 2019, will contribute to reducing air pollution levels across the West of England area, including the Staple Hill AQMA.
- Entire fleet of Council pool cars switched to electric in early 2017, with OLEV funding secured to switch 20% of other fleet vehicles to electric by 2021.
- Access funding secured to 2020, to enable the continuation of school, business and community travel planning measures to promote sustainable travel choices.
- Lighting installed along the Bristol/Bath railway cycle path during 2014/15 and 2015/16. These works will significantly improve conditions for cyclists along this major cycling corridor which also serves the Staple Hill AQMA.
- Local Pinch Point Funding has enabled improvements to the M5 motorway junctions 16 and 17, in order to manage the impact of anticipated development and reduce congestion. Works were completed during 2015/16 and should be

of benefit to the Cribbs Causeway AQMA and should help to maintain the nitrogen dioxide concentrations below the air quality objective.

- A signing review of delivery bays was undertaken during 2015 in Kingswood. Implementation of remedial measures following that review were completed in October 2016, which will improve local enforcement.
- The local transport capital programme 2016/17 approved a wider parking management review of the extended Kingswood - Warmley AQMA. Recommendations from the review address parking issues along the A420 Hill Street/Deanery Road and in Warmley, and the two resulting schemes are due to be completed in 2018 and 2019 respectively. This builds on the delivery of measure KS2 already delivered in the former Kingswood AQMA.

Full details of progress in implementing the existing Air Quality Action Plan for Kingswood and Staple Hill are contained in Section 2.2 of this report.

Other actions being progressed on a wider West of England basis aimed at reducing traffic congestion which should contribute to improved air quality include:

- Metrobus - a rapid public transport system which will provide direct routes to key employment, education and leisure destinations around the area[8]. Further information is also provided in Appendix D.
- Cribbs Patchway Metrobus Extension[9] - an extension of the Metrobus scheme to help reduce traffic levels caused by the proposed Cribbs Patchway New Neighbourhood on the former Filton Airfield. It will provide a direct route between Bristol Parkway railway station and The Mall, via the new neighbourhood.
- MetroWest[10] – improved rail services and infrastructure. This project is being delivered in two phases by the West of England councils, working in partnership with Network Rail and Great Western Railway, along with a separate new stations package looking at the potential for future new stations. The Phase 2 project is proposing to re-open the Henbury Line to an hourly spur passenger service and increase train services to Yate to a half-hourly service and the plans include new rail stations at Henbury, North Filton and

[8] https://travelwest.info/metrobus
[9] https://travelwest.info/projects/cribbs-patchway-metrobus-extension
[10] https://travelwest.info/projects/metrowest

Ashley Down. This project is led by South Gloucestershire Council on behalf of the four West of England Councils

- Cycle Ambition Fund – improvements to cycle routes to provide better door-to-door journeys[11], including various projects in South Gloucestershire[12], e.g. Bromley Heath Walking and Cycling Bridge and Mangotsfield Cycle Path Lighting.
- GoUltraLowWest[13] - a grant funded project by OLEV (Office for Low Emission Vehicles) for investment in the promotion of electric vehicles throughout the West of England region. The Government's aspiration is that by 2040, every new car in the UK will be an ultra-low emission vehicle.
- The Joint Local Transport Plan (JLTP) for the West of England region, currently JLTP3 covering the period 2011 - 2026, is being updated to produce a new Joint Local Transport Plan (JLTP4) to take strategic transport planning beyond 2026. Goal 3 within the existing JLTP3 is to improve air quality in the AQMAs and a greater emphasis will be placed on air quality in the JLTP4.

During 2017 and early 2018, South Gloucestershire Council officers continued to be involved in the Project Steering Group for the Clean Air Feasibility Study with Bristol City Council. However, the project needed to refocus as Bristol developed its Outline Business Case for the Clean Air Plan in line with the Ministerial Direction, so changes to the governance and delivery arrangements of the project were made.

Subsequently, through meetings organised by the West of England Combined Authority (WECA), there has been continued collaboration with Bristol City Council and Bath and North East Somerset Council on their Clean Air Plans, which both consider the implementation of a Clean Air Zone, alongside other measures. Modelling work has indicated that if a Clean Air Zone were to be introduced in Bristol that this would impact sufficient "through" vehicle trips to also improve air quality in the Kingswood – Warmley and Staple Hill AQMAs. Further information about the Bristol Clean Air Plan is available on the Clean Air for Bristol website[14] and for the Bath Clean Air Plan, on the Bath Breathes website[15].

[11] https://travelwest.info/projects/cycle-ambition-fund
[12] https://travelwest.info/projects/cycle-ambition-fund/south-gloucestershire
[13] https://travelwest.info/drive/electric-vehicles/go-ultra-low-west
[14] https://www.cleanairforbristol.org/
[15] http://www.bathnes.gov.uk/bath-breathes-2021

In February 2018, South Gloucestershire Council was also mandated by the Government to undertake a Targeted Feasibility Study into possible actions to bring forward compliance with nitrogen dioxide EU limit values on a 1.27km section of the A4174 Ring Road between the Bromley Heath and M32 Junction 1 roundabouts. This section of the A4174 was predicted to exceed the EU annual mean Limit Value for nitrogen dioxide (40 µg/m^3) until 2020 by national Pollution Climate Mapping (PCM) modelling used by Defra to report to the EU on UK air quality. This was the only local authority road link in South Gloucestershire where an exceedance was predicted beyond 2017.

The study concludes that it would be possible to bring forward compliance of the identified section of the A4174 from 2020 to 2019 if the following measures were implemented:

- Removal of westbound A4174 right-turn to B4058 Bristol Road towards Winterbourne and northbound B4058 Bristol Road right-turn to A4174 from Frenchay at the A4174 Hambrook crossroads.
- In addition to the above, the use of 'soft gating' to limit traffic movements from Bromley Heath roundabout to be implemented by adjusting the peak traffic timings to ensure that additional trips are not generated by the additional capacity provided.

The Feasibility Study has been submitted to the Joint Air Quality Unit (JAQU); a new joint unit formed between Defra and the Department for Transport (DfT), and is currently being reviewed. South Gloucestershire Council was one of 33 local authorities mandated in the so-called "Third wave" of authorities required to achieve compliance with air quality limits in the shortest possible time and the approved studies will be included in the supplement to the 2017 UK Air Quality Plan[16] due in October 2018. It is also intended to publish each study alongside the Supplement.

Conclusions and Priorities

Some exceedances of the nitrogen dioxide annual mean objective remain, albeit fewer (3) than in 2016 (11), with two exceedances occurring in the Kingswood – Warmley AQMA and one in the Staple Hill AQMA, confirming the AQMAs are still

[16] https://www.gov.uk/government/publications/air-quality-plan-for-nitrogen-dioxide-no2-in-uk-2017

currently required. However, following a review of the monitoring site locations in the Staple Hill AQMA in 2017 and the setting up of six additional monitoring sites at the facades of properties that better represent relevant exposure, only one site (61) from the existing sites in the AQMA remains borderline (within 10% of the annual mean objective i.e. >36 µg/m^3) following distance adjustment to the nearest façade and only one of the new sites set up at worse-case façades of relevant exposure is borderline (site 165). On this basis, the AQMA would no longer be required, however, we are mindful that as pollutant concentrations can vary significantly from year to year, it would be appropriate to review the situation over time to ensure it is sustained before revocation of the AQMA can be considered.

There were no exceedances within the Cribbs Causeway AQMA or outside of the AQMAs.

Since the declaration of the Cribbs Causeway AQMA in 2010, the monitoring results have shown the nitrogen dioxide concentrations are below the annual mean objective at the façade of the single residential property within the AQMA. Defra recommended in their appraisal of the 2016 Air Quality Annual Status Report that revocation of the AQMA should be considered. This report confirms that there was no exceedance in 2017 within this AQMA, demonstrating compliance for the last seven years. We propose to revoke the Cribbs Causeway AQMA and will consult shortly on this.

The monitoring results showed a fall in nitrogen dioxide concentrations at the majority of the Council's monitoring sites in 2017, including at the majority of sites within the AQMAs. However, as already mentioned, pollutant concentrations can vary significantly from one year to another due to a number of factors, in particular, the meteorological conditions. Further discussion of the monitoring results is provided in Chapter 3.

South Gloucestershire Council's priority for the coming year continues to be to review and update the Air Quality Action Plan for Kingswood and Staple Hill in order to incorporate the extension of the Kingswood AQMA to Warmley. The progress on this in 2017/18 has been limited due to the Joint Air Quality Unit mandated Feasibility Study we have been involved in.

We will continue to collaborate with Bristol City Council, Bath and North East Somerset Council on their Clean Air Plans and share progress on each of our mandated JAQU projects via regular WECA Clean Air Zones progress meetings to

deliver improvements and compliance with air quality objectives and limit values in the shortest timescale possible.

However, the Council faces major challenges at a time of significant pressure on public finances, particularly in relation to local government funding, which could impact on delivering air quality improvements. We will be relying upon a commitment from national government to provide the required funding to implement the measures to bring forward compliance in NO_2 levels on the section of the A4174 considered in the Targeted Feasibility Study, should the study outcomes be approved.

The transport system is subject to significant pressure within South Gloucestershire, due to the sheer level of travel demand generated by the current population and by people coming into the area on a daily basis to work, shop and for leisure reasons. These pressures are shown through traffic congestion on South Gloucestershire's road network and capacity problems on local rail services.

The provision for the housing requirement of 105,500 new homes by 2036 for the West of England area has been made in the Joint Spatial Plan[17] (JSP) which has been developed by the four West of England authorities. 32,500 of these new homes are likely to be built in South Gloucestershire.

Alongside the JSP, the four councils developed a Joint Transport Study (JTS)[18]. The JTS is designed to help the region meet the growing travel demands that new growth will bring, as well as tackling existing pressure on road and public transport networks. This includes providing the key transport infrastructure needed to reduce reliance on cars and tackle congestion and measures to improve walking and cycling, better access to public transport and, where necessary, highway capacity improvements. This joint approach to planning and transport will ensure that future growth decisions are made with an understanding of the necessary transport investment needed to achieve sustainable communities.

Local Engagement and How to get Involved

Engagement work to raise public awareness of air quality locally was undertaken by the Council's Public Health Team through the 'Air Quality on the School Journey' project developed jointly with the University of the West of England in 2017. This

[17] https://www.jointplanningwofe.org.uk/consult.ti?
[18] https://www.jointplanningwofe.org.uk/consult.ti/JTSTransportVision

used public participatory research to raise awareness of air pollution, specifically particulate matter, its effects on health and opportunities to reduce it. The project was carried out in partnership with a school adjacent to the Kingswood – Warmley AQMA in early 2018, together with the Council's Road Safety Team and also linked in with projects run on their behalf by the national charity 'Living Streets' which encourage active travel methods. The project concentrated on raising awareness of air pollution; its causes, effects and solutions, among children in year 7 who are at the stage where they may begin to have choices about how they travel to school. The project included indicative monitoring of $PM_{2.5}$ using personal monitors to record levels of pollution to which children were exposed during travel to and from school.

Children using a variety of travel modes were measured; walking, cycling and travel by car; and the monitoring was carried out over several days. The results were used to highlight the differences in exposure to $PM_{2.5}$ pollution by using different modes of transport. During the project relevant travel messages such as 'no parking on zig zags' and 'anti idling' were also provided to parents via the school's normal communication channels; email and social media, in addition to placing banners on railings outside the school. The project also included use of questionnaires and two assemblies to the year group to both introduce the project and present the findings. There was an increase in awareness of air pollution and its effects on health over the course of the project and the children learned that they could make positive choices in relation to their travel modes, to both increase their active travel and help to reduce air pollution. Following the success of this project, consideration is being given to rolling the project out to other schools in South Gloucestershire, depending on resources.

What you can do to reduce air pollution?

Everyone can help to improve air quality in South Gloucestershire and beyond. By making informed personal choices, particularly with regard to travel, we can help to improve air quality and improve our own health in the process.

- Substituting car use, if and when possible, with a bus or train journey, or preferably by walking or cycling, not only reduces air pollution but improves your health and wellbeing.
- If possible, sharing lifts with colleagues to work will save you money as well as reducing the number of cars on the road.

- Chose to travel outside peak hours if possible or work from home if that is an option.
- When looking to change your vehicle, take air pollution in consideration and opt for the cleanest vehicle you feasibly can. Low emission electric and /or hybrid vehicles are becoming more affordable and government funding and grants are available. As a general rule, the hierarchy below can be followed to identify which types of vehicles have the lowest emissions of pollutants which are harmful to health:
    - Electric vehicles — Lowest emissions
    - Plug in petrol hybrid
    - Petrol hybrid
    - Gas or petrol
    - Plug in diesel hybrid
    - Diesel hybrid
    - Diesel — Highest Emissions
- However, some vehicle manufacturers and models perform better than other in terms of pollutant emissions. Measurements of the level of pollution emitted under real-world driving conditions have shown large discrepancies with the required Euro emissions standards for vehicles. To check the emissions of your vehicle or the performance of a vehicle that you are considering purchasing, there is an online vehicle checker[19] that has been launched by the Mayor of London to enable consumers to get the latest data on real world vehicle emissions, complied through robust independent emissions tests by Emissions Analytics and the International Council on Clean Transportation.
- We recommend you visit the Travel West[20] website as this provides live information on public transport for journey planning as well as route information for walkers and cyclists. It also provides traffic reports, information on electric vehicle charging infrastructure and other information that simplifies travel choices.

[19] https://www.london.gov.uk/what-we-do/environment/pollution-and-air-quality/cleaning-londons-vehicles
[20] https://travelwest.info/

While most air pollution in South Gloucestershire is caused by road traffic, domestic heating, in particular wood-burning, is another source of pollution, especially particulates (PM_{10} and $PM_{2.5}$). Measures that could be considered to reduce pollution from domestic heating, include:

- Upgrading boilers to newest and most efficient gas condensing boilers with lowest NO_x (and carbon) emissions.
- "Clean" renewable energy generation, for example via solar photovoltaics.
- If you are currently using a wood burner or open fire make sure that you are using it correctly and not breaking the Smoke Control Area regulations. Some of South Gloucestershire is covered by a smoke control area[21] which allows only approved fuels and appliances to be used.
- Should you plan to install a stove, then the lowest emission stoves currently on the market are those that are 'Ecodesign Ready'. These will meet the future EU standards for all new stoves in the UK set to be introduced in 2022.
- While the type of solid fuel appliance used is an important factor in determining the level of pollution emitted, the way in which they are used is equally as important. Understanding the right fuels and the right way to use them is explained within the "Open fires and wood-burning stoves" guidance leaflet[22] issued by Defra.
- However, from an air pollution perspective, if you do not own an existing stove or open fireplace, the best option is not to install one as recent research shows that even the lowest emitting wood burning appliance emits an order of magnitude more particulate matter than a gas oil appliance and two orders of magnitude more than a gas appliance.

There are decisions we can all make to reduce air pollution. Even relatively small changes can add up and make a real difference to the quality of the air we all breathe.

Further information is available on our website www.southglos.gov.uk/airquality.

[21] https://www.southglos.gov.uk/environment-and-planning/pollution/pollution-control-clean-air-act-approval/smoke-control-areas/
[22] https://consult.defra.gov.uk/airquality/domestic-burning-of-wood-and-coal/supporting_documents/open%20fires%20wood%20burning%20stoves%20%20guideA4update12Oct.pdf

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1 Local Air Quality Management

This report provides an overview of air quality in South Gloucestershire area during 2017. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) and the relevant Policy and Technical Guidance documents.

The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where an exceedance is considered likely the local authority must declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives. This Annual Status Report (ASR) is an annual requirement showing the strategies employed by South Gloucestershire 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 F.1 in Appendix F.

2 Actions to Improve Air Quality

2.1 Air Quality Management Areas

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

In 2010, three AQMAs were declared in the centres of both Kingswood and Staple Hill and at Cribbs Causeway adjacent to the M5 Junction 17 roundabout. The Kingswood and Staple Hill AQMAs were extended in 2012 following further assessment and the Council produced an Action Plan in 2012, focusing mainly on transport measures.

In 2014, a detailed assessment of air quality in Warmley along the A420 corridor identified new locations where the nitrogen dioxide annual mean objective was being exceeded. An extension of the Kingswood AQMA along the A420 to Warmley was proposed and the Kingswood - Warmley AQMA was declared in December 2015. Work to review and update the Air Quality Action Plan for Kingswood and Staple Hill is progressing to incorporate appropriate actions to cover the extension of the Kingswood AQMA to Warmley and to include a wider range of actions to improve air quality in the AQMAs.

Since the declaration of the Cribbs Causeway AQMA in 2010, the monitoring results have shown the nitrogen dioxide concentrations are below the annual mean objective at the façade of the single residential property within the AQMA. Defra recommended in their appraisal of the 2016 Air Quality Annual Status Report that revocation of the AQMA should be considered. This report confirms that there was no exceedance in 2017 within this AQMA. The proposed revocation of the Cribbs Causeway AQMA is discussed further in Section 3.2.1. We propose to consult on the proposed revocation of the Cribbs Causeway AQMA shortly.

A summary of the current AQMAs declared by South Gloucestershire Council can be found in Table 2.1. The levels of exceedance at the declaration of the AQMAs (2010) and in 2017 are compared in Table 2.1. However, the monitoring undertaken within the AQMAs has changed during this timeframe to reflect extensions to the AQMAs

and also to better represent relevant exposure. Consequently, the monitoring locations in 2017 are not necessarily directly comparable to those in 2010 and comparison between the exceedance levels may not provide a true reflection of trends in nitrogen dioxide levels over that timeframe.

The trends in annual mean nitrogen dioxide concentrations in the Kingswood – Warmley and Staple Hill AQMAs are shown in Figure A.3 to Figure A.5 and are discussed in Section 3.2.1. Further discussion of a review of the monitoring in the Staple Hill AQMA is included in Appendix D. Distance adjusted monitoring data has also been provided in Table B.1 in Appendix B.

Further information related to declared or revoked AQMAs, including maps of AQMA boundaries are available online on the Council website at www.southglos.gov.uk/airquality and on the Defra website at https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=238.

Alternatively, in Appendix E, maps of the current AQMAs are available in Figure E.1 to Figure E.3. Maps of the air quality monitoring locations in relation to the AQMAs are also available in Figure E.8 (Cribbs Causeway AQMA), Figure E.10 (Staple Hill AQMA) and Figure E.11 to Figure E.13 (Kingswood –Warmley AQMA).

Table 2.1 Declared Air Quality Management Areas

AQMA Name	Date of Declaration	Pollutants and Air Quality Objectives	City / Town	One Line Description	Is air quality in the AQMA influenced by roads controlled by Highways England?	Level of Exceedance (maximum monitored/modelled concentration at a location of relevant exposure)		Action Plan (including name, date of publication and link)
						At Declaration	Now	
AQMA 1 Cribbs Causeway	Declared 14 April 2010	NO_2 Annual Mean	Bristol (North fringe) Cribbs Causeway	The area incorporates a single property (Hollywood Cottage, Blackhorse Hill) adjacent to the M5 Junction 17 Roundabout.	YES	33.0 µg/m^3 (Site 87 at façade 2010) NB: AQMA declared on basis of distance adjusted results of roadside sites (80 & 81) no longer in operation.	27.0 µg/m^3 (Triplicate Site 87 at façade average)	No Action Plan as under objective
AQMA 2 Kingswood – Warmley	Declared 14 April 2010 Amended 25 May 2012 Amended 16 December 2015	NO_2 Annual Mean	Bristol (East fringe) Kingswood & Warmley	The area incorporates A420 road from South Gloucestershire /Bristol City Council boundary in Kingswood extending eastwards to junction of Goldney Avenue in Warmley; to the south along Hanham Road (up to and	NO	45.0 µg/m^3 (Site 68 at façade in Kingswood AQMA as declared in 2010. NB: no ground floor exposure)	46.3 µg/m^3 (Site 146 at façade in Kingswood – Warmley AQMA) 39.7 µg/m^3 (Site 68 at façade for comparison in former	2012 Air Quality Action Plan for Kingswood and Staple Hill (published March 2012) http://www.southglos.gov.uk/documents/cos120094.pdf (The AQAP is currently being updated to include the extension to Warmley in Dec 2015)

				including The Folly); and to the south-east along Tower Road North to the junction of Crown Gardens; and includes any properties that lie within the outlined boundary.			Kingswood AQMA. NB: no ground floor exposure)	
AQMA 3 Staple Hill	Declared 14 April 2010 Amended 25 May 2012	NO_2 Annual Mean	Bristol (East fringe) Staple Hill	The area incorporates the Broad Street (A4175), High Street (B4465), Victoria Street and Soundwell Road (A4017) crossroads; along Broad Street to the junction with York Road; High Street (up to and including no's 40 and 49); Soundwell Road (up to and including no's 16a and 47); Victoria Street to the junction of Clarence Road; and includes any properties that lie within the outlined boundary.	NO	47.9 µg/m^3 (Site 73 in Staple Hill AQMA as declared in 2010. NB: not distance adjusted, no ground floor exposure)	40.3 µg/m^3 (Site 75 Distance adjusted result 32.7 µg/m^3 NB: no ground floor exposure) 37.3 µg/m^3 (Site 73 for comparison. NB: Distance adjusted result 32.2 µg/m^3, no ground floor exposure)	2012 Air Quality Action Plan for Kingswood and Staple Hill (published March 2012) http://www.southglos.gov.uk/documents/cos120094.pdf

☒ **South Gloucestershire Council confirm the information on UK-Air regarding their AQMAs is up to date**

2.2 Progress and Impact of Measures to address Air Quality in South Gloucestershire

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

The report is well structured, detailed, and provides the information specified in the Guidance. The Council have provided a comprehensive and well detailed report summarising the current updates on monitoring and status of action plan measures. The following comments are made to inform the development of future reports.

1. The details of levels of exceedances have been omitted from Table 2.1, these are designed to provide an overview of the status of current AQMAs, based upon latest monitoring. *(These have been included in Table 2.1 of this report).*

2. Latest monitoring results confirm the status of the Cribbs Causeway AQMA as meeting the air quality objectives, and there appears no reason why the AQMA should not be revoked, and the Council should proceed with this action. As discussed in the report, we agree monitoring should remain for the time being to consider the impact of new developments. *(Consultation on the proposed revocation of the AQMA will be undertaken shortly).*

3. The current action plan and recent measures introduced highlight the commitment within the Council to engage with air quality issues. Joint working with the West of England local Authorities on a Joint Transport Study, and with Bristol City Council on developing a feasibility study for a Clean Air Zone, are clear examples, along with the Public Health initiatives.

4. The current action plan however is also 7 years old and as reported is due for a review including the addition of measures to address the Warmley AQMA area. There are many measures in the current AQAP that have either been completed or are inactive waiting for further funding. *(Please note, the current action plan was produced in March 2012 so it was less than 6 years old at the time of the 2017 ASR. Progress has been limited on the updated Air Quality Action Plan in 2017/18 due to work on the mandated SGC Feasibility Study).*

5. The remaining exceedances in Kingswood, Warmley and Staple Hill may require further assessment as part of the AQAP review. The ASR reports that there have been some significant increases in monitored pollution levels during 2016, and overall trend has only indicated marginal improvements in recent years. *(In 2017,*

concentrations fell across the majority of monitoring sites in South Gloucestershire, including within the AQMAs. For further detail, see Chapter 3).

6. There appears to be a single recorded exceedance within the Staple Hill AQMA at a position of relevant exposure, although the report suggests that there is no exposure at ground floor level. It is not clear whether the monitoring is representative of ground floor or 1st floor exposure. *(This related to site 102 where the monitoring is at ground floor level although exposure is at first floor level. Details for 2017 monitoring in the Staple Hill AQMA are fully discussed in Chapter 3 and Appendix D).*
7. The exceedance outside of an AQMA at Soundwell Road should be subject to further investigation. (*In 2017, the results were below the objective at this site).*
8. Future AQAP measures should be developed in line with the guidance in Chapter 2 of LAQM.TG(16), providing the full details including reduction targets that are currently missing. It may be important to re-evaluate the required level of emissions reductions to achieve the air quality objectives. *(This will be considered in the updated Action Plan).*
9. The emphasis in future reports is to show progress in developing and implementing action plan measures year on year, and providing updates in each ASR report. AQAP measures should target pollution hotspots. *(Noted)*

South Gloucestershire Council has taken forward a number of direct measures during the current reporting year of 2017 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2.

More detail on these measures can be found in the 2012 Air Quality Action Plan for Kingswood and Staple Hill[23] and also in related plans and strategies, such as the West of England Joint Local Transport Plan 3 (JLTP3) 2011 – 2026[24], which is supported by various strategies on key issues such as public transport, smarter travel choices, cycling and walking.

[23] http://www.southglos.gov.uk/documents/cos120094.pdf
[24] https://travelwest.info/projects/joint-local-transport-plan

Key completed measures are:

- A second successful Clean Bus Technology Fund (CBTF) bid was confirmed for the West of England in February 2018 and will be used to upgrade 81 Euro IV buses to Euro VI standard to reduce NOx emissions. 13 of these vehicles will operate in the SGC AQMAs.
- A £4.79m Office for Low Emission Vehicles (OLEV) funding grant was awarded to the four West of England local authorities and First Bus in August 2017. This funding will help unlock a £28m investment by First, to potentially transform a significant part of their fleet (up to 110 vehicles) into bio-methane powered buses. The new buses, which could start running by 2019, will contribute to reducing air pollution levels across the West of England area, including the Staple Hill AQMA.
- Entire fleet of Council pool cars switched to electric in early 2017, with OLEV funding secured to switch 20% of other fleet vehicles to electric by 2021.
- Access funding secured to 2020, to enable the continuation of school, business and community travel planning measures to promote sustainable travel choices.
- Lighting installed along the Bristol/Bath railway cycle path during 2014/15 and 2015/16. These works will significantly improve conditions for cyclists along this major cycling corridor which also serves the Staple Hill AQMA.
- Clean Bus Technology Funding (CBTF) awarded in December 2015 following a joint bid by Bristol, South Gloucestershire and Bath and North East Somerset Councils. The funding was used to upgrade 35 of the most polluting Euro II and III local buses by retrofitting Selective Catalytic Reduction Technology (SCRT) to achieve Euro Standard V/VI, thereby reducing tailpipe NOx emissions on those services, all of which operate in the Bristol, Bath and South Gloucestershire AQMAs. The retrofitting was completed in 2017.
- Local Pinch Point Funding has enabled improvements to the M5 motorway junctions 16 and 17, in order to manage the impact of anticipated development and reduce congestion. Works were completed during 2015/16 and should be

of benefit to the Cribbs Causeway AQMA and should help to maintain the nitrogen dioxide concentrations below the air quality objective.

- A signing review of delivery bays was undertaken during 2015 in Kingswood. Implementation of remedial measures following that review were completed in October 2016, which will improve local enforcement.
- The local transport capital programme 2016/17 approved a wider parking management review of the extended Kingswood - Warmley AQMA. Recommendations from the review address parking issues along the A420 Hill Street/Deanery Road and in Warmley, and the two resulting schemes are due to be completed in 2018 and 2019 respectively. This builds on the delivery of measure KS2 already delivered in the former Kingswood AQMA.

During 2017 and early 2018, South Gloucestershire Council (SGC) officers continued to be involved in the Project Steering Group for the Clean Air Feasibility Study with Bristol City Council. However, the project needed to refocus as Bristol developed its Outline Business Case for the Clean Air Plan in line with the Ministerial Direction, so changes to the governance and delivery arrangements of the project were made.

Subsequently, though meetings organised by the West of England Combined Authority (WECA), there has been continued collaboration with Bristol City Council and Bath and North East Somerset Council on their Clean Air Plans, which both consider the implementation of a Clean Air Zone, alongside other measures. Modelling work has indicated that if a Clean Air Zone were to be introduced in Bristol that this would impact sufficient “through” vehicle trips to also improve air quality in the Kingswood – Warmley and Staple Hill AQMAs. Further information about the Bristol Clean Air Plan is available on the Clean Air for Bristol website[25] and for the Bath Clean Air Plan, on the Bath Breathes website[26].

South Gloucestershire Targeted Feasibility Study

In February 2018, South Gloucestershire Council was also mandated by the Government to undertake a Targeted Feasibility Study into possible actions to bring forward compliance with nitrogen dioxide EU limit values on a 1.27km section of the

[25] https://www.cleanairforbristol.org/
[26] http://www.bathnes.gov.uk/bath-breathes-2021

A4174 Ring Road between the Bromley Heath roundabout and the M32 Junction 1 roundabout as shown in Figure 2.1.

This section of the A4174 is predicted to exceed the EU annual mean Limit Value for nitrogen dioxide (40 µg/m^3) until 2020 by national Pollution Climate Mapping (PCM) modelling used by Defra to report to the EU on UK air quality. This was the only local authority road link in South Gloucestershire where an exceedance was predicted beyond 2017.

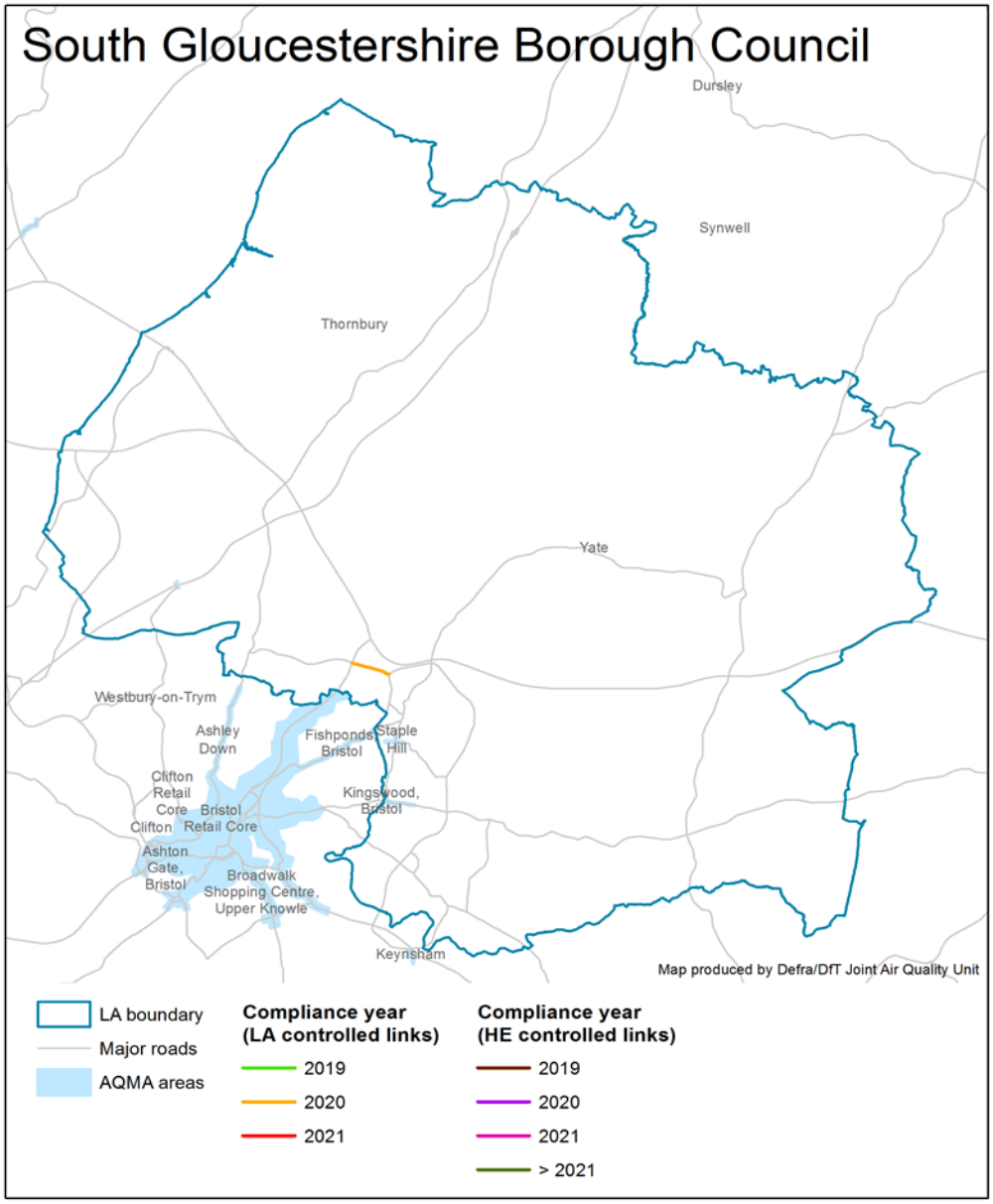


Figure 2.1 Map showing exceeding PCM A4174 road link

The study concludes that it would be possible to bring forward compliance of the identified section of the A4174 from 2020 to 2019 if the following measures were implemented:

- Removal of westbound A4174 right-turn to B4058 Bristol Road towards Winterbourne and northbound B4058 Bristol Road right-turn to A4174 from Frenchay at the A4174 Hambrook crossroads.
- In addition to the above, the use of 'soft gating' to limit traffic movements from Bromley Heath roundabout to be implemented by adjusting the peak traffic timings to ensure that additional trips are not generated by the additional capacity provided.

