



# 2023 Air Quality Annual Status Report (ASR)

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

Date: August 2023

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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, the elderly, and those with existing heart and lung conditions. There is also often a strong correlation with equalities issues because areas with poor air quality are also often less affluent areas<sup>1,2</sup>.

The mortality burden of air pollution within the UK is equivalent to 29,000 to 43,000 deaths at typical ages<sup>3</sup>, with a total estimated healthcare cost to the NHS and social care of £157 million in 2017<sup>4</sup>.

Air pollution can arise from many different sources, including transport, industry and commercial and domestic heating, in particular solid fuel burning. Pollutant levels are assessed against national air quality objectives (shown in Appendix E) and 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.

## Air Quality in South Gloucestershire

South Gloucestershire lies to the north and east of the city of Bristol with the River Severn on the western boundary and the Cotswold escarpment to the eastern edge. The area is a diverse mix of urban and rural areas, including major residential, industrial and commercial developments. The major junction of the M4 and M5 motorways (the Almondsbury Interchange) is within South Gloucestershire.

The population estimate for South Gloucestershire from the 2021 Census is 290,400<sup>5</sup>, which is an increase of 10.5% compared to the recorded population in the 2011 census

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<sup>1</sup> Public Health England. Air Quality: A Briefing for Directors of Public Health, 2017

<sup>2</sup> Defra. Air quality and social deprivation in the UK: an environmental inequalities analysis, 2006

<sup>3</sup> Defra. Air quality appraisal: damage cost guidance, January 2023

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

<sup>5</sup> [Census | BETA - South Gloucestershire Council \(southglos.gov.uk\)](https://southglos.gov.uk/census-beta)

(262,800). The growth in population over the last 10 years in South Gloucestershire is higher than in all of its neighbouring authorities, Bristol, Bath and North East Somerset, North Somerset and Gloucestershire<sup>6</sup>. Most of the population lives within the urban areas on the north and east fringes of Bristol and in the towns of Yate and Thornbury, while the remainder live in the villages and more rural areas of South Gloucestershire. The population is projected to continue increasing to 354,300 by 2043<sup>7</sup> so managing future development and providing vital transport infrastructure is a key challenge.

The main air pollutant of concern locally is nitrogen dioxide (NO<sub>2</sub>), which mostly arises from road traffic (34%, rising to 80% near roadsides)<sup>8</sup>. Particulate matter is also a pollutant of concern. Sources of particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub> which are described by the particle size) include domestic wood and coal burning (38%), industrial combustion (16%) and road transport (12%)<sup>9</sup>.

### **Air Quality Management Areas**

There are two AQMAs currently declared in South Gloucestershire in relation to exceedances, or likely exceedances, of the annual mean objective for nitrogen dioxide (40 µg/m<sup>3</sup>):

- Kingswood – Warmley – from the Bristol/ South Gloucestershire boundary in Kingswood along the A420 to the junction with Goldney Avenue in Warmley.
- Staple Hill – in the centre around the Broad Street/ High Street/ Soundwell Road/ Victoria Street crossroads and the High Street/ Acacia Road/ Pendennis Road crossroads.

Details of the current AQMAs are included in Table 2.1 of this report and maps are available in Appendix D. Further information on the AQMAs is available on the Council website [Air quality | BETA - South Gloucestershire Council \(southglos.gov.uk\)](https://www.southglos.gov.uk/air-quality) and on the Defra UK-AIR website [Local Authority Details - Defra, UK](https://uk-air.defra.gov.uk/details.aspx?category=local-authority).

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<sup>6</sup> [Key facts and figures about the area | BETA - South Gloucestershire Council \(southglos.gov.uk\)](https://www.southglos.gov.uk/air-quality)

<sup>7</sup> [Subnational population projections for England - Office for National Statistics](https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/subnationalpopulationprojections)

<sup>8</sup> Defra Clean Air Strategy 2019 [Clean Air Strategy 2019 \(publishing.service.gov.uk\)](https://www.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/811111/clean-air-strategy-2019.pdf)

<sup>9</sup> Defra Clean Air Strategy 2019 [Clean Air Strategy 2019 \(publishing.service.gov.uk\)](https://www.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/811111/clean-air-strategy-2019.pdf)



The former Cribbs Causeway AQMA adjacent to the M5 Junction 17 roundabout was revoked in July 2020 as nitrogen dioxide concentrations within the AQMA have consistently been below the annual mean objective since 2010. Further information is provided in Section 2.1 of the report.

### **Trends in monitored pollutant concentrations**

South Gloucestershire Council carried out automatic (continuous) monitoring at the following three sites during 2022 (the pollutant(s) monitored at each site are shown in brackets):

- Yate – Station Road (NO<sub>2</sub> and PM<sub>10</sub>) – a long standing site
- Stoke Gifford A4174 Ring Road near Coldharbour Lane and the University of West England (NO<sub>2</sub>, PM<sub>10</sub>, PM<sub>2.5</sub> and Ozone (O<sub>3</sub>)) – began operating in August 2021
- Hambrook A4174 Ring Road (NO<sub>2</sub>) – a new site from April 2022.

The key outcomes from the automatic monitoring in 2022 are:

- NO<sub>2</sub> concentrations were below the annual mean objective of 40 µg/m<sup>3</sup> and the 1-hour objective (200 µg/m<sup>3</sup> not to be exceeded more than 18 times a year) was met at all three automatic sites.
  - The annual mean concentration at Hambrook was 29.6 µg/m<sup>3</sup>. As monitoring began part way through 2022, the result was “annualised” (adjusted from short to long-term) to reflect the whole year.
  - There were slight decreases in the annual mean NO<sub>2</sub> concentrations at Yate (13 µg/m<sup>3</sup>) and Stoke Gifford (21 µg/m<sup>3</sup>) compared to 2021.
  - The Yate annual mean showed a 31% decrease from the pre-pandemic 2019 annual mean of 19 µg/m<sup>3</sup>. This follows a similar trend across the national automatic urban and rural monitoring network (AURN) roadside sites where the average 2022 NO<sub>2</sub> annual mean concentration also decreased slightly from the 2021 concentration and remained 24% lower than the concentrations in 2019<sup>10</sup>.
  - The long-term trend data for Yate shows an overall continuing decline in annual mean NO<sub>2</sub> concentrations over the last decade from 27 µg/m<sup>3</sup> in 2012.

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<sup>10</sup> [Nitrogen dioxide \(NO<sub>2</sub>\) - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/statistics/nitrogen-dioxide-no2-statistics)

- PM<sub>10</sub> concentrations were below the annual mean objective of 40 µg/m<sup>3</sup> and met the 24-hour mean objective (50 µg/m<sup>3</sup> not to be exceeded more than 35 times a year) at both the Yate and Stoke Gifford sites.
  - The annual mean concentration at Yate was 12 µg/m<sup>3</sup> and 20 µg/m<sup>3</sup> at Stoke Gifford.
  - The longer-term data at Yate shows a slight decrease compared to pre-pandemic annual mean of 13 µg/m<sup>3</sup> in 2019 but the levels remain slightly higher than the 2020 annual mean of 11 µg/m<sup>3</sup>. This follows the trend in annual average PM<sub>10</sub> concentrations at the national AURN roadside sites which have remained relatively stable between 2015 and 2022, although overall, roadside PM<sub>10</sub> pollution has reduced in the longer-term<sup>11</sup>.
  - This is mirrored at Yate where overall, the annual mean PM<sub>10</sub> concentrations have been slowly declining over the last decade from 16 µg/m<sup>3</sup> in 2012.
  - There were 3 exceedances of the 24-hour daily mean at Stoke Gifford, however 35 exceedances are allowed so the objective was met. There were no exceedances of the daily mean at Yate.
- PM<sub>2.5</sub> concentrations monitored at Stoke Gifford were below the annual mean limit of 20 µg/m<sup>3</sup> and the new annual mean concentration target of 10 µg/m<sup>3</sup> to be met by 2040 (and the interim target of 12 µg/m<sup>3</sup> by 2028) introduced under the Environment Act 2021.
  - The annual mean concentration in 2022 was 9 µg/m<sup>3</sup> at Stoke Gifford, which is a slight increase on the annualised mean of 7.4 µg/m<sup>3</sup> in 2021.
- Ozone (O<sub>3</sub>) concentrations monitored at Stoke Gifford exceeded the ozone objective (100 µg/m<sup>3</sup> not to be exceeded more than 10 times a year) in 2022, as there were 22 days when the maximum running 8-hour mean was above 100 µg/m<sup>3</sup>. However, the responsibility for meeting this objective sits with national government because of the transboundary nature of ozone. Nevertheless, it is useful to monitor ozone as reducing levels of NO<sub>2</sub> are invariably accompanied by an increase in ozone levels. This is of concern due to the health impacts of ozone<sup>12</sup> and because ozone is a greenhouse gas in the lower atmosphere.

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<sup>11</sup> [Particulate matter \(PM10/PM2.5\) - GOV.UK \(www.gov.uk\)](https://www.gov.uk/guidance/particulate-matter-pm10-pm25)

<sup>12</sup> [Ozone \(O3\) - GOV.UK \(www.gov.uk\)](https://www.gov.uk/guidance/ozone)

There was also extensive monitoring of nitrogen dioxide at the 92 non-automatic (passive) diffusion tube monitoring sites that formed the local air quality management (LAQM) network across the district in 2022.

The key outcomes from the diffusion tube monitoring are:

- NO<sub>2</sub> concentrations were below the annual mean objective of 40 µg/m<sup>3</sup> so there were no exceedances at the LAQM diffusion tube monitoring sites in South Gloucestershire, including within the Kingswood – Warmley and Staple Hill AQMAs.
- The 2022 annual mean NO<sub>2</sub> concentrations slightly increased by an average of 1% across the LAQM diffusion tube sites compared to 2021. However, overall since 2019, the NO<sub>2</sub> concentrations across the long-term sites reduced by 17% on average. This compares reasonably well with the trend across the national automatic roadside monitoring sites where the average 2022 NO<sub>2</sub> annual mean was 24% lower than in 2019.
- In the Kingswood – Warmley AQMA, annual mean NO<sub>2</sub> concentrations decreased by an average of 1.7% from 2021 to 2022. There were no exceedances of the annual mean NO<sub>2</sub> objective or any “borderline” sites (within 10% of the annual mean objective, so greater than 36 µg/m<sup>3</sup>) in this AQMA. From 2019 to 2022, the NO<sub>2</sub> concentrations reduced by an average of 21.5% in the AQMA.
- At the single previously exceeding site pre-pandemic in 2019 (and 2018) in South Gloucestershire within the Kingswood – Warmley AQMA (Site 146 Kingswood - Hill Street), the NO<sub>2</sub> concentration decreased by 23% from 2019 (42.3 µg/m<sup>3</sup>) to 2022 (32.8 µg/m<sup>3</sup>). The 2022 NO<sub>2</sub> concentration monitored at this site was the highest in either of the AQMAs.
- In the Staple Hill AQMA, NO<sub>2</sub> concentrations increased very slightly by an average of 0.25% from 2021 to 2022 at the monitoring sites in the AQMA. Overall, from 2019 to 2022, the NO<sub>2</sub> concentrations have reduced by an average of 18% in this AQMA. There were no exceedances of the annual mean NO<sub>2</sub> objective or any “borderline” sites in this AQMA.
- Outside of the AQMAs, there was one marginally “borderline” site (once adjusted for distance to the façade of the nearest residential property to reflect relevant exposure) in Patchway on the A38 Gloucester Road close to Hayes Way (Site 188). The same site was marginally borderline in 2021. This indicates a potential area of concern away from the AQMAs.

The details of the monitoring sites and results are provided in Appendix A. The monitoring results and trends in the data are discussed fully in Section 3.2 of the report and trend graphs are available in Appendix A. The monitoring data from the South Gloucestershire automatic sites is available to view on the [Air Quality in the United Kingdom \(ukairquality.net\)](https://ukairquality.net) website.

## **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 Directorate for Place enabling close working between these teams. There is also a close working relationship with the Public Health Team in the Directorate for People, 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 development of a council-wide approach to air quality has brought services which have an interest and/or impact on air quality, including Public Health, Environmental Health, Transport Policy, Environmental Policy and Climate Change, Spatial Planning, Development Control, Street Care and Highways and Strategic Communications, together into a Board. The Clean Air and Climate Change Board is co-chaired by the Director for Place and the Director of Public Health. With the Board also covering Climate Change, this ensures there is a joined-up approach across the two work areas, which are closely interlinked with often the same sources and interventions and secures alignment with the Council's Climate Emergency Strategy and Action Plans<sup>13</sup>.

Public Health led on the development of a South Gloucestershire Clean Air Strategy, which was approved by the Council in July 2020. Subsequently, a new Clean Air Action Plan (CAAP) has been developed to implement the visions and priorities contained within South Gloucestershire's Clean Air Strategy and to fulfil the Council's statutory local air quality management duties to update the 2012 Air Quality Action Plan for the Kingswood and Staple Hill AQMAs.

Public Consultation was carried out on the draft Clean Air Action Plan between 6 December 2022 and 31 January 2023 to seek the views of the public and businesses on

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<sup>13</sup> [Climate and nature emergency in South Gloucestershire | BETA - South Gloucestershire Council \(southglos.gov.uk\)](https://southglos.gov.uk)

the 30 proposed actions designed to improve air quality within the AQMAs and across South Gloucestershire. Further information, including the consultation findings, is available on the [Clean Air Action Plan - South Gloucestershire Online Consultations \(southglos.gov.uk\)](https://southglos.gov.uk/clean-air-action-plan) webpage. The feedback from the consultation is being considered and will help shape the final Clean Air Action Plan.

South Gloucestershire works closely with other neighbouring authorities in the West of England (Bath and North East Somerset, Bristol City and North Somerset Councils), and also with the West of England Combined Authority (WECA), to develop, implement and refine schemes with cross-boundary characteristics and particularly with regard to regional strategic work areas such as transport, e.g. the Joint Local Transport Plan (JLTP4<sup>14</sup>) and the Travel West<sup>15</sup> brand which acknowledges commuters do not think in terms of Council boundaries.

## Actions to Improve Air Quality

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

The Environmental Improvement Plan<sup>16</sup> sets out actions that will drive continued improvements to air quality and to meet the new national interim and long-term PM<sub>2.5</sub> targets. The National Air Quality Strategy<sup>17</sup>, published in 2023, provides more information on local authorities' responsibilities to work towards these new targets and reduce PM<sub>2.5</sub> in their areas. The Road to Zero<sup>18</sup> details the approach to reduce exhaust emissions from road transport through a number of mechanisms; this is extremely important given that the majority of Air Quality Management Areas (AQMAs) are designated due to elevated concentrations heavily influenced by transport emissions.

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<sup>14</sup> [Joint Local Transport Plan - Combined Authority \(westofengland-ca.gov.uk\)](https://westofengland-ca.gov.uk/jltp4)

<sup>15</sup> [Homepage - Travelwest](https://travelwest.co.uk)

<sup>16</sup> Defra. Environmental Improvement Plan 2023, January 2023

<sup>17</sup> [The air quality strategy for England - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/publications/the-air-quality-strategy-for-england)

<sup>18</sup> DfT. The Road to Zero: Next steps towards cleaner road transport and delivering our Industrial Strategy, July 2018

The key completed measures to improve air quality are:

- Under the second round of the Clean Bus Technology Fund, First Bus and CT Plus (while it was operating) have retrofitted nearly 150 buses with emissions-reducing technology.
- 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 has enabled the delivery of 98 bio-methane buses and two re-fuelling stations in the area. The new buses will contribute to reducing air pollution levels across the West of England area, including in the Staple Hill AQMA.
- Entire fleet of Council pool cars switched to electric in 2017, with OLEV funding secured to switch 20% of other fleet vehicles to electric in 2021.
- Capability funding was secured, which ran from July 2021 until June 2022 and replaced the previous Access funding, to continue providing support to encourage sustainable and active travel modes across South Gloucestershire. This has since been replaced by Capability and Ambition funding which supports a range of activities, including Dr Bikes and Roadshow events being delivered to Workplaces and Communities, community cycle training and specific immersive young adult cycle training and cycle maintenance training across South Gloucestershire.
- The Road Safety Team continues to work with schools to promote active travel, including school street schemes; one of which was introduced at Kings Oak Academy, Kingswood, close to the Kingswood – Warmley AQMA, in September 2020<sup>19</sup>.

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

Other actions progressed in South Gloucestershire and on a wider West of England regional basis aimed at reducing traffic congestion and improving air quality include:

- Kingswood Town Centre Regeneration<sup>20</sup> - West of England Combined Authority (WECA) funding from the “Love our High Streets” programme enabled investigation into the redevelopment potential of Kingswood High Street, including the possibility

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<sup>19</sup> [Active travel to school | BETA - South Gloucestershire Council \(southglos.gov.uk\)](https://southglos.gov.uk/active-travel-to-school/)

<sup>20</sup> [Kingswood Masterplan | BETA - South Gloucestershire Council \(southglos.gov.uk\)](https://southglos.gov.uk/kingswood-masterplan/)

of re-routing traffic in Kingswood town centre. A masterplan was subsequently developed and consulted on during 2021 and work is ongoing to refine the proposals. The ability to improve local air quality will be one of the specific considerations for the final scheme.

- Metrobus - an express bus service, which aims to relieve congestion, reduce pollution, improve journey times and access to key employment, education and leisure destinations<sup>21</sup>. The Metrobus services began operating in 2018 and there are currently four metrobus routes in operation; three of which run between South Gloucestershire and Bristol (M1, M3 and M4 services).
- Cribbs Patchway Metrobus Extension<sup>22</sup> - this extension of the Metrobus network in South Gloucestershire provides an alternative, fast, direct route between The Mall at Cribbs Causeway and Bristol Parkway railway station (and onto Bristol City centre via the University of West of England). It benefits communities in Stoke Gifford, Patchway and the forthcoming Cribbs Patchway New Neighbourhood on the former Filton Airfield site. Passenger services on the M4 service began in January 2023.
- MetroWest<sup>23</sup> – improved rail services and infrastructure being delivered in two phases by the West of England councils, working in partnership with Network Rail and Great Western Railway. In South Gloucestershire, Phase 1 proposes to enhance local passenger train services on the Severn Beach line to an hourly service to Bristol Temple Meads. Phase 2 proposes to re-open the Henbury Line to an hourly spur passenger service and increase train services between Bristol Temple Meads and to Gloucester via Yate to a half-hourly service; the latter commenced from May 2023. Plans for new rail stations at Henbury, North Filton, Ashley Down and Charfield<sup>24</sup> are being developed with WECA funding.
- Cribbs Patchway New Neighbourhood Cycle Links – a £3.125m package of walking and cycling schemes has been delivered ahead of the completion of the first phase

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<sup>21</sup> [Metrobus - Travelwest](#)

<sup>22</sup> [m4: Cribbs Causeway to City Centre - Travelwest](#)

<sup>23</sup> [MetroWest - Travelwest](#)

<sup>24</sup> [Charfield train station | BETA - South Gloucestershire Council \(southglos.gov.uk\)](#)



of the development to encourage more people to choose a sustainable travel mode from the outset.

- GoUltraLowWest<sup>25</sup> - completion of a £7m project funded by Office for Low Emission Vehicles (OLEV) to accelerate the purchase of electric vehicles and provision of charge points across Bristol, South Gloucestershire, North Somerset and Bath & North East Somerset.
- A38 and Bradley Stoke Way improvements – development of a scheme along the Thornbury to Bradley Stoke Way corridor to improve conditions for people walking, cycling, and travelling by bus to encourage mode shift. Funding has been secured to advance the scheme to detailed design and it is envisaged to be open by 2026.
- A432 Yate to Ring Road A4174 Corridor – development of a scheme along this corridor to improve conditions for people walking, cycling, and travelling by bus and encourage mode shift. Funding has been secured to advance the scheme to detailed design and it is envisaged to be open by 2026.
- South Gloucestershire Electric Vehicle (EV) Charging Strategy – was adopted in March 2023<sup>26</sup>. The strategy aims to support residents transitioning to EVs through a variety of measures, including the expansion of public charging infrastructure provision, supporting the creation of e-mobility hubs, encouraging the provision of EV charging at workplaces and requiring new developments to adequately cater for EVs.

Further information on the wider actions is provided in Section 2.2 of this report.

South Gloucestershire Council continues to engage with Bristol City Council and Bath and North East Somerset Council on their Clean Air Plans, both of which include Clean Air Zones, through meetings organised by the West of England Combined Authority (WECA).

The Bath Clean Air Zone (CAZ)<sup>27</sup> launched on 15 March 2021 and results show the average 2022 annual mean NO<sub>2</sub> concentrations within the CAZ are 26% lower than in

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<sup>25</sup> [Go Ultra Low West - Travelwest](#)

<sup>26</sup> [Electric Vehicle Charging Strategy \(southglos.gov.uk\)](#)

<sup>27</sup> [Bath's Clean Air Zone | Bath and North East Somerset Council \(bathnes.gov.uk\)](#)



2019<sup>28</sup> and 27% lower in the area immediately around the CAZ. The Bristol CAZ<sup>29</sup> was launched on 28 November 2022 and further information about the Bristol Clean Air Plan is available on the [Clean Air for Bristol](#) website<sup>30</sup>. The Government's Vehicle Checker tool can be used to check whether there is a charge to drive any vehicle in either CAZ [Check your vehicle \(GOV.UK\)](#).