The Feasibility Study has been submitted to the Joint Air Quality Unit (JAQU); a new joint unit formed between Defra and the Department for Transport (DfT), and is currently being reviewed. South Gloucestershire Council was one of 33 local authorities mandated in the so-called "Third wave" of authorities required to achieve compliance with air quality limits in the shortest possible time on exceeding road links in their areas. The approved studies will be included in the supplement to the 2017 UK Air Quality Plan[27] due early October 2018. It is also intended to publish each study alongside the Supplement.

Air Quality and Public Health Progress

The alignment of the air quality agenda and public health outcomes continued to be a focus during 2017-18.

The Joint Strategic Needs Assessment (JSNA) completed in 2016 recognised the close links between spatial planning, transport and air quality. The South Gloucestershire Joint Health and Wellbeing Strategy 2017- 2021 was approved by the Health and Wellbeing Board in early 2018. The document contains four priority areas for collective action; one if these is to "Maximise the potential of our built and natural environment to enable healthy lifestyles and prevent disease".

The strategy highlights that poor air quality exacerbates heart and lung conditions, such as asthma and chronic obstructive pulmonary disease, and can contribute to premature death. It calls for the health impacts from poor air quality to be reduced through lower emissions and reduced exposure to pollutants. The Health and Wellbeing Board agreed to raise awareness of the impacts of air pollution on health and work with partners to promote a consistent approach.

[27] https://www.gov.uk/government/publications/air-quality-plan-for-nitrogen-dioxide-no2-in-uk-2017

Following the 2016 air quality workshop mentioned in the 2017 Annual Status Report, two needs were identified as pre-requisites for further action. These were:

- To raise public awareness of air quality locally, and;
- To provide indicative monitoring for $PM_{2.5}$.

Business cases were successful in obtaining public health funding for two projects which would begin to address these requirements:

1. A participatory awareness raising project 'Air Quality on the School Journey' was undertaken in early 2018 in partnership with the University of the West of England. The project involved monitoring school children on their commute to school in the Kingswood-Warmley AQMA and providing a series of activities to raise awareness of air pollution and how both it and their health could be improved by choosing active travel methods.
2. The purchase and installation of three "AQ Mesh" monitoring units to provide indicative particulate monitoring in key areas of South Gloucestershire.

These projects are described in further detail in Section 2.3.

The continued commitment of resource from the Public Health Team into built environment and air quality work, recognises the importance of this work in terms of public health. A public health consultant, whose portfolio includes air quality, has lead on the inception of a council wide 'air quality expert reference panel', bringing together services which have an interest and/or impact on air quality; including Environmental Health, Transport Policy, Spatial Planning, Development Control, Street Care and Highways and Strategic Communications.

The strategic group of the Heads of Planning and Transport plus the Director of Public Health continue to meet regularly to consider strategic planning issues and public health. This group retains links to a wider West of England group to ensure that public health issues, including air quality, continue to be considered as strategic plans, including the Joint Spatial Plan and Joint Local Transport Plan 4, are developed and also local planning policy, such as the emerging South Gloucestershire Council Local Plan.

South Gloucestershire Council's priority for the coming year continues to be to review and update the Air Quality Action Plan for Kingswood and Staple Hill in order to

incorporate the extension of the Kingswood AQMA to Warmley, as mentioned above, progress on this in 2017/18 has been limited due to the JAQU mandated feasibility study work we have been involved in.

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

- Continued significant pressure on local government funding, which could impact on delivering air quality improvements. We will be relying upon a commitment from national government to provide the required funding to implement the measures to bring forward compliance in NO_2 levels on the section of the A4174 considered in the Targeted Feasibility Study, should the study outcomes be approved.
- The transport system within South Gloucestershire is under pressure, due to the travel demand generated by the current population and by people coming into the area on a daily basis to work, shop and for leisure reasons. These pressures are shown through traffic congestion on South Gloucestershire's road network and capacity problems on local rail services.

Whilst the measures stated above and in Table 2.2 will help to contribute towards compliance, South Gloucestershire Council anticipates that further additional measures not yet prescribed will be required in subsequent years to achieve compliance and enable the revocation of the Kingswood - Warmley and Staple Hill AQMAs.

Table 2.2 Progress on Measures to Improve Air Quality

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
Kingswood Action Plan											
KS1	Travel Plan for Kingswood Civic Centre	Promoting Travel Alternatives	Workplace Travel Planning	South Gloucestershire Council Local Transport Capital Programme (LTCP)	2011/12	2012 onwards	• Reduction in solo occupancy vehicles • Increased cycling levels • Increased walking levels	No specific target emissions reduction.	Action complete. Implementation of travel plan is continuous process.	Completed	
KS2	Parking review (Kingswood)	Traffic Management	Workplace Parking Levy, Parking Enforcement on highway	South Gloucestershire Council LTCP	2012-14	2014 - 2018	• Road safety benefits • Reduced congestion	None, impact considered too small to be measurable.	Initial parking review implemented in 2015/16. 3 additional measures from the 2nd phase of the review are expected to be implemented in Spring 2019.	Estimated 2018/19	
KS3	Ensure air quality is a priority in development of transport schemes (Kingswood)	Transport Planning and Infrastructure	Other	South Gloucestershire Council LTCP	2013/14	2013/14	Number of actions taken forward within Capital Programme	No specific target emissions reduction.	The prioritisation framework for the Local Transport Capital Programme (LTCP) was reviewed in 2013, and now includes an assessment of the contribution to meeting LTP carbon emissions/air quality goals.	Action completed 2013	
KS4	Bus partnership (Kingswood) Working with operators to address AQ issues	Vehicle Fleet Efficiency	Promoting Low Emission Public Transport	South Gloucestershire Council in partnership with bus operators and neighbouring local authorities OLEV Grant	2012/13	2013 onwards	Number of buses replaced for lower emission vehicles	No specific target emissions reduction.	£4.79m OLEV funding for bio-methane buses awarded to WoE and First Bus in Aug 2017. A second successful Clean Bus Technology Fund (CBTF) bid was confirmed for the West of England in February 2018 and will be used to upgrade 81 Euro IV buses to Euro VI standard to reduce NOx emissions. 13 of these vehicles will operate in the SGC AQMAs.	Continuous process	

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
KS5	Review of Council Fleet to ensure lowest emission vehicles (Kingswood)	Vehicle Fleet Efficiency	Other	South Gloucestershire Council OLEV Grant	2012/13	2013 onwards	Reduction in vehicle emissions	No specific target emissions reduction. .	The Council continually assesses its in-house vehicle fleet requirements, we are seeking to reduce the overall fleet size, we continue to increase the number of low or zero emission vehicles within the existing fleet and all replacement vehicles introduced into the fleet meet or exceed the latest emission standards . OLEV funding received in January 2016, will ensure 20% of Council fleet will be Low Emission vehicles by 2021. The entire fleet of pool cars at main SGC offices were electric from early 2017.	Continuous process	
KS6	Promotion of more efficient use of taxi ranks and bus stops (Kingswood) .	Vehicle Fleet Efficiency	Driver training and ECO driving aids	South Gloucestershire Council in liaison with taxi operators and bus operators LTCP	2012/13	2013 onwards	Number of bus/taxi operators signed up to programme	No specific target emissions reduction.	Bus lay-by and taxi bay on Regent Street altered to improve traffic flow in June 2013. First Bus regularly review vehicle timing points to remove excessive idling times. The Council continues to work with local bus and taxi operators to encourage the transition of fleets to low emission vehicles.	Continuous process	
KS7	Ensure adequate landscaping is considered within new planning applications and urban designs (Kingswood)	Policy Guidance and Development Control	Other policy	South Gloucestershire Council Council Funds	2012/13	2013 onwards	Number of new trees planted. NB: Data relating to the indicator for this measure is not currently available.	No specific target emissions reduction.	Policies CS2 and CS9 within the Councils adopted Core Strategy set out how Green Infrastructure and the natural environment is to be planned, delivered and managed within proposed development. Planting schemes using Council own funds have been completed.	Action completed 2013.	
KS8	Promotion of VOSA Smoky Vehicle Hotline (Kingswood)	Public Information	Via the Internet	South Gloucestershire Council n/a	2012/13	2012/13	Number of vehicles reported to VOSA (data not currently available).	No specific target emissions reduction.	Information added to the Council's website on the Exhaust emissions testing and Improving air quality webpages.	Action completed 2013.	

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
KM1	School travel planning (Kingswood)	Promoting Travel Alternatives	School Travel Plans	South Gloucestershire Council in conjunction with local schools DfT Grant Funding	2012/13	2013 onwards	'Hands up' surveys within participating schools indicate mode share for pupils arriving at school.	No specific target emissions reduction.	A series of interventions undertaken annually with LSTF and STTY funding since 2013 to promote sustainable travel in schools. Access funding confirmed to continue this until 2020.	Continuous process.	Further progress subject to funding availability.
KM2	Travel planning for Kingswood Town Centre (Kingswood)	Promoting Travel Alternatives	Intensive active travel campaign & infrastructure	South Gloucestershire Council in conjunction with Kingswood Business Association DfT Grant Funding	2013/14	2014 onwards	Measured by increased: • Cycling levels • Bus patronage • Walking levels	No specific target emissions reduction.	A series of measures to encourage sustainable travel offered to businesses and communities as part of LSTF and STTY projects. Access funding confirmed to continue measures until 2020.	Continuous process.	Further progress subject to funding availability.
KM3	Review bus terminals and timing points (Kingswood)	Vehicle Fleet Efficiency	Promoting Low Emission Public Transport	South Gloucestershire Council in conjunction with bus operators Undertaken by operators	2012/13	2013/14	Reduction in number of buses idling at bus stops	No specific target emissions reduction.	Review of bus network to reduce no. of services terminating in AQMA. Bus stop infrastructure and parking review schemes to improve traffic flow.	Action completed 2014/15	
KM4	Smarter Choices promotions/ roadshows (Kingswood)	Promoting Travel Alternatives	Intensive active travel campaign & infrastructure	South Gloucestershire Council DfT Grant Funding	2013/14	2014 - 2016	Measured by increased: • Cycling levels • Bus patronage • Walking levels Also measure by number of proactive events	No specific target emissions reduction.	Access West continues to build on the work delivered through LSTF and STTY, working with Businesses, Schools and Communities across South Gloucestershire to promote and support sustainable and active travel choices. The funding for the Access West work programme will continue to March 2020.	Continuous process.	
KM5	Cycling infrastructure (Kingswood)	Transport Planning and Infrastructure	Cycle network	South Gloucestershire Council LTCP and DfT Grant Funding	2012/13	2014 onwards	Increases in numbers of cyclists as measured as part of the Joint Local Transport Plan	No specific target emissions reduction.	Cycle parking installed at John Cabot School as part of LSTF. No other cycle infrastructure schemes within the AQMA or surrounding area in recent years. Cycle infrastructure is constantly under review as issues and	Continuous process.	Further progress subject to funding availability.

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
							(JLTP3) Annual Progress Reports.		possible measures are identified by Officers, Members and the public.		
KL1	ECO Stars Fleet Recognition Scheme (Kingswood)	Vehicle Fleet Efficiency	Fleet efficiency and recognition schemes	South Gloucestershire Council Unknown at Present	2012/13	2013/14	Membership numbers.	No specific target emissions reduction.	Not currently feasible to implement due to resource availability. Progression of this action is unlikely for the foreseeable future, but will be reviewed as part of AQAP update.	Unknown at present.	Resource availability currently prevents implementation
KL2	Car club (Kingswood)	Alternatives to private vehicle use	Car Clubs	South Gloucestershire Council Unknown at Present	2012/13	2014/15	Car club membership	No specific target emissions reduction	Long term action - currently in conversation with car club operators. Progress dependant on results seen from the Car Clubs being established elsewhere in the Council area.	Unknown at present.	
KL3	Restrict traffic turning movements onto A420 (Kingswood)	Traffic Management	UTC, Congestion management, traffic reduction	South Gloucestershire Council LTCP	2012/13	2016/17	Reduction in volume of traffic travelling towards and along A420	No specific target emissions reduction	Long term action - preparatory work has commenced. Micro-simulation model to test options commissioned to assess impact of LTCP and developer proposals upon air quality. Progress with Modelling work has stalled due to need to focus resources on JAQU mandated study for SGC.	2019/2020.	
KL4	Review traffic signal numbers and operations (Kingswood)	Traffic Management	UTC, Congestion management, traffic reduction	South Gloucestershire Council LTCP	2012-14	2014/15	Improved traffic speeds and reduced congestion	No specific target emissions reduction.	MOVA signalling system has been installed 3 junctions in the AQMA to improve traffic flow. A review of mid-block pedestrian signals within the AQMA was undertaken in 2014 and recommends the removal of 1 or 2 pedestrian crossings from Kingswood High Street. This scheme is subject to future funding bids.	Review completed. Implementation unknown	Implementation dependant on securing funding.
KL5	Review of delivery bays (Kingswood)	Freight and Delivery Management	Delivery and Service plans	South Gloucestershire Council LTCP	2012/13	2016/17	• Number of reported issues with delivery bays • Reduced	No specific target emissions reduction	Entry and exit kerbing into delivery bays on the High Street have been adjusted to allow easier access and reduce delays and traffic queues.	2013/14	

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
							congestion		A signing review of delivery bays was completed in 2016/17.		
KL6	Controlled deliveries/collections (Kingswood)	Freight and Delivery Management	Freight Consolidation Centre	South Gloucestershire Council Unknown at Present	2016/17	2019/20	Number of delivery & collection agreements made with businesses	No specific target emissions reduction	Long term action - no progress yet.	2019/20	
KL7	Reclassify strategic routes and signing strategy (Kingswood)	Traffic Management	Other	South Gloucestershire Council Unknown at Present	2016/17	2019/20	Reduction in traffic volumes on and travelling towards A420	No specific target emissions reduction	Long term action - no progress yet.	2019/20	
KL8	Taxi ranks (Kingswood)	Promoting Low Emission Transport	Taxi emission incentives	South Gloucestershire Council in conjunction with taxi operators Unknown at Present	2015/16	2019/20	Production of review report	No specific target emissions reduction	Long term action - no progress yet.	2019/20	
CR39/ 2013	Improved pedestrian crossing facilities at High St/ Alma Rd	Promoting Travel Alternatives	Promotion of walking	South Gloucestershire Council LTCP	2014/15	2015/16	Implement infrastructure improvements to promote walking	No specific target emissions reduction	Scheme added to the Council's Local Transport Capital Programme using the scheme prioritisation framework (see Action KS3). Following design and public consultation the scheme was implemented in 2015/16.	2015/16	
Staple Hill Action Plan											
SS1	Ensure air quality is a priority in development of transport schemes (Staple Hill)	Transport Planning and Infrastructure	Other	South Gloucestershire Council LTCP	2012/13	2013/14	Number of actions taken forward within Capital Programme	No specific target emissions reduction	The prioritisation framework for the Local Transport Capital Programme (LTCP) was reviewed in 2013, and now includes an assessment of the contribution to meeting LTP carbon emissions/air quality goals.	Action completed 2013	

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
SS2	Bus partnership (Staple Hill) Working with operators to address AQ issues	Vehicle Fleet Efficiency	Promoting Low Emission Public Transport	South Gloucestershire Council in partnership with bus operators OLEV Grant	2012/13	2013 onwards	Number of buses replaced for lower emission vehicles.	No specific target emissions reduction	£4.79m OLEV funding for bio-methane buses awarded to WoE and First Bus in Aug 2017 A second successful Clean Bus Technology Fund (CBTF) bid was confirmed for the West of England in February 2018 and will be used to upgrade 81 Euro IV buses to Euro VI standard to reduce NOx emissions. 13 of these vehicles will operate in the SGC AQMAs.	Continuous process	
SS3	Review of Council Fleet to ensure lowest emission vehicles (Staple Hill)	Vehicle Fleet Efficiency	Other	South Gloucestershire Council OLEV Grant	2012/13	2013 onwards	Reduction in vehicle emissions	No specific target emissions reduction. .	The Council continually assesses its in-house vehicle fleet requirements, we are seeking to reduce the overall fleet size, we continue to increase the number of low or zero emission vehicles within the existing fleet and all replacement vehicles introduced into the fleet meet or exceed the latest emission standards . OLEV funding received in January 2016, will ensure 20% of Council fleet will be Low Emission vehicles by 2021. The entire fleet of pool cars at main SGC offices were electric from early 2017.	Continuous process	
SS4	Promotion of more efficient use of taxi ranks and bus stops (Staple Hill)	Vehicle Fleet Efficiency	Driver training and ECO driving aids	South Gloucestershire Council in liaison with taxi operators and bus operators LTCP	2012/13	2017/18	Number of bus/taxi operators signed up to programme	No specific target emissions reduction	The parking review as part of SM4 is complete and any subsequent issues have been addressed. First Bus regularly review vehicle timing points to remove excessive idling times. The Council continues to work with local bus and taxi operators to encourage the transition of fleets to low emission vehicles.	Continuous process	

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
SS5	Ensure adequate landscaping is considered within new planning applications and urban designs (Staple Hill)	Policy Guidance and Development Control	Other policy	South Gloucestershire Council Council Funds	2012/13	2014 onwards	Number of new trees planted. NB: Data relating to the indicator for this measure is not currently available.	No specific target emissions reduction.	Policies CS2 and CS9 within the Councils adopted Core Strategy set out how Green Infrastructure and the natural environment is to be planned, delivered and managed within proposed development. Planting schemes using Council own funds have been completed.	Action completed 2013.	
SS6	Promotion of VOSA Smoky Vehicle Hotline (Staple Hill)	Public Information	Via the Internet	South Gloucestershire Council n/a	2012/13	2012/13	Number of vehicles reported to VOSA (data not currently available).	No specific target emissions reduction.	Information added to the Council's website on the Exhaust emissions testing and Improving air quality webpages.	Action completed 2013.	
SM1	School travel planning (Staple Hill)	Promoting Travel Alternatives	School Travel Plans	South Gloucestershire Council in conjunction with local schools DfT Grant funding	2012/13	2013 onwards	'Hands up' surveys within participating schools indicate mode share for pupils arriving at school.	No specific target emissions reduction.	A series of interventions undertaken annually with LSTF and STTY funding since 2013 to promote sustainable travel in schools. Access funding confirmed to continue this until 2020.	Continuous process.	Further progress subject to funding availability.
SM2	Travel planning for Staple Hill Town Centre	Promoting Travel Alternatives	Intensive active travel campaign & infrastructure	South Gloucestershire Council in conjunction with Staple Hill Chamber of Trade DfT Grant funding	2013/14	2014 onwards	Measured by increased: • Cycling levels • Bus patronage • Walking levels	No specific target emissions reduction.	A series of measures to encourage sustainable travel offered to businesses and communities as part of LSTF and STTY projects. Access funding confirmed to continue measures until 2020.	Continuous process.	Further progress subject to funding availability.
SM3	Relocation of bus stops on Soundwell Road (Staple Hill)	Traffic Management	UTC, Congestion management, traffic reduction	South Gloucestershire Council LTCP	2012/13	2013/14	Measured by relocation of bus stop	No specific target emissions reduction.	Bus stop locations reviewed when the shelters were replaced, but due to site constraints a better location could not be found. Action closed, as the bus stops are unable to be re-located.	Action closed.	

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
SM4	Parking Review (Staple Hill)	Traffic Management	Workplace Parking Levy, Parking Enforcement on highway	South Gloucestershire Council LTCP	2013/14	2014/15	Measured by: • Road safety benefits • Reduced congestion	Impact of action considered too small to be measurable.	A review of parking restrictions within Staple Hill was undertaken. The resulting scheme was delivered as part of the 2014/15 local transport capital programme. Any subsequent issues have been addressed in a further review which is also now complete.	2014/15	
SM5	Smarter Choices promotions /roadshows (Staple Hill)	Promoting Travel Alternatives	Intensive active travel campaign & infrastructure	South Gloucestershire Council DfT Grant funding	2013/14	2014-16	Measured by increased: • Cycling levels • Bus patronage • Walking levels Also measure by number of proactive events	No specific target emissions reduction.	Access West continues to build on the work delivered through LSTF and STTY, working with Businesses, Schools and Communities across South Gloucestershire to promote and support sustainable and active travel choices. The funding for the Access West work programme will continue to March 2020.	Continuous process.	
SM6	Cycling infrastructure (Staple Hill)	Transport Planning and Infrastructure	Cycle network	South Gloucestershire Council DfT Grant funding	2012/13	2014 onwards	Increases in numbers of cyclists as measured as part of the Joint Local Transport Plan (JLTP3) Annual Progress Reports.	No specific target emissions reduction.	Two grant funded cycle route lighting schemes were implemented nearby between 2014 and 2016. Cycle infrastructure is constantly under review as issues and possible measures are identified by Officers, Members and the public.	Continuous process.	Further progress subject to funding availability.
SL1	ECO Stars Fleet Recognition Scheme (Staple Hill)	Vehicle Fleet Efficiency	Fleet efficiency and recognition schemes	South Gloucestershire Council Unknown at present	2012/13	2013/14	Membership numbers.	No specific target emissions reduction.	Not currently feasible to implement due to resource availability. Progression of this action is unlikely for the foreseeable future, but will be reviewed as part of AQAP update.	Unknown at present.	Resource availability currently prevents implementation

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
SL2	Car club (Staple Hill)	Alternatives to private vehicle use	Car Clubs	South Gloucestershire Council Unknown at present	2012/13	2014/15	Car club membership	No specific target emissions reduction	Long term action - currently in conversation with car club operators. Progress dependant on results seen from the Car Clubs being established elsewhere in the Council area.	Unknown at present.	
SL3	Review traffic signal numbers and operations (Staple Hill)	Traffic Management	UTC, Congestion management, traffic reduction	South Gloucestershire Council Defra Grant funding/ LTCP	2012/13	2013/14	Improved traffic speeds and reduced congestion	No specific target emissions reduction.	Traffic signals reviewed and amended at the junction of A4175 Broad Street/A4017 Victoria Street in 2012. Upgrading of the traffic signals at the Pendennis Road and Acacia Road junction was completed in 2013, using DEFRA grant.	Action completed and closed 2013/14	
SL4	Review of delivery bays (Staple Hill)	Freight and Delivery Management	Delivery and Service plans	South Gloucestershire Council LTCP	2012/13	Implementation 2014/15 as part of Parking Review (SM4)	Measured by • number of reported issues with delivery bays • Reduced congestion	No specific target emissions reduction	This action was programmed as part of the Local Transport capital programme. The parking review completed in 2013/14 under SM4 including the review of delivery bays.	Action completed 2013/14	
SL5	Restrict traffic turning movements at A4017 junction (Staple Hill)	Traffic Management	UTC, Congestion management, traffic reduction	South Gloucestershire Council Unknown at present	2016/17	2019/20	Measured by reduction in traffic volumes at A4017 junction	No specific target emissions reduction	Long term action – no progress yet. The impact of the signal improvement identified under measure SL3 will be monitored and a decision made on further changes at this junction.	2019/2020	
SL6	Controlled deliveries/collections (Staple Hill)	Freight and Delivery Management	Freight Consolidation Centre	South Gloucestershire Council Unknown at present	2016/17	2019/20	Measured by number of delivery & collection agreements made with businesses	No specific target emissions reduction	Long term action - no progress yet.	2019/20	
SL7	Reclassify strategic routes and signing strategy (Staple Hill)	Traffic Management	Other	South Gloucestershire Council Unknown at present	2016/17	2019/20	Measured by reduction in traffic volumes on and travelling towards A4017.	No specific target emissions reduction	Long term action - no progress yet.	2019/20	

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

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

The introduction of this role into local air quality management supports efforts to reduce exposure at national level and also links strongly to the public health agenda, in particular the Public Health Outcome Framework (PHOF)[28] which includes the following indicator:

- PHOF Indicator 3.01 Health Protection: Fraction of all cause adult mortality attributable to anthropogenic (originating from human activity) particulate air pollution (measured as fine particulate matter $PM_{2.5}$).

Estimates of mortality burden are based on modelled annual average concentrations of fine particulate matter ($PM_{2.5}$) originating from human activities in each local authority area. The estimates of the fraction of mortality attributable to long-term exposure to particulate air pollution range from 2.6% in the lowest local authority area (Isles of Scilly) to nearly 7% in some London boroughs.

In 2016, the most recent year for which data is available, the estimated fraction of mortality in South Gloucestershire was 5.2%. This is comparable with England as a whole (5.3%), but higher than the South West region average (4.5%). The other West of England unitary authorities are; Bristol (5.3%), Bath and North East Somerset (4.7%) and North Somerset (4.4%). The estimated fractions of mortality have increased for all the above mentioned areas when compared to the previously reported 2015 data when, for example, the estimated fraction for South Gloucestershire (and England as a whole) was 4.7%.

The Council's Joint Strategic Needs Assessment (JSNA)[29] also contains information on air quality impacts on the South Gloucestershire population, including data for

[28] http://www.phoutcomes.info/
[29] Joint Strategic Needs Assessment

attributable deaths and associated life years lost and the associated Joint Health and Wellbeing Strategy 2017-21[30] has as one of its four priorities:

"Maximise the potential of our built and natural environment to enable healthy lifestyles and prevent disease"

The strategy recognises that poor air quality exacerbates heart and lung conditions such as asthma and chronic obstructive pulmonary disease and that the effect of air pollution can contribute to the premature death of people who already have serious illnesses. Within the strategy, the Health and Wellbeing Board pledge to:

"Raise awareness of the impacts of air pollution and poor air quality on health, and work with partners in South Gloucestershire and more widely to promote a consistent and unified approach to improve air quality and reduce health impacts associated with air pollution".

The PHOF indicator discussed above has been adopted within the Health and Wellbeing Board's own suite of performance indicators, which are reported annually to senior Elected Members. This recognition of air pollution politically and at senior levels within the Council is necessary to move this agenda forward and provides evidence that South Gloucestershire Council recognises it is expected to work towards reducing emissions and concentrations of $PM_{2.5}$ in its area.

The establishment of an internal 'air quality expert reference panel' aims to raise the profile of air quality within the Council. It brings together relevant professionals within the council who have an interest in air quality, either directly, such as environmental health, public health and transport; or indirectly, where there is opportunity for impact; such as planning policy, major development sites, development control and transport assets and maintenance. A representative from the communications team is also included and the panel is led by a tier 2 officer with public health consultant input.

Recognising the role played by these numerous work areas in influencing air quality, this group will aim to strengthen and coordinate work in this field across the council. It aims to accomplish this by ensuring dialogue between relevant teams and exploring opportunities for co-production and partnership approaches. The panel has collectively provided a response to NICE guidance consultation and the National Clean Air Strategy consultation.

[30] http://www.southglos.gov.uk/health-and-social-care/staying-healthy/health-strategies/joint-health-and-wellbeing-strategy-jhws/

Two specific air quality projects, led by Public Health and funded by public health business case funding in 2016, have been carried out during 2017-18:

1. ‘Air Quality on the School Journey’ was a project developed jointly with the University of the West of England which used public participatory research to raise awareness of air pollution (specifically particulate matter), its effects on health and opportunities to reduce the impacts. The project was carried out in partnership with a school adjacent to the Kingswood – Warmley AQMA, together with the Council’s Road Safety Team and also linked in with projects run on their behalf by the national charity ‘Living Streets’ which encourage active travel methods. The project concentrated on raising awareness of air pollution; its causes, effects and solutions, among children in year 7 who are at the stage where they may begin to have choices about how they travel to school. The project included indicative monitoring of $PM_{2.5}$ using personal monitors to record levels of pollution to which children were exposed during travel to and from school.

   Children using a variety of travel modes were measured; walking, cycling and travel by car; and the monitoring was carried out over several days. The results were used to highlight the differences in exposure to $PM_{2.5}$ pollution by using different modes of transport. During the project relevant travel messages such as ‘no parking on zig zags’ and ‘anti idling’ were also provided to parents via the school’s normal communication channels; email and social media, in addition to placing banners on railings outside the school. The project also included use of questionnaires and two assemblies to the year group to both introduce the project and present the findings. There was an increase in awareness of air pollution and its effects on health over the course of the project and the children learned that they could make positive choices in relation to their travel modes, to both increase their active travel and help to reduce air pollution.

2. In recognition that no monitoring of $PM_{2.5}$ was carried out within the South Gloucestershire area, a second public health business case was successful in obtaining funding for the purchase of three “AQ Mesh” monitoring units. These are small outdoor air quality monitors, which are configured to deliver localised real-time readings of a variety of pollutants including $PM_{2.5.}$ The Units were purchased in 2017 and installed early in 2018 in the following locations:

- Within the Kingswood-Warmley AQMA
- Within the Staple Hill AQMA
- Adjacent to the A4174 near Hambrook.

Issues around co-location with a reference station have yet to be overcome, however by setting up the units in worse-case locations, the units will provide indicative monitoring data which will be a useful step towards quantifying the extent of any problem, especially in relation to $PM_{2.5}$.

South Gloucestershire Council is also taking the following measures to address $PM_{2.5}$:

- The progress made in implementing measures in the existing Air Quality Action Plan, as detailed in Section 2.2, will also contribute to reducing emissions and concentrations of $PM_{2.5}$. While the measures are primarily aimed at reducing nitrogen dioxide, road traffic is also a source of particulate matter so the implementation of measures will have co-benefits.
- The wider regional transport initiatives, such as Metrobus[31], (see Appendix D), will contribute to reducing emissions and concentrations of $PM_{2.5}$. In addition to reduced exhaust emissions, by making traffic flows smoother, these schemes will reduce non-exhaust emissions from brake and tyre wear.
- Dust Management Plans (DMPs), which are usually incorporated into Construction Environmental Management Plans (CEMPs), are routinely conditioned on major development planning permissions to control and minimise the risk of construction dust impacts, and therefore $PM_{2.5}$, on nearby receptors.
- Regular inspections of industrial processes permitted by the Council where combustion and non-combustion processes could lead to anthropogenic emissions of $PM_{2.5}$.
- Alongside measures to tackle nitrogen dioxide in the updated Action Plan, consideration will be also be given to reducing emissions and concentrations of $PM_{2.5}$. The Council is mindful of the potential co-benefits of action plan measures on multiple pollutants of concern and will follow appropriate guidance, such as the LAQM Action Toolbox in Annex A of the Defra LAQM Technical Guidance

[31] https://travelwest.info/metrobus

(TG16), which indicates measures that will likely be beneficial to reducing $PM_{2.5}$ levels (in addition to other pollutants).

- Some of South Gloucestershire is covered by a Smoke Control Area[32] which allows only approved fuels and appliances to be used. Further extension of the smoke control areas could be considered in the updated Action Plan to better control particulate (and NOx) emissions from open fires and wood-burning stoves. The Council's Environmental Health team has produced an information sheet on Solid Fuel Appliances Smoke Control[33] and will investigate smoke complaints. Non-compliance with smoke control legislation can result in a fine of up to £1000.
- The Council will also promote initiatives such as the "Ready to burn" scheme. Understanding the right fuels and the right way to use them is explained within the "Open fires and wood-burning stoves" guidance leaflet[34] issued by Defra. The measure outlined for reducing emissions include:
    - Choosing the right stove
    - Considering burning less
    - Buying 'Ready to Burn' fuel
    - Season freshly chopped wood before use
    - Do not burn treated waste wood (e.g. old furniture) or household rubbish
    - Regularly service and maintain your stove (annually)
    - Get your chimney swept regularly (up to twice a year)

In terms of the current situation with regard to $PM_{2.5}$ concentrations locally, while there is no regulatory standard applied to the $PM_{2.5}$ role for local authorities, the EU Ambient Air Quality Directive[35] does however set out air quality standards for $PM_{2.5}$, which can act as a guide:

- Annual average EU limit value of 25µg/m^3 by 2020.
- EU target value of 15% reduction in concentrations at urban background locations between 2010 and 2020.