## Conclusions and Priorities

In 2022, there were no exceedences of the NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub> pollutant objectives identified at any local air quality monitoring site, including in the Kingswood – Warmley and Staple Hill AQMAs. There was an exceedance of the ozone objective at the Stoke Gifford automatic site, however, the responsibility for meeting this objective sits with national government.

While the 2022 annual mean NO<sub>2</sub> concentrations across the LAQM diffusion tube network slightly increased by an average of 1% compared to 2021, overall since 2019, the NO<sub>2</sub> concentrations across the long-term sites reduced by 17% on average. At the long-standing Yate automatic site, the 2022 NO<sub>2</sub> annual mean concentration decreased by 31% from 2019 and there has been long-term declining trends in both NO<sub>2</sub> and PM<sub>10</sub> concentrations over the past decade.

The overall trend of lower NO<sub>2</sub> concentrations than pre-pandemic continued in 2022 at the diffusion tube monitoring sites in both AQMAs with NO<sub>2</sub> concentrations remaining below the annual mean objective and borderline level. Aside from the significant decreases in concentrations in 2020, there has been an overall gradual downward trend in nitrogen dioxide concentrations in the Kingswood – Warmley and Staple Hill AQMAs over the past decade.

As of 2022, the Kingswood – Warmley AQMA has been compliant with both the NO<sub>2</sub> annual mean objective and borderline level for 3 years (2020 – 2022), and the Staple Hill AQMA has been compliant with the annual mean objective for 5 years (2018 – 2022) and the borderline level for 3 years (2020 – 2022), so the AQMAs could potentially be

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<sup>28</sup> [Bath's Clean Air Zone Annual Monitoring Report 2022 \(bathnes.gov.uk\)](#)

<sup>29</sup> [Bristol's Clean Air Zone](#)

<sup>30</sup> [Clean Air for Bristol | Clean air for everyone | Bristol Clean Air Zone](#)

considered for revocation. However, because the compliant periods include 2020 and 2021, which were both impacted by the Covid-19 pandemic and associated lockdowns, these years are not considered to be representative of long-term trends in NO<sub>2</sub> concentrations. Also noting that pollutant concentrations can vary significantly from one year to the next due to the influence of meteorological conditions, and with the continuing uncertainties and changes in traffic volumes and travel patterns following the Covid-19 pandemic, we consider that a precautionary approach in reviewing the possible revocation of the AQMAs is appropriate to ensure with reasonable certainty, there would not be further exceedances and that below borderline concentrations would be maintained.

For these reasons, we are not proposing to consider revocation of either AQMA at this point but the 2023 monitoring data will be reviewed and revocation considered in the 2024 Air Quality Annual Status Report, particularly in respect of the Staple Hill AQMA as it has been compliant for longer.

There was one diffusion tube site in 2022 with marginally “borderline” concentrations just above 36 µg/m<sup>3</sup> (once adjusted to reflect relevant exposure) outside of the AQMAs in Patchway on the A38 Gloucester Road close to Hayes Way. This indicates a potential area of concern away from the AQMAs and emphasises the need for the new Clean Air Action Plan, which aims to improve air quality across the whole district as well as in the AQMAs.

Continuing improvement in air quality beyond compliance across South Gloucestershire is of key importance as there is no clear evidence of a safe level of exposure to particulate matter (PM) or NO<sub>2</sub> below which there is no risk of adverse health impacts, so further reductions of particulate matter and NO<sub>2</sub> concentrations below current targets is likely to bring additional health benefits<sup>31</sup>.

South Gloucestershire Council's priorities for the coming year are to:

- Produce the final Clean Air Action Plan, taking into consideration the outcome of the public consultation, and seek formal approval of the CAAP to enable implementation of the actions to improve air quality within the AQMAs and across South Gloucestershire as a whole.

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<sup>31</sup> [Air Quality - A guide for directors of public health \(defra.gov.uk\)](https://www.defra.gov.uk/publications/default.aspx?publication=6544)

- Continue to monitor and assess the effectiveness of the JAQU directed scheme on the A4174 at Hambrook in achieving compliance with the annual mean NO<sub>2</sub> limit value, as traffic conditions settle to a “new normal” following the Covid-19 pandemic.

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

- Significant continued pressure on local government funding, exacerbated by the energy crisis, which could impact on delivering air quality improvements, including funding for the actual Clean Air Action Plan measures themselves.
- Travel patterns and traffic volumes have significantly changed following the Covid-19 pandemic. Many organisations have continued to offer flexible working arrangements to their staff, including the ability to work from home for all or part of their contracted hours. This has helped reduce the pressures on the highway network (with Tuesday, Wednesday and Thursdays typically now being the busiest days similar to pre-pandemic conditions). However, the acceleration in the popularity of home delivery services has increased the number of delivery vehicles on the road. Continuing uncertainties and changes in travel behaviour make future transport trends harder to predict.
- Public transport usage continues to be well below pre-Covid-19 pandemic levels, which is impacting on the commercial viability of some bus routes with operators responding by reducing or withdrawing services. This makes it harder for travellers to choose sustainable modes of transport over the private car.
- With the increased uptake of electric powered vehicles being constrained by cost of living and supply chain issues, the knock-on impacts on fleet composition and future trends in pollutant concentrations is difficult to predict.

## Local Engagement and How to get Involved

Some local engagement was carried out through the public consultation on our draft Clean Air Action Plan. One of the questions asked in the consultation survey was “How concerned are you about air quality in South Gloucestershire?”. Just over half (55%) of the people who responded to this question said they were concerned about air quality. However, the number of people who responded was relatively small (115 people) considering the population of South Gloucestershire. Continuing to raise awareness and

understanding of the impacts of air pollution on health is a key focus and measures to address this included in the new Clean Air Action Plan.

### **What can you do to reduce air pollution?**

There are many ways that everyone can help contribute towards improving air quality in South Gloucestershire. By making informed personal choices, particularly around how we travel and heat our homes, we can all reduce our personal contribution to air pollution and help improve air quality and improve our own health in the process.

To reduce pollution when travelling:

- Swap some trips in the car for walking, cycling or taking a bus or train, where possible, as this not only reduces air pollution but also, if walking and cycling, improves your health and wellbeing.
- Consider sharing lifts which will save you money on fuel as well as reducing the number of cars on the road.
- Travel outside peak hours and/or work from home, if possible, to save time spent in traffic and use less fuel, reducing emissions while saving time and money.
- If you are thinking of changing your vehicle, try switching to a less polluting type of vehicle and opt for the cleanest vehicle you feasibly can. As a general rule, electric vehicles have the lowest emissions, and then in order of increasing emissions; petrol hybrids, gas or petrol vehicles, diesel hybrids and lastly, diesels have the highest emissions. Emissions can vary depending on make and model and some perform better than others when the emissions in real world driving conditions are compared to the required Euro standards for vehicles. To check the emissions of your vehicle or a vehicle you are considering purchasing, you can use the Government's on-line Vehicle Checker tool – [Check your vehicle \(GOV.UK\)](#).
- Visit the [Travel West](#)<sup>32</sup> and [Better by Bike](#)<sup>33</sup> websites for live information on public transport, traffic reports, routes and journey planning for walkers and cyclists, electric vehicle charge points and other information that simplifies travel choices.

To help reduce pollution from domestic heating:

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<sup>32</sup> [Homepage - Travelwest](#)

<sup>33</sup> [Homepage - Better By Bike](#)

- If a property does not already have a solid fuel burner, e.g. a stove or fireplace, the best option is not to install one, as even the cleanest wood burning appliance emits significantly more particulate matter pollution than a gas oil or gas appliance.
- Should you still plan to install a stove, then consider using an ‘Eco-design’ stove. They produce lower emissions and are more efficient than non Eco-design stoves and open fires. (Since January 2022 new stoves entering the UK market must be Eco-design compliant).
- If you already own a stove or fireplace and choose to use it, make sure you follow the “[Open fires and wood-burning stoves](#)” advice leaflet<sup>34</sup> by using the right fuel on an efficient and well-maintained appliance. Some of South Gloucestershire is covered by a [Smoke Control Area](#)<sup>35</sup> which allows only approved appliances and fuels to be used.
- Consider a boiler upgrade to the newest and most efficient gas condensing boiler with lowest NOx (and carbon) emissions, especially if the boiler is more than 10 years old. In many cases, the long-term savings made with a more efficient boiler will cover the outlay.
- Consider installing “clean” renewable energy generation, for example, solar photovoltaics or an air source or ground source heat pump.

There are choices that we can all make to reduce air pollution. Relatively small changes all add up, and if everyone contributes, it can make a big difference overall. Further information is available on our website – [Air quality | BETA - South Gloucestershire Council \(southglos.gov.uk\)](#)

## Local Responsibilities and Commitment

This ASR was prepared by the Environmental Health Team of South Gloucestershire Council with the support and agreement of officers from the following teams:

Transport and Environmental Policy

Public Health

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<sup>34</sup> [Open fires wood burning stoves - guide-A4-update-12Oct \(defra.gov.uk\)](#)

<sup>35</sup> [Smoke control areas | BETA - South Gloucestershire Council \(southglos.gov.uk\)](#)

This ASR has been approved by:

Executive Director of Place (Nigel Riglar), Environmental Health and Trading Standards Manager (Shaun Fudge) and Environmental Protection Team Leader (Allison Jay).

This ASR has been signed off by the Director of Public Health (Sarah Weld).

If you have any comments on this ASR, please send them to the Environmental Protection Team at:

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# 1 Local Air Quality Management

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

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

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

## 2 Actions to Improve Air Quality

### 2.1 Air Quality Management Areas

Air Quality Management Areas (AQMAs) are declared when there is an exceedance or likely exceedance of an air quality objective. After declaration, the authority should prepare an Air Quality Action Plan (AQAP) within 18 months. The AQAP should specify how air quality targets will be achieved and maintained, and provide dates by which measures will be carried out.

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 Air Quality Action Plan for the Kingswood and Staple Hill AQMAs<sup>36</sup> in 2012, focusing mainly on transport measures.

In December 2015, the Kingswood - Warmley AQMA was declared, extending the 2012 Kingswood AQMA along the A420 corridor east to Warmley. This followed a detailed assessment in 2014 which had identified new locations on this corridor where the nitrogen dioxide annual mean objective was being exceeded.