[32] https://www.southglos.gov.uk/environment-and-planning/pollution/pollution-control-clean-air-act-approval/smoke-control-areas/
[33] http://www.southglos.gov.uk/documents/Solid-Fuel-Appliances.pdf
[34] https://consult.defra.gov.uk/airquality/domestic-burning-of-wood-and-coal/supporting_documents/open%20fires%20wood%20burning%20stoves%20%20guideA4update12Oct.pdf
[35] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:152:0001:0044:EN:PDF

While South Gloucestershire Council does not locally monitor $PM_{2.5}$ with a reference monitor, the local $PM_{2.5}$ concentrations have been estimated from the PM_{10} concentrations measured at the Yate automatic monitoring site, using the method specified in Technical Guidance LAQM TG16 Box 7.7. The results of this are provided in Table A.9. The estimated concentrations compare well to the $PM_{2.5}$ annual mean concentrations measured at the nearest national Automatic and Urban Rural Network (AURN) monitoring site; Bristol St. Pauls. The estimated local $PM_{2.5}$ concentrations are below the annual average EU limit value and greater % reductions than the EU target value of 15% can already be seen in concentrations between 2010 and 2017.

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 it compares with objectives. Local authorities no longer have to report annually on the following pollutants: 1,3 butadiene, benzene, carbon monoxide and lead, unless local circumstances indicate there is a problem. National monitoring results are available on the Defra UK-AIR (Air Information Resource) website[36].

3.1.1 Automatic Monitoring Sites

South Gloucestershire Council undertook automatic (continuous) monitoring at one site in Yate during 2017. Nitrogen dioxide (NO_2) is monitored using an API Model 200A chemiluminescent analyser and particulate matter (PM_{10}) is monitored using a Met One BAM 1020 Beta-Attenuated Mass (BAM) Monitor (unheated). Table A.1 in Appendix A shows the details of the Yate automatic monitoring site.

The Kingswood and Filton automatic monitoring sites, which also monitored nitrogen dioxide and particulate matter (PM_{10}), ceased operation in September 2010 and March 2014 respectively. The Badminton automatic monitoring site, which monitored ozone, ceased operation in 2015. Further details and previous monitoring results for these sites can be found in the 2015 Updating and Screening Assessment[37].

Maps showing the location of the monitoring site are provided in Figure E.4 and Figure E.5 in Appendix E. Further details on how the monitors are calibrated and how the data has been adjusted are included in Appendix C.

3.1.2 Non-Automatic Monitoring Sites

South Gloucestershire Council undertook non- automatic (passive) monitoring of NO_2 at 104 sites during 2017. Table A.2 in Appendix A shows the details of the sites.

Triplicate monitoring (using three diffusion tubes) is undertaken at three of the monitoring locations to ensure robust monitoring datasets:

[36] https://uk-air.defra.gov.uk/
[37] http://www.southglos.gov.uk//documents/Air-quality-management-updating-and-screening-assessment-2015.pdf

- Yate, Station Road, where the tubes are co-located with the automatic monitoring station (sites 4A, B and C - these sites were previously numbered 4, 5 and 6).
- At the façade of the single property in the Cribbs Causeway AQMA, Hollywood Cottage (sites 87A, B and C).
- In Soundwell at the façade of 264 Soundwell Road located adjacent to the busy junction of Soundwell Road, Syston Way and Downend Road, where concentrations have been borderline with the annual mean objective (sites 147A, B and C).

The monitoring results are reported for 110 diffusion tubes in total.

In 2017, fifteen new diffusion tube monitoring sites were set up. Ten of these were set up within the AQMAs; six in the Staple Hill AQMA (sites 160 – 165) and four in the Kingswood – Warmley AQMA (sites 166 - 169) and a further three in Patchway (site 170), Soundwell (site 171) and Downend (site 172) to refine the monitoring locations, monitor in the potential worse case locations and better represent relevant exposure. A further two sites were set up in response to concerns about air quality raised by local residents in Wickwar (site 159) and Mangotsfield (site 173).

The following ten diffusion tube sites ceased operation towards in 2017;

- Site 17 Kingswood - 79 Regent St HSBC because monitored concentrations have been consistently well below the annual mean objective.
- Site 23 Kingswood - Cecil Rd because the site was replaced with a new site (site 166) in a narrower section of Cecil Rd at a potential worse case location which also better represents residential exposure.
- Site 26 Kingswood - 8 Gilbert Rd because monitored concentrations have been consistently well below the annual mean objective since monitoring commenced.
- Site 45 Bradley Stoke - Bradley Stoke Way because the lamppost on which the tube was mounted was removed as part of Metrobus works. However, a replacement monitoring site (site 154) had already been set up in 2015 in anticipation of this which also better represents relevant exposure.

- Site 90 Kingswood - Downend Rd Junction with Boultons Rd because the site has been site subject to occasional vandalism. A replacement site was set up further along the road which also better represents residential exposure (site 167).
- Site 97 Kingswood - 129 High Street. This site was replaced by site 168 at the façade of a nearby residential property to better represent exposure.
- Site 103 Staple Hill - Page Road Brookridge Court because the monitored concentrations at this site have been consistently well below the annual mean objective since monitoring commenced in 2009.
- Site 104 Staple Hill - Page Road EOTAS because the monitored concentrations at this site have been consistently well below the annual mean objective since monitoring commenced in 2009.
- Site 108 Patchway - 204 Gloucester Road rear façade because this site was set up for the 2012 Detailed Assessment for Moving Locomotives, which was completed without any exceedances being identified. The site was replaced with site 170 on the front façade of the same property to monitor roadside concentrations.
- Site 140 Warmley - 2 Stanley Road façade because the monitored concentrations have been consistently well below the annual mean objective since monitoring commenced in 2013.

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

3.2 Individual Pollutants

The air quality monitoring results presented in this section are, where relevant, adjusted for bias, “annualisation”. Distance corrected results are reported in Table B.1 (Appendix B). Further details on adjustments are provided in Appendix C.

3.2.1 Nitrogen Dioxide (NO_2)

Table A.3 in Appendix A compares the ratified and adjusted monitored NO_2 annual mean concentrations from the automatic and non-automatic (diffusion tube) monitoring sites for the past 5 years with the air quality objective of 40µg/m^3.

Automatic Monitoring Data

The results of monitoring at the Yate automatic site show the NO_2 concentrations are well below the annual mean objective in 2017 and all other reported years (Table A.3, Appendix A). The trend data presented in Figure A.1 (Appendix A) shows that annual mean nitrogen dioxide concentrations have been generally stable and in 2017, there was a slight decrease from 24 µg/m^3 in 2016 to 23 µg/m^3.

Table A.4 in Appendix A compares the ratified continuous monitored NO_2 hourly mean concentrations for the past 5 years with the air quality objective of 200 µg/m^3, not to be exceeded more than 18 times per year. There were no exceedances of the 1-hour mean (200 µg/m^3) recorded at the Yate automatic monitoring site during 2017 and the site has been below the hourly mean objective in all reported years.

Non-Automatic (Diffusion Tube) Monitoring Data

The NO_2 annual mean concentrations from the diffusion tube monitoring sites are provided in Table A.3 (Appendix A). The data reported in Table A.3 has been bias adjusted and annualised. The data has not been corrected for distance to the nearest relevant receptor so that it can be fairly compared to the previously reported data for the years 2013 to 2016.

Bias adjusted, annualised and distance corrected diffusion tube monitoring data, including the full 2017 dataset of monthly mean values, is provided in Table B.1 (Appendix B).

Discussion of 2017 Diffusion Tube Monitoring Results

Exceeding Sites

In 2017, exceedances of the annual mean objective were measured at three monitoring sites (compared to eleven in 2016). Of these, two sites were within the Kingswood – Warmley AQMA (compared to five in 2016), and one was within the Staple Hill AQMA (compared to five in 2016). There were no exceedances within the

Cribbs Causeway AQMA or outside of the AQMAs. The exceeding sites are detailed below:

Kingswood – Warmley AQMA

- Site 139 Warmley - 14 High Street Webbs (downpipe on façade)
- Site 146 Kingswood - 34 Hill Street (downpipe on façade)

Staple Hill AQMA

- Site 75 Staple Hill – 118 High Street Santander (lamppost at roadside)

Relevant exposure is slightly set back at the one exceeding site in the Staple Hill AQMA (site 75) so the result has been distance adjusted to façade using the "Nitrogen dioxide fall off with distance" calculator[38], which is the procedure specified in LAQM Technical Guidance (TG16). The distance adjustment calculation for site 75 is presented in Table C.5 (Appendix C).The estimated concentration at the façade was 32.7 µg/m^3 so is below the annual mean objective and also not borderline.

The fall off with distance calculator has some uncertainty and provides an estimated concentration only so ideally, diffusion tubes should be located at relevant receptor façades. During 2017, the Staple Hill AQMA monitoring locations in particular were reviewed and some façade monitoring was set up to better represent relevant exposure where this was possible. Existing monitoring sites were retained to enable comparison. This will allow a robust assessment of whether the AQMA is still required or whether concentrations are below the objective where there is relevant exposure. These results are discussed further in the section on Trends in the AQMAs and in Appendix D.

No annual means greater than 60 µg/m^3 were recorded at any of the diffusion tube monitoring sites, so exceedances of the 1-hour mean objective are considered unlikely.

Borderline Exceedances

There were thirteen sites approaching the objective i.e. within 10% of the objective at 36 µg/m^3 or above in 2017 (compared to fifteen in 2016). Of these, seven sites are within the Kingswood – Warmley AQMA (sites 67, 68, 95, 116, 137, 138 and 169),

[38] http://laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html

five are within the Staple Hill AQMA (sites 61, 73, 78, 102 and 165) and one (site 147) is outside the AQMAs.

All of the borderline sites are at façade, apart from at sites 61, 73 and 78 in the Staple Hill AQMA. Distance adjustment of these sites to the nearest façade reduces the annual mean concentrations further below the objective as shown in Table C.5 (Appendix C), although site 61 remains within 10% of the objective (37.3 µg/m^3). It should be noted however, that there is no relevant exposure at ground floor level in relation to sites 61, 73, 102 and 165 in the Staple Hill AQMA, and also at sites 67, 68 and 95 in the Kingswood - Warmley AQMA, although there is first floor exposure at the majority of these sites or at first floor in adjoining properties and concentrations at first floor or higher would be further reduced.

The final borderline site in 2017 is site 147 in Soundwell - 264 Soundwell Rd (façade), outside of the AQMAs. The monitoring is at façade and is representative of relevant exposure. This site marginally exceeded the annual mean objective in 2014 (40.6 µg/m^3), however, in 2015 the concentration was below the objective, although still borderline at 38.7 µg/m^3. Triplicate diffusion tube monitoring (147A, B and C) was set up in March 2016 to ensure more robust monitoring of the nitrogen dioxide concentrations at this location.

In 2016, the nitrogen dioxide concentration recorded at the existing site 147 (which in effect became one of the triplicate tubes (147A)) was 39.9 µg/m^3, so marginally below the annual mean objective. This was in relation to a data capture of 92%. However, due to the commencement of the triplicate monitoring in March and the loss of the whole set of triplicate tubes in December 2016, the data capture for the additional two tubes; 147B and C at the site dropped to 67%. With the data capture below 75%, this led to annualised means being calculated which were above the objective (147B 46.5 µg/m^3 and 147C 46.6 µg/m^3). However, the 2016 raw monthly triplicate monitoring results showed good precision when checked using precision and accuracy LAQM spreadsheet tool[39] available on the Defra website and with the non-annualised results for 147B and C, an average bias adjusted annual mean of 38.7 µg/m^3 was attained, which was below the objective.

In 2017, the raw monthly triplicate monitoring results showed good precision when checked using precision and accuracy LAQM spreadsheet tool. An average bias

[39] http://laqm.defra.gov.uk/bias-adjustment-factors/local-bias.html

adjusted annual mean of the triplicate tubes of 38.1 µg/m^3 was attained, which is below the objective.

Site 171 was set up further along Soundwell Road in 2017 to monitor the possible extent of any exceedance area relating to the triplicate site 147. A bias adjusted annual mean of 29.7 µg/m^3 was attained at site 171, which is below the objective. No other exceedances or borderline results have been identified at the other worse-case monitoring sites (128 and 150) around the junction since 2013. This area and in particular site 147, will continue to be kept under review to check compliance is sustained.

All the borderline sites will continue to be closely observed, especially with regard to planning or transport developments that may affect future nitrogen dioxide concentrations.

In 2017, decreases in monitored nitrogen dioxide concentrations were observed as a general trend across the majority of the monitoring sites in South Gloucestershire, including at the Yate automatic station.

Discussion of Trends in Annual Mean Nitrogen Dioxide Concentrations in Kingswood - Warmley and Staple Hill Air Quality Management Areas

The trends in annual mean nitrogen dioxide concentrations measured at diffusion tube monitoring sites in the AQMAs are shown in graphs in Appendix A. The trends within the Kingswood – Warmley AQMA are shown in Figure A.3 (Kingswood section) and Figure A.4 (Warmley section) and the trends in the Staple Hill AQMA in Figure A.5. For ease of reference, the diffusion tube monitoring results within the Kingswood – Warmley and Staple Hill AQMAs can be found in Table A.7 and Table A.8 respectively.

In the Kingswood – Warmley AQMA, two sites (139 and 146) exceeded the annual mean objective in 2017, with the highest exceedance 46.3 µg/m^3 (site 146). In comparison to 2016 when there were five exceeding sites (67, 68, 116, 137 and 146) and the highest exceedance was 45.7 µg/m^3 (site 146), this represents a decrease in the number of exceeding sites, although there is an increase in the extent of exceedance at site 146.

In the Staple Hill AQMA, the only exceedance in 2017 was at site 75 (40.3 µg/m^3). In 2016, there were five exceeding sites (61, 73, 75, 78 and 102) with the highest

exceedance at site 75 (46.1 µg/m^3). This represents a decrease in both the number of exceeding sites and the extent of the exceedance from 2016 to 2017. However, it should also be noted as previously discussed, that relevant exposure at the only exceeding site (75) is set back and when distance adjusted, the estimated concentration is below the annual mean objective at the nearest façade. Furthermore, there is no relevant exposure at ground floor or first floor level in relation to site 75, although there is first floor exposure at an adjoining property.

In 2017, the monitoring site locations in the Staple Hill AQMA were reviewed to enable ongoing robust assessment of whether the AQMA should remain in place or whether nitrogen dioxide concentrations are below the objective where there is relevant exposure.

Six additional monitoring sites (160 – 165) were set up at façade to better represent relevant exposure and monitor in the potential worse case locations, where this was possible as there are many commercial/retail premises within the AQMA. Existing monitoring sites in similar locations but closer to the roadside, were retained for comparison. A map showing the location of the diffusion tube monitoring sites is provided in Figure E.10 (Appendix E).

Comparison of the results from established sites closer to the road, distance adjusted results for these sites and new sites at nearby worse-case façades of relevant exposure are shown in Table D.1 and discussed further in Appendix D.

In summary, only one site (61) from the existing exceeding and borderline sites in the Staple Hill AQMA remains borderline following distance adjustment and only one of the new sites set up at worse-case façades of relevant exposure is borderline (site 165). On this basis, the AQMA would no longer be required, however, we are mindful that as pollutant concentrations can vary significantly from one year to another and also with the change of analysing laboratory for 2017, even though the selected local bias adjustment factor was conservative, it would be appropriate to review the situation over time to ensure that this situation is sustained before revocation of the AQMA can be considered.

The overall trends in nitrogen dioxide concentrations in the Kingswood – Warmley and Staple Hill AQMAs have been relatively stable over the past decade with a slight downward trend in recent years, although there was an upward trend in 2016. However, in 2017, concentrations fell at all sites in the AQMAs apart from two (the

exceeding sites 139 and 146 in the Kingswood – Warmley AQMA). It is difficult to determine exactly why concentrations would have increased at these two sites.

Overall, the decreases in monitored nitrogen dioxide concentrations at the majority of sites within the AQMAs are in line with the general decreasing trend across the majority of the monitoring sites in South Gloucestershire, including at the Yate automatic station. Pollutant concentrations can vary from year to year due to a number of factors, in particular meteorological conditions which can affect pollutant dispersion. The change of laboratory for the preparation and analysis of the diffusion tubes may have also played a part in the lower concentrations observed in 2017, although the local bias adjustment factor used to adjust the 2017 data is slightly higher and therefore more conservative than the bias adjustment factor used in previous recent years.

Proposed Revocation of the Cribbs Causeway AQMA

Following the declaration of the Cribbs Causeway AQMA (see Figure E.1), a Further Assessment of air quality within the AQMA was undertaken. The Cribbs Causeway AQMA was originally declared on the basis of exceeding distance adjusted results from roadside monitoring sites 80 and 81. These sites ceased operation once a monitoring site (87) was set up at the façade of the single property within the AQMA as part of the Further Assessment. The Further Assessment Report 2011 concluded the 2010 nitrogen dioxide concentration (33.0 µg/m^3) at site 87 was below the annual mean objective, indicating the AQMA was longer required. As a precaution, the recommendation was made to continue monitoring and review the 2011 results and if these results were also below the objective, then it would be appropriate to revoke the AQMA.

The 2011 result (34.0 µg/m^3) also showed the annual mean nitrogen dioxide concentration at site 87 was below the objective. The revocation of the AQMA was proposed in the 2012 Updating and Screening Assessment, however, the Defra appraisal of the report recommended the AQMA be retained pending further monitoring results, as while 2010 and 2011 results were below the objective, pollutant concentrations can vary significantly from one year to another.

The Council accepted the recommendation to retain the AQMA and review further monitoring results. Triplicate diffusion tube monitoring, which is considered to be more robust, was set up at the façade of the single property within the AQMA in

2013. The average of the triplicate monitored concentrations in 2013 was 32.3 µg/m^3, in 2014, 34.5 µg/m^3 and in 2015, 28.9 µg/m^3. The significant decrease in concentrations in 2015 could be due to the works completed at the M5 junction 17 in 2015/16 following the Local Pinch Point Funding secured in 2013.

In 2016, the data capture for the triplicate tubes was 67% so being below 75%, the data was annualised in line with LAQM TG16. The average of the annualised triplicate results was 29.1 µg/m^3, similar to that in 2015.

In 2017, the precision between the triplicate results was checked using the precision and accuracy LAQM spreadsheet tool[40] available on the Defra website and the precision was shown to be good. The average of the triplicate results was 27.0 µg/m^3, a decrease of 2.1 µg/m^3 when compared to 2016 result.

Since the declaration of the Cribbs Causeway AQMA in 2010, the nitrogen dioxide concentrations have been below the annual mean objective at the façade of the single residential property within the AQMA. An action plan has therefore not been required for this AQMA.

Defra recommended in their appraisal of the 2016 Air Quality Annual Status Report that revocation of the AQMA should be considered. Taking the 2017 monitoring results into account, this report confirms that there have been no exceedances of the nitrogen dioxide annual mean objective where there is relevant exposure for the last seven years, which demonstrates sustained compliance with the objective. We proposed to revoke the Cribbs Causeway AQMA in the 2017 ASR. However, work to progress this has been delayed but we will proceed to consult on the proposed revocation as soon as possible.

Monitoring will continue to remain in place to consider the impact of the new developments in the Cribbs Causeway/ Patchway New Neighbourhood at this location.

[40] http://laqm.defra.gov.uk/bias-adjustment-factors/local-bias.html

3.2.2 Particulate Matter (PM_{10})

The PM_{10} monitoring data from the Yate automatic site has been adjusted to gravimetric equivalent with the BAM data corrected for slope (see Appendix C).

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

Table A.6 in Appendix A compares the ratified continuous monitored PM_{10} daily (24-hour) mean concentrations for the past 5 years with the air quality objective of 50 µg/m^3, not to be exceeded more than 35 times per year.

The PM_{10} concentrations measured at the Yate automatic site are well below the annual mean and 24-hour mean objectives in 2017 and all other reported years. In 2017, the annual mean was to 14 µg/m^3, the same as in 2016. The trend data presented in Figure A.2 (Appendix A) shows that overall, the annual mean PM_{10} concentrations at Yate have been slowly declining since 2010.

Appendices

Appendix A: Monitoring Results

Appendix B: Full Monthly Diffusion Tube Results for 2017

Appendix C: Air Quality Monitoring Data QA/QC

Appendix D: Supporting Technical Information

Appendix E: Maps

Appendix F: Summary of Air Quality Objectives in England

Appendix A: Monitoring Results

Table A.1 Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Inlet Height (m)
-	**Yate** Station Road	Roadside	370418	182525	NO_2	NO	Chemiluminescent	N/A	6	1.6
					PM_{10}		Gravimetric (BAM)			1.8

Notes:

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

(2) N/A if not applicable.

Table A.2 Details of Non-Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
1	Yate – 88 Station Road The Candle	Roadside	370692	182499	NO_2	NO	4.6	2.5	NO	2.7
4A	Yate - Station Road Co-Location 1	Roadside	370418	182525	NO_2	NO	N/A	6	YES	2.4
4B	Yate - Station Road Co-location 2	Roadside	370418	182525	NO_2	NO	N/A	6	YES	2.4
4C	Yate - Station Road Co-location 3	Roadside	370418	182525	NO_2	NO	N/A	6	YES	2.4
10	Filton - 152 Gloucester Road North – Pizza Bello façade	Roadside	360266	179136	NO_2	NO	0	3.5	NO	2.3
11	Thornbury – 48 High Street Uniq Family Wealth	Roadside	363654	189893	NO_2	NO	N/A	0.6	NO	2.5
12	Stoke Gifford - Church Road Rear of Aviva	Roadside	362161	179570	NO_2	NO	N/A	1	NO	2.6
13	Filton - MOD Roundabout	Roadside	361523	178732	NO_2	NO	N/A	1	NO	2.3
21	Downend – Boscombe Crescent St Augustines Church	Urban Background	365673	177475	NO_2	NO	N/A	1.5	NO	2.5
22	Hanham – 44 High Street Lloyds Bank	Roadside	364116	172413	NO_2	NO	N/A	3	NO	2.4
27	Kingswood - 90 Regent Street Nat West façade	Roadside	364866	173835	NO_2	YES	0	2	NO	2.8
29	Staple Hill - 123 High Street Backhouse Bet	Roadside	364822	175932	NO_2	YES	2	1	NO	2.7

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
34	Bradley Stoke – 109 Ormonds Close M4 East of Almondsbury Interchange	Roadside	362395	182544	NO_2	NO	11	24.8 (M4 33)	NO	2.5
35	Bradley Stoke - Woodlands Lane M4 East of Almondsbury Interchange (lp47)	Roadside	362118	183031	NO_2	NO	9.8	3.3 (M4 22.5)	NO	2.5
36	Hambrook – Whiteshill M4 East of M32 Fairwater	Roadside	364544	178855	NO_2	NO	N/A	30 (M4)	NO	2.2
37	Almondsbury - Old Aust Road M4 West of Almondsbury Interchange	Roadside	361147	184846	NO_2	NO	N/A	7 (M4)	NO	2.3
38	Severn Beach – Ableton Lane Severn Beach Primary School	Urban Background	354282	184653	NO_2	NO	0	49	NO	2.5
42	Little Stoke – 21 Braydon Ave	Urban Background	361418	181674	NO_2	NO	8	1.5	NO	2.9
44	Stoke Gifford - Hatchet Road	Roadside	362061	180025	NO_2	NO	14	4	NO	2.8
46	Winterbourne - High Street opp Winterbourne International Academy	Roadside	364852	180758	NO_2	NO	16.5	1.3	NO	2.6
53	Hambrook – Bristol Road Rear of 17 Fenbrook Close	Roadside	363907	178389	NO_2	NO	16	6.5	NO	1.9
54	Longwell Green - A431 / Aldermoor Way	Roadside	365256	171656	NO_2	NO	N/A	1.5	NO	2.7
57	Coalpit Heath - Badminton Rd Frome Valley Kitchens	Roadside	367742	181160	NO_2	NO	12	2	NO	2.5

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
58	Longwell Green - Kingsfield Lane/ Aspects Leisure Site (lp6)	Roadside	365327	172141	NO_2	NO	27	31 (A4174)	NO	2.7
60	Downend - North Street Kustom Floors & Furniture	Roadside	365101	176688	NO_2	NO	4	0.5	NO	2.6
61	Staple Hill Crossroads - 1 Broad Street William Hill	Roadside	364926	175926	NO_2	YES	0.95	2.3	NO	2.5
62	Staple Hill Crossroads - 2 Broad Street 501 Bar façade	Roadside	364909	175908	NO_2	YES	0	1.5	NO	2.4
63	Patchway – 28 Park Leaze	Roadside	359487	182479	NO_2	NO	8	1.5	NO	2.5
67	Kingswood - 40 Regent Street Thomas Cook façade	Roadside	364671	173877	NO_2	YES	0	2.5	NO	2.8
68	Kingswood - 26-32 Regent Street Store Twenty One façade	Roadside	364631	173886	NO_2	YES	0	2.5	NO	2.7
69	Kingswood - 12 Regent Street Silver Brides façade	Roadside	364597	173892	NO_2	YES	0	2.5	NO	2.0
70	Kingswood - Two Mile Hill Road Job Centre Plus façade	Roadside	364533	173896	NO_2	YES	0	2.5	NO	2.5
71	Staple Hill - 11 The Square Bunch Florist	Roadside	365075	175918	NO_2	YES	0.5	6.5	NO	2.7
72	Staple Hill - 25 Broad Street Westbury Inks	Roadside	364990	175920	NO_2	YES	6.5	1.5	NO	2.7
73	Staple Hill - 11 Soundwell Road Starlight	Roadside	364902	175843	NO_2	YES	1.5	0.4	NO	2.5

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
74	Staple Hill - 29-31 Soundwell Road opp Page Comm Assoc	Roadside	364885	175772	NO_2	YES	4	0.4	NO	2.5
75	Staple Hill - 118 High Street Lloyd Bottoms/Eclipse Sewing	Roadside	364856	175917	NO_2	YES	2.5	0.5	NO	2.5
76	Staple Hill - 84-86 High Street Staple Hill Oak Pub façade	Roadside	364722	175926	NO_2	YES	0	2	NO	2.7
78	Staple Hill - 9-11 Victoria Street	Roadside	364909	176016	NO_2	YES	3.7	1.2	NO	2.6
79	Staple Hill - 27-29 Victoria Street	Roadside	364913	176067	NO_2	YES	3.3	1.2	NO	2.6
83	Chipping Sodbury – 51A Broad Street façade	Roadside	372791	182241	NO_2	NO	0	4.7	NO	2.2
87A	Cribbs Causeway – Blackhorse Hill Hollywood Cottage façade	Roadside	357739	181334	NO_2	YES	0	13	NO	1.7
87B	Cribbs Causeway – Blackhorse Hill Hollywood Cottage façade	Roadside	357739	181334	NO_2	YES	0	13	NO	1.7
87C	Cribbs Causeway – Blackhorse Hill Hollywood Cottage façade	Roadside	357739	181334	NO_2	YES	0	13	NO	1.7
92	Kingswood - Regent Street Entertainment & Sports Club	Roadside	364968	173836	NO_2	YES	0	2	NO	2.7
93	Kingswood - Hanham Road Exchange Court Flats	Roadside	364979	173801	NO_2	YES	0	2	NO	2.8
95	Kingswood - 45 High Street Adam Lee	Roadside	365078	173846	NO_2	YES	0	2.7	NO	2.5

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
96	Kingswood - 71 High Street SGYH Youth Housing	Roadside	365164	173832	NO_2	YES	5.5	2.3	NO	2.7
98	Kingswood - High Street Sainsbury's Local façade	Roadside	365463	173785	NO_2	YES	N/A	2.5	NO	2.6
101	Staple Hill - High Street lp outside Beech House	Roadside	364546	175951	NO_2	NO	9	1.5	NO	2.9
102	Staple Hill - 58 High Street CBS Consultants	Roadside	364637	175934	NO_2	YES	0	1.5	NO	2.4
105	Staple Hill - North Street lp outside no 2	Roadside	364932	176147	NO_2	YES	2.5	2	NO	2.7
106	Stoke Gifford - 73 Hambrook Lane façade	Other (3)	363112	179559	NO_2	NO	0	10	NO	1.9
113	Patchway - 5 Falcon Close façade	Roadside	359112	181909	NO_2	NO	0	7.5 (M5 45)	NO	1.9
114	Pilning - 23 Keens Grove façade	Roadside	355263	185351	NO_2	NO	0	7	NO	2.3
115	Pilning - 2 Wick Road façade	Roadside	355212	185360	NO_2	NO	0	8.5	NO	2.3
116	Warmley - 14 High Street Webbs (lp at façade)	Roadside	366882	173562	NO_2	YES	0	2.2	NO	3.1
117	Filton Northville - 29 Gloucester Road North Rowe Vets	Roadside	359874	178259	NO_2	NO	2.5	2.9	NO	2.5
118	Filton Northville - 19 Gloucester Road North Dental Lab	Roadside	359875	178207	NO_2	NO	3.4	4.7	NO	2.4

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
119	Filton - 137 Gloucester Road North	Roadside	360263	179250	NO_2	NO	0.5	3.6	NO	2.5
122	Filton - 549 Filton Avenue	Roadside	360566	178229	NO_2	NO	4.5	4	NO	2.1
123	Filton - 542 Filton Avenue Spar	Roadside	360575	178265	NO_2	NO	5	4	NO	2.4
124	Filton - 702a Filton Ave Way Ahead	Roadside	360918	178905	NO_2	NO	6.6	1.9	NO	2.3
125	Filton - 71 Station Road	Roadside	360891	179005	NO_2	NO	5.4	0.5 (A4174 9.3)	NO	2.6
128	Kingswood - 109 Downend Road	Roadside	364587	174431	NO_2	NO	1.6	1.4	NO	2.4
129	Cribbs Causeway – 1 Holly Cottages façade	Roadside	357508	181059	NO_2	NO	0	18 (M5 44)	NO	2.1
130	Cribbs Causeway – 2 Mayfield Cottages façade	Roadside	357488	181011	NO_2	NO	0	17 (A4018 38)	NO	1.8
132	Hanham - 66 High St Sassy Hair Studio	Roadside	364178	172337	NO_2	NO	0.6	2.7	NO	2.5
133	Hambrook - 123 Old Gloucester Road façade (dp)	Roadside	363736	178507	NO_2	NO	0	10.4 (A4174)	NO	1.9
134	Hambrook – Bristol Road, Old Bakery façade (dp)	Roadside	364048	178719	NO_2	NO	0	2.2	NO	1.9
135	Frenchay – Harford Drive Dyrham Flats	Roadside	364029	178413	NO_2	NO	12.5*	24.5 (A4174)	NO	2.5
136	Little Stoke – 26 Gipsy Patch Lane façade (dp)	Roadside	361242	180544	NO_2	NO	0	12.0	NO	2.2

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
137	Warmley - 35 High Street (lp at façade)	Roadside	366984	173563	NO_2	YES	0	1.9	NO	2.6
138	Warmley - 18 High Street façade (dp)	Roadside	366941	173558	NO_2	YES	0	2.0	NO	2.8
139	Warmley - 14 High Street Webbs façade (dp)	Roadside	366890	173560	NO_2	YES	0	2.3	NO	2.7
141	Warmley - 41 Deanery Road façade (dp)	Roadside	366705	173581	NO_2	YES	0	7.7	NO	2.7
142	Warmley - 33 Deanery Road Warmley Court façade (dp)	Roadside	366613	173597	NO_2	YES	0	8.9 (A4174 18.2)	NO	2.0
143	Warmley - 1 High Street Ideal Pharmacy façade (dp)	Roadside	366815	173574	NO_2	YES	0	5	NO	2.5
144	Warmley - 8 Tower Road North façade (dp)	Roadside	366913	173523	NO_2	NO	0	4.3	NO	2.0
145	Warmley - 1 London Road (Cycle Path)	Roadside	367107	173531	NO_2	YES	4.9*	5	NO	2.3
146	Kingswood - 34 Hill Street façade (dp)	Roadside	365910	173680	NO_2	YES	0	1.6	NO	2.2
147A	Soundwell - 264 Soundwell Rd façade (dp)	Roadside	364586	174496	NO_2	NO	0	2.6	NO	2.3
147B	Soundwell - 264 Soundwell Rd façade (dp)	Roadside	364586	174496	NO_2	NO	0	2.6	NO	2.3
147C	Soundwell - 264 Soundwell Rd façade (dp)	Roadside	364586	174496	NO_2	NO	0	2.6	NO	2.3

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
148	Filton – 109 Gloucester Road North façade (dp)	Roadside	360076	178901	NO_2	NO	0	10.2	NO	1.9
149	Filton – 707 Southmead Road façade (dp)	Roadside	360050	179020	NO_2	NO	0	9.8	NO	1.8
150	Soundwell – 296 Soundwell Road façade (dp)	Roadside	364528	174425	NO_2	NO	0	4.3	NO	1.7
151	Hambrook – Bristol Road Old Bakery FP signpost	Roadside	364048	178726	NO_2	NO	1*	1.2	NO	2.3
152	Bradley Stoke -188 Oaktree Crescent lp49	Roadside	360942	182833	NO_2	NO	1*	12.2	NO	2.8
153	Bradley Stoke -141 Wheatfield Drive (façade)	Roadside	361841	182417	NO_2	NO	0	8.2	NO	2.1
154	Bradley Stoke - 166 Ellan Hay Road (façade)	Roadside	363241	180724	NO_2	NO	0	9.7	NO	1.8
155	Stoke Gifford - 3 Earl Close (façade)	Roadside	363324	179854	NO_2	NO	0	26.5 (SGTL)	NO	2.2
156	Stoke Gifford - Lancelot Road lp1	Roadside	362400	177624	NO_2	NO	21.2	1.8	NO	2.4
157	Hambrook - Bristol Road Poplars House (façade)	Roadside	364006	178517	NO_2	NO	0	30.8	NO	2.2
158	Downend - 5 Wick Wick Close (façade)	Roadside	366156	178556	NO_2	NO	0	20.2 (A4174)	NO	2.1
159	Wickwar - 21 High Street (façade)	Roadside	372395	188581	NO_2	NO	0	2.5	NO	2.3
160	Staple Hill - 62 High Street lp10	Roadside	364655	175931	NO_2	YES	0.4	1.6	NO	2.9

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
161	Staple Hill - 13 Victoria Street (façade)	Roadside	364906	176022	NO_2	YES	0	4.4	NO	2.0
162	Staple Hill - 28 Victoria Street (façade)	Roadside	364925	176062	NO_2	YES	0	4.8	NO	1.9
163	Staple Hill - 2 Victoria Street (façade)	Roadside	364918	175979	NO_2	YES	0	4.8	NO	1.9
164	Staple Hill - 102 High Street Charlie & Co Barbers (façade)	Roadside	364811	175919	NO_2	YES	0	3.5	NO	2.2
165	Staple Hill - 3 Soundwell Rd Chinese Kitchen (façade)	Roadside	364906	175864	NO_2	YES	0	1.5	NO	2.5
166	Kingswood - 12 Cecil Road lp9	Roadside	364770	173695	NO_2	NO	2.1	1.5	NO	2.5
167	Kingswood - 7 Downend Road lp4	Roadside	364652	173957	NO_2	NO	2.9	2.3	NO	2.4
168	Kingswood - 133 High Street (façade)	Roadside	365366	173805	NO_2	YES	0	3.1	NO	2.4
169	Warmley - 20 Deanery Road Warmley Community Centre (façade)	Roadside	366714	173560	NO_2	YES	0	4.2	NO	2.5
170	Patchway - 204 Gloucester Road front façade	Roadside	360606	181675	NO_2	NO	0	10.5	NO	2.3
171	Soundwell - 225 Soundwell Rd (façade)	Roadside	364664	174672	NO_2	NO	0	2.6	NO	2.7
172	Downend - 31 Badminton Road Brownes (façade)	Roadside	365153	176812	NO_2	NO	0	5.4	NO	2.2

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
173	Mangotsfield - 10 Cossham Street (façade)	Roadside	366459	176138	NO_2	NO	0	2.4	NO	2.3

Notes:

(1) 0m if the monitoring site is at a location of exposure (e.g. installed on/adjacent to the façade of a residential property).* Where the receptor is located off to the side of the monitor rather than behind the monitor.

(2) N/A if not applicable.

(3) Other locations where any special source orientated monitoring is undertaken in relation to specific emission sources; in this case, railway line.

Table A.3 Annual Mean NO_2 Monitoring Results

Site ID	Site Name	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	NO_2 Annual Mean Concentration (µg/m³) (3)				
						2013	2014	2015	2016	2017
-	Yate Station Road (Automatic)	Roadside	Automatic	n/a	98.5%	26	24	21	24	23
1	Yate – 88 Station Road The Candle	Roadside	Diffusion Tube	n/a	92%	31.5	31.4	29.1	32.2	29.6
4A	Yate - Station Road Co-Location 1	Roadside	Diffusion Tube	n/a	92%	25.5	25.0	22.7	24.7	22.1
4B	Yate - Station Road Co-location 2	Roadside	Diffusion Tube	n/a	100%	25.6	24.3	23.0	22.7	22.8
4C	Yate - Station Road Co-location 3	Roadside	Diffusion Tube	n/a	100%	25.0	24.6	22.8	24.7	23.2
10	Filton - 152 Gloucester Road North Pizza Bello façade	Roadside	Diffusion Tube	n/a	100%	31.7	***38.1***	33.2	34.1[a]	34.7
11	Thornbury – 48 High Street Uniq Family Wealth	Roadside	Diffusion Tube	n/a	100%	27.8	27.6	25.5	26.8	25.6
12	Stoke Gifford - Church Road Rear of Aviva	Roadside	Diffusion Tube	n/a	100%	32.7	31.0	28.6	29.7	28.4
13	Filton - MOD Roundabout	Roadside	Diffusion Tube	n/a	100%	35.3	33.7	32.1	34.6	30.1
21	Downend – Boscombe Crescent St Augustines Church	Urban Background	Diffusion Tube	n/a	92%	18.8	17.7	16.6	17.4	16.4
22	Hanham – 44 High Street Lloyds Bank	Roadside	Diffusion Tube	n/a	100%	32.5	31.5	28.7	30.7	29.6
27	Kingswood - 90 Regent Street Nat West façade	Roadside	Diffusion Tube	n/a	100%	32.3	31.0	30.2	31.4	29.8

Site ID	Site Name	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	NO_2 Annual Mean Concentration (µg/m³) (3)				
						2013	2014	2015	2016	2017
29	Staple Hill - 123 High Street Backhouse Bet	Roadside	Diffusion Tube	n/a	100%	35.2	35.2	31.2	***36.2***	30.9
34	Bradley Stoke – 109 Ormonds Close M4 East of Almondsbury Interchange	Roadside	Diffusion Tube	n/a	92%	33.5	31.5	28.9	31.0	26.9
35	Bradley Stoke - Woodlands Lane M4 East of Almondsbury Interchange (lp47)	Roadside	Diffusion Tube	n/a	100%	33.3	32.0	27.9	32.0	26.1
36	Hambrook – Whiteshill M4 East of M32 Fairwater	Roadside	Diffusion Tube	n/a	100%	20.9	20.5	19.3	19.4	18.8
37	Almondsbury - Old Aust Road M4 West of Almondsbury Interchange	Roadside	Diffusion Tube	n/a	100%	***37.0***	31.3	31.5	32.2	25.2
38	Severn Beach – Ableton Lane Severn Beach Primary School	Urban Background	Diffusion Tube	n/a	100%	18.2	14.9	14.6	14.6	13.8
42	Little Stoke – 21 Braydon Ave	Urban Background	Diffusion Tube	n/a	100%	27.0	23.1	22.2	23.9	22.0
44	Stoke Gifford - Hatchet Road	Roadside	Diffusion Tube	n/a	100%	31.5	31.5	29.8	31.9	30.1
46	Winterbourne - High Street opp Winterbourne International Academy	Roadside	Diffusion Tube	n/a	100%	34.4	32.7	29.4	32.9	28.8
53	Hambrook – Bristol Road Rear of 17 Fenbrook Close	Roadside	Diffusion Tube	n/a	92%	***39.4***	34.7	30.0	33.7	27.9
54	Longwell Green - A431 / Aldermoor Way	Roadside	Diffusion Tube	n/a	100%	33.4	33.6	30.2	34.9	31.9

Site ID	Site Name	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	NO_2 Annual Mean Concentration (µg/m³) (3)				
						2013	2014	2015	2016	2017
57	Coalpit Heath - Badminton Rd Frome Valley Kitchens	Roadside	Diffusion Tube	n/a	100%	32.9	32.4	29.0	28.7	24.7
58	Longwell Green - Kingsfield Lane/ Aspects Leisure Site (lp6)	Roadside	Diffusion Tube	n/a	100%	24.2	20.8	20.4	22.4	19.2
60	Downend - North Street Kustom Floors & Furniture	Roadside	Diffusion Tube	n/a	100%	***36.0***	33.7	30.7	33.7	28.4
61	Staple Hill Crossroads - 1 Broad Street William Hill	Roadside	Diffusion Tube	n/a	100%	**42.1**	**41.5**	***39.4***	**41.5**	***39.2***
62	Staple Hill Crossroads - 2 Broad Street 501 Bar façade	Roadside	Diffusion Tube	n/a	100%	***36.4***	***36.0***	***36.4***	***39.2***	34.6
63	Patchway – 28 Park Leaze	Roadside	Diffusion Tube	n/a	83%	25.1	25.6	23.1	25.9	24.8
67	Kingswood - 40 Regent Street Thomas Cook façade	Roadside	Diffusion Tube	n/a	92%	**40.9**	**40.2**	***38.1***	**40.7**	***37.9***
68	Kingswood - 26-32 Regent Street Store Twenty One façade	Roadside	Diffusion Tube	n/a	100%	**41.3**	**40.1**	**40.5**	**42.5**	***39.7***
69	Kingswood - 12 Regent Street Silver Brides façade	Roadside	Diffusion Tube	n/a	92%	***36.0***	***36.2***	34.8	***36.5***	33.2
70	Kingswood - Two Mile Hill Road Job Centre Plus façade	Roadside	Diffusion Tube	n/a	100%	34.7	32.1	31.0	32.7	30.8
71	Staple Hill - 11 The Square Bunch Florist	Roadside	Diffusion Tube	n/a	83%	27.1	24.7	23.6	26.1	24.6
72	Staple Hill - 25 Broad Street Westbury Inks	Roadside	Diffusion Tube	n/a	92%	34.8	31.9	32.2	***36.2***	31.1

Site ID	Site Name	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	NO_2 Annual Mean Concentration (µg/m³) (3)				
						2013	2014	2015	2016	2017
73	Staple Hill - 11 Soundwell Road Starlight	Roadside	Diffusion Tube	n/a	100%	***39.3***	***39.9***	**40.4**	**40.2**	***37.3***
74	Staple Hill - 29-31 Soundwell Road opp Page Community Association	Roadside	Diffusion Tube	n/a	100%	32.2	28.1	28.5	30.9	27.1
75	Staple Hill - 118 High Street Lloyd Bottoms/Eclipse Sewing	Roadside	Diffusion Tube	n/a	100%	**43.6**	**45.3**	**44.8**	**46.1**	**40.3**
76	Staple Hill - 84-86 High Street Staple Hill Oak Pub façade	Roadside	Diffusion Tube	n/a	100%	34.9	***36.2***	34.9	***36.9***	32.9
78	Staple Hill - 9-11 Victoria Street	Roadside	Diffusion Tube	n/a	100%	**44.4**	**43.3**	**41.5**	**44.9**	***39.0***
79	Staple Hill - 27-29 Victoria Street	Roadside	Diffusion Tube	n/a	100%	35.8	***37.5***	***37.5***	***37.2***	34.7
83	Chipping Sodbury – 51A Broad Street façade	Roadside	Diffusion Tube	n/a	92%	23.6	22.4	23.1	25.4	22.8
87A	Cribbs Causeway – Blackhorse Hill Hollywood Cottage façade	Roadside	Diffusion Tube	n/a	92%	32.7	34.9	28.4	28.3[a]	26.6
87B	Cribbs Causeway – Blackhorse Hill Hollywood Cottage façade	Roadside	Diffusion Tube	n/a	100%	32.2	34.3	28.7	29.9[a]	27.2
87C	Cribbs Causeway – Blackhorse Hill Hollywood Cottage façade	Roadside	Diffusion Tube	n/a	100%	32.1	34.3	29.5	29.3[a]	27.2
92	Kingswood - Regent Street Entertainment & Sports Club	Roadside	Diffusion Tube	n/a	100%	***36.9***	34.0	34.1	***36.7***	33.2
93	Kingswood - Hanham Road Exchange Court Flats	Roadside	Diffusion Tube	n/a	100%	32.0	29.5	29.2	31.1	26.7
95	Kingswood - 45 High Street Adam Lee	Roadside	Diffusion Tube	n/a	100%	***37.4***	34.5	34.3	***39.6***	***36.6***

Site ID	Site Name	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	NO_2 Annual Mean Concentration (µg/m³) (3)				
						2013	2014	2015	2016	2017
96	Kingswood - 71 High Street SGYH Youth Housing	Roadside	Diffusion Tube	n/a	92%	***38.3***	***36.0***	34.2	***37.0***	35.0
98	Kingswood - High Street Sainsbury's Local façade	Roadside	Diffusion Tube	n/a	92%	***37.9***	***37.1***	***37.0***	35.3	34.8
101	Staple Hill - High Street lp outside Beech House	Roadside	Diffusion Tube	n/a	100%	28.0	26.3	25.7	28.5	25.4
102	Staple Hill - 58 High Street CBS Consultants	Roadside	Diffusion Tube	n/a	100%	**41.7**	***39.8***	***38.4***	**40.7**	***37.2***
105	Staple Hill - North Street lp outside no 2	Roadside	Diffusion Tube	n/a	100%	28.1	27.3	26.7	29.8	27.0
106	Stoke Gifford - 73 Hambrook Lane façade	Other	Diffusion Tube	n/a	100%	22.1	21.6	20.1	20.9	20.5
113	Patchway - 5 Falcon Close façade	Roadside	Diffusion Tube	n/a	100%	30.8	30.2	32.4	31.9	30.3
114	Pilning - 23 Keens Grove façade	Roadside	Diffusion Tube	n/a	83%	29.0	25.6	25.7	27.5	23.4
115	Pilning - 2 Wick Road façade	Roadside	Diffusion Tube	n/a	92%	27.6	25.9	24.9	25.5	24.2
116	Warmley - 14 High Street Webbs (lp at façade)	Roadside	Diffusion Tube	n/a	100%	**44.3**	**40.8**	**42.9**	**40.2**[a]	***39.7***
117	Filton Northville - 29 Gloucester Road North Rowe Vets	Roadside	Diffusion Tube	n/a	100%	35.1	32.7	31.0	34.2	30.5
118	Filton Northville - 19 Gloucester Road North Dental Lab	Roadside	Diffusion Tube	n/a	100%	32.7	31.3	30.4	32.8	30.5

Site ID	Site Name	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	NO_2 Annual Mean Concentration (µg/m³) (3)				
						2013	2014	2015	2016	2017
119	Filton - 137 Gloucester Road North	Roadside	Diffusion Tube	n/a	92%	***37.0***	***36.1***	33.6	34.6	30.2
122	Filton - 549 Filton Avenue	Roadside	Diffusion Tube	n/a	100%	34.5	33.2	30.6	31.4	29.4
123	Filton - 542 Filton Avenue Spar	Roadside	Diffusion Tube	n/a	100%	33.6	31.9	30.1	31.2	29.2
124	Filton - 702a Filton Ave Way Ahead	Roadside	Diffusion Tube	n/a	100%	***39.1***	35.0	32.1	34.4	29.7
125	Filton - 71 Station Road	Roadside	Diffusion Tube	n/a	100%	29.5	26.7	25.8	26.7	29.1
128	Kingswood - 109 Downend Road	Roadside	Diffusion Tube	n/a	100%	***35.3***	32.9	33.2	34.6	31.7
129	Cribbs Causeway – 1 Holly Cottages façade	Roadside	Diffusion Tube	n/a	100%	32.2	29.9	29.5	33.4	29.2
130	Cribbs Causeway – 2 Mayfield Cottages façade	Roadside	Diffusion Tube	n/a	92%	29.7	27.3	26.8	28.9	26.5
132	Hanham - 66 High Street Sassy Hair Studio	Roadside	Diffusion Tube	n/a	100%	***36.1***	31.9	29.2	31.6	29.0
133	Hambrook - 123 Old Gloucester Road façade (dp)	Roadside	Diffusion Tube	n/a	100%	32.5	27.6	28.4	30.7	25.6
134	Hambrook – Bristol Road Old Bakery façade (dp)	Roadside	Diffusion Tube	n/a	100%	**41.9**	***39.4***	***36.0***	***37.4***	32.7
135	Frenchay – Harford Drive Dyrham Flats	Roadside	Diffusion Tube	n/a	75%	32.0	27.0	26.8	28.5	27.4

Site ID	Site Name	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	NO_2 Annual Mean Concentration (µg/m³) (3)				
						2013	2014	2015	2016	2017
136	Little Stoke – 26 Gipsy Patch Lane façade (dp)	Roadside	Diffusion Tube	n/a	92%	24.9[a]	23.7	22.1	22.9	22.5
137	Warmley - 35 High Street (lp at façade)	Roadside	Diffusion Tube	n/a	83%	**50.2**[a]	**42.3**	**43.2**	**43.7**	***39.0***
138	Warmley - 18 High Street façade (dp)	Roadside	Diffusion Tube	n/a	92%	**41.1**[a]	***39.2***	***37.5***	***37.3***	***36.3***
139	Warmley - 14 High Street Webbs façade (dp)	Roadside	Diffusion Tube	n/a	67%	**43.2**[a]	***36.6***	***39.6***	***38.3***[a]	**41.4**
141	Warmley - 41 Deanery Road façade (dp)	Roadside	Diffusion Tube	n/a	92%	***37.2***[a]	34.5	30.9	32.6	31.8
142	Warmley - 33 Deanery Road Warmley Court façade (dp)	Roadside	Diffusion Tube	n/a	100%	34.2[a]	29.7	29.7	29.3	29.0
143	Warmley - 1 High Street Ideal Pharmacy façade (dp)	Roadside	Diffusion Tube	n/a	100%	29.3[a]	26.1	25.6	27.1	25.1
144	Warmley - 8 Tower Road North façade (dp)	Roadside	Diffusion Tube	n/a	100%	28.7[a]	26.6	26.5	25.7	25.3
145	Warmley - 1 London Road (Cycle Path)	Roadside	Diffusion Tube	n/a	92%	27.7[a]	25.5	25.6	26.0	26.8
146	Kingswood - 34 Hill Street façade (dp)	Roadside	Diffusion Tube	n/a	100%	***39.5***[a]	**46.1**	**41.8**	**45.7**	**46.3**
147A	Soundwell - 264 Soundwell Road façade (dp)	Roadside	Diffusion Tube	n/a	83%	33.7[a]	**40.6**	***38.7***	***39.9***	***37.3***
147B	Soundwell - 264 Soundwell Road façade (dp)	Roadside	Diffusion Tube	n/a	100%	n/a	n/a	n/a	**46.5**[a]	***37.8***

Site ID	Site Name	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	NO_2 Annual Mean Concentration (µg/m³) (3)				
						2013	2014	2015	2016	2017
147C	Soundwell - 264 Soundwell Road façade (dp)	Roadside	Diffusion Tube	n/a	100%	n/a	n/a	n/a	**46.6[a]**	***39.4***
148	Filton – 109 Gloucester Road North façade (dp)	Roadside	Diffusion Tube	n/a	100%	n/a	28.9	34.0	34.2	24.2
149	Filton – 707 Southmead Road façade (dp)	Roadside	Diffusion Tube	n/a	100%	n/a	30.4	29.4	31.3	26.9
150	Soundwell – 296 Soundwell Road façade (dp)	Roadside	Diffusion Tube	n/a	100%	n/a	30.9	29.4	32.7	26.1
151	Hambrook – Bristol Road Old Bakery FP signpost	Roadside	Diffusion Tube	n/a	100%	n/a	***39.9***	***39.5***	***38.8***	35.5
152	Bradley Stoke 188 Oaktree Crescent lp49	Roadside	Diffusion Tube	n/a	92%	n/a	n/a	30.9[a]	30.1	30.5
153	Bradley Stoke – 141 Wheatfield Drive (façade)	Roadside	Diffusion Tube	n/a	100%	n/a	n/a	18.2	22.2	19.5
154	Bradley Stoke - 166 Ellan Hay Road (façade)	Roadside	Diffusion Tube	n/a	100%	n/a	n/a	20.5	25.0	22.5
155	Stoke Gifford - 3 Earl Close (façade)	Roadside	Diffusion Tube	n/a	100%	n/a	n/a	17.2	21.8	19.5
156	Stoke Gifford - Lancelot Road lp1	Roadside	Diffusion Tube	n/a	100%	n/a	n/a	19.9	23.2	21.8
157	Hambrook - Bristol Road Poplars House (façade)	Roadside	Diffusion Tube	n/a	100%	n/a	n/a	30.5[a]	28.7	25.3
158	Downend - 5 Wick Wick Close (façade)	Roadside	Diffusion Tube	n/a	100%	n/a	n/a	28.4[a]	29.6	24.8
159	Wickwar - 21 High Street (façade)	Roadside	Diffusion Tube	100%	92%	n/a	n/a	n/a	n/a	27.2

Site ID	Site Name	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	NO_2 Annual Mean Concentration (µg/m³) (3)				
						2013	2014	2015	2016	2017
160	Staple Hill - 62 High Street lp10	Roadside	Diffusion Tube	90%	75%	n/a	n/a	n/a	n/a	30.9
161	Staple Hill - 13 Victoria Street (façade)	Roadside	Diffusion Tube	100%	83%	n/a	n/a	n/a	n/a	29.8
162	Staple Hill - 28 Victoria Street (façade)	Roadside	Diffusion Tube	100%	83%	n/a	n/a	n/a	n/a	25.7
163	Staple Hill - 2 Victoria Street (façade)	Roadside	Diffusion Tube	100%	83%	n/a	n/a	n/a	n/a	26.9
164	Staple Hill - 102 High Street Charlie & Co Barbers (façade)	Roadside	Diffusion Tube	100%	83%	n/a	n/a	n/a	n/a	28.3
165	Staple Hill - 3 Soundwell Rd Chinese Kitchen (façade)	Roadside	Diffusion Tube	90%	75%	n/a	n/a	n/a	n/a	***36.3***
166	Kingswood - 12 Cecil Road lp9	Roadside	Diffusion Tube	100%	83%	n/a	n/a	n/a	n/a	27.9
167	Kingswood - 7 Downend Road lp4	Roadside	Diffusion Tube	100%	83%	n/a	n/a	n/a	n/a	32.5
168	Kingswood - 133 High Street (façade)	Roadside	Diffusion Tube	100%	58%	n/a	n/a	n/a	n/a	29.4
169	Warmley - 20 Deanery Road Warmley Community Centre (façade)	Roadside	Diffusion Tube	100%	58%	n/a	n/a	n/a	n/a	***36.9***
170	Patchway - 204 Gloucester Road front façade	Roadside	Diffusion Tube	100%	58%	n/a	n/a	n/a	n/a	24.3
171	Soundwell - 225 Soundwell Rd (façade)	Roadside	Diffusion Tube	86%	50%	n/a	n/a	n/a	n/a	32.1

Site ID	Site Name	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	NO_2 Annual Mean Concentration (µg/m³) (3)				
						2013	2014	2015	2016	2017
172	Downend - 31 Badminton Road Brownes (façade)	Roadside	Diffusion Tube	100%	42%	n/a	n/a	n/a	n/a	35.2
173	Mangotsfield - 10 Cossham Street (façade)	Roadside	Diffusion Tube	100%	42%	n/a	n/a	n/a	n/a	27.0

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

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

Notes:

Exceedances of the NO_2 annual mean objective of 40 µg/m³are show in **red bold**

Borderline results within 10% of NO_2 annual mean objective (>36 µg/m³) are shown in ***blue bold italics***

NO_2 annual means exceeding 60 µg/m³, indicating a potential exceedance of the NO_2 1-hour mean objective are shown in **bold and underlined.**

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

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

(3) Means for diffusion tubes have been corrected for bias. All means have been "annualised" as per Boxes 7.9 and 7.10 in LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details. ([a] denotes annualised results for previous years 2013 – 2016 where full calendar year data capture <75%, with exception of Warmley Detailed Assessment sites in 2013 with 75% data capture, which were also annualised.

Figure A.1 Trends in Annual Mean NO_2 Concentrations at Automatic Monitoring Sites

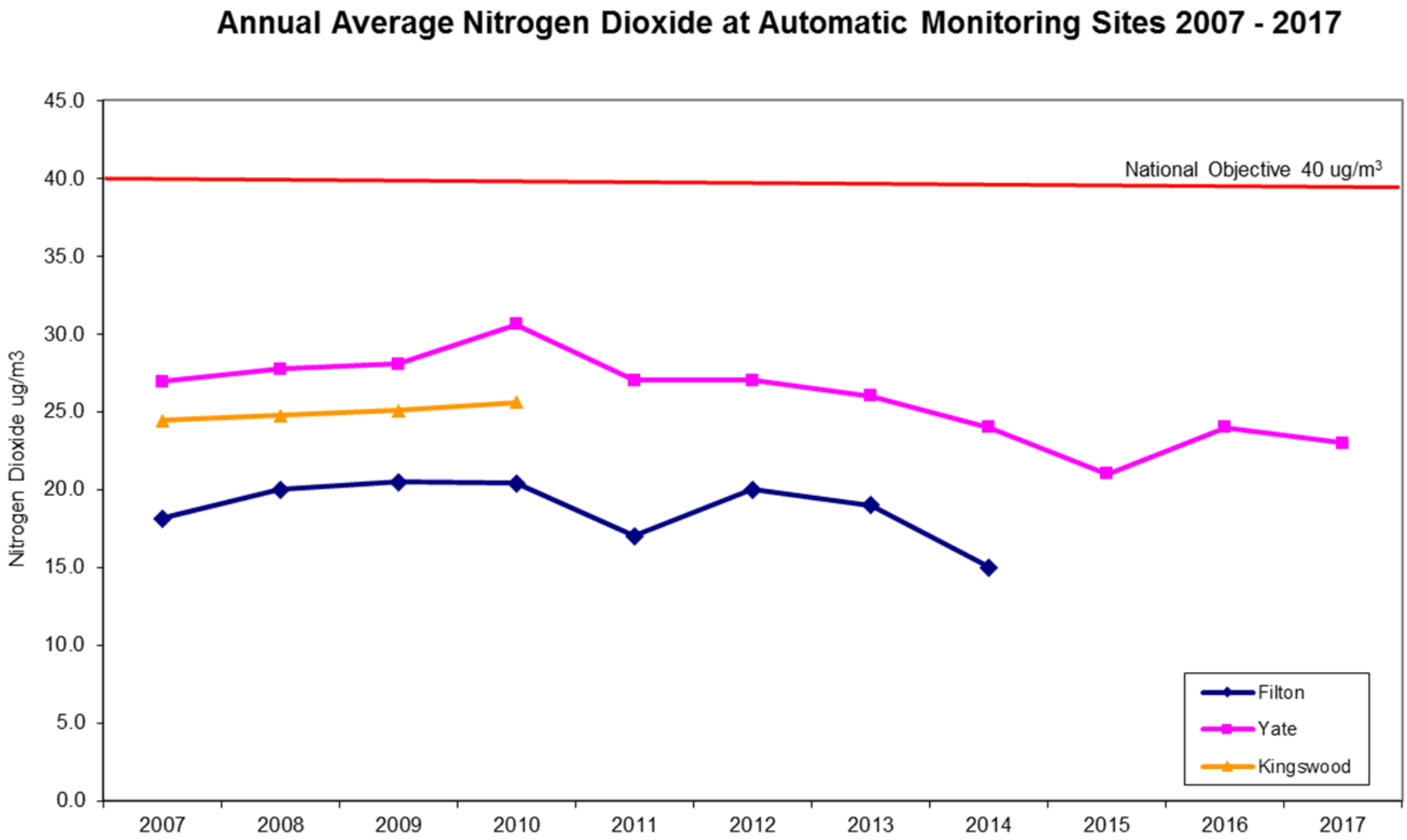


Table A.4 1-Hour Mean NO_2 Monitoring Results

Site ID	Site Name	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	NO_2 1-Hour Means > 200µg/m^3 (3)				
						2013	2014	2015	2016	2017
-	**Yate** Station Road	Roadside	Automatic	n/a	98.5%	0	0	0	0	0

Notes:

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

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

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

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

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

Site ID	Site Name	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	PM_{10} Annual Mean Concentration (µg/m³) (3)				
					2013	2014	2015	2016	2017
-	**Yate** Station Road	Roadside	n/a	98.2%	15	15	15	14	14

☒ **Annualisation has been conducted where data capture is <75%. However data capture has been above 75% for all years shown so it has not been necessary to annualise the data.**

Notes:

Exceedances of the PM_{10} annual mean objective of 40 µg/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) All means have been "annualised" as per Boxes 7.9 and 7.10 in LAQM.TG16, where valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Figure A.2 Trends in Annual Mean PM_{10} Concentrations at Automatic Monitoring Sites

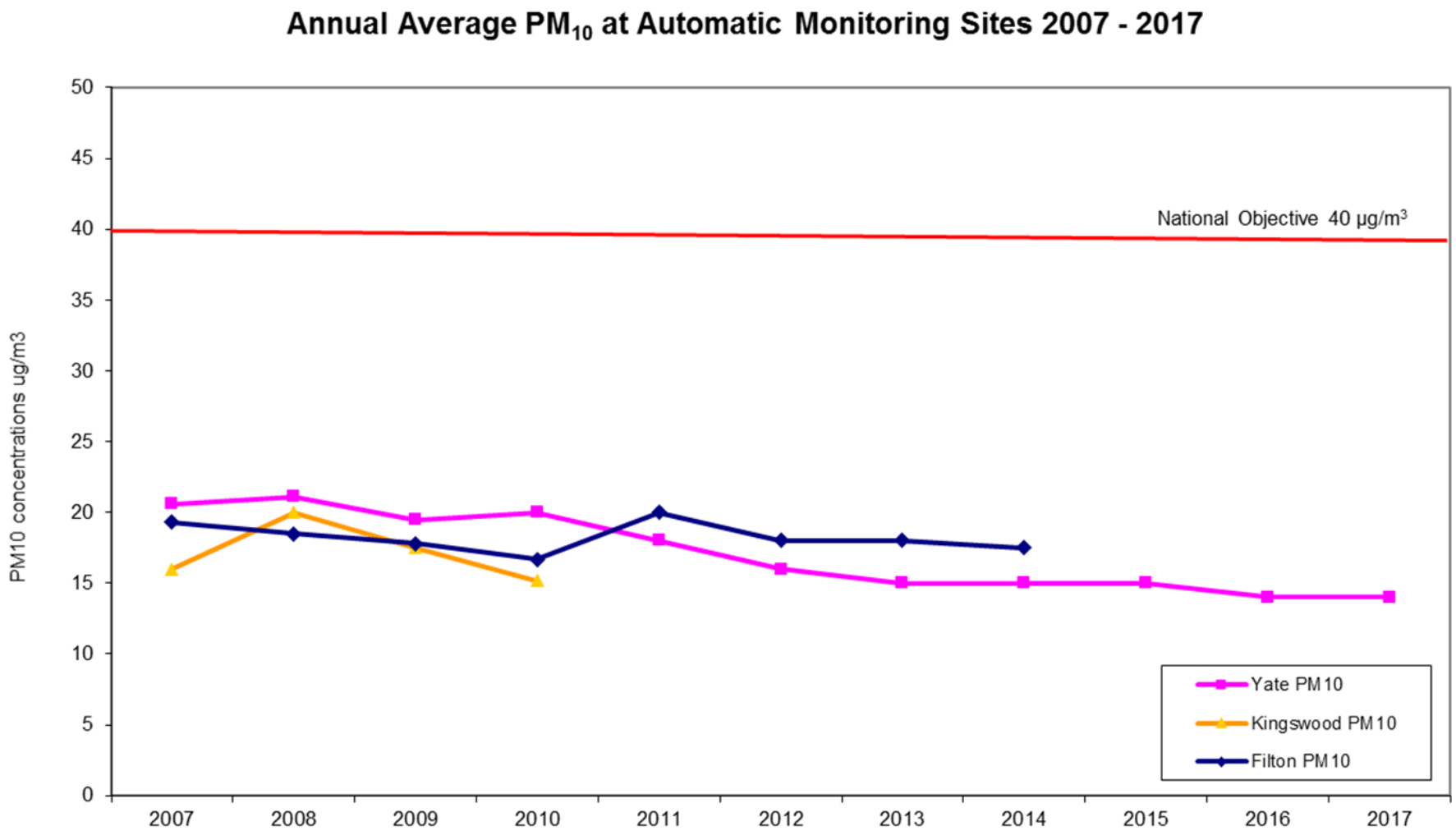


Table A.6 24-Hour Mean PM_{10} Monitoring Results

Site ID	Site Name	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	PM_{10} 24-Hour Means > 50µg/m³ (3)				
					2013	2014	2015	2016	2017
-	**Yate** Station Road	Roadside	n/a	98.2%	0	1	4	0	0

Notes:

Exceedances of the PM_{10} 24-hour mean objective (50 µg/m³ not to be exceeded more than 35 times/year) are shown in **bold.**

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

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

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

Table A.7 Kingswood- Warmley AQMA Annual Mean NO_2 Monitoring Results

Site ID	Site Name	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	NO_2 Annual Mean Concentration (µg/m³) (3)				
						2013	2014	2015	2016	2017
27	Kingswood - 90 Regent Street Nat West façade	Roadside	Diffusion Tube	n/a	100%	32.3	31.0	30.2	31.4	29.8
67	Kingswood - 40 Regent Street Thomas Cook façade	Roadside	Diffusion Tube	n/a	92%	**40.9**	**40.2**	***38.1***	**40.7**	***37.9***
68	Kingswood - 26-32 Regent Street Store Twenty One façade	Roadside	Diffusion Tube	n/a	100%	**41.3**	**40.1**	**40.5**	**42.5**	***39.7***
69	Kingswood - 12 Regent Street Silver Brides façade	Roadside	Diffusion Tube	n/a	92%	***36.0***	***36.2***	34.8	***36.5***	33.2
70	Kingswood - Two Mile Hill Road Job Centre Plus façade	Roadside	Diffusion Tube	n/a	100%	34.7	32.1	31.0	32.7	30.8
92	Kingswood - Regent Street Entertainment & Sports Club	Roadside	Diffusion Tube	n/a	100%	***36.9***	34.0	34.1	***36.7***	33.2
93	Kingswood - Hanham Road Exchange Court Flats	Roadside	Diffusion Tube	n/a	100%	32.0	29.5	29.2	31.1	26.7
95	Kingswood - 45 High Street Adam Lee	Roadside	Diffusion Tube	n/a	100%	***37.4***	34.5	34.3	***39.6***	***36.6***
96	Kingswood - 71 High Street Homeless Project	Roadside	Diffusion Tube	n/a	92%	***38.3***	***36.0***	34.2	***37.0***	35.0
98	Kingswood - High Street Sainsbury's Local façade	Roadside	Diffusion Tube	n/a	92%	***37.9***	***37.1***	***37.0***	35.3	34.8
116	Warmley - 14 High Street Webbs (lp at façade)	Roadside	Diffusion Tube	n/a	100%	**44.3**	**40.8**	**42.9**	**40.2**[a]	***39.7***
137	Warmley - 35 High Street (lp at façade)	Roadside	Diffusion Tube	n/a	83%	**50.2**[a]	**42.3**	**43.2**	**43.7**	***39.0***

Site ID	Site Name	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	NO_2 Annual Mean Concentration (µg/m³) (3)				
						2013	2014	2015	2016	2017
138	Warmley - 18 High Street façade (dp)	Roadside	Diffusion Tube	n/a	92%	**41.1**[a]	***39.2***	***37.5***	***37.3***	***36.3***
139	Warmley - 14 High Street Webbs façade (dp)	Roadside	Diffusion Tube	n/a	67%	**43.2**[a]	***36.6***	***39.6***	***38.3***[a]	**41.4**
141	Warmley - 41 Deanery Road façade (dp)	Roadside	Diffusion Tube	n/a	92%	***37.2***[a]	34.5	30.9	32.6	31.8
142	Warmley - 33 Deanery Road Warmley Court façade (dp)	Roadside	Diffusion Tube	n/a	100%	34.2[a]	29.7	29.7	29.3	29.0
143	Warmley - 1 High Street Ideal Pharmacy façade (dp)	Roadside	Diffusion Tube	n/a	100%	29.3[a]	26.1	25.6	27.1	25.1
145	Warmley - 1 London Road (Cycle Path)	Roadside	Diffusion Tube	n/a	92%	27.7[a]	25.5	25.6	26.0	26.8
146	Kingswood - 34 Hill Street façade (dp)	Roadside	Diffusion Tube	n/a	100%	***39.5***[a]	**46.1**	**41.8**	**45.7**	**46.3**
168	Kingswood - 133 High Street (façade)	Roadside	Diffusion Tube	100%	58%	n/a	n/a	n/a	n/a	29.4
169	Warmley - 20 Deanery Road Warmley Community Centre (façade)	Roadside	Diffusion Tube	100%	58%	n/a	n/a	n/a	n/a	***36.9***

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

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

Notes:

Exceedances of the NO_2 annual mean objective of 40 µg/m³are show in **red bold**

Borderline results within 10% of NO_2 annual mean objective (>36 µg/m³) are shown in ***blue bold italics***

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

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

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

(3) Means for diffusion tubes have been corrected for bias. All means have been "annualised" as per Boxes 7.9 and 7.10 in LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details. ([a] denotes annualised results for previous years 2012 – 2015 where full calendar year data capture <75%, with exception of Warmley Detailed Assessment sites in 2013 with 75% data capture, which were also annualised.