Work continues to progress in developing a new Air Quality Action Plan, known as the South Gloucestershire Clean Air Action Plan (CAAP), to replace the 2012 Air Quality Action Plan for Kingswood and Staple Hill. The Clean Air Action Plan has been produced to implement the visions and priorities contained within South Gloucestershire's Clean Air Strategy<sup>37</sup> and to fulfil the Council's statutory local air quality management duties to update the action plan for the AQMAs. The CAAP includes a broad range of actions to improve air quality both within the Kingswood – Warmley and Staple Hill AQMAs and across South Gloucestershire as a whole. Further information is provided in Section 2.2.

Public Consultation was undertaken on the draft Clean Air Action Plan between 6 December 2022 and 31 January 2023. Further information, including the consultation

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<sup>36</sup> [2012 Air Quality Action Plan Kingswood and Staple Hill \(southglos.gov.uk\)](https://southglos.gov.uk/2012-air-quality-action-plan-kingswood-and-staple-hill)

<sup>37</sup> [Clean Air Strategy 2020 – 2024 BETA - South Gloucestershire Council \(southglos.gov.uk\)](https://southglos.gov.uk/clean-air-strategy-2020-2024-beta)

findings, is available on the [Clean Air Action Plan - South Gloucestershire Online Consultations \(southglos.gov.uk\)](https://southglos.gov.uk/clean-air-action-plan) webpage. The feedback from the consultation is being considered and will help shape the final Clean Air Action Plan.

Since the declaration of the Cribbs Causeway AQMA in 2010, the nitrogen dioxide concentrations at the façade of the single residential property within the AQMA have been below the annual mean objective ( $40 \mu\text{g}/\text{m}^3$ ). Following Defra's recommendation to revoke the AQMA and the subsequent consultation in 2019, the Cribbs Causeway AQMA was revoked by a legal order in July 2020. The nitrogen dioxide concentrations in 2022 remained well below the objective within the former AQMA, demonstrating continued compliance. Monitoring will continue at this location to assess the impact of the new developments in the vicinity.

A summary and description of the two AQMAs currently declared by South Gloucestershire Council can be found in Table 2.1. The air quality objective pertinent to the current AQMA designations is as follows:

- NO<sub>2</sub> annual mean

The levels of exceedance at the declaration of the AQMAs in 2010 and in 2022 are also compared in Table 2.1, however the monitoring undertaken within the AQMAs has changed during this timeframe to reflect extensions to the AQMAs and to better represent relevant exposure. Consequently, the monitoring locations in 2022 are not necessarily directly comparable to those in 2010 and comparison between the exceedance levels may not provide a true reflection of trends in NO<sub>2</sub> levels over that timeframe.

In 2020 and 2021, the reduced traffic levels as a result of the Covid-19 pandemic restrictions significantly impacted NO<sub>2</sub> concentrations to the extent that there were no exceedences or "borderline" concentrations i.e. within 10% of the objective ( $>36 \mu\text{g}/\text{m}^3$ ) in either the Kingswood – Warmley or Staple Hill AQMAs. Lower NO<sub>2</sub> concentrations than pre-pandemic continued in 2022 with the concentrations in both AQMAs remaining below the annual mean objective and borderline level.

The Kingswood – Warmley AQMA has been compliant with both the annual mean objective and borderline level for 3 years, and the Staple Hill AQMA has been compliant with the annual mean objective for 5 years and the borderline level for 3 years. While having regard for the LAQM.TG22 guidance, the compliant periods include 2020 and 2021, both of which were impacted by the Covid-19 pandemic and associated lockdowns,

so both years are not considered to be representative of long-term trends in NO<sub>2</sub> concentrations.

Noting also that pollutant concentrations can vary significantly from one year to the next due to the influence of meteorological conditions, and with the continuing uncertainties and changes in traffic volumes and travel patterns following the Covid-19 pandemic, a precautionary approach in reviewing the possible revocation of the AQMAs is considered appropriate to ensure reasonable certainty there would not be further objective exceedances and that below borderline concentrations would be maintained to avoid cycling between revoking and declaring the AQMAs again.

For these reasons, we do not propose to consider revocation of either AQMA at this point but the 2023 monitoring data will be reviewed and revocation considered in the 2024 Air Quality Annual Status Report, particularly in respect of the Staple Hill AQMA as it has been compliant for longer.

The trends in annual mean nitrogen dioxide concentrations in the Kingswood –Warmley and Staple Hill AQMAs are shown in Appendix A and discussed in Section 3.2.1.

Further information on the declared or revoked AQMAs, including maps, are available on the Council website [Air quality | BETA - South Gloucestershire Council \(southglos.gov.uk\)](https://www.southglos.gov.uk/air-quality) and on the Defra UK-AIR website [Local Authority Details - Defra, UK](https://uk-air.defra.gov.uk/details.aspx?category=local-authority).

Alternatively, Appendix D provides maps of the current AQMAs and the revoked Cribbs Causeway AQMA and also maps of the air quality monitoring locations in relation to the AQMAs.

**Table 2.1 – Declared Air Quality Management Areas**

AQMA Name	Date of Declaration	Pollutants and Air Quality Objectives	One Line Description	Is air quality in the AQMA influenced by roads controlled by National Highways?	Level of Exceedance: Declaration	Level of Exceedance: Current Year	Number of Years Compliant with Air Quality Objective	Name and Date of AQAP Publication	Web Link to AQAP
AQMA 2 Kingswood – Warmley	Declared 14 April 2010  Amended 25 May 2012  Amended 16 December 2015	NO <sub>2</sub> Annual Mean	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 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.	NO	45.0 µg/m <sup>3</sup> (Site 68 at façade in Kingswood AQMA as declared in 2010. NB: no ground floor exposure)	32.8 µg/m <sup>3</sup> (Site 146 at façade in Kingswood – Warmley AQMA)  28.3 µg/m <sup>3</sup> (Site 68 at façade for comparison in former Kingswood AQMA. NB: no ground floor exposure)	3 years (However, includes 2020 & 2021 Covid-19 Pandemic impacted years not typical of long-term trends)	Air Quality Action Plan for Kingswood and Staple Hill 2012  (Consultation undertaken on new draft Action Plan from 6 Dec 2022 - 31 Jan 2023)	<a href="#">Visit the 2012 Air Quality Action Plan for Kingswood and Staple Hill</a>  <a href="#">(Visit the Draft Clean Air Action Plan 2022–22026)</a>

AQMA Name	Date of Declaration	Pollutants and Air Quality Objectives	One Line Description	Is air quality in the AQMA influenced by roads controlled by National Highways?	Level of Exceedance: Declaration	Level of Exceedance: Current Year	Number of Years Compliant with Air Quality Objective	Name and Date of AQAP Publication	Web Link to AQAP
AQMA 3 Staple Hill	Declared 14 April 2010  Amended 25 May 2012	NO <sub>2</sub> Annual Mean	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 <sup>3</sup> (Site 73 in Staple Hill AQMA as declared in 2010. NB: not distance adjusted, no ground floor exposure)	29.9 µg/m <sup>3</sup> (Site 165 at façade in Staple Hill AQMA. NB: no ground floor exposure)  (Site 73 for comparison no longer operational)	5 years (However includes 2020 & 2021 Covid-19 Pandemic impacted years not typical of long term trends)	Air Quality Action Plan for Kingswood and Staple Hill 2012  (Consultation undertaken on new draft Action Plan from 6 Dec 2022 - 31 Jan 2023)	<a href="#">Visit the 2012 Air Quality Action Plan for Kingswood and Staple Hill</a>  <a href="#">(Visit the Draft Clean Air Action Plan 2022 – 2026)</a>

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

☒ South Gloucestershire Council confirm that all current AQAPs have been submitted to Defra.



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

Defra's appraisal of the combined 2021 & 2022 ASR concluded the following:

(The Council's responses are shown in brackets where appropriate)

*The report is well structured, detailed, and provides the information specified in the Guidance. The following comments are designed to help inform future reports.*

1. *There is a good discussion of annual mean concentration trends across the district. Observed trends are also presented clearly, this is encouraged.*
2. *There is detailed discussion of the impacts, opportunities, and challenges of COVID-19 for air quality within South Gloucestershire, this is commended.*
3. *The Council have provided additional information on Ozone Monitoring in the district, this is welcomed.*
4. *Some of the policy text, for example around the Environment Act, which was amended in 2021, is now outdated and so could be updated.* (Noted and updated where relevant)
5. *The Council have provided clear and accurate mapping of the diffusion tube network, which is commended.*
6. *It seems that robust and accurate QA/QC procedures have been used; the national adjustment bias has been determined and justified, this is welcomed.*
7. *Overall, this report is comprehensive and well detailed. South Gloucestershire Council are committed to improving air quality, with plans to draft an updated AQAP in 2022. Further comments on the progress of this should be included in the 2023 ASR.* (An update is provided in this report)

South Gloucestershire Council has prepared an area wide draft Clean Air Action Plan that will be the focus of our efforts in future years, once the plan is finalised and approved.

During 2022, South Gloucestershire Council have taken forward a number of direct measures in pursuit of improving local air quality. Details of the existing Air Quality Action Plan (measures completed, in progress or planned) are set out in Table 2.2.

41 measures are included within Table 2.2, with the type of measure and the progress South Gloucestershire Council have made during the reporting years of 2022 presented.

Where there have been, or continue to be, barriers restricting the implementation of the measure, these are also presented within Table 2.2.

More detail on these measures can be found in the 2012 Air Quality Action Plan for Kingswood and Staple Hill<sup>38</sup> and in related plans and strategies, such as the West of England Joint Local Transport Plan 4 (JLTP4) 2020– 2036<sup>39</sup>, which is supported by various strategies on public transport, smarter travel choices, cycling and walking and aims to address strategic transport planning in the region. One of the five key objectives within the JLTP4 is to “Take action against climate change and address poor air quality” thereby placing a greater emphasis on air quality and climate change in strategic transport planning through to 2036.

Key completed measures are:

- Under the second round of the Clean Bus Technology Fund, First Bus and CT Plus (while it was operating) have retrofitted nearly 150 buses with emissions-reducing technology.
- 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 has enabled the delivery of 98 bio-methane buses and 2 re-fuelling stations in the area. The new buses will contribute to reducing air pollution levels across the West of England area, including in the Staple Hill AQMA.
- Entire fleet of Council pool cars switched to electric in 2017, with OLEV funding secured to switch 20% of other fleet vehicles to electric in 2021.
- Lighting installed along the Bristol/Bath railway cycle path during 2014/15 and 2015/16. This work has significantly improved conditions for cyclists along this major cycling corridor which also serves the Staple Hill AQMA.
- Local Pinch Point Funding enabled improvements to the M5 motorway junctions 16 and 17 to manage the impact of planned development and reduce congestion. Works were completed during 2015/16 and have contributed to reduced nitrogen dioxide

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<sup>38</sup> [2012 Air Quality Action Plan Kingswood and Staple Hill \(southglos.gov.uk\)](https://southglos.gov.uk/2012-air-quality-action-plan-kingswood-and-staple-hill)

<sup>39</sup> [Joint Local Transport Plan - Combined Authority \(westofengland-ca.gov.uk\)](https://westofengland-ca.gov.uk/joint-local-transport-plan-combined-authority)

concentrations within the former Cribbs Causeway AQMA and should help maintain concentrations below the air quality objective.