Figure A.3 Trends in Annual Mean Nitrogen Dioxide Concentrations in Kingswood Section of Kingswood - Warmley AQMA

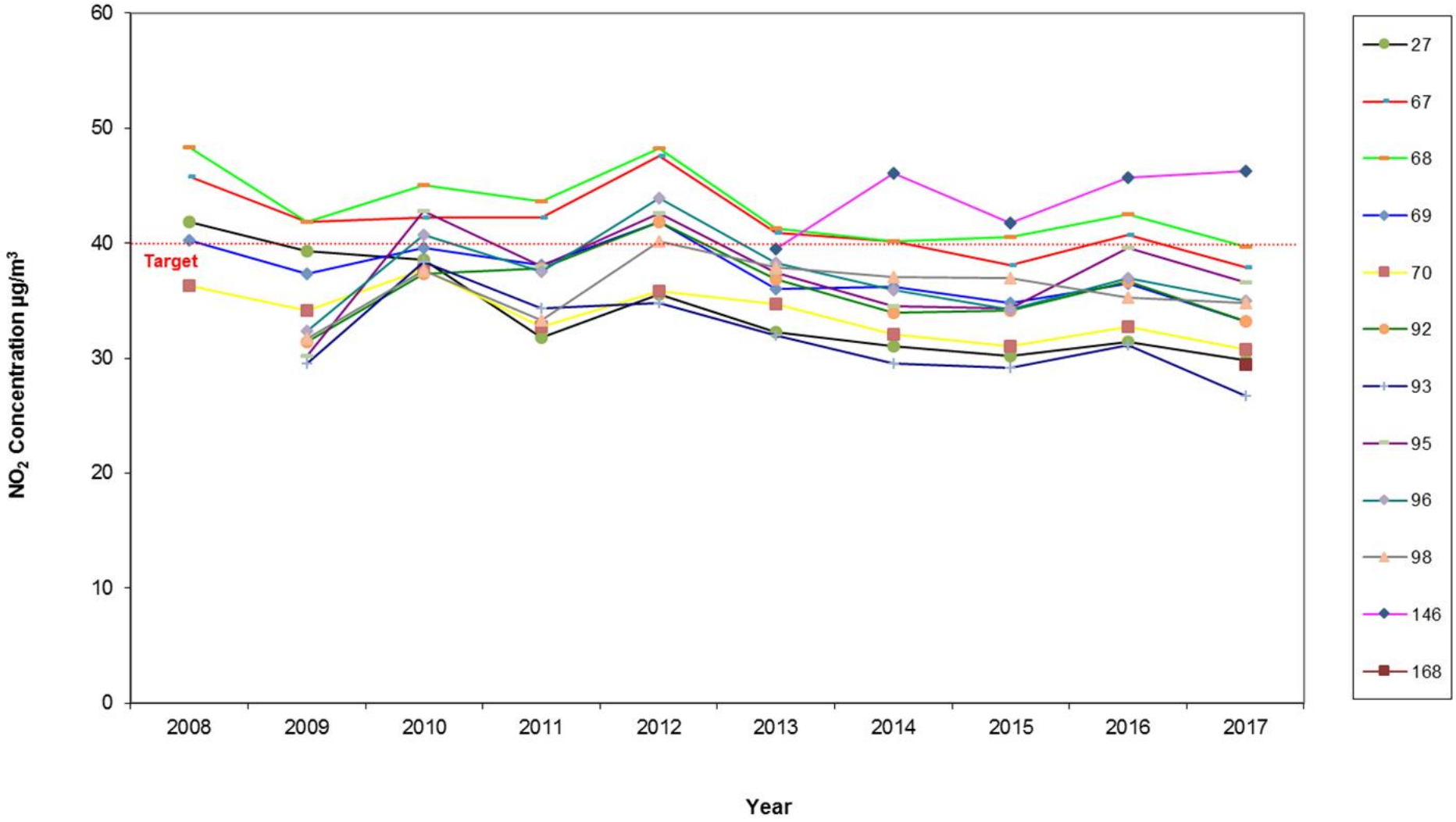


Figure A.4 Trends in Annual Mean Nitrogen Dioxide Concentrations in Warmley Section of Kingswood - Warmley AQMA

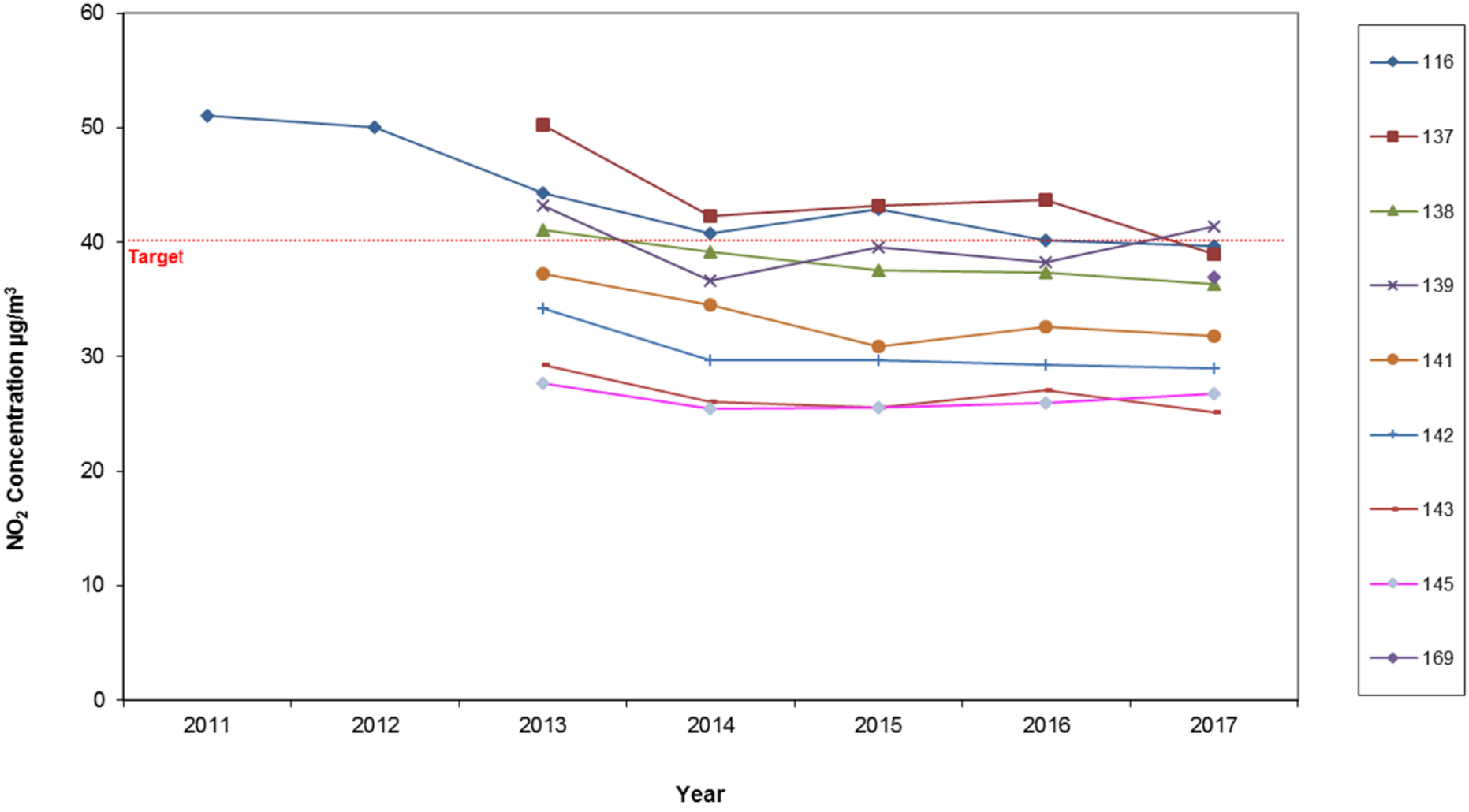


Table A.8 Staple Hill AQMA Annual Mean NO_2 Monitoring Results

Site ID	Site Name	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	NO_2 Annual Mean Concentration (µg/m³) (3)				
						2013	2014	2015	2016	2017
29	Staple Hill - 123 High Street Backhouse Bet	Roadside	Diffusion Tube	n/a	100%	35.2	35.2	31.2	36.2	30.9
61	Staple Hill Crossroads - 1 Broad Street William Hill	Roadside	Diffusion Tube	n/a	100%	42.1	41.5	39.4	41.5	39.2
62	Staple Hill Crossroads - 2 Broad Street 501 Bar façade	Roadside	Diffusion Tube	n/a	100%	36.4	36.0	36.4	39.2	34.6
71	Staple Hill - 11 The Square Bunch Florist	Roadside	Diffusion Tube	n/a	83%	27.1	24.7	23.6	26.1	24.6
72	Staple Hill - 25 Broad Street Westbury Inks	Roadside	Diffusion Tube	n/a	92%	34.8	31.9	32.2	36.2	31.1
73	Staple Hill - 11 Soundwell Road Starlight	Roadside	Diffusion Tube	n/a	100%	39.3	39.9	40.4	40.2	37.3
74	Staple Hill - 29-31 Soundwell Road opp Page Community Association	Roadside	Diffusion Tube	n/a	100%	32.2	28.1	28.5	30.9	27.1
75	Staple Hill - 118 High Street Lloyd Bottoms/Eclipse Sewing	Roadside	Diffusion Tube	n/a	100%	43.6	45.3	44.8	46.1	40.3
76	Staple Hill - 84-86 High Street Staple Hill Oak Pub façade	Roadside	Diffusion Tube	n/a	100%	34.9	36.2	34.9	36.9	32.9
78	Staple Hill - 9-11 Victoria Street	Roadside	Diffusion Tube	n/a	100%	44.4	43.3	41.5	44.9	39.0
79	Staple Hill - 27-29 Victoria Street	Roadside	Diffusion Tube	n/a	100%	35.8	37.5	37.5	37.2	34.7
102	Staple Hill - 58 High Street CBS Consultants	Roadside	Diffusion Tube	n/a	100%	41.7	39.8	38.4	40.7	37.2

Site ID	Site Name	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	NO_2 Annual Mean Concentration (µg/m³) (3)				
						2013	2014	2015	2016	2017
105	Staple Hill - North Street lp outside no 2	Roadside	Diffusion Tube	n/a	100%	28.1	27.3	26.7	29.8	27.0
160	Staple Hill - 62 High Street lp10	Roadside	Diffusion Tube	90%	75%	n/a	n/a	n/a	n/a	30.9
161	Staple Hill - 13 Victoria Street (façade)	Roadside	Diffusion Tube	100%	83%	n/a	n/a	n/a	n/a	29.8
162	Staple Hill - 28 Victoria Street (façade)	Roadside	Diffusion Tube	100%	83%	n/a	n/a	n/a	n/a	25.7
163	Staple Hill - 2 Victoria Street (façade)	Roadside	Diffusion Tube	100%	83%	n/a	n/a	n/a	n/a	26.9
164	Staple Hill - 102 High Street Charlie & Co Barbers (façade)	Roadside	Diffusion Tube	100%	83%	n/a	n/a	n/a	n/a	28.3
165	Staple Hill - 3 Soundwell Rd Chinese Kitchen (façade)	Roadside	Diffusion Tube	90%	75%	n/a	n/a	n/a	n/a	***36.3***

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

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

Notes:

Exceedances of the NO_2 annual mean objective of 40 µg/m³are show in **red bold**

Borderline results within 10% of NO_2 annual mean objective (>36 µg/m³) are shown in ***blue bold italics***

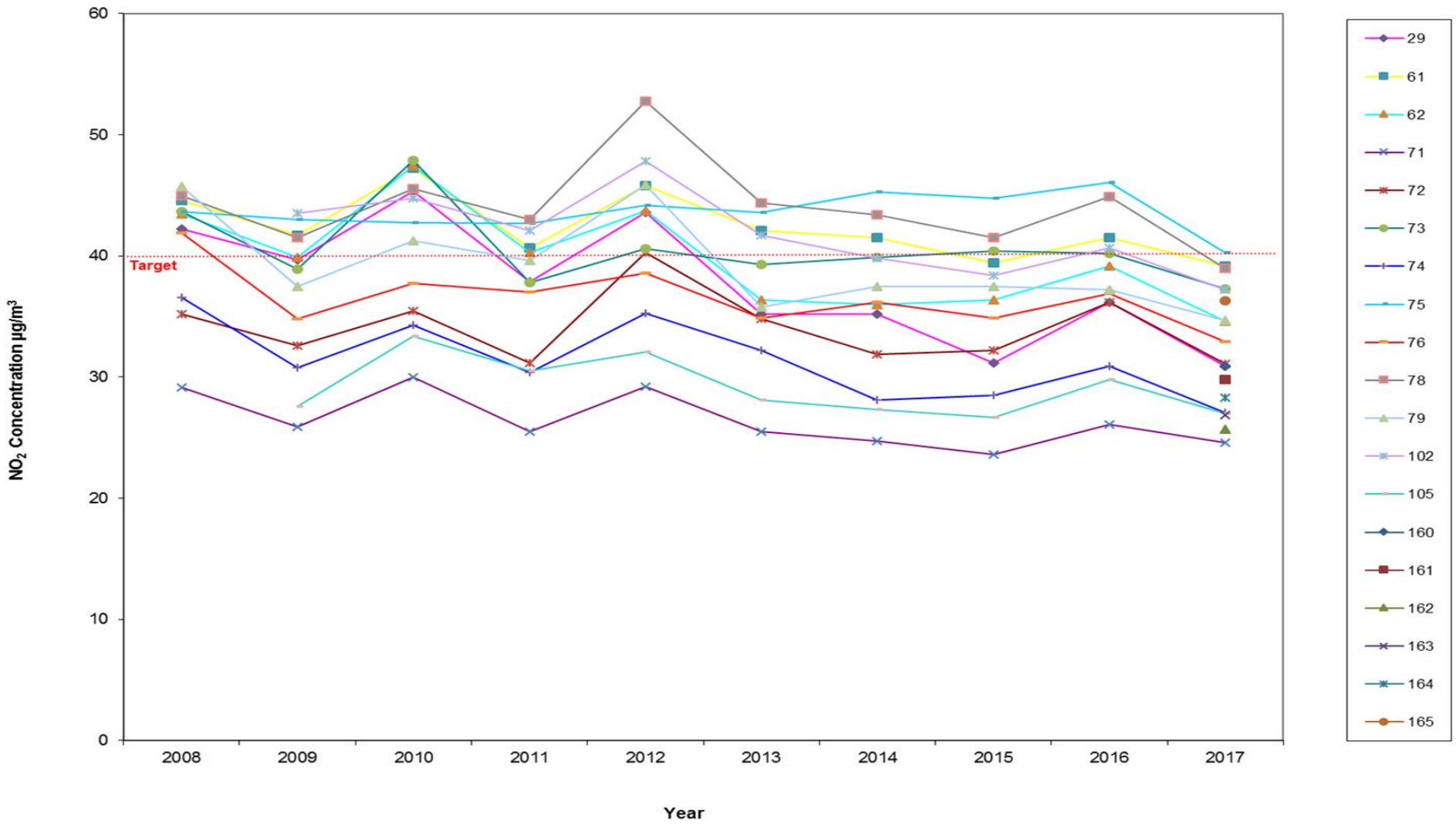
NO_2 annual means exceeding 60 µg/m³, indicating a potential exceedance of the NO_2 1-hour mean objective are shown in **bold and underlined.**

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

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

(3) Means for diffusion tubes have been corrected for bias. All means have been "annualised" as per Boxes 7.9 and 7.10 in LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details. ([a] denotes annualised results for previous years 2013 – 2016 where full calendar year data capture <75%)

Figure A.5 Trends in Annual Mean Nitrogen Dioxide Concentrations in Staple Hill AQMA



Estimated $PM_{2.5}$ Concentrations

Table A.9 Estimation of $PM_{2.5}$ concentrations and % reductions

Year	Yate PM_{10} Annual Means (1) ($\mu g/m^3$)	Yate Estimated $PM_{2.5}$ Annual Means (PM_{10} x 0.7) (2) ($\mu g/m^3$)	Bristol St. Pauls (AURN) Monitored $PM_{2.5}$ Annual Means (3) ($\mu g/m^3$)
2017	14	9.8	10
2016	14	9.8	12
2015	15	10.5	10
2014	15	10.5	13
2013	15	10.5	13
2012	16	11.2	13
2011	18	12.6	15
2010	20	14	14
% Reduction 2010 -2017	**30%**	**30%**	**29%**

(1) As reported in Table A.5, Appendix A
(2) Estimated as per Technical Guidance LAQM TG16 Box 7.7
(3) Obtained from UK-AIR Data Archive Annual and Exceedance Statistics https://uk-air.defra.gov.uk/data/exceedence

Appendix B: Full Monthly Diffusion Tube Results for 2017

Table B.1 NO_2 Monthly Diffusion Tube Results - 2017

Site ID	Site Name	NO_2 Mean Concentrations (µg/m³)														
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
														Raw Data	Bias Adjusted (0.91) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
1	Yate – 88 Station Road The Candle	43.4	34.4	28.0		26.3	30.2	28.1	27.0	28.2	32.3	45.2	34.2	32.5	29.6	25.9
4A	Yate - Station Road Co-Location 1	39.7	26.7	27.4	20.5	18.9	21.1	16.8	18.5	23.1	22.7	31.2		24.2	22.1	n/a
4B	Yate - Station Road Co-location 2	39.5	27.2	28.5	19.5	19.0	22.6	18.7	19.2	20.8	25.1	31.1	28.9	25.0	22.8	n/a
4C	Yate - Station Road Co-location 3	39.2	30.9	26.3	20.8	18.8	21.2	17.4	20.7	23.1	23.9	32.6	31.0	25.5	23.2	n/a
10	Filton - 152 Gloucester Road North Pizza Bello façade	49.2	39.8	33.8	33.6	26.4	34.5	29.1	35.4	36.5	45.3	50.0	43.5	***38.1***	34.7	-
11	Thornbury – 48 High Street Uniq Family Wealth	39.9	26.9	26.1	24.9	22.9	26.6	23.8	21.9	26.7	29.7	38.1	30.5	28.2	25.6	n/a
12	Stoke Gifford - Church Road Rear of Aviva	42.4	33.1	28.7	28.8	25.2	26.0	23.5	27.4	28.8	30.2	44.2	36.1	31.2	28.4	n/a
13	Filton - MOD Roundabout	56.0	31.8	29.0	30.8	30.4	25.1	26.3	27.7	32.6	31.0	44.5	31.7	33.1	30.1	n/a
21	Downend – Boscombe Crescent St Augustines Church	34.8	22.3	16.2	16.8	12.2		10.5	11.6	13.5	13.6	26.4	21.0	18.1	16.4	n/a

Site ID	Site Name	NO_2 Mean Concentrations (µg/m^3)														
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
														Raw Data	Bias Adjusted (0.91) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
22	Hanham – 44 High Street Lloyds Bank	50.1	32.6	30.9	28.3	30.3	28.3	27.6	25.6	32.2	30.9	40.4	32.8	32.5	29.6	n/a
27	Kingswood - 90 Regent Street Nat West façade	43.1	32.4	32.7	29.3	26.6	29.8	26.9	28.8	30.6	32.1	42.8	37.7	32.7	29.8	-
29	Staple Hill - 123 High Street Backhouse Bet	53.4	34.9	32.7	32.0	28.3	32.9	27.0	27.2	32.6	31.1	45.4	29.9	34.0	30.9	27.7
34	Bradley Stoke – 109 Ormonds Close M4 East of Almondsbury Interchange	46.6	35.5	31.1		28.0	24.4	20.9	23.5	23.8	26.3	35.0	30.6	29.6	26.9	25.7
35	Bradley Stoke - Woodlands Lane M4 East of Almondsbury Interchange (lp47)	43.5	31.4	30.4	25.0	26.7	23.3	20.5	23.9	28.2	25.6	34.5	30.9	28.7	26.1	23.8
36	Hambrook – Whiteshill M4 East of M32 Fairwater	30.2	23.8	19.1	17.6	16.0	18.2	16.3	16.3	21.3	19.7	28.2	21.7	20.7	18.8	n/r
37	Almondsbury - Old Aust Road M4 West of Almondsbury Interchange	50.8	34.0	24.3	14.9	33.5	25.1	25.7	18.3	29.6	25.5	28.7	22.5	27.7	25.2	n/a
38	Severn Beach – Ableton Lane Severn Beach Primary School	26.4	17.9	13.7	13.4	11.7	12.2	10.9	12.1	12.1	14.7	20.4	16.4	15.2	13.8	-
42	Little Stoke – 21 Braydon Ave	42.8	27.3	25.4	15.8	16.9	18.2	17.4	18.8	20.3	23.4	34.1	30.3	24.2	22.0	20.1
44	Stoke Gifford - Hatchet Road	47.2	37.4	30.8	18.3	27.8	31.0	25.1	28.9	33.5	35.2	42.5	38.8	33.0	30.1	24.3

Site ID	Site Name	NO_2 Mean Concentrations (µg/m³)														
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
														Raw Data	Bias Adjusted (0.91) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
46	Winterbourne - High Street opp Winterbourne International Academy	46.9	36.4	32.4	26.4	25.3	27.9	21.3	23.3	26.3	32.6	46.5	34.9	31.7	28.8	22.3
53	Hambrook – Bristol Road Rear of 17 Fenbrook Close	45.3	32.8	30.8	34.2	26.0		23.5	20.8	25.5	28.1	36.8	33.4	30.7	27.9	25.4
54	Longwell Green - A431 / Aldermoor Way	55.2	35.6	32.6	32.5	28.4	30.5	28.0	29.0	32.0	33.4	44.5	38.1	35.0	31.9	n/a
57	Coalpit Heath - Badminton Rd Frome Valley Kitchens	45.2	32.7	27.8	24.0	21.8	11.8	21.7	22.2	22.7	26.7	37.3	31.5	27.1	24.7	19.6
58	Longwell Green - Kingsfield Lane/ Aspects Leisure Site (lp6)	34.6	26.2	23.2	16.9	21.8	15.1	16.7	13.7	16.6	20.7	25.5	21.9	21.1	19.2	n/r
60	Downend - North Street Kustom Floors & Furniture	47.5	40.3	29.1	29.4	26.7	21.5	27.3	22.2	28.0	28.4	39.5	34.8	31.2	28.4	23.3
61	Staple Hill Crossroads - 1 Broad Street William Hill	53.8	44.8	43.4	38.1	35.4	38.5	37.7	33.4	43.1	45.2	57.8	45.2	**43.0**	***39.2***	***37.3***
62	Staple Hill Crossroads - 2 Broad Street 501 Bar façade	53.1	38.2	36.1	35.8	36.8	35.8	35.8	28.3	36.0	37.3	48.0	35.2	***38.0***	34.6	-
63	Patchway – 28 Park Leaze	38.8	30.0	30.1	23.0		22.2		22.6	21.8	23.4	34.3	26.1	27.3	24.8	24.1
67	Kingswood - 40 Regent Street Thomas Cook façade	55.8	44.1		38.0	32.0	43.1	35.7	38.2	40.9	39.1	47.5	44.1	**41.7**	***37.9***	-

Site ID	Site Name	NO_2 Mean Concentrations (µg/m³)														
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
														Raw Data	Bias Adjusted (0.91) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
68	Kingswood - 26-32 Regent Street Store Twenty One façade	53.9	44.3	43.1	36.8	33.6	41.9	34.8	38.9	46.1	45.1	57.0	47.8	**43.6**	***39.7***	-
69	Kingswood - 12 Regent Street Silver Brides façade	51.5	34.5	40.1	32.4	32.2		28.1	32.2	34.3	34.2	42.5	39.4	***36.5***	33.2	-
70	Kingswood - Two Mile Hill Road Job Centre Plus façade	51.4	37.5	37.8	29.8	31.1	30.9	25.5	27.9	29.8	28.7	41.1	35.2	33.9	30.8	-
71	Staple Hill - 11 The Square Bunch Florist	39.5	27.2	41.0		20.5	19.9	19.6	20.0	21.6		33.1	28.5	27.1	24.6	24.4
72	Staple Hill - 25 Broad Street Westbury Inks	46.4	33.6	42.8	30.3	25.1	24.2	29.3		31.2	32.4	43.6	36.9	34.2	31.1	25.7
73	Staple Hill - 11 Soundwell Road Starlight	56.0	45.0	47.8	38.0	33.5	32.2	33.2	33.2	38.3	37.3	55.3	41.7	**41.0**	***37.3***	32.2
74	Staple Hill - 29-31 Soundwell Road opp Page Comm Assoc	43.5	28.7	35.2	28.6	24.9	23.0	23.0	23.7	25.3	28.2	40.4	33.0	29.8	27.1	22.7
75	Staple Hill - 118 High Street Lloyd Bottoms/Eclipse Sewing	63.8	48.2	54.3	37.7	37.8	39.8	33.7	35.3	37.2	43.5	55.3	44.9	**44.3**	**40.3**	32.7
76	Staple Hill - 84-86 High Street Staple Hill Oak Pub façade	47.2	35.5	37.9	29.9	27.4	38.0	34.8	30.8	34.3	34.8	44.9	38.0	***36.1***	32.9	-
78	Staple Hill - 9-11 Victoria Street	56.2	49.9	43.7	40.0	31.1	39.3	33.8	34.7	37.0	44.3	57.4	46.4	**42.8**	***39.0***	32.1
79	Staple Hill - 27-29 Victoria Street	49.4	46.0	36.0	35.2	30.5	35.0	31.5	28.1	31.2	38.0	51.2	45.8	***38.1***	34.7	29.4

Site ID	Site Name	NO_2 Mean Concentrations (µg/m³)														
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
														Raw Data	Bias Adjusted (0.91) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
83	Chipping Sodbury – 51A Broad Street façade	41.2	30.1	23.5	23.7	23.2	19.3	19.5	15.9	23.0	23.7	32.3		25.0	22.8	-
87A	Cribbs Causeway – Blackhorse Hill Hollywood Cottage façade	48.5	36.9	27.0		22.6	26.8	24.4	23.1	25.7	29.0	29.7	28.0	29.2	26.6	-
87B	Cribbs Causeway – Blackhorse Hill Hollywood Cottage façade	49.4	38.9	32.3	23.8	27.4	19.4	24.6	23.1	26.2	32.2	34.1	27.7	29.9	27.2	-
87C	Cribbs Causeway – Blackhorse Hill Hollywood Cottage façade	50.7	32.8	27.8	24.4	30.8	25.0	24.2	21.9	25.6	31.3	34.0	30.0	29.9	27.2	-
92	Kingswood - Regent Street Entertainment & Sports Club	50.0	37.8	37.0	32.2	29.2	34.4	30.3	33.5	32.5	34.8	47.8	38.8	***36.5***	33.2	-
93	Kingswood - Hanham Road Exchange Court Flats	46.5	30.7	30.3	24.5	27.0	25.4	22.9	22.4	26.6	26.0	37.6	32.7	29.4	26.7	-
95	Kingswood - 45 High Street Adam Lee	52.8	35.0	35.9	33.4	29.6	30.0	34.1	37.3	39.3	41.0	64.5	50.1	**40.2**	***36.6***	**-**
96	Kingswood - 71 High Street Homeless Project	56.0	39.9	39.7	34.0		32.5	29.7	31.0	33.3	35.5	48.2	43.0	***38.4***	35.0	28.9
98	Kingswood - High Street Sainsbury's Local façade	57.7	41.1	36.3		31.8	34.6	28.7	30.4	34.5	37.5	48.2	40.4	***38.3***	34.8	-
101	Staple Hill - High Street lp outside Beech House	44.4	35.1	26.9	22.6	23.6	27.3	17.0	20.0	24.2	25.5	36.6	31.7	27.9	25.4	21.6
102	Staple Hill - 58 High Street CBS Consultants	58.6	42.9	39.8	38.3	37.8	43.8	33.5	34.1	35.1	38.4	47.9	40.2	**40.9**	***37.2***	**-**