- Capability funding was secured, which ran from July 2021 until June 2022 and replaced the previous Access funding, to continue providing support to encourage sustainable and active travel modes across South Gloucestershire. This has since been replaced by Capability and Ambition funding which supports a range of activities, including Dr Bikes and Roadshow events being delivered to Workplaces and Communities, community cycle training and specific immersive young adult cycle training and cycle maintenance training across South Gloucestershire.
- The Road Safety Team continues to work with schools to promote active travel, including school street schemes; one of which was introduced at Kings Oak Academy, Kingswood, close to the Kingswood – Warmley AQMA, in September 2020<sup>40</sup>.

Other actions progressed in South Gloucestershire and on a wider West of England regional basis aimed at reducing traffic congestion and improving air quality include:

- Kingswood Town Centre Regeneration<sup>41</sup> - West of England Combined Authority (WECA) funding from the “Love our High Streets” programme enabled investigation into the redevelopment potential of Kingswood High Street, including the possibility of re-routing traffic in Kingswood town centre. A masterplan was subsequently developed and consulted on during 2021 and work is ongoing to refine the proposals. The ability to improve local air quality will be one of the specific considerations for the final scheme.
- Metrobus - an express bus service, which started operating in 2018, aiming to speed up journey times, relieve congestion, reduce pollution, and give people improved access to key employment, education and leisure destinations<sup>42</sup>. There are currently four metrobus routes in operation; three of which run between South Gloucestershire and Bristol (M1, M3 and M4 services).

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<sup>40</sup> [Active travel to school | BETA - South Gloucestershire Council \(southglos.gov.uk\)](https://southglos.gov.uk/active-travel-to-school/)

<sup>41</sup> [Kingswood Masterplan | BETA - South Gloucestershire Council \(southglos.gov.uk\)](https://southglos.gov.uk/kingswood-masterplan/)

<sup>42</sup> [Metrobus - Travelwest](https://travelwest.co.uk/metrobus/)

- Cribbs Patchway Metrobus Extension<sup>43</sup> - this extension of the Metrobus network provides an alternative, fast and direct route between The Mall at Cribbs Causeway and Bristol Parkway railway station (and onto Bristol City centre via the University of West of England). It benefits communities in Stoke Gifford, Patchway and the forthcoming Cribbs Patchway New Neighbourhood on the former Filton Airfield site. Passenger services began in January 2023 on the M4 route.
- MetroWest<sup>44</sup> – improved rail services and infrastructure being delivered in two phases by the West of England councils, working in partnership with Network Rail and Great Western Railway. Phase 1 proposes to re-open the Portishead rail line and to enhance local passenger train services on the Bath to Bristol lines and on the Severn Beach/Avonmouth line. Phase 2 proposes to re-open the Henbury Line to an hourly spur passenger service and increase train services between Bristol Temple Meads and to Gloucester via Yate to a half-hourly service; the latter commenced from May 2023. Plans for new rail stations at Henbury, North Filton, Ashley Down and Charfield<sup>45</sup> are being developed with WECA funding.
- Cribbs Patchway New Neighbourhood Cycle Links – a £3.125m package of walking and cycling schemes has been delivered. The aim of this project is to provide walking and cycling infrastructure links to the Cribbs Patchway New Neighbourhood development site ahead of the completion of the first phase of the development, to encourage more people to choose a sustainable travel mode from the outset.
- Go Ultra Low West<sup>46</sup> - a £7m project grant funded by Office for Low Emission Vehicles (OLEV) to accelerate the purchase of electric vehicles across Bristol, South Gloucestershire, North Somerset and Bath & North East Somerset. All works have now been completed and funding utilised. Key achievements include:
  - Launched a highly successful flagship rapid charging hub at the Bristol and Bath Science Park
  - Supported the conversion of 33 electric vehicles within our own fleet

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<sup>43</sup> [m4: Cribbs Causeway to City Centre - Travelwest](#)

<sup>44</sup> [MetroWest - Travelwest](#)

<sup>45</sup> [Charfield train station | BETA - South Gloucestershire Council \(southglos.gov.uk\)](#)

<sup>46</sup> [Go Ultra Low West - Travelwest](#)

- Provided business grants to enable the installation of 73 workplace charging points which have supported over 12,000 staff
- Worked with North Somerset Council to offer over 140 West of England residents the opportunity to ‘try before you buy’ through demonstrator electric vehicles
- Implemented marketing and communications plans to promote EVs and raise awareness of our local network of Revive charging points
- Installed 46 Revive EV public charging bays.
- A38 and Bradley Stoke Way improvements – SGC are developing a scheme along the Thornbury to Bradley Stoke Way corridor aimed at improving conditions for people walking, cycling, and travelling by bus. The aim is to encourage mode shift, reduce carbon emissions and consequently improve air quality. Measures include the provision of sections of bus lane and LTN1/20 standard cycling infrastructure<sup>47</sup>. Funding has been secured to advance the scheme to detailed design and it is envisaged to be open by 2026.
- A432 Yate to Ring Road A4174 Corridor - SGC are developing a scheme along this corridor aimed at improving conditions for people walking, cycling, and travelling by bus and encourage mode shift. Measures included provision of sections of bus lane and LTN1/20 standard cycling infrastructure. Funding has been secured to advance the scheme to detailed design and it is envisaged to be open by 2026.
- South Gloucestershire Electric Vehicle (EV) Charging Strategy – was adopted in March 2023<sup>48</sup>. The strategy aims to support residents transitioning to EVs through a variety of measures, including the expansion of public charging infrastructure provision through the implementation of our ‘Community Hubs’ schemes; supporting the creation of e-mobility hubs, including the introduction of electric car clubs; exploring opportunities to encourage the provision of EV charging at workplaces and requiring new developments to adequately cater for EVs.

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<sup>47</sup> [Cycle infrastructure design \(LTN 1/20\) - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/publications/cycle-infrastructure-design-ltn-1-20)

<sup>48</sup> [Electric Vehicle Charging Strategy \(southglos.gov.uk\)](https://southglos.gov.uk/electric-vehicle-charging-strategy)

South Gloucestershire Council will also continue to engage with Bristol City Council and Bath and North East Somerset Council on their Clean Air Plans, both of which include Clean Air Zones, through meetings organised by the West of England Combined Authority.

The Bath Clean Air Zone (CAZ)<sup>49</sup> launched on 15 March 2021 and is a class C CAZ charging high-emission buses, coaches, taxis, private hire vehicles, heavy goods vehicles, vans and minibuses to travel through the zone but not private cars and motorbikes. The monitoring results have shown the average 2022 annual mean NO<sub>2</sub> concentrations within the CAZ are 26% lower than in 2019<sup>50</sup> and 27% lower in the area immediately around the CAZ.

The Bristol Clean Air Zone<sup>51</sup> launched on 28 November 2022 and, as a Class D CAZ, charges for non-compliant private cars, in addition to the vehicles listed above for the Class C CAZ. Further information about the Bristol Clean Air Plan is available on the [Clean Air for Bristol](#) website<sup>52</sup>. The Government's Vehicle Checker tool can be used to check whether there is a charge to drive any vehicle in any CAZ – [Check your vehicle \(GOV.UK\)](#).

### **A4174 Hambrook Air Quality Action**

Following the Government's UK Air Quality Plan<sup>53</sup> for nitrogen dioxide published in July 2017, South Gloucestershire Council was mandated by the Government in February 2018 to undertake a Targeted Feasibility Study. The study was required to identify actions that could be taken to reduce roadside nitrogen dioxide levels on the A4174 Ring Road between the A4017 Bromley Heath and M32 Junction 1 roundabouts to meet the annual mean NO<sub>2</sub> concentration limit (40 µg/m<sup>3</sup>) as set out in the Air Quality Standards Regulations 2010<sup>54</sup>, in the shortest time possible.

The study concluded that it would be possible to bring forward compliance on this section of the A4174 if certain traffic management measures were put in place at the Hambrook junction. The outcome of the study was approved by the Joint Air Quality Unit (JAQU); a

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<sup>49</sup> [Bath's Clean Air Zone | Bath and North East Somerset Council \(bathnes.gov.uk\)](#)

<sup>50</sup> [Bath's Clean Air Zone Annual Monitoring Report 2022 \(bathnes.gov.uk\)](#)

<sup>51</sup> [Bristol's Clean Air Zone](#)

<sup>52</sup> [Clean Air for Bristol | Clean air for everyone | Bristol Clean Air Zone](#)

<sup>53</sup> [Air quality plan for nitrogen dioxide \(NO<sub>2</sub>\) in UK \(2017\) - GOV.UK \(www.gov.uk\)](#)

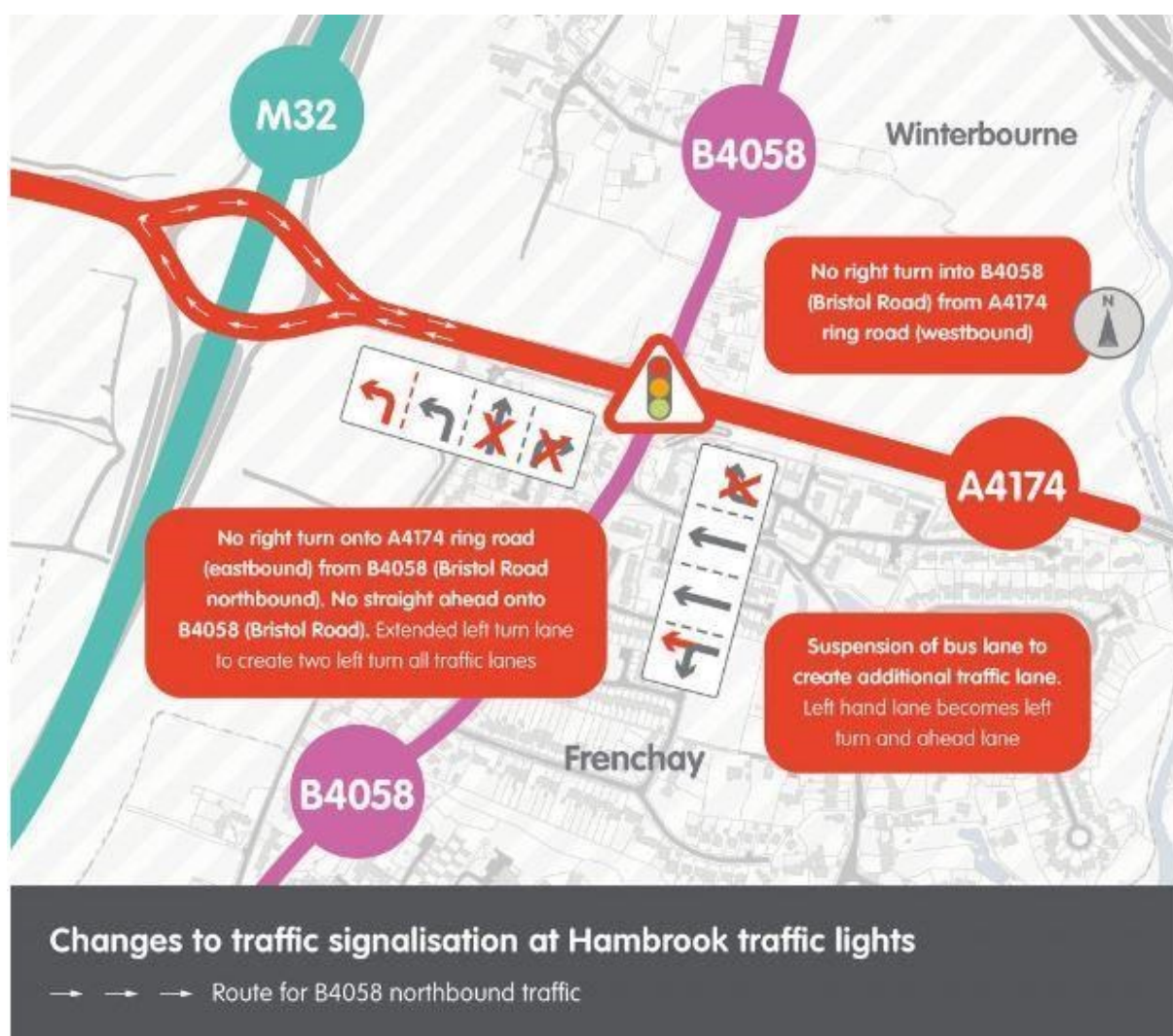
<sup>54</sup> [UK Air Quality Limits - Defra, UK](#)



joint unit formed between Defra and the Department for Transport (DfT). The feasibility studies of all 33 mandated authorities in the “third wave” of Government air quality action were used to develop the supplement<sup>55</sup> to the 2017 UK Air Quality Plan and were also published separately by Defra<sup>56</sup>.

The Council was subsequently legally directed through a further Ministerial Direction to implement the identified measures with full funding provided by JAQU. The measures shown in Figure 2.1 were implemented at the A4174 Hambrook junction on a trial basis through an Experimental Traffic Order (ETO) in August 2019.

**Figure 2.1 – Traffic measures at A4174 Hambrook Junction**



<sup>55</sup> [Supplement to the UK plan for tackling roadside nitrogen dioxide concentrations \(publishing.service.gov.uk\)](https://publishing.service.gov.uk)

<sup>56</sup> [Supplement to the UK plan for tackling roadside nitrogen dioxide concentrations: local authorities feasibility studies - Defra, UK](#)

The measures are as detailed below:

- Removal of the right turn facility onto the B4058 from the westbound carriageway of the A4174 ring road
- Removal of the straight on movement for the B4058 northbound from Frenchay
- Removal of the right turn facility from the B4058 from Frenchay onto the A4174
- Removal of the westbound bus lane on the A4174 through the junction to the M32 traffic signals.

An ETO allows a trial for a period up to 18 months so that the effectiveness of the measures can be considered before a decision is taken on whether to implement them permanently. Orders are subject to a statutory process which allows the public to comment formally and provide feedback. The consultation ran until 11 February 2020 on the Council website<sup>57</sup>.

Additional monitoring was set up at the roadside for the purposes of the trial to monitor the impact of the traffic restrictions at the junction. This is because the NO<sub>2</sub> annual mean limit value applies where there is public access (with some exceptions), so includes pedestrian and cycle paths. However, the national (UK) air quality objectives, which form the basis of the Local Air Quality Management framework, take “relevant exposure” into consideration with the objectives applying where the public are regularly present for the averaging period of the objective; so relevant exposure for the national annual mean NO<sub>2</sub> objective generally relates to long-term exposure, such as at the façades of residential properties and care homes but also schools and hospitals.

The Council has been monitoring nitrogen dioxide levels where people live near this junction for some years in line with LAQM requirements. These results show that the levels are below the national air quality objectives where people live. This is mainly because the houses are set back from the road and pollutant concentrations quickly drop off with increasing distance from the roadside.

Unfortunately, we have not been able to assess the effectiveness of the scheme during the trial period because of the impact of the Covid-19 pandemic restrictions on traffic levels, which were much reduced during 2020, and therefore not representative of

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<sup>57</sup> [HAMBROOK - A4174 Filton Road and B4058 Bristol Road, Experimental Traffic Order - STATUTORY NOTICE - South Gloucestershire Online Consultations \(southglos.gov.uk\)](#)



“normal” traffic conditions. These impacts also continued into 2021 and so both years are not considered to be very representative of long-term trends in NO<sub>2</sub> concentrations.

Consequently, the Council has not been released from the Ministerial Direction to reduce roadside nitrogen dioxide levels at this location and have been instructed by the Government’s Joint Air Quality Unit to continue monitoring as we return to more normal traffic conditions.

Further information about the scheme is available on the following webpage [Hambrook lights – changes to traffic movements | BETA - South Gloucestershire Council \(southglos.gov.uk\)](https://southglos.gov.uk/transport/hambrook-lights-changes-traffic-movements-beta-south-gloucestershire-council) and any updates will also be published here.

### **Air Quality and Public Health Progress**

Work continued to progress the alignment of the air quality agenda and public health outcomes during 2022 and it has continued to be recognised in the 2023 refresh of the 2022 – 2025 Divisional Plan for the South Gloucestershire Public Health & Wellbeing (PHWB) Division.

The Joint Strategic Needs Assessment (JSNA) was updated in 2022 and relaunched within the newly created South Gloucestershire Population Health Intelligence Portal (PHIP)<sup>58</sup>. The JSNA continues to recognise the wider determinants of health and the influence these have on physical and mental health, and on health inequalities. It also highlights the links between access to green space, housing, active travel and sustainable transport and the mutual benefits of these for both mental and physical health.

The South Gloucestershire Joint Health and Wellbeing Strategy 2021 - 2025<sup>59</sup> focusses on four “Strategic Objectives” for collective action. One of these is to “Maximise the potential of our built and natural environment to enable healthy lifestyles and prevent disease”. The Public Health division have prepared a detailed report on the above strategic objective for review and comment by the Health and Wellbeing Board. The report evidences the progress made towards the seven components of this strategic objective, which includes work contributing to reducing air pollution and maximising use of active travel and community transport.

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<sup>58</sup> [Population Health Intelligence Portal | BETA - South Gloucestershire Council \(southglos.gov.uk\)](https://southglos.gov.uk/population-health-intelligence-portal-beta-south-gloucestershire-council)

<sup>59</sup> [Joint Health and Wellbeing Strategy 2021-25 | BETA - South Gloucestershire Council \(southglos.gov.uk\)](https://southglos.gov.uk/joint-health-and-wellbeing-strategy-2021-25-beta-south-gloucestershire-council)

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. This resource was strengthened through the Public Health and Wellbeing Division 'reset' in November 2021, where a clear focus on healthy places was recognised and the 'healthy lifestyles and places' (HLP) programme area was created and has allowed for aspects of the built and natural environment to be included in the workplans of wider members of the HLP team in 2022/23. There is also a newly created built and natural environment matrix working group across Public Health, which has the aim to share developments across this field of work, including air quality.

A succession of Public Health Registrars have led on clean air work, including the 2020 – 2024 South Gloucestershire Clean Air Strategy and the 2022 Director of Public Health (DPH) Annual Report, which was entitled "Clean Air and Climate Change"<sup>60</sup>. The DPH report outlines the potential health and wellbeing impacts of clean air and climate change and recognises the commitment to strengthen the relationship between environmental health and public health to address air quality issues.

In the absence of a project officer to progress air quality work, resource from the wider Environmental Health and Public Health teams has been utilised to produce and progress the Draft Clean Air Action Plan 2022-2026 through public consultation, which took place between 6 December 2022 and 31 January 2023.

The consultation aimed to seek the views of the public and businesses who may be affected by the actions and gather opinions on the 30 proposed actions designed to improve air quality within the AQMAs and across South Gloucestershire. In total 1,285 copies of the Clean Air Action Plan were downloaded from the consultation webpage, and 119 surveys responses were received. A consultation report has been prepared to summarise the responses and is available on the [Clean Air Action Plan - South Gloucestershire Online Consultations \(southglos.gov.uk\)](https://southglos.gov.uk/clean-air-action-plan-south-gloucestershire-online-consultations) webpage. The views obtained, where appropriate, will help shape the final Clean Air Action Plan.

The Clean Air and Climate Change Board, co-chaired by the Executive Director of Place and the Director of Public Health, continues to oversee the Clean Air Strategy and Action Plan and also covers the Council's work on Climate Change. This ensures a joined-up approach across the two work areas, which are closely interlinked with often the same

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<sup>60</sup> [DPH-report-2022.pdf \(southglos.gov.uk\)](https://southglos.gov.uk/dph-report-2022.pdf)

sources and interventions and secures alignment with the Council's Climate Emergency Strategy and Action Plans<sup>61</sup>.

As work ceased on the West of England Combined Authority (WECA) Spatial Development Strategy, the Public Health team no longer regularly meet with the West of England group. However, the Public Health team, and other relevant teams, will have input into the emerging new South Gloucestershire Council Local Plan<sup>62</sup> which will provide further opportunity to recommend policies to improve air quality.

South Gloucestershire Council continues to work in close partnership with its neighbouring local authorities and the West of England Combined Authority to develop, implement and refine schemes with cross-boundary characteristics. The Council also continues to work closely with JAQU regarding the Hambrook Air Quality Scheme.

South Gloucestershire Council's priorities for the coming year are to:

- Produce the final Clean Air Action Plan, taking into consideration the outcome of the public consultation, and seek formal approval of the CAAP to enable implementation of the actions to improve air quality within the AQMAs and across South Gloucestershire as a whole.
- Continue to monitor and assess the effectiveness of the JAQU directed scheme on the A4174 at Hambrook in achieving compliance with the annual mean NO<sub>2</sub> limit value, as traffic conditions settle to a "new normal" following the Covid-19 pandemic.