Site ID	Site Name	NO_2 Mean Concentrations (µg/m³)														
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
														Raw Data	Bias Adjusted (0.91) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
105	Staple Hill - North Street lp outside no 2	47.7	36.7	32.3	29.1	16.7	22.0	22.4	21.0	26.2	26.0	40.6	34.5	29.6	27.0	24.8
106	Stoke Gifford - 73 Hambrook Lane façade	37.8	22.0	19.7	19.7	17.1	18.1	14.5	18.5	22.3	22.1	32.0	26.1	22.5	20.5	-
113	Patchway - 5 Falcon Close façade	41.8	34.9	32.5	33.2	26.7	33.9	30.3	35.5	28.5	27.5	39.7	35.3	33.3	30.3	-
114	Pilning - 23 Keens Grove façade	37.5	29.4	25.9	26.3	21.4	23.3	21.7	22.5	24.2			25.1	25.7	23.4	-
115	Pilning - 2 Wick Road façade	38.3	28.5	23.3	23.2	23.5	23.4		22.9	25.9	27.6	30.6	25.2	26.6	24.2	-
116	Warmley - 14 High Street Webbs (lp at façade)	55.7	47.5	41.3	39.6	37.1	40.5	40.4	37.6	38.8	47.4	53.8	43.4	**43.6**	***39.7***	**-**
117	Filton Northville - 29 Gloucester Road North Rowe Vets	47.5	38.6	32.6	27.6	26.8	30.0	27.8	28.3	31.0	32.6	45.4	34.4	33.5	30.5	28.0
118	Filton Northville - 19 Gloucester Road North Dental Lab	46.4	39.0	35.3	34.9	24.2	28.7	24.2	25.0	30.3	32.4	41.9	40.4	33.6	30.5	28.0
119	Filton - 137 Gloucester Road North		37.5	29.1	35.6	24.8	31.6	28.5	28.2	32.4	34.3	43.6	39.5	33.2	30.2	29.7
122	Filton - 549 Filton Avenue	50.1	41.3	31.7	30.0	26.0	26.3	23.8	23.5	26.9	32.2	39.3	36.7	32.3	29.4	26.6
123	Filton - 542 Filton Avenue Spar	47.3	40.0	31.2	26.2	25.4	25.1	24.7	23.1	27.4	34.9	40.9	38.6	32.1	29.2	26.2

Site ID	Site Name	NO_2 Mean Concentrations (µg/m³)														
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
														Raw Data	Bias Adjusted (0.91) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
124	Filton - 702a Filton Ave Way Ahead	51.7	40.2	32.7	30.4	29.6	25.5	26.3	22.0	30.0	31.2	39.4	32.8	32.7	29.7	25.0
125	Filton - 71 Station Road	51.8	40.5	29.6	25.8	24.4	25.8	22.0	23.9	28.8	32.6	40.3	38.1	32.0	29.1	23.5
128	Kingswood - 109 Downend Road	49.7	43.5	35.9	33.0	27.4	29.2	27.9	29.1	29.6	32.1	43.9	36.6	34.8	31.7	29.1
129	Cribbs Causeway – 1 Holly Cottages façade	44.4	36.5	30.6	34.7	27.4	27.5	27.6	27.2	30.6	27.9	38.0	32.9	32.1	29.2	-
130	Cribbs Causeway – 2 Mayfield Cottages façade	38.6	35.9	33.6		23.6	25.9	22.8	25.5	25.8	25.3	32.5	30.6	29.1	26.5	-
132	Hanham - 66 High St Sassy Hair Studio	56.3	36.7	29.9	31.0	24.1	22.7	24.4	22.6	31.5	26.5	43.0	33.9	31.9	29.0	28.3
133	Hambrook - 123 Old Gloucester Road façade (dp)	40.6	28.9	23.2	32.7	27.3	14.5	25.5	24.7	26.2	23.3	38.9	31.2	28.1	25.6	-
134	Hambrook – Bristol Road, Old Bakery façade (dp)	49.7	43.2	32.7	36.8	32.2	24.5	34.6	30.4	33.6	35.8	41.9	35.7	35.9	32.7	-
135	Frenchay – Harford Drive Dyrham Flats	45.8	31.7	26.7	32.5	21.3			21.1		24.4	36.2	31.3	30.1	27.4	26.8
136	Little Stoke – 26 Gipsy Patch Lane façade (dp)	37.9	27.1	24.1	20.1	16.7	19.5		18.1	24.3	22.3	32.5	28.8	24.7	22.5	-
137	Warmley - 35 High Street (lp at façade)	56.3		39.8	38.6	36.4	39.3		36.0	37.6	43.0	55.9	46.0	**42.9**	***39.0***	-

Site ID	Site Name	NO_2 Mean Concentrations (µg/m³)														
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
														Raw Data	Bias Adjusted (0.91) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
138	Warmley - 18 High Street façade (dp)	49.8	45.7	38.7	35.0	32.1	38.8		31.0	35.9	39.7	48.3	43.6	***39.9***	***36.3***	-
139	Warmley - 14 High Street Webbs façade (dp)	N/O	N/O	N/O	37.0	33.6	43.8		37.1	35.3	44.5	50.4	52.3	**41.7**	**41.4**	-
141	Warmley - 41 Deanery Road façade (dp)	49.1	31.6	35.3	28.8	25.9	31.8		29.8	31.5	33.9	44.8	41.8	34.9	31.8	-
142	Warmley - 33 Deanery Road Warmley Court façade (dp)	42.8	37.3	29.2	30.4	24.5	27.9	23.1	27.3	27.5	33.2	41.1	38.1	31.9	29.0	-
143	Warmley - 1 High Street Ideal Pharmacy façade (dp)	42.3	33.0	28.9	22.8	22.2	26.1	22.5	20.7	24.7	27.9	33.6	27.0	27.6	25.1	-
144	Warmley - 8 Tower Road North façade (dp)	40.4	31.6	28.5	25.0	21.0	23.0	22.0	21.7	23.8	25.5	36.6	34.5	27.8	25.3	-
145	Warmley - 1 London Road (Cycle Path)	43.8	34.0	30.8	24.7	23.6	26.0		23.5	23.6	27.1	33.9	32.7	29.4	26.8	27.6
146	Kingswood - 34 Hill St façade (dp)	68.5	58.8	48.5	49.2	40.9	49.2	36.8	42.3	46.4	47.2	67.3	55.0	**50.8**	**46.3**	-
147A	Soundwell - 264 Soundwell Rd façade (dp)	54.3	38.8	37.4	39.7	31.3	36.1			40.0	37.2	53.1	41.9	**41.0**	***37.3***	-
147B	Soundwell - 264 Soundwell Rd façade (dp)	54.1	44.7	32.5	47.2	26.5	41.5	35.3	36.9	42.1	43.4	50.8	43.0	**41.5**	***37.8***	-
147C	Soundwell - 264 Soundwell Rd façade (dp)	56.5	46.1	41.2	46.8	37.6	40.0	35.6	35.1	40.5	39.7	57.7	42.8	**43.3**	***39.4***	-

Site ID	Site Name	NO_2 Mean Concentrations (µg/m³)														
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
														Raw Data	Bias Adjusted (0.91) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
148	Filton – 109 Gloucester Road North façade (dp)	41.2	31.0	25.9	25.2	22.4	22.2	18.6	20.1	25.3	22.2	34.8	30.1	26.6	24.2	-
149	Filton – 707 Southmead Road façade (dp)	45.9	35.0	24.6	27.7	28.4	25.8	22.6	24.3	25.7	25.8	38.2	30.7	29.6	26.9	-
150	Soundwell – 296 Soundwell Road façade (dp)	46.2	36.5	26.1	29.9	25.4	21.7	22.4	21.5	25.0	24.6	37.3	27.6	28.7	26.1	-
151	Hambrook – Bristol Road Old Bakery FP signpost	51.8	46.3	41.4	40.3	31.7	36.4	31.4	31.8	37.2	36.7	47.3	35.0	***39.0***	35.5	-
152	Bradley Stoke -188 Oaktree Crescent lp49	48.4	38.2	31.8	37.6	27.0	26.2	26.3		27.4	29.9	42.4	33.4	33.5	30.5	30.6
153	Bradley Stoke -141 Wheatfield Drive (façade)	40.0	25.2	21.0	20.6	17.1	16.5	14.7	18.1	16.2	18.0	24.4	25.1	21.4	19.5	-
154	Bradley Stoke - 166 Ellan Hay Road (façade)	43.0	28.3	23.9	20.3	18.9	17.6	15.8	19.2	22.8	23.2	33.8	29.7	24.7	22.5	-
155	Stoke Gifford - 3 Earl Close (façade)	39.0	25.1	19.5	17.2	15.0	15.9	12.7	16.4	18.8	22.2	29.1	25.9	21.4	19.5	-
156	Stoke Gifford - Lancelot Road lp1	43.0	30.4	22.2	22.0	18.0	16.5	16.6	18.0	21.0	23.3	32.4	24.3	24.0	21.8	19.3
157	Hambrook - Bristol Road Poplars House (façade)	41.6	33.1	27.2	28.1	20.1	14.4	22.6	23.7	22.5	28.9	37.4	33.6	27.8	25.3	-
158	Downend - 5 Wick Wick Close (façade)	45.1	27.4	21.3	36.2	25.0	14.5	22.2	18.9	25.9	22.6	39.8	28.2	27.3	24.8	-

Site ID	Site Name	NO_2 Mean Concentrations (µg/m³)														
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
														Raw Data	Bias Adjusted (0.91) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
159	Wickwar - 21 High Street (façade)	N/O	33.3	29.0	33.8	28.6	25.4	27.6	23.7	29.0	27.9	42.2	28.9	29.9	27.2	-
160	Staple Hill - 62 High Street lp10	N/O	N/O	38.9		26.4	37.8	27.7	29.3	33.8	31.1	44.4	35.9	33.9	30.9	30.2
161	Staple Hill - 13 Victoria Street (façade)	N/O	N/O	36.4	35.4	24.4	33.5	26.5	28.0	33.1	34.9	37.9	37.5	32.8	29.8	-
162	Staple Hill - 28 Victoria Street (façade)	N/O	N/O	29.5	29.3	27.7	24.4	23.7	21.3	24.8	30.8	40.8	30.5	28.3	25.7	-
163	Staple Hill - 2 Victoria Street (façade)	N/O	N/O	33.8	31.9	27.8	25.6	23.7	22.6	26.6	30.2	40.9	32.2	29.5	26.9	-
164	Staple Hill - 102 High Street Charlie & Co Barbers (façade)	N/O	N/O	34.9	30.1	24.8	30.5	26.7	25.4	29.2	32.0	42.3	34.9	31.1	28.3	-
165	Staple Hill - 3 Soundwell Rd Chinese Kitchen (façade)	N/O	N/O	41.9	43.6		36.0	33.9	31.7	38.2	38.1	52.7	42.7	***39.8***	***36.3***	-
166	Kingswood - 12 Cecil Road lp9	N/O	N/O	30.9	29.4	27.0	28.4	25.3	26.4	27.3	31.5	41.5	39.5	30.7	27.9	25.6
167	Kingswood - 7 Downend Road lp4	N/O	N/O	41.7	36.0	26.9	33.9	26.6	29.5	33.7	36.8	47.5	45.0	35.8	32.5	29.2
168	Kingswood - 133 High Street (façade)	N/O	N/O	N/O	N/O	N/O	24.3	23.0	25.1	27.0	29.0	41.7	30.1	28.6	29.4	-

Site ID	Site Name	NO_2 Mean Concentrations (µg/m³)														
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
														Raw Data	Bias Adjusted (0.91) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
169	Warmley - 20 Deanery Road Warmley Community Centre (façade)	N/O	N/O	N/O	N/O	N/O	36.1	29.8	33.7	32.2	35.9	44.1	38.9	35.8	***36.9***	-
170	Patchway - 204 Gloucester Road front façade	N/O	N/O	N/O	N/O	N/O	20.9	20.7	21.7	14.9	24.4	34.1	28.4	23.6	24.3	-
171	Soundwell - 225 Soundwell Rd (façade)	N/O	N/O	N/O	N/O	N/O		25.4	24.3	31.2	31.9	46.4	36.7	32.7	32.1	-
172	Downend - 31 Badminton Road Brownes (façade)	N/O	N/O	N/O	N/O	N/O	N/O	N/O	34.5	39.0	40.0	42.2	38.9	***38.9***	35.2	-
173	Mangotsfield - 10 Cossham Street (façade)	N/O	N/O	N/O	N/O	N/O	N/O	N/O	23.3	27.0	30.2	37.3	31.5	29.9	27.0	-

☒ **Local bias adjustment factor used**

☐ **National bias adjustment factor used**

☒ **Annualisation has been conducted where data capture is <75% (i.e. Sites 139 and 168 - 173)**

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

Notes:

Exceedances of the NO_2 annual mean objective of 40 µg/m³ are show in **red bold**

Borderline results within 10% of NO_2 annual mean objective (>36 µg/m³) are shown in ***blue bold italics***

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

(2) Distance corrected to nearest relevant public exposure (- where monitoring location at façade of relevant exposure so distance correction not required; n/a where not applicable as no relevant exposure; n/r (no result) where distance adjustment could not be calculated (see Appendix C)

N/O Not operational

Appendix C: Air Quality Monitoring Data QA/QC

QA/QC of Diffusion Tube Monitoring

In 2017, the diffusion tubes were prepared and analysed by Gradko, following a change from Somerset County Council Scientific Services for the period 2012 - 2016. The tubes are prepared by Gradko using 20% triethanolamine (TEA) in water. Gradko are UKAS accredited for diffusion tube analysis and the laboratory participates in the AIR-NO_2 Proficiency Testing (PT) scheme for which the results were 100% satisfactory in 2017[41].

The tube changing frequency is in line with the calendar of suggested exposure periods for 2017[42] and is carried out by South Gloucestershire Council officers.

Data Ratification and Bias Adjustment

The diffusion tube results are examined on a monthly basis to identify any spurious data and any suspect data is investigated further. Trends in monitored levels across the diffusion tube sites are compared to take into account seasonal factors, such as changing weather patterns and increased traffic flows, and to detect any local changes at the sites, such as road works. The monthly raw data is then averaged for the calendar year to give an annual mean.

While diffusion tubes provide a simple, cost-effective way of monitoring a wide range of locations, the accuracy of the tubes can be variable depending on the laboratory preparation, handling and analysis. To overcome this, a Bias Adjustment Factor, is applied to the raw mean for the relevant monitoring period. This factor is calculated from monitoring sites where triplicate diffusion tubes are co-located with an automatic NO_x analyser by comparing results of the two measurement methods.

Diffusion Tube Bias Adjustment Factors

National Bias Adjustment Factor

During 2017 the Council operated a co-location study at the Yate automatic monitoring site and the study was included in the national bias adjustment factors database provided by the LAQM Helpdesk. Combined bias adjustment factors from

[41] https://laqm.defra.gov.uk/assets/AIR-PT-Rounds-13-to-24-Apr-2016-Feb-2018.pdf
[42] https://laqm.defra.gov.uk/documents/DT-Timetable-2017-v1.pdf

the local authority co-location studies are calculated for each laboratory that analyse diffusion tubes[43].

The 2017 national bias-adjustment factor for Gradko obtained at the time the data was compiled for this report was 0.89 (spreadsheet version 03/17).

The Summary of Precision Results for NO_2 Diffusion Tube Co-location Studies, by Laboratory[44] show Gradko to have good tube precision (the ability for a measurement to be consistently reproduced) in 2017.

Local Bias Adjustment Factor

The precision and accuracy spreadsheet available on the LAQM Tools Defra webpage[45] was used to compare the triplicate co-located diffusion tubes with the automatic monitor in Yate and calculate a local bias adjustment factor for 2017 of 0.91 as shown in Figure C.1.

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements										Automatic Method		Data Quality Check	
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 µgm -3	Tube 2 µgm -3	Tube 3 µgm -3	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean	Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
1	05/01/2017	31/01/2017	39.7	39.5	39.2	39	0.3	1	0.6	38.1	99	Good	Good
2	31/01/2017	28/02/2017	26.7	27.2	30.9	28	2.3	8	5.7	25.7	99.7	Good	Good
3	28/02/2017	27/03/2017	27.4	28.5	26.3	27	1.1	4	2.7	23.8	99.7	Good	Good
4	27/03/2017	25/04/2017	20.5	19.5	20.8	20	0.7	3	1.7	21.9	97.3	Good	Good
5	25/04/2017	30/05/2017	18.9	19.0	18.8	19	0.1	1	0.3	17.2	96.5	Good	Good
6	30/05/2017	27/06/2017	21.1	22.6	21.2	22	0.9	4	2.1	15.8	98.8	Good	Good
7	27/06/2017	02/08/2017	16.8	18.7	17.4	18	1.0	5	2.4	14.7	98.6	Good	Good
8	02/08/2017	30/08/2017	18.5	19.2	20.7	19	1.1	6	2.8	16.4	97.9	Good	Good
9	30/08/2017	27/09/2017	23.4	21.1	23.5	23	1.4	6	3.4	18.8	98.2	Good	Good
10	27/09/2017	31/10/2017	22.7	25.1	23.9	24	1.2	5	2.9	20.3	99.4	Good	Good
11	31/10/2017	05/12/2017	31.2	31.1	32.6	32	0.9	3	2.2	33.6	96.5	Good	Good
12	05/12/2017	03/01/2018		28.9	31.0	30	1.4	5	13.0	26.7	99.7	Good	Good
13													
											Overall survey -->	Good precision	Good Overall DC

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

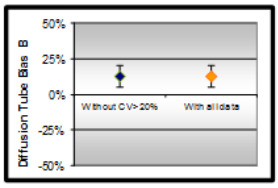
(Check average CV & DC from Accuracy calculations)

Site Name/ID: Yate Station Road Co-Location

Precision: 12 out of 12 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval)
without periods with CV larger than 20%
Bias calculated using 12 periods of data
Bias factor A 0.91 (0.85 - 0.98)
Bias B 10% (3% - 18%)
Diffusion Tubes Mean: 25 µgm-3
Mean CV (Precision): 4
Automatic Mean: 23 µgm-3
Data Capture for periods used: 98%
Adjusted Tubes Mean: 23 (21 - 25) µgm-3

Accuracy (with 95% confidence interval)
WITH ALL DATA
Bias calculated using 12 periods of data
Bias factor A 0.91 (0.85 - 0.98)
Bias B 10% (3% - 18%)
Diffusion Tubes Mean: 25 µgm-3
Mean CV (Precision): 4
Automatic Mean: 23 µgm-3
Data Capture for periods used: 98%
Adjusted Tubes Mean: 23 (21 - 25) µgm-3



Jaume Targa, for AEA
Version 04 - February 2011

Figure C.1 2017 Precision and Accuracy spreadsheet for Yate Co-location Study

[43] http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html
[44] https://laqm.defra.gov.uk/diffusion-tubes/precision.html
[45] http://laqm.defra.gov.uk/bias-adjustment-factors/local-bias.html

Discussion of Choice of Factor to Use

For 2017, the national bias adjustment factor (0.89) and local bias adjustment factor (0.91) compare well, with the local bias adjustment factor being slightly more conservative.

Guidance on the choice of bias adjustment factor is included in LAQM TG16 Box 7.11. Having considered this guidance and also consulted the LAQM Helpdesk, it was decided it would be more robust and precautionary to use the local bias adjustment factor of 0.91 as this would give the worse-case annual means.

This is also consistent with the 2017 monitoring data used to verify the modelling in the Targeted Feasibility Study the Council has been undertaking in 2018.

Short-term to Long-term Data adjustment

In 2017, data capture was less than 75% at the following diffusion tube monitoring sites; 139 and 168 - 173 due to a combination of access issues, missing or compromised tubes and monitoring starting part way through 2017. The results for these sites have been annualised as detailed in LAQM TG16.

Long-term data from four monitoring sites from the national Automatic Urban and Rural Network (AURN)[46] within 50 miles of South Gloucestershire was used to calculate adjustment factors to annualise the short term data. The annual and period mean concentrations from the AURN monitoring sites, along with the average factor used to adjust the short term data, are shown in Table C.1 to Table C.4. Data was used where data capture for the relevant periods was greater than 85%. The annual mean for each AURN station was calculated for the diffusion tube exposure year and the period means were calculated for the actual diffusion tube exposure periods at each of the monitoring sites.

[46] https://uk-air.defra.gov.uk/data/data_selector

Table C.1 Data used to adjust short-term NO_2 monitoring data to 2017 annual mean for Site 139

Site 139	Warmley – 14 High St Webbs façade dp Period: 2017 Apr – Jun; Aug – Dec			Raw Mean (µg/m³)	Annualised Mean (µg/m³)	Bias Adjusted Annualised Mean (µg/m³)
AURN Site	**Annual Mean[1] (µg/m³)**	**Period Mean (µg/m³)**	**Ratio**			
Bristol St Paul's	23.4	21.6	1.083			
Cardiff Centre	20.2	19.8	1.024			
Cwmbran	12.0	11.1	1.082			
Charlton Mackrell	5.7	4.9	1.175			
	Average Ratio		**1.091**	41.7	45.5	**41.4**

Table C.2 Data used to adjust short-term NO_2 monitoring data to 2017 annual mean for Sites 168, 169 & 170

Site 168	Kingswood – 133 High St façade			Raw Mean (µg/m³)	Annualised Mean (µg/m³)	Bias Adjusted Annualised Mean (µg/m³)
Site 169	**Warmley – 20 Deanery Rd Community Centre façade**					
Site 170	**Patchway – 204 Gloucester Rd front façade**					
	Period: 2017 Jun - Dec					
AURN Site	**Annual Mean (µg/m³)**	**Period Mean (µg/m³)**	**Ratio**			
Bristol St Paul's	23.4	21.6	1.082			
Cardiff Centre	20.2	18.3	1.104			
Cwmbran	12.0	10.7	1.123			
Charlton Mackrell	5.7	4.7	1.218			
	Average Ratio		**1.132**			
			Site 168	28.6	32.4	**29.4**
			Site 169	35.8	40.5	**36.9**
			Site 170	23.6	26.7	**24.3**

Table C.3 Data used to adjust short-term NO_2 monitoring data to 2017 annual mean for Site 171

Site 171	Soundwell – 225 Soundwell Rd façade Period: 2017 Jul - Dec			Raw Mean (µg/m³)	Annualised Mean (µg/m³)	Bias Adjusted Annualised Mean (µg/m³)
AURN Site	**Annual Mean (µg/m³)**	**Period Mean (µg/m³)**	**Ratio**			
Bristol St Paul's	23.4	23.0	1.017			
Cardiff Centre	20.2	19.2	1.055			
Cwmbran	12.0	11.4	1.053			
Charlton Mackrell	5.7	4.8	1.189			
	Average Ratio		**1.079**	32.7	35.2	**32.1**

Table C.4 Data used to adjust short-term NO_2 monitoring data to 2017 annual mean for Sites 172 & 173

Site 172	Downend – 31 Badminton Rd Brownes façade			Raw Mean (µg/m³)	Annualised Mean (µg/m³)	Bias Adjusted Annualised Mean (µg/m³)
Site 173	**Mangotsfield – 10 Cossham St façade**					
	Period: 2017 Aug – Dec					
AURN Site	**Annual Mean (µg/m³)**	**Period Mean (µg/m³)**	**Ratio**			
Bristol St Paul's	23.4	24.7	0.945			
Cardiff Centre	20.2	20.8	0.972			
Cwmbran	12.0	12.8	0.941			
Charlton Mackrell	5.7	5.1	1.122			
	Average Ratio		**0.995**			
			Site 172	38.9	38.7	**35.2**
			Site 173	29.9	29.7	**27.0**

Distance Adjustment to façade

It is not always possible to locate diffusion tubes on building facades representing worst case exposure. However, nitrogen dioxide concentrations fall off rapidly with increasing distance from the roadside so where the monitoring location is closer to the road than a location of relevant exposure, the NO_2 concentration can be estimated at the nearest location of relevant exposure using the NO_2 fall-off with distance calculator[47] on the LAQM Tools Defra webpage. Distance correction of results to the façade is particularly important for monitoring sites where exceedances or borderline NO_2 concentrations have been recorded.

In 2017, there was one diffusion tube monitoring site with a measured exceedance (Site 75) where the relevant exposure is set back from the monitoring site. There were also three other sites (sites 61, 73 & 78) where the concentrations were borderline i.e. within 10% of the objective. All of these sites are located within the Staple Hill AQMA. The results have been distance corrected to the façade of the nearest relevant receptor using the NO_2 fall-off with distance calculator and the data and results from the calculator are presented in Table C.5.

When the results are adjusted for distance, none of the sites are estimated to exceed at the façade, although site (61) is borderline with an estimated concentration of 37.3 $\mu g/m^3$. It should be noted however that there is no relevant exposure at ground floor level in relation to sites 61, 73 and 75 and concentrations at higher floors would be further reduced.

The distance adjusted results were also calculated in the same way for the other monitoring sites where monitoring is not directly at a location of relevant exposure (i.e. façade) and are reported in Table B.1 in Appendix B, apart from site 36, where the measured annual mean NO_2 concentration was less than the local annual mean background NO_2 concentration and site 58, where the receptor was more than 50m away from the kerb so the distance calculator could not estimate the concentrations.

[47] https://laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html

Table C.5 Adjustment of nitrogen dioxide to the façade of the nearest receptors

Site No.	Site Name	Monitor distance to kerb (m)	Receptor distance to kerb (m)	Background NO_2 2017 (µg/m³)	Annual mean concentrations 2017 (µg/m³) adjusted for bias	Adjusted to façade (µg/m³)
61	Staple Hill Crossroads – 1 Broad Street William Hill	**2.3**	**3.25**	**16.4**	***39.2***	***37.3***
73	Staple Hill – 11 Soundwell Road Starlight	**0.5**	**2.0**	**16.4**	***37.3***	**32.2**
75	Staple Hill – 118 High Street Lloyd Bottoms/Eclipse Sewing	**0.5**	**3.0**	**16.4**	**40.3**	**32.7**
78	Staple Hill – 9-11 Victoria Street	**1.2**	**4.9**	**15.7**	***39.0***	**32.1**

Notes:

Exceedances of the NO_2 annual mean objective of 40 µg/m³ are show in **red bold**

Borderline results within 10% of NO_2 annual mean objective (>36 µg/m³) are shown in ***blue bold italics***

QA/QC of Automatic Monitoring

The automatic monitoring sites follow the QA/QC programme outlined below:

- Regular checks on the data to ensure analysers and communications are operating correctly and faults are reported as soon as possible
- Four-weekly calibration checks on the analysers using nationally traceable standard gases by Bristol City Council (BCC) under contract to South Gloucestershire Council
- Ad-hoc site inspections to check equipment operational status, site security, detect equipment malfunction and to change inlet filters
- Repairs as required and planned six monthly servicing and re-calibration of the analysers by EnviroTechnology Services under contract to South Gloucestershire Council.

Calibration methods

Calibration procedures are carried out four-weekly by BCC. The methodology for the calibration procedure, which includes a two point zero/span calibration check, is derived from the manufacturers' instruction handbooks and from the AURN Site Operator's Manual as follows:

- Pre-calibration check - the site condition and status of the analyser is recorded prior to the zero/span check being conducted
- Zero check – the response of the analyser to the absence of the gas being monitored
- Span check – the response of the analyser to the presence of the gas of a known concentration
- Post calibration check - the site condition and status of the analyser on completion of all checks.

Each analyser zero/span check is fully documented and sheets and the records are kept centrally using Google Sheets. The calibration factors are calculated in Google Sheets and used in the data scaling and ratification process.

The two point calibration is conducted on the NO_x analysers using a zero air scrubber and a reference nitric oxide (NO) mixture at a concentration of approximately 470

ppb, which is supplied and certified by BOC. The contents of the portable scrubber used for zero air generation (hopcalite, activated charcoal, purafil and drierite) are changed when necessary or at least every six months.

Equipment Servicing and Maintenance

The automatic analysers and associated equipment are serviced and maintained on a planned schedule following manufacturers' instructions. A six monthly full service and multi-point recalibration is carried out on the Yate NO_x analyser under contract by the equipment suppliers; EnviroTechnology Services. The multi-point calibration involves the use of zero air, NO and NO_2 calibration gases, which are again traceable to national standards, enabling the analyser data slope and offset factors to be reset. A check on the efficiency of the molybdenum converter is undertaken during the services.

The contract also covers unscheduled site visits and repairs, for example in the event of equipment failure, within a specified period of time to minimise data loss. Results of the servicing, calibrations and repairs are fully documented and stored centrally.

Data Processing, Validation and Ratification

Raw data from the Yate analysers is downloaded automatically twice a day to a designated PC within the council via a modem and telephone line from the site. All data is collected by Opsis EnviMan software. The data from the analysers is visually screened regularly in-house using EnviMan ComVisioner to check for obvious erroneous data and equipment faults.

The data is also collected by Air Quality Data Management (AQDM). AQDM then undertakes the subsequent validation, scaling and ratification of the data in accordance with LAQM (TG16) on behalf of the Council. Data validation involves continually screening algorithmically and manually for anomalies. This includes visual examination of the data to check for any spurious or unusual measurements, such as large spikes, 'flat-lines' and excessive negative data. Suspicious data is "flagged" for further investigation. The data is scaled against the four weekly and full six monthly calibration data.

During data ratification, all the information relating to the dataset and monitoring location is critically reviewed and any initial spurious data that was flagged is re-examined and appropriately edited. The original raw dataset is kept for reference.

The monitoring data is compared to trends at nearby AURN sites throughout the whole process. The ratified data is the final data presented in this report.

PM_{10} Monitoring Adjustment

The PM_{10} data measured by the Beta Attenuation Monitor (BAM) at the Yate automatic monitoring site have been adjusted to gravimetric equivalent by using a factor of 0.833.

Appendix D: Supporting Technical Information

Review of Monitoring in Staple Hill AQMA

In 2017, the monitoring site locations in the Staple Hill AQMA were reviewed to enable ongoing robust assessment of whether the AQMA should remain in place or whether nitrogen dioxide concentrations are below the objective where there is relevant exposure.

While results can be distance adjusted using the "Nitrogen dioxide fall off with distance" calculator[48] where relevant exposure is set back from the monitoring site, this provides an estimated concentration only as the calculator has some uncertainty so diffusion tubes should preferably be located at relevant receptor façades.

Six additional monitoring sites (160 – 165) were set up at façade to better represent relevant exposure and monitor in the potential worse case locations, where this was possible bearing in mind there are many commercial/retail premises within the AQMA. Existing monitoring sites in similar locations but closer to the roadside, were retained for comparison. A map showing the location of the diffusion tube monitoring sites is provided in Figure E.10 (Appendix E).

The results from the established sites closer to the road, the distanced adjusted results for these sites and the new sites at nearby worse-case façades of relevant exposure are shown in Table D.1 and the comparison of results is discussed below.

New site 160 was set up adjacent to a façade of relevant exposure at ground floor to better represent relevant exposure in a worse-case location near the High Street, Pendennis Road, Acacia Road crossroads because there is no ground floor relevant exposure at existing site 102 at this junction, although there is relevant exposure at first floor. The results are borderline at site 102 but much further below the objective at site 160.

On Victoria Street, sites 161 and 162 were set up at façades of relevant exposure in effect to eventually replace site 78 and site 79 respectively, which are closer to the roadside. The monitored concentration at site 161 was 29.8 µg/m^3 compared to the distance adjusted result of 32.1 µg/m^3 for site 78, with the distance adjusted result showing a conservative higher estimate. Site 162 is on the opposite side of the road

[48] http://laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html

to site 79 but is located in a worse case location on the side of the road where traffic can queue up to the Broad Street/ High Street/ Soundwell Road/Victoria Street crossroads. Although not directly comparable as the monitoring sites are on opposite sides of the road, the results for both sites are well below the objective with a monitoring result of 25.7 µg/m^3 at site 162 and the distance adjusted result of 29.4 µg/m^3 for site 79.

Site 163 was set up on the same side of Victoria Street as site 162 at the façade of the property closest to the crossroads in a worse-case location of relevant exposure, because at the closest existing site (61) around the corner on Broad Street, there is no relevant exposure at ground floor or first floor as it is single storey. Although not strictly comparable locations, concentrations at site 163 were well below the objective, and site 61 remained borderline on distance adjustment but with no relevant exposure.

Site 164 was set up at façade slightly further west along High Street (B4465) than the consistently exceeding site 75 located closer to the roadside. The monitored concentration at site 164 was 28.3 µg/m^3 and compares reasonably to more conservative distanced adjusted result for site 75 (32.7 µg/m^3). However site 164 is more representative of where there is likely to be relevant exposure, being at façade, although it should be noted that there is no relevant exposure at ground floor level in relation to site 75 or 164 as the premises are commercial/retail premises, however there is relevant exposure at first floor level in respect of site 164. Neither the distance adjusted result for site 75 nor the result at site 164 at façade, exceed or are borderline.

Site 165 was set up at façade on Soundwell Road within the narrow street canyon section closer to the Broad Street/High Street/Soundwell Road/Victoria Street crossroads than the existing site 73. While there is no ground floor relevant exposure at site 165, there is first floor exposure and also ground floor exposure at the adjoining property, compared to only first floor exposure set back from site 73. The results show the monitoring better represents a worse-case location with a borderline concentration of 36.3 µg/m^3 at site 165, compared to the distance adjusted result at site 73 of 32.2 µg/m^3 and where concentrations at higher floors would be further reduced.