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

- Significant continued pressure on local government funding, exacerbated by the energy crisis, which could impact on delivering air quality improvements, including funding for the final Clean Air Action Plan measures themselves.
- Travel patterns and traffic volumes have significantly changed following the Covid-19 pandemic. Many organisations have continued to offer flexible working arrangements to their staff, including the ability to work from home for all or part of

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<sup>61</sup> [Climate and nature emergency in South Gloucestershire | BETA - South Gloucestershire Council \(southglos.gov.uk\)](https://southglos.gov.uk/beta/climate-and-nature-emergency-in-south-gloucestershire)

<sup>62</sup> [South Gloucestershire New Local Plan | BETA - South Gloucestershire Council \(southglos.gov.uk\)](https://southglos.gov.uk/beta/south-gloucestershire-new-local-plan)

their contracted hours. This has helped reduce the pressures on the highway network (with Tuesday, Wednesday and Thursdays typically now being the busiest days akin to pre-pandemic conditions). However, the acceleration in the popularity of home delivery services has increased the number of delivery vehicles on the road. Continuing uncertainties and changes in travel behaviour make future transport trends harder to predict.

- Public transport usage continues to be well below pre-Covid-19 pandemic levels, which is impacting on the commercial viability of many bus routes with operators responding by reducing or withdrawing services. This makes it harder for travellers to choose sustainable modes of transport over the private car.
- With the increased uptake of electric powered vehicles being constrained by cost of living and supply chain issues, the knock-on impacts on fleet composition and future trends in pollutant concentrations is difficult to predict.

While South Gloucestershire Council anticipates that the measures stated above and in Table 2.2 should contribute towards continued compliance in the Kingswood - Warmley and Staple Hill AQMAs, the situation will be reviewed in light of the 2023 monitoring data (in the 2024 Annual Status Report) as to whether revocation of the AQMAs would be appropriate. The implementation of the new Clean Air Action Plan once finalised and approved, should significantly contribute to maintaining compliance and to improving air quality beyond compliance in future years.

Continuing improvement in air quality is of key importance as there is no clear evidence of a safe level of exposure to particulate matter (PM) or NO<sub>2</sub> below which there is no risk of adverse health impacts, so further reductions of PM and NO<sub>2</sub> concentrations below current targets is likely to bring additional health benefits<sup>63</sup>.

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<sup>63</sup> [Air Quality - A guide for directors of public health \(defra.gov.uk\)](https://www.defra.gov.uk/publications/default.aspx?publication=6888)

Table 2.2 – Progress on Measures to Improve Air Quality

Measure No.	Measure	Category	Classification	Year Measure Introduced in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
KS1	Travel Plan for Kingswood Civic Centre	Promoting Travel Alternatives	Workplace Travel Planning	2012		South Gloucestershire Council	Local Transport Capital Programme (LTCP)	NO	Funded	£10k - 50k	Completed	No specific target emissions reduction.	<ul style="list-style-type: none"> <li>• Reduction in solo occupancy vehicles</li> <li>• Increased cycling levels</li> <li>• Increased walking levels</li> </ul>	Action complete. Implementation of travel plan is continuous process.	
KS2	Parking review (Kingswood)	Traffic Management	Workplace Parking Levy, Parking Enforcement on highway	2015/16	2015/16	South Gloucestershire Council	LTCP	NO	Funded	£10k - 50k	Completed	None, impact considered too small to be measurable.	<ul style="list-style-type: none"> <li>• Road safety benefits</li> <li>• Reduced congestion</li> </ul>	<p>Initial parking review implemented in 2015/16 Following 2nd review three additional waiting restriction schemes delivered.</p> <p>An electric vehicle charging point with 2 vehicle capacity has been installed at Cecil Road car park in Kingswood.</p>	
KS3	Ensure air quality is a priority in development of transport schemes (Kingswood)	Transport Planning and Infrastructure	Other	2013/14	2013	South Gloucestershire Council	LTCP	NO	Funded		Completed	No specific target emissions reduction.	Number of actions taken forward within Capital Programme	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.	
KS4	Bus partnership (Kingswood) Working with operators to address AQ issues	Vehicle Fleet Efficiency	Promoting Low Emission Public Transport	2013		South Gloucestershire Council in partnership with bus operators and neighbouring local authorities	OLEV Grant	NO	Funded	£1 million - £10 million	Completed	No specific target emissions reduction.	Number of buses replaced for lower emission vehicles	<p>The £4.79m OLEV funding for bio-methane buses has enabled the delivery of 98 buses and 2 re-fuelling stations in the area.</p> <p>The latest round of Clean Bus Technology Fund (CBTF) enabled 149 buses to be retrofitted with cleaner engines.</p>	

Measure No.	Measure	Category	Classification	Year Measure Introduced in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
KS5	Review of Council Fleet to ensure lowest emission vehicles (Kingswood)	Vehicle Fleet Efficiency	Other	2016		South Gloucestershire Council	OLEV Grant	NO	Partially Funded	£100k - £500k	Implementation	No specific target emissions reduction.	Reduction in vehicle emissions		The Council has continued to introduce low or zero emission vehicles into its Fleet. All replacement vehicles introduced into the fleet meet or better the latest emission standards. The Council has also been successful in reducing its overall Fleet size. We have conducted base line assessments of CO2 emissions across the fleet to assist in targeting future emissions reductions. The Council has also introduced further charging infrastructure to allow the introduction of more electric or hybrid vehicles.
KS6	Promotion of more efficient use of taxi ranks and bus stops (Kingswood).	Vehicle Fleet Efficiency	Driver training and ECO driving aids	2013		South Gloucestershire Council in liaison with taxi operators and bus operators	Local Transport Capital Programme (LTCP)	NO	Funded	£10k - 50k	Completed	No specific target emissions reduction.	Number of bus/taxi operators signed up to programme		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.
KS7	Ensure adequate landscaping is considered within new planning applications and urban designs (Kingswood)	Policy Guidance and Development Control	Other policy	2013	2013	South Gloucestershire Council	Council Funds	NO	Funded	£10k - 50k	Completed	No specific target emissions reduction.	Number of new trees planted. NB: Data relating to the indicator for this measure is not currently available.		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.
KS8	Promotion of VOSA Smoky Vehicle Hotline (Kingswood)	Public Information	Via the Internet	2013	2013	South Gloucestershire Council	n/a	NO	Funded	< £10k	Completed	No specific target emissions reduction.	Number of vehicles reported to VOSA (data not currently available).		Information was added to the Council's website on the Exhaust emissions testing and Improving air quality webpages.

Measure No.	Measure	Category	Classification	Year Measure Introduced in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
KM1	School travel planning (Kingswood)	Promoting Travel Alternatives	School Travel Plans	2013		South Gloucestershire Council in conjunction with local schools	DfT Grant Funding	NO	Funded	£500k - £1 million	Implementation	No specific target emissions reduction.	'Hands up' surveys within participating schools indicate mode share for pupils arriving at school.	A series of interventions undertaken annually with LSTF, STTY and Access West funding since 2013 to promote sustainable travel in schools. The Road Safety Team works with schools to promote active travel across the region, including a school street scheme at Kings Oak Academy.	Further progress subject to funding availability.
KM2	Travel planning for Kingswood Town Centre (Kingswood)	Promoting Travel Alternatives	Intensive active travel campaign & infrastructure	2013		South Gloucestershire Council in conjunction with Kingswood Business Association DfT Grant Funding	DfT Grant Funding	NO	Funded	£500k - £1 million	Implementation	No specific target emissions reduction.	Measured by increased: • Cycling levels • Bus patronage • Walking levels	Measures to encourage sustainable travel were previously delivered through LSTF and STTY projects and continue with Access West. In March 2020, the DfT confirmed funding to March 2021 (Access West Y4) to continue to work with Businesses, Schools and Communities to promote and support sustainable and active travel choices. Capability Funding followed Access West Y4 and was completed at the end of Q2 2022. This builds on the previous work completed by Access West.	Further progress subject to funding availability.
KM3	Review bus terminals and timing points (Kingswood)	Vehicle Fleet Efficiency	Promoting Low Emission Public Transport	2014/15	2014/15	South Gloucestershire Council in conjunction with bus operators	Undertaken by operators	NO	Funded	< £10k	Implementation	No specific target emissions reduction.	Reduction in number of buses idling at bus stops	Review of bus network to reduce number of services terminating in AQMA. Bus stop infrastructure and parking review schemes to improve traffic flow.	



Measure No.	Measure	Category	Classification	Year Measure Introduced in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
KM4	Smarter Choices promotions/ roadshows (Kingswood)	Promoting Travel Alternatives	Intensive active travel campaign & infrastructure	2014		South Gloucestershire Council	DfT Grant Funding	NO	Funded	£500k - £1 million	Implementation	No specific target emissions reduction.	Measured by increased: • Cycling levels • Bus patronage • Walking levels Also measure by number of proactive events	The Access West project (finished March 2020) built on work delivered through LSTF and STTY, working with Businesses, Schools and Communities across South Gloucestershire to promote and support sustainable and active travel modes. Access West Yr 4 ran through 2020. Large elements of the project had to be adapted quickly in response to Covid-19 restrictions and the impact on travel and engagement work. The Project continued to run the Wheels to Work Project and the Kingswood One Stop Shop was one of the key partners. The Communities Team also continued work by Southern Brooks in uploading the Discover Guide for Kingswood to the Around Your Way microsite for promoting the local area and encouraging active travel modes. The Capability Fund followed Access West Y4 and was completed at the end of Q2 2022. This continued the work of Access West providing support to encourage sustainable and active travel modes across South Gloucestershire.	
KM5	Cycling infrastructure (Kingswood)	Transport Planning and Infrastructure	Cycle network	2015		South Gloucestershire Council	LTCP and DfT Grant Funding	NO	Partially Funded	£1 million - £10 million	Planning	No specific target emissions reduction.	Increases in numbers of cyclists.	Priority routes in the area have been identified through the Local Cycling and Walking Infrastructure Plan (LCWIP) adopted by WECA in 2020.	Further progress subject to funding availability.
KL1	ECO Stars Fleet Recognition Scheme (Kingswood)	Vehicle Fleet Efficiency	Fleet efficiency and recognition schemes	n/a		South Gloucestershire Council	Unknown at Present	NO	Not Funded		Planning	No specific target emissions reduction.	Membership numbers.	Not currently feasible to implement due to resource availability. Progression of this action is unlikely but will be reviewed as part of AQAP review.	Resource availability currently prevents implementation