As discussed in Chapter 3, only one site (61) from the existing exceeding and borderline sites in the AQMA remains borderline following distance adjustment and only one of the new sites set up at worse-case façades of relevant exposure is borderline (site 165). On the basis of this evidence, the AQMA would no longer be required, however, as pollutant concentrations can vary significantly from one year to another and also with the change of analysing laboratory for 2017 even though the selected bias adjustment factor was conservative, it would be appropriate to continue monitoring and review the situation over time to ensure that this situation is sustained before revocation of the AQMA can be considered.

Table D.1 Comparison of Staple Hill AQMA monitoring sites at roadside and façade of the nearest receptors

Site No.	Site Name (Existing Sites close to roadside)	Annual mean concentrations 2017 (µg/m³) adjusted for bias	Adjusted to façade (µg/m³)	Site No. (comparison new site at façade)	Site Name	Annual mean concentrations 2017 (µg/m³) adjusted for bias
61	Staple Hill Crossroads – 1 Broad Street William Hill	***39.2***	***37.3***	**163**	Staple Hill - 2 Victoria Street (façade)	26.9
73	Staple Hill – 11 Soundwell Road Starlight	***37.3***	32.2	**165**	Staple Hill - 3 Soundwell Rd Chinese Kitchen (façade)	***36.3***
75	Staple Hill – 118 High Street Lloyd Bottoms/Eclipse Sewing	**40.3**	32.7	**164**	Staple Hill - 102 High Street Charlie & Co Barbers (façade)	28.3
78	Staple Hill – 9-11 Victoria Street	***39.0***	32.1	**161**	Staple Hill - 13 Victoria Street (façade)	29.8
79	Staple Hill - 27-29 Victoria Street	34.7	29.4	**162**	Staple Hill - 28 Victoria Street (façade)	25.7
102	Staple Hill - 58 High Street CBS Consultants (TL adj to façade)	***37.2***		**160**	Staple Hill - 62 High Street lp10 adj to façade	30.9

Notes:

Exceedances of the NO_2 annual mean objective of 40 µg/m³ are show in **red bold**

Borderline results within 10% of NO_2 annual mean objective (>36 µg/m³) are shown in ***blue bold italics***

Screening of Potential Pollution Sources

The following potential pollution sources, as detailed in LAQM TG16, have been considered to identify whether there are any new or significantly changed sources, or any new exposure near existing sources, since the 2017 Annual Status Report.

Road Traffic Sources

No additional road traffic sources have been newly identified from the following potential sources below:

- Narrow congested streets with residential properties close to the kerb
- Busy streets where people may spend 1 hour or more close to traffic
- Roads with a high flow of heavy duty vehicles
- Junctions
- New roads constructed or proposed since last review and assessment
- Roads with significantly changed traffic flows
- Bus and coach stations

However, further detail is provided with regard to new roads below and while not meeting all the criteria to be classified as a narrow, congested street, monitoring commenced in Wickwar and Mangotsfield in response to concerns about local air quality.

Also in terms of traffic generating proposals, there are a number of large scale developments proposed, some of which have already come forward. All significant developments have been or will be fully assessed through the planning system to ensure that the potential impacts on air quality are quantified and fully understood.

To update from the 2017 ASR, further information on current major road transport projects in South Gloucestershire is included below.

Metrobus

Metrobus is a joint project for the West of England region between South Gloucestershire Council, Bristol City Council and North Somerset Council to provide a rapid, high capacity public transport system by using a combination of segregated busways, bus lanes, priority at junctions and off-bus ticketing. Metrobus aims to

speed up journey times, relieve congestion, reduce levels of pollution and give people improved access to key employment, education and leisure destinations.

During 2017, construction works for the new Metrobus routes caused significant but temporary disruptions to traffic in some locations. Any potential short term increases in pollution as a result of temporarily increased congestion should ultimately be off-set by an improved public transport system which aims to encourage modal shift to public transport.

Metrobus services commenced in 2018 on two of the three planned Metrobus routes; m2 and m3, with the m1 route expected to start in January 2019. The m3 service, which started operation at the end of May, runs from Emersons Green in South Gloucestershire to Bristol City Centre, via Lyde Green Park and Ride and University of West of England Frenchay campus. Over 120,000 passengers travelled on the m3 in its first two months of service, with take-up exceeding expectations.

The m2 service from Long Ashton Park and Ride in North Somerset via Temple Meads mainline railway station to the City Centre, commenced operation early September. Both the m2 and m3 services are operated by First West of England.

The m1 service will run from Hengrove in the south of Bristol through to Cribbs Causeway in South Gloucestershire. This service will be operated by Bristol Community Transport (BCT) under contract to First West of England.

Figure D.1 shows the completed new bridge over the M32 motorway which facilitates a bus only junction onto the motorway for the m1 and m3 Metrobus services.

Figure D.1 New bridge for Metrobus services constructed over M32 motorway

Euro VI as a minimum is being specified for the Metrobus vehicles for the first two years, then improvements on those standards moving forward. BCT are investing £7 million in a fleet of 21 biogas buses for the m1 Metrobus service and work is starting on the gas refuelling facilities at their Bedminster depot in Bristol. The buses will run on gas generated from food waste and will be carbon neutral.

In 2015, seven new diffusion tube monitoring sites (sites 152 – 158) were set up to monitor the potential impacts of the Metrobus scheme. The 2017 monitoring results show nitrogen dioxide concentrations to be well below the annual mean objective at all of these sites. The monitoring will continue and be reviewed as necessary. No further work is required at this stage.

Stoke Gifford Transport Link

This new road, which runs from Parkway North in Stoke Gifford to the A4174 Ring Road at Harry Stoke, opened in Dec 2017. It should significantly ease congestion around Filton and Abbey Wood and also forms part of the Metrobus network on which the m1 Metrobus service will run.

Monitoring of the potential impacts of the Metrobus Scheme, including the Stoke Gifford Transport Link, commenced in 2015. The monitoring will continue and be reviewed as necessary, for example if any new relevant exposure is introduced

through residential development adjacent to road. Consequently, no further work is required at this stage.

Non-Road Transport Sources

No additional non-road transport sources have been identified since the 2017 ASR. This includes the following:

- Airports
- Railways
- Ports
- Non-Road Mobile Machinery (NRMM)

To update from the 2017 ASR, the following information is included:

Electrification of Great Western Railway Line

The Department of Transport announced plans to electrify the Great Western Main Line to Cardiff via Bristol Parkway, and to Bath and Bristol Temple Meads in March 2011[49]. A brand new fleet of Inter City Express trains were also given the go-ahead as part of the Intercity Express Programme (IEP). This will bring about faster journey times between Bristol and London. Electrified railways are quieter and more reliable than non-electrified railways and particularly benefit air quality as no air pollutants are emitted at the trackside because electric trains have zero emissions at the point of use.

Significant work continues on the electrification project which is due for completion in 2018/19. The electrification of the railway line to Bristol Parkway is planned to be completed by the end of this year. Further information on the electrification of the Great Western Mainline in South Gloucestershire can be found on the Network Rail website[50].

Non-road mobile machinery (NRMM) was specified as a new potential pollution source in LAQM TG16. As a result of this, the example measures of how NRMM emissions from construction sites may be minimised, as specified in paragraph 7.25

[49] http://www.dft.gov.uk/news/press-releases/dft-press-20110301/
[50] https://www.networkrail.co.uk/running-the-railway/our-routes/western/great-western-mainline/south-gloucestershire/

of LAQM TG16, are recommended as a planning condition to Planning Officers, where appropriate.

Industrial Sources

Industrial sources include the following:

- Industrial Installations
- Major Petrol Storage Depots
- Petrol Stations
- Poultry Farms

Industrial sources are controlled by the Environment Agency (EA) and by local authorities under the Pollution Prevention and Control Regulations and through the Clean Air Act. Details of the EA permitted installations (Part A1) in South Gloucestershire are available on the EA website[51]. Details of the Part A2 and B installations permitted by South Gloucestershire Council are available on our website[52].

In 2017, there were no new Part B industrial process and three Part B industrial processes ceased operating; Tytherington Quarry (LAEP B 006), A Nicholls (Cow Mills) Ltd (LAEP B 026), and Airbus UK Ltd (Petrol Unloading) (LAEP B 046).

No additional industrial sources in South Gloucestershire have been newly identified. Any new processes would be assessed as part of the permitting process and would not be likely to give rise to significant pollution emissions.

Commercial and Domestic Sources

Commercial and domestic sources include the following:

- Gas-Fired CHP combustion – Individual Installations
- Biomass Combustion – Individual Installations
- Biomass Combustion – Combined Installations
- Other Solid Fuel Combustion

[51] https://environment.data.gov.uk/public-register/industrial-installations/registration?easting=&northing=&name-search=&number-search=&local-authority=South+Gloucestershire&address-search=&__postcode=&dist=1
[52] http://www.southglos.gov.uk/documents/List-of-IPC-permits.pdf

Apart from Biomass Combustion – Combined Installations, there were no newly identified sources for which assessment predicted exceedances in 2017.

Biomass Combustion – Combined Installations

Numerous small biomass combustion units, while acceptable individually, may have a cumulative impact on PM_{10} concentrations. Some of South Gloucestershire is covered by a Smoke Control Area[53] which allows only approved fuels and appliances to be used.

The Council's Building Control Department collate notifications of solid fuel equipment installations provided by HETAS; the official body recognised by the Government to approve solid fuel domestic heating appliances.

Normally the installations in 2017 would be considered in addition to the 2011 -2016 installations to assess the cumulative impacts of the total known installations. However, due to technical difficulties, the data is not currently available to be included in this report. An update will be provided in the 2019 ASR to cover both 2017 and 2018.

Fugitive or uncontrolled sources

Dust emissions from a range of fugitive or uncontrolled sources can give rise to elevated PM10 concentrations. Dust may arise from sources such as quarries, landfill sites, stockyards, construction sites and waste management sites, particularly from the handling of dusty materials, the passage of vehicles over unpaved roads, process dust, e.g. concrete cutting and wind-blown dust from stockpiles and dusty surfaces.

Fugitive emissions from quarries and landfill sites have been previously assessed and any complaints received are addressed under the procedures for permitted activities.

Dust Management Plans (DMPs), which are usually incorporated into Construction Environmental Management Plans (CEMPs), are routinely conditioned on major development planning permissions to control and minimise the risk of construction dust impacts on nearby sensitive receptors.

There were no new fugitive or uncontrolled sources identified in 2017.

[53] https://www.southglos.gov.uk/environment-and-planning/pollution/pollution-control-clean-air-act-approval/smoke-control-areas/

Appendix E: Maps of Monitoring Locations and AQMAs

Maps of Current Air Quality Management Areas

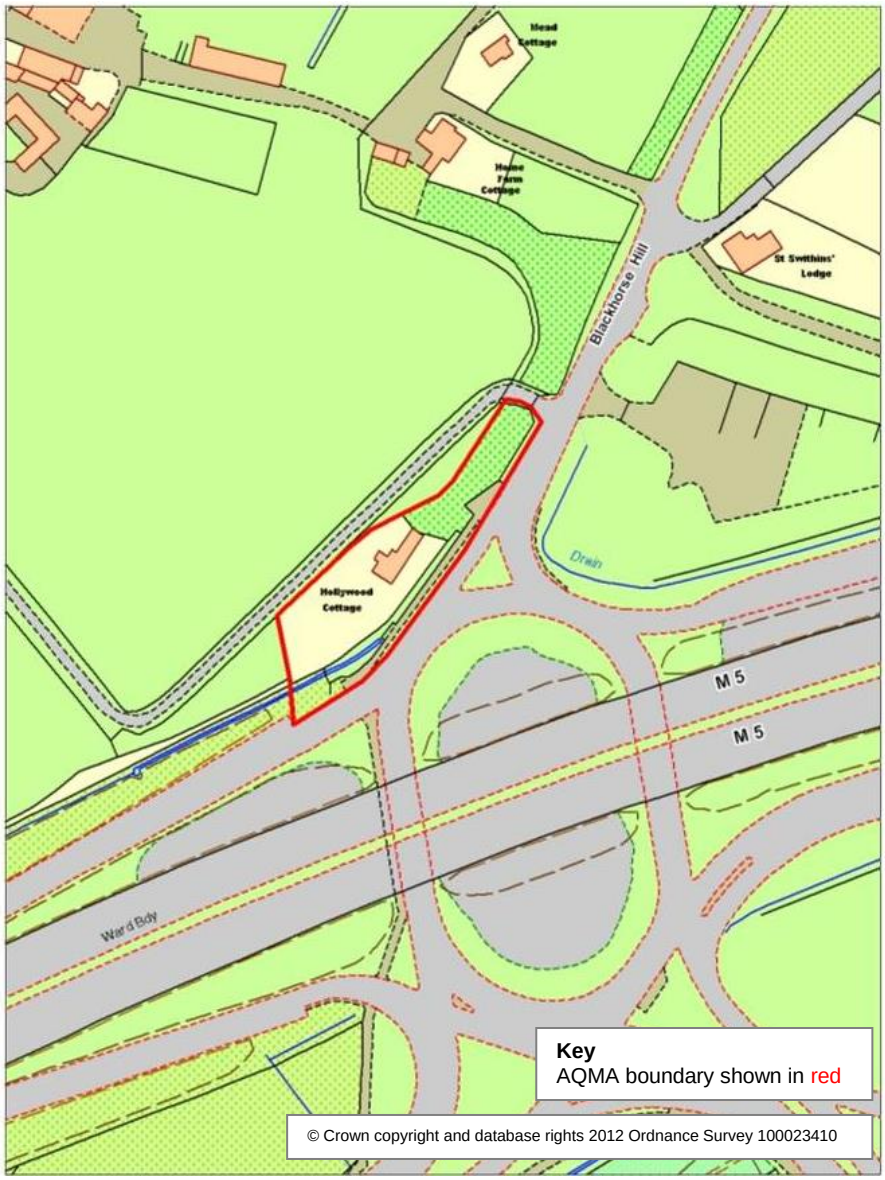


Figure E.1 Cribbs Causeway AQMA (Declared 2010)

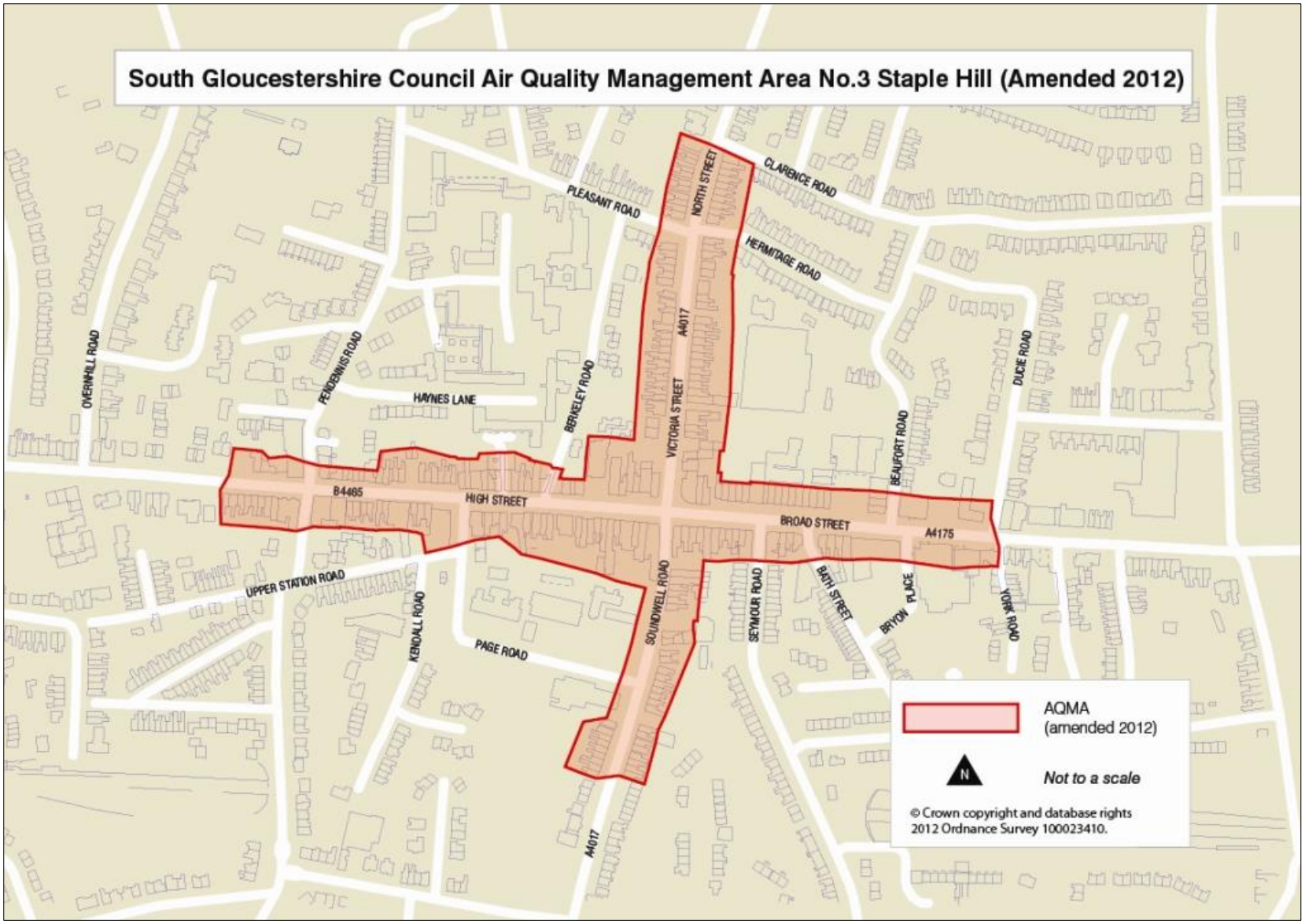


Figure E.2 Staple Hill AQMA (Amended 2012)

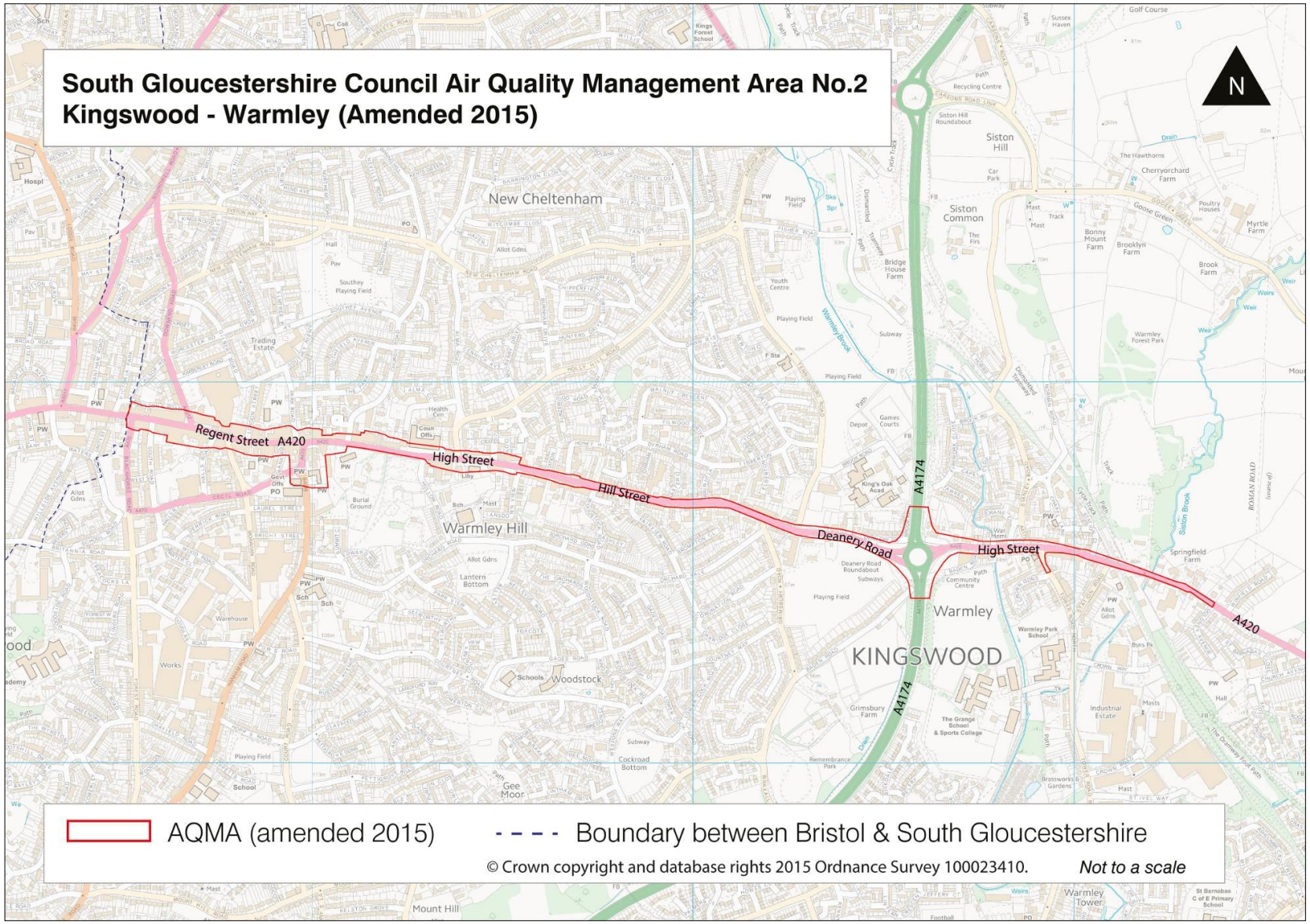


Figure E.3 Kingswood – Warmley AQMA (Amended 2015)

Maps of Monitoring Locations

Maps of Automatic Monitoring Site

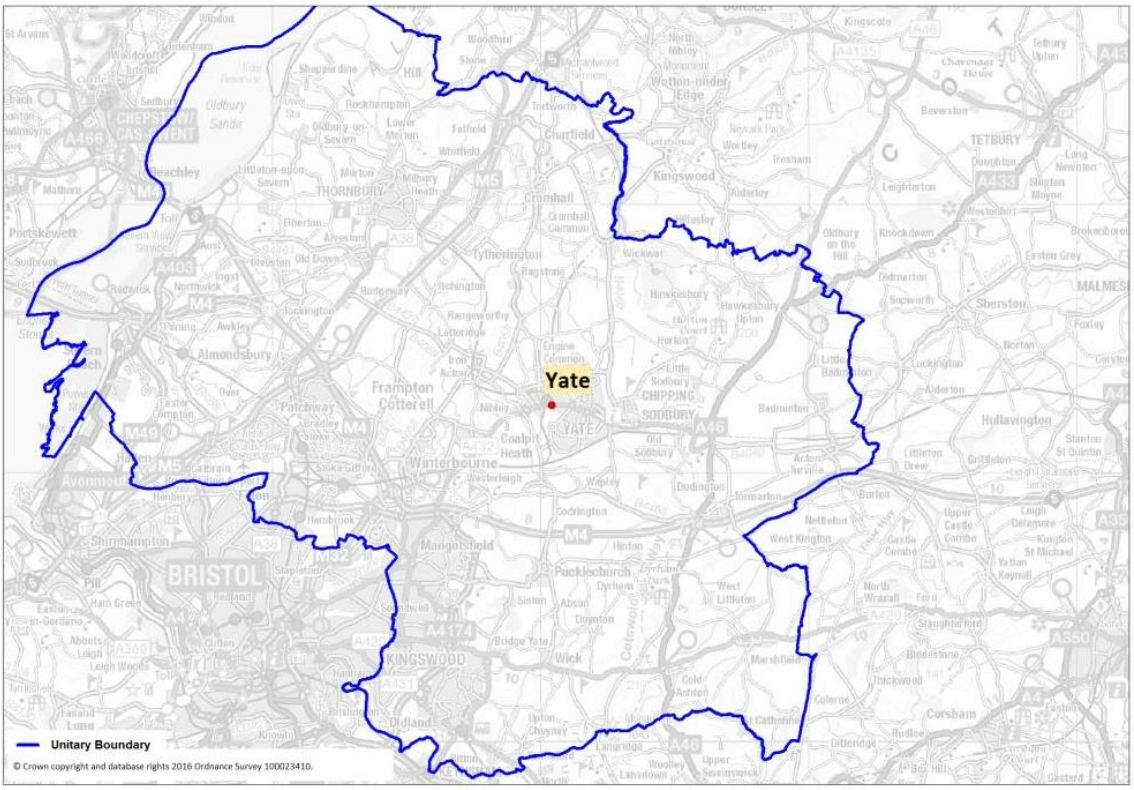


Figure E.4 Automatic Monitoring Site in South Gloucestershire – Yate

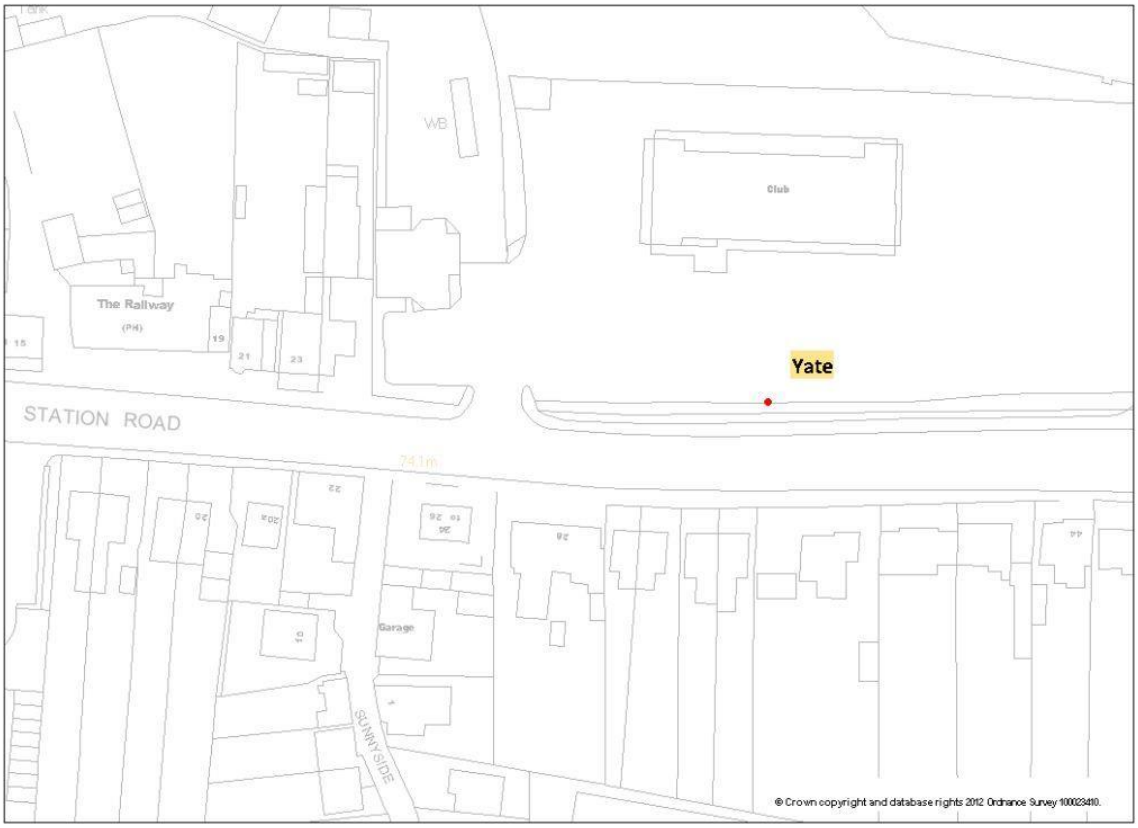


Figure E.5 Automatic Monitoring Site Yate - Station Road

Maps of Diffusion Tube Monitoring Sites

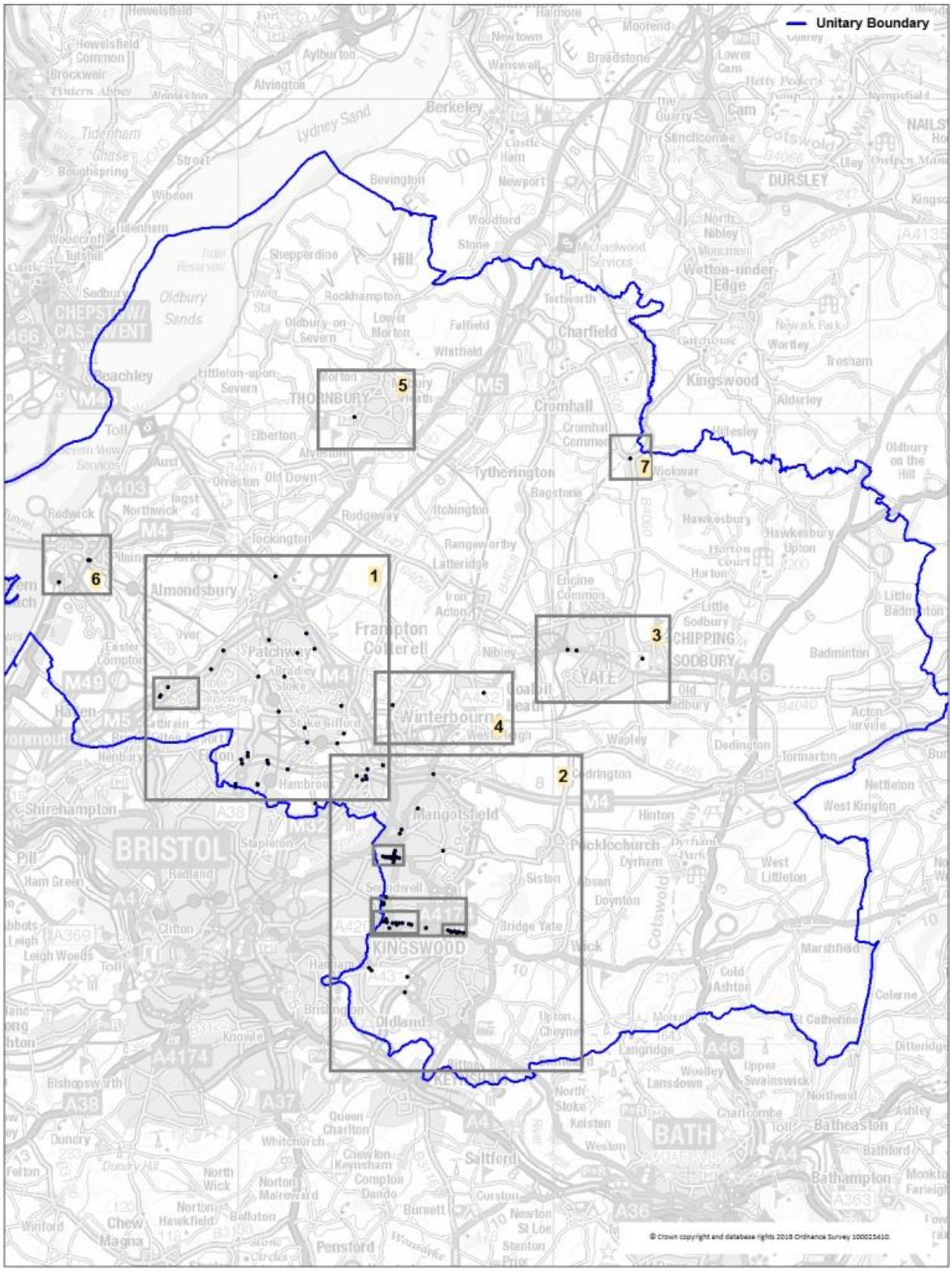


Figure E.6 All Diffusion Tube Sites showing locations of following Figures

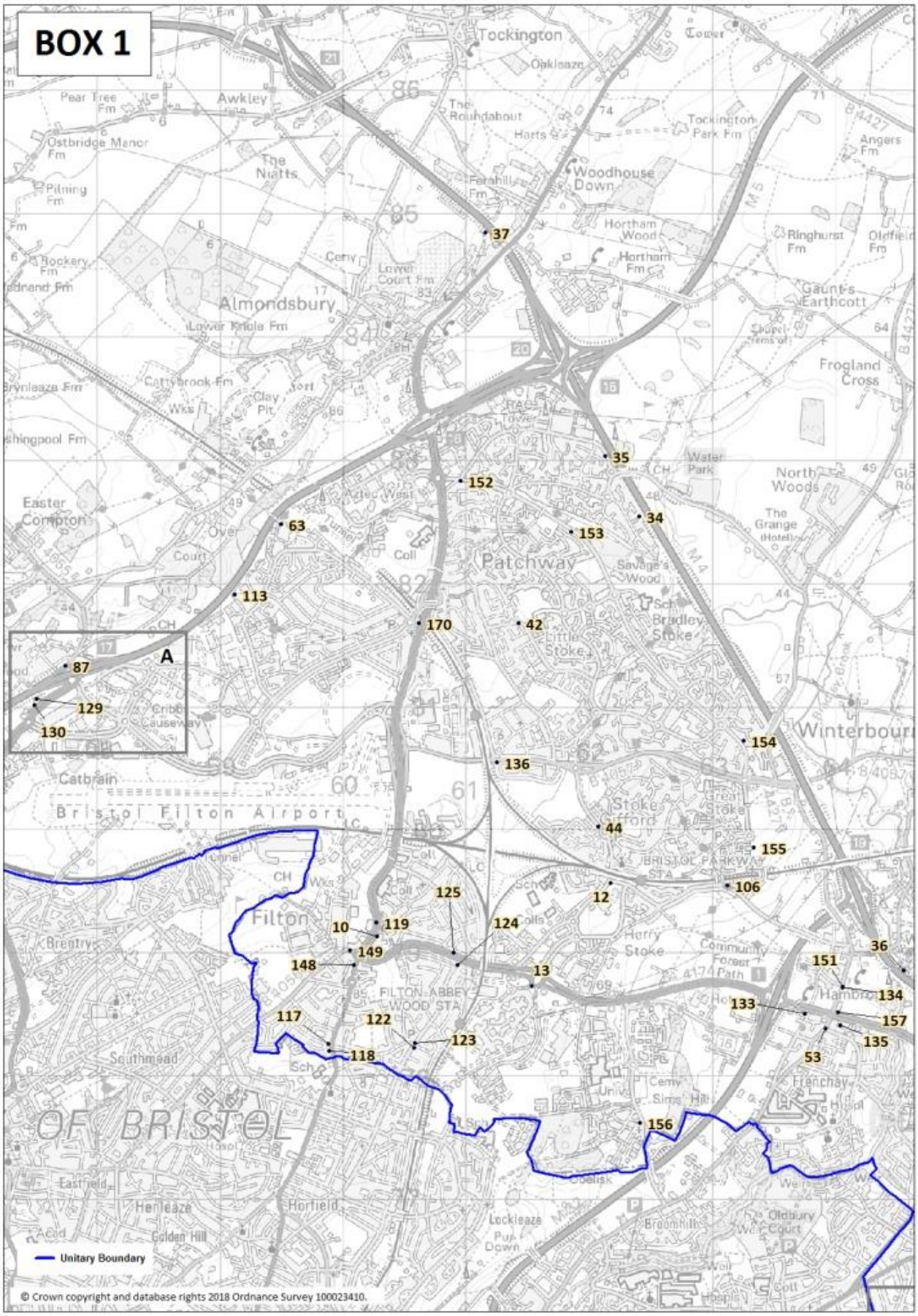


Figure E.7 Diffusion Tube Sites in Bristol North (Box 1 Figure E.6)

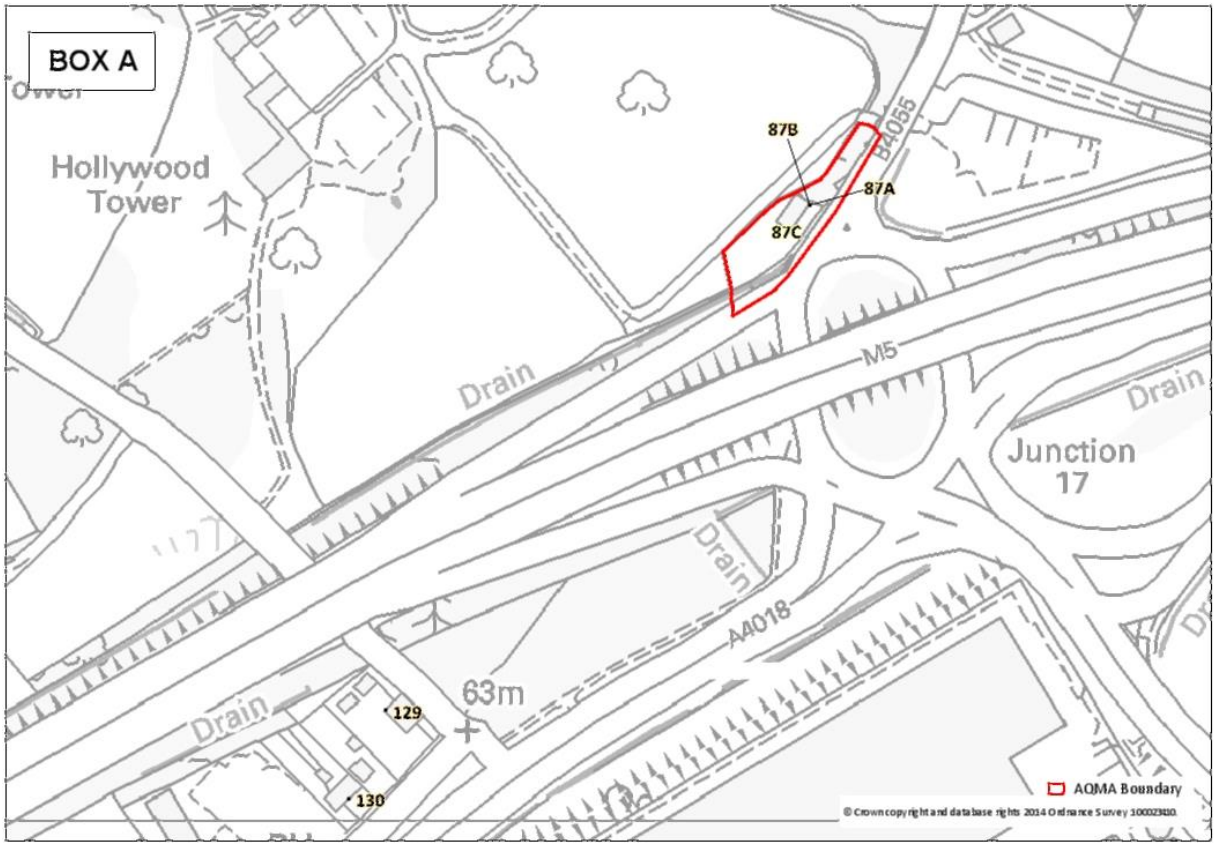


Figure E.8 Diffusion Tube Sites in Cribbs Causeway (Box A Figure E.7)

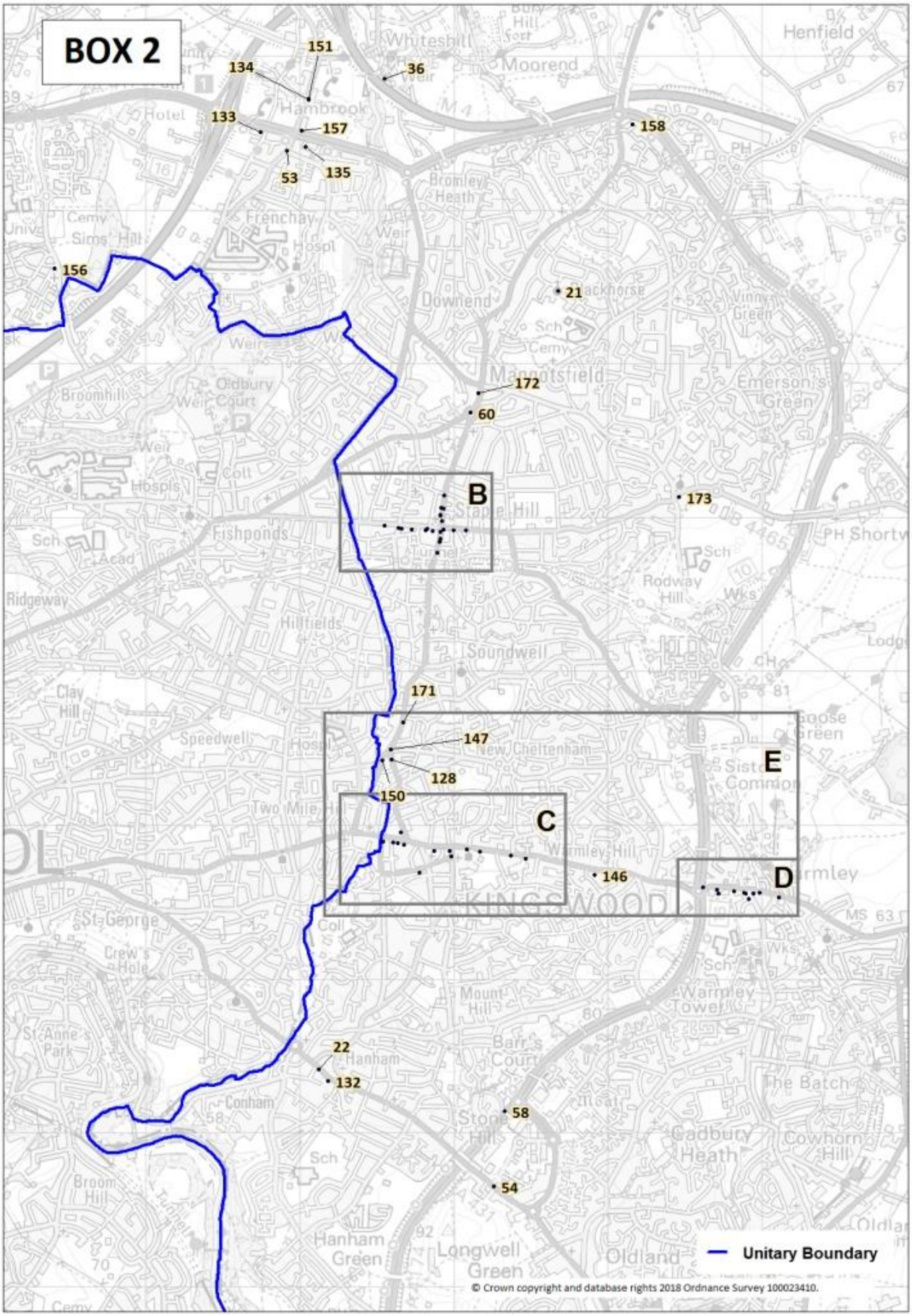


Figure E.9 Diffusion Tube Sites in Bristol East (Box 2 Figure E.6)

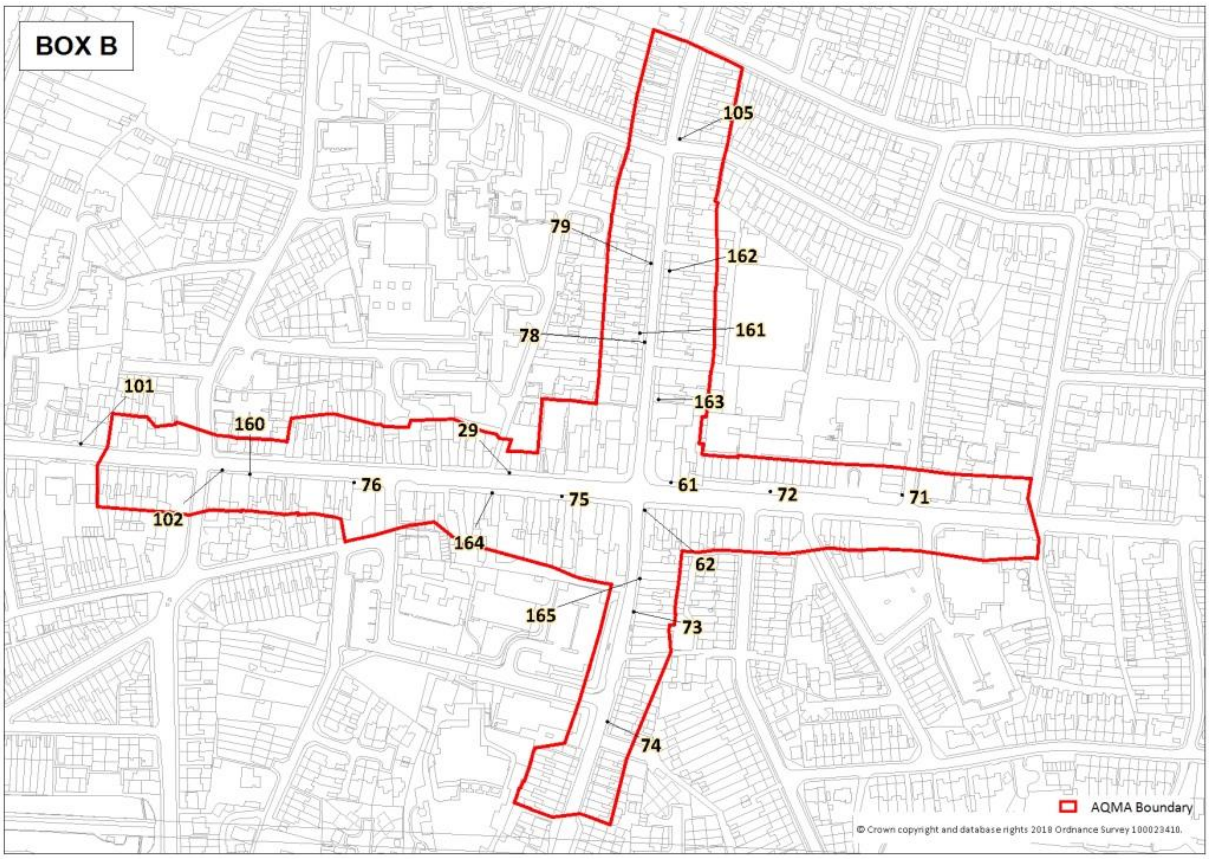


Figure E.10 Diffusion Tube Sites in Staple Hill (Box B Figure E.9)

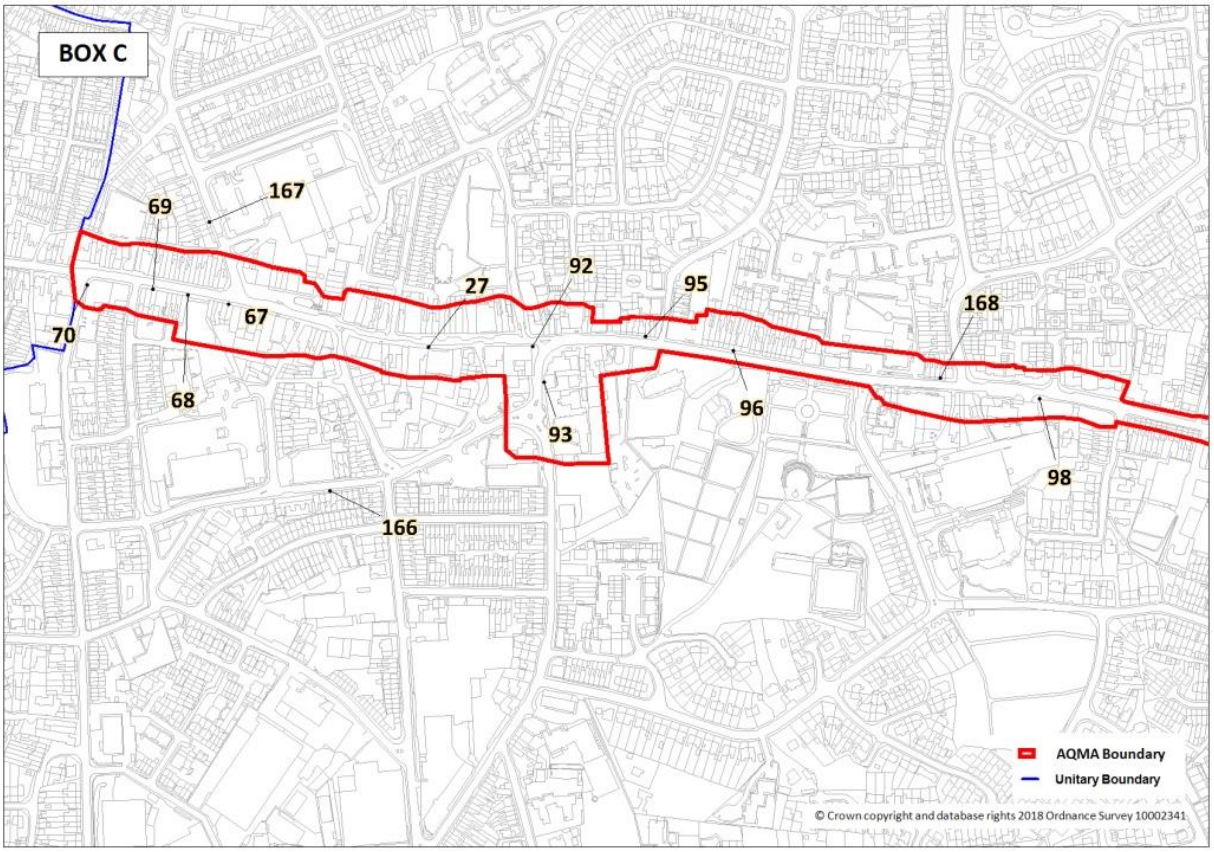


Figure E.11 Diffusion Tube Sites in Kingswood (Box C Figure E.9)

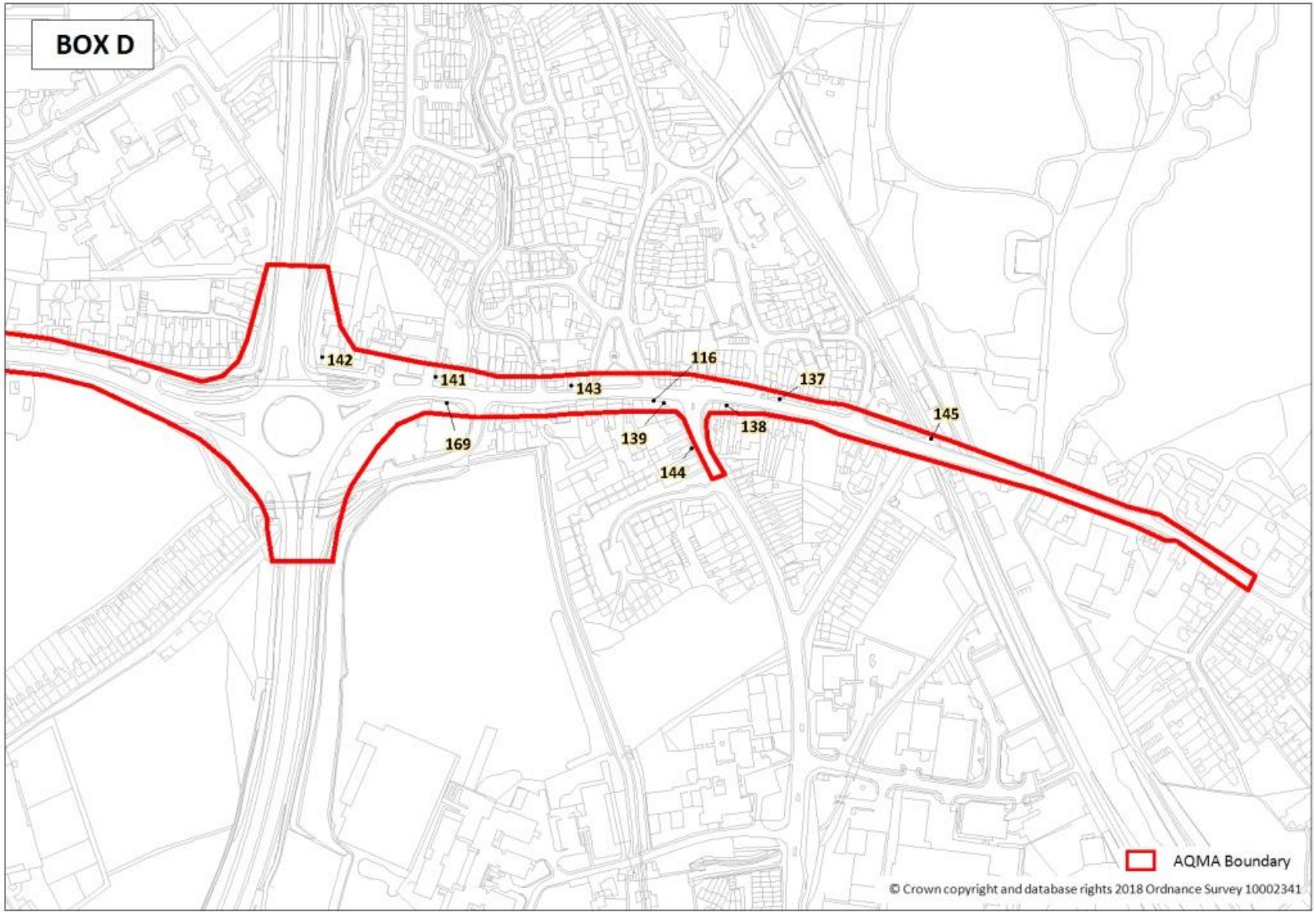


Figure E.12 Diffusion Tube Sites in Warmley (Box D Figure E.9)

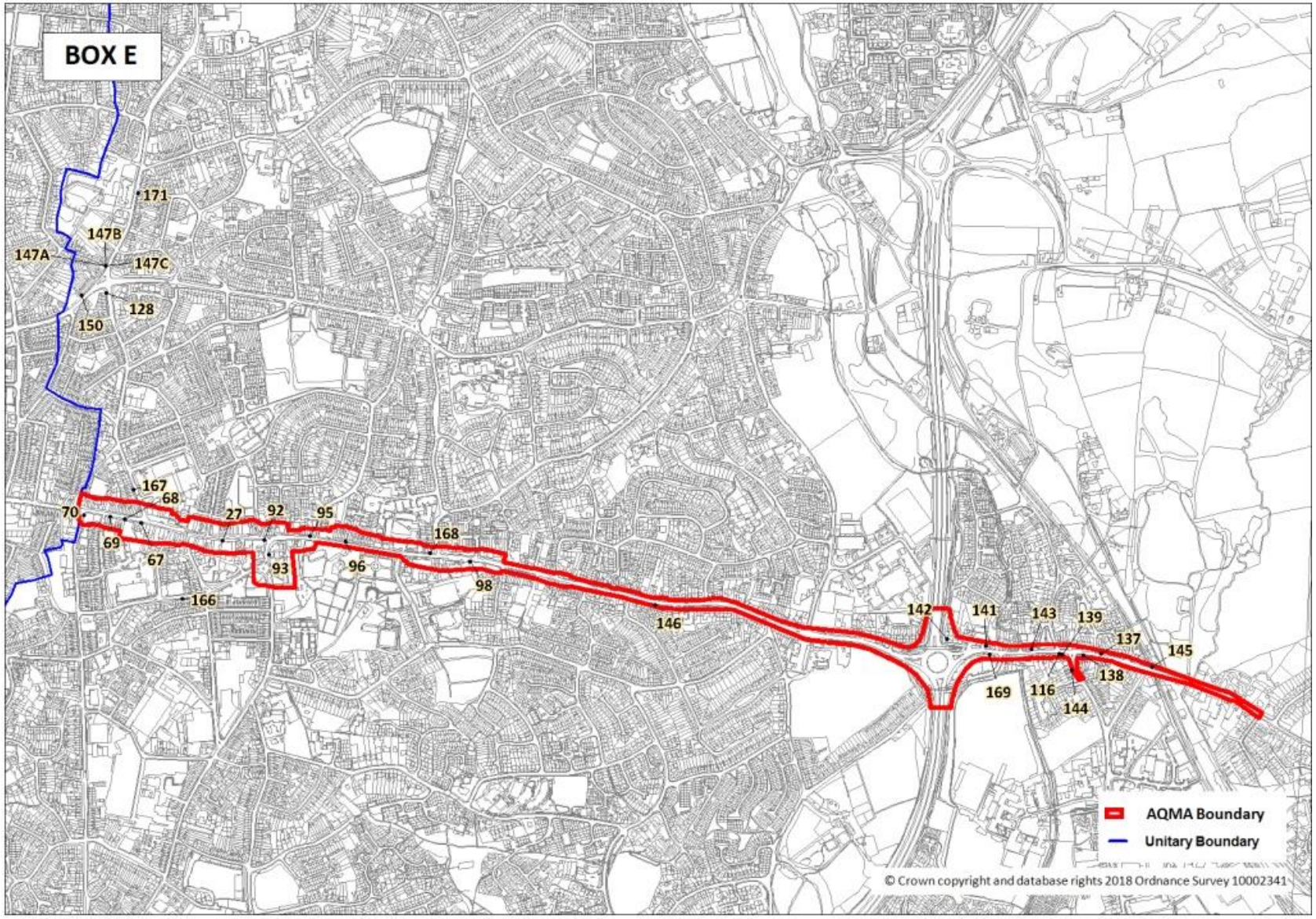


Figure E.13 Diffusion Tube Sites in Kingswood & Warmley (Box E Figure E.9)

Figure E.14 Diffusion Tube Sites in Yate and Chipping Sodbury (Box 3 Figure E.6)

Figure E.15 Diffusion Tube Sites in Winterbourne & Coalpit Heath (Box 4 Figure E.6)

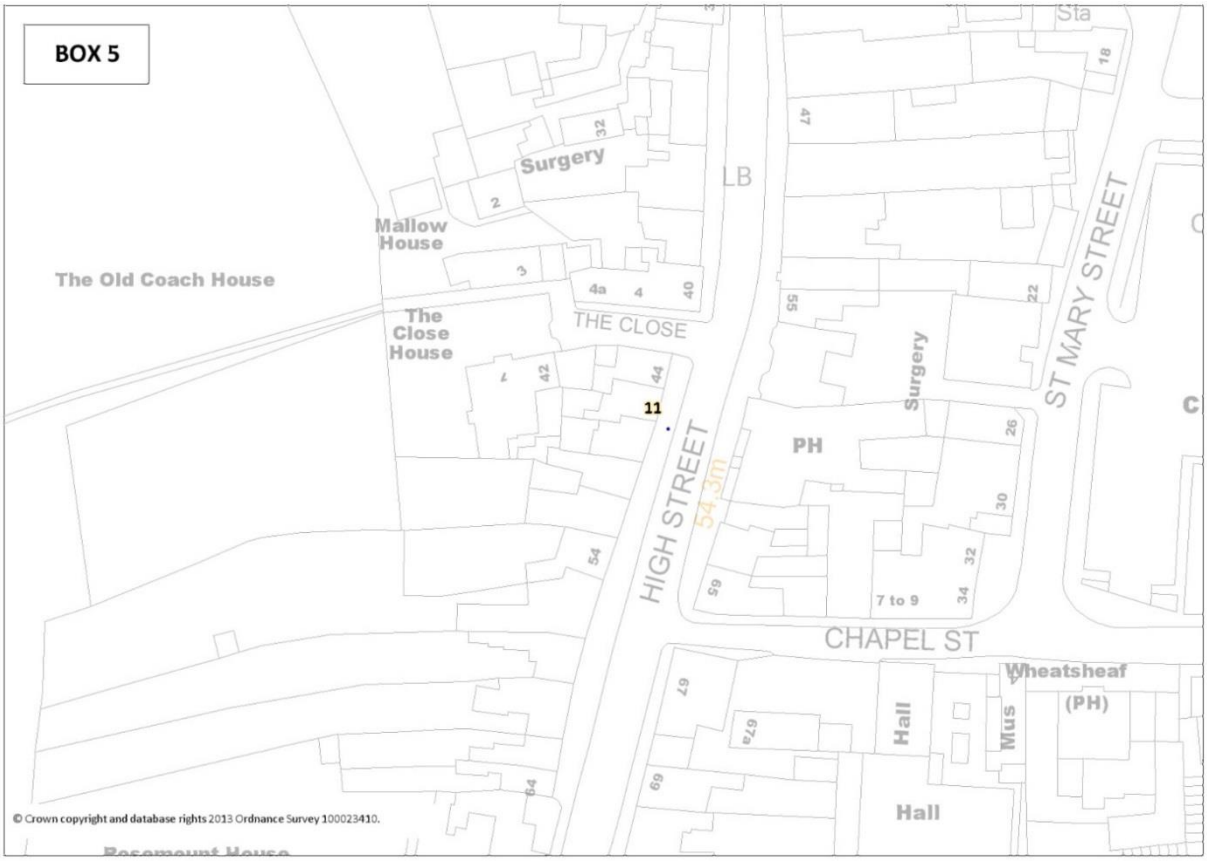


Figure E.16 Diffusion Tube Site in Thornbury (Box 5 Figure E.6)

Figure E.17 Diffusion Tube Sites in Severn Beach and Pilning (Box 6 Figure E.6)

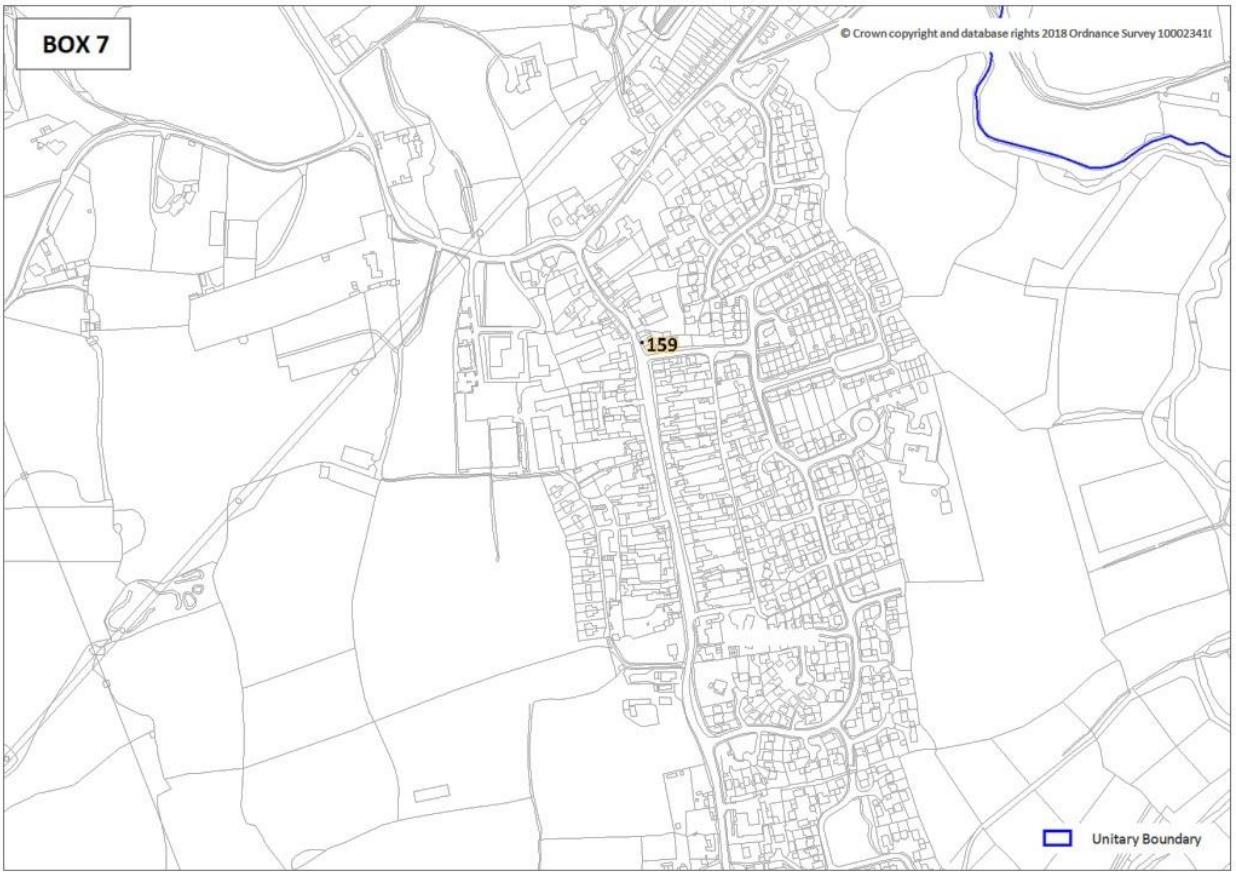


Figure E.18 Diffusion Tube Site in Wickwar (Box 7 Figure E.6)

Appendix F: Summary of Air Quality Objectives in England

Table F.1 Air Quality Objectives in England

Pollutant	Air Quality Objective[54]	
	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

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

Glossary of Terms

Abbreviation	Description
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the local authority intends to achieve air quality limit values'
AQMA	Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives
ASR	Air quality Annual Status Report
AURN	Automatic Urban and Rural Network – a national automatic monitoring network
BAM	Beta Attenuation Monitor (for PM_{10} measurement)
Defra	Department for Environment, Food and Rural Affairs
EU	European Union
Exceedance	A period of time where the concentration of a pollutant is greater than the appropriate air quality objective
JLTP	Joint Local Transport Plan
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
SGC	South Gloucestershire Council
WoE	West of England Authorities (Bath & North East Somerset, Bristol City Council, North Somerset and South Gloucestershire Council)
$\mu g/m^3$	Microgrammes per cubic metre

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