Measure No.	Measure	Category	Classification	Year Measure Introduced in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
KL2	Car club (Kingswood)	Alternatives to private vehicle use	Car Clubs	n/a		South Gloucestershire Council	Unknown at Present	NO	Not Funded	£50k - £100k	Planning	No specific target emissions reduction	Car club membership	Discussions held in the past with car club operators failed to firm commitment. May be considered as part of the on-going regeneration of the Kingswood shopping area.	
KL3	Restrict traffic turning movements onto A420 (Kingswood)	Traffic Management	UTC, Congestion management, traffic reduction	n/a		South Gloucestershire Council	LTCP	NO	Partially Funded		Aborted	No specific target emissions reduction	Reduction in volume of traffic travelling towards and along A420	Traffic modelling was undertaken to test options commissioned to assess impact of LTCP and developer proposals upon air quality, however no measures were identified that improved the flow of traffic.	
KL4	Review traffic signal numbers and operations (Kingswood)	Traffic Management	UTC, Congestion management, traffic reduction	2014		South Gloucestershire Council	LTCP	NO	Partially Funded		Planning	No specific target emissions reduction.	Improved traffic speeds and reduced congestion	MOVA signalling system has been installed at 3 junctions in the AQMA to improve traffic flow. A review of mid-block pedestrian signals within the AQMA was undertaken in 2014 and recommended the removal of 1 or 2 pedestrian crossings from Kingswood High Street. The on-going regeneration of Kingswood will make substantial changes to traffic flow and access arrangements.	Implementation dependant on securing funding.
KL5	Review of delivery bays (Kingswood)	Freight and Delivery Management	Delivery and Service plans	2016/17	2016/17	South Gloucestershire Council	LTCP	NO	Funded	£50k - £100k	Completed	No specific target emissions reduction	<ul style="list-style-type: none"> <li>• Number of reported issues with delivery bays</li> <li>• Reduced congestion</li> </ul>	Entry and exit kerbing into delivery bays on the High Street have been adjusted to allow easier access and reduce delays and traffic queues. A signing review of delivery bays was completed in 2016/17.	
KL6	Controlled deliveries/ collections (Kingswood)	Freight and Delivery Management	Freight Consolidation Centre	n/a		South Gloucestershire Council	Unknown at Present	NO	Not Funded		Planning	No specific target emissions reduction	Number of delivery & collection agreements made with businesses	No further progress. The plans for Kingswood Town Centre will mean this will not be a standalone action and will be considered as part of the town centre regeneration work.	
KL7	Reclassify strategic routes and signing strategy (Kingswood)	Traffic Management	Other	n/a		South Gloucestershire Council	Unknown at Present	NO	Not Funded		Planning	No specific target emissions reduction	Reduction in traffic volumes on and travelling towards A420	No further progress. The new Clean Air Action Plan does not propose to take the measure forward.	

Measure No.	Measure	Category	Classification	Year Measure Introduced in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
KL8	Taxi ranks (Kingswood)	Promoting Low Emission Transport	Taxi emission incentives	n/a		South Gloucestershire Council in conjunction with taxi operators	Unknown at Present	NO	Not Funded		Planning	No specific target emissions reduction	Production of review report	No further progress. The new Clean Air Action Plan proposes to undertake a review of Taxi Licensing Standards across our area.	
CR39/2013	Improved pedestrian crossing facilities at High St/ Alma Rd	Promoting Travel Alternatives	Promotion of walking	2015/16	2015/16	South Gloucestershire Council	LTCP	NO	Funded	£100k - £500k	Completed	No specific target emissions reduction	Implement infrastructure improvements to promote walking	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.	
SS1	Ensure air quality is a priority in development of transport schemes (Staple Hill)	Transport Planning and Infrastructure	Other	2013	2013	South Gloucestershire Council	LTCP	NO	Funded	< £10k	Completed	No specific target emissions reduction	Number of actions taken forward within Capital Programme	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.	
SS2	Bus partnership (Staple Hill) Working with operators to address AQ issues	Vehicle Fleet Efficiency	Promoting Low Emission Public Transport	2013		South Gloucestershire Council in partnership with bus operators	OLEV Grant	NO	Funded	£1 million - £10 million	Completed	No specific target emissions reduction	Number of buses replaced for lower emission vehicles.	The £4.79m OLEV funding for bio-methane buses has enabled the delivery of 98 buses and 2 re-fuelling stations in the area.  The latest round of Clean Bus Technology Fund (CBTF) has enabled 149 buses to be retrofitted with cleaner engines.	

Measure No.	Measure	Category	Classification	Year Measure Introduced in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
SS3	Review of Council Fleet to ensure lowest emission vehicles (Staple Hill)	Vehicle Fleet Efficiency	Other	2016		South Gloucestershire Council	OLEV Grant	NO	Partially Funded	£100k - £500k	Implementation	No specific target emissions reduction.	Reduction in vehicle emissions		The Council has continued to introduce low or zero emission vehicles into its Fleet. All replacement vehicles introduced into the fleet meet or better the latest emission standards. The Council has also been successful in reducing its overall Fleet size. We have conducted base line assessments of CO2 emissions across the fleet to assist in targeting future emissions reductions. The Council has also introduced further charging infrastructure to allow the introduction of more electric or hybrid vehicles.
SS4	Promotion of more efficient use of taxi ranks and bus stops (Staple Hill)	Vehicle Fleet Efficiency	Driver training and ECO driving aids	2015		South Gloucestershire Council in liaison with taxi operators and bus operators	LTCP	NO	Funded	< £10k	Implementation	No specific target emissions reduction	Number of bus/taxi operators signed up to programme		The parking review as part of SM4 is complete. 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.
SS5	Ensure adequate landscaping is considered within new planning applications and urban designs (Staple Hill)	Policy Guidance and Development Control	Other policy	2013	2013	South Gloucestershire Council	Council Funds	NO	Funded	£10k - 50k	Completed	No specific target emissions reduction.	Number of new trees planted. NB: Data relating to the indicator for this measure is not currently available.		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.
SS6	Promotion of VOSA Smoky Vehicle Hotline (Staple Hill)	Public Information	Via the Internet	2013	2013	South Gloucestershire Council	n/a	NO	Funded	< £10k	Completed	No specific target emissions reduction.	Number of vehicles reported to VOSA (data not currently available).		Information was added to the Council's website on the Exhaust emissions testing and Improving air quality webpages.

Measure No.	Measure	Category	Classification	Year Measure Introduced in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
SM1	School travel planning (Staple Hill)	Promoting Travel Alternatives	School Travel Plans	2013		South Gloucestershire Council in conjunction with local schools	DfT Grant funding	NO	Funded	£500k - £1 million	Implementation	No specific target emissions reduction.	'Hands up' surveys within participating schools indicate mode share for pupils arriving at school.	A series of interventions undertaken annually with LSTF, STTY and Access West funding since 2013 to promote sustainable travel in schools.	Further progress subject to funding availability.
SM2	Travel planning for Staple Hill Town Centre	Promoting Travel Alternatives	Intensive active travel campaign & infrastructure	2014		South Gloucestershire Council in conjunction with Staple Hill Chamber of Trade	DfT Grant funding	NO	Funded	£500k - £1 million	Implementation	No specific target emissions reduction.	Measured by increased: • Cycling levels • Bus patronage • Walking levels	Measures to encourage sustainable travel were previously delivered through LSTF and STTY projects and continued with Access West. In March 2020, the DfT confirmed funding to March 2021 (Access West Y4) to continue to work with Businesses, Schools and Communities to promote and support sustainable and active travel choices. The Capability Fund followed Access West Y4 and was completed at the end of Q2 in 2022. This has now been replaced by the Capability and Ambition Fund which supports a range of activities across South Gloucestershire.	Further progress subject to funding availability.
SM3	Relocation of bus stops on Soundwell Road (Staple Hill)	Traffic Management	UTC, Congestion management, traffic reduction	n/a		South Gloucestershire Council	LTCP	NO	Partially Funded		Aborted	No specific target emissions reduction.	Measured by relocation of bus stop	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.	

Measure No.	Measure	Category	Classification	Year Measure Introduced in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
SM4	Parking Review (Staple Hill)	Traffic Management	Workplace Parking Levy, Parking Enforcement on highway	2014/15	2014/15	South Gloucestershire Council	LTCP	NO	Funded	£50k - £100k	Completed	Impact of action considered too small to be measurable.	Measured by: • Road safety benefits • Reduced congestion	A new electric vehicle charging point with 2 vehicle capacity has been installed at Haynes Lane car park in Staple Hill. 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.	
SM5	Smarter Choices promotions /roadshows (Staple Hill)	Promoting Travel Alternatives	Intensive active travel campaign & infrastructure	2014		South Gloucestershire Council	DfT Grant Funding	NO	Funded	£500k - £1 million	Completed	No specific target emissions reduction.	Measured by increased: • Cycling levels • Bus patronage • Walking levels Also measure by number of proactive events	The Access West project (finished March 2020) built on work delivered through LSTF and STTY, working with Businesses, Schools and Communities across South Gloucestershire to promote and support sustainable and active travel modes. Access West Yr 4 ran through 2020. Large elements of the project had to be adapted quickly in response to Covid-19 restrictions and the impact on travel and engagement work. The Capability Fund followed Access West Y4 and was completed at the end of Q2 in 2022. This has now been replaced by the Capability and Ambition Fund which supports a range of activities across South Gloucestershire.	
SM6	Cycling infrastructure (Staple Hill)	Transport Planning and Infrastructure	Cycle network	2014-16		South Gloucestershire Council	DfT Grant funding	NO	Partially Funded	£1 million - £10 million	Implementation	No specific target emissions reduction.	Increases in numbers of cyclists.	Two grant funded cycle route lighting schemes were implemented nearby between 2014 and 2016. More recently priority routes in the area have been identified through the Local Cycling and Walking Infrastructure Plan (LCWIP) adopted by WECA in 2020.	Further progress subject to funding availability.

Measure No.	Measure	Category	Classification	Year Measure Introduced in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
SL1	ECO Stars Fleet Recognition Scheme (Staple Hill)	Vehicle Fleet Efficiency	Fleet efficiency and recognition schemes	n/a		South Gloucestershire Council	Unknown at Present	NO	Not Funded		Planning	No specific target emissions reduction.	Membership numbers.	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 AQMA extension review.	Resource availability currently prevents implementation
SL2	Car club (Staple Hill)	Alternatives to private vehicle use	Car Clubs	n/a	2024	South Gloucestershire Council	Unknown at Present	NO	Not Funded	£50k - £100k	Planning	No specific target emissions reduction	Car club membership	SGC are supporting the operation of a car club in Staple Hill. Expected to be operational by March 2024.	
SL3	Review traffic signal numbers and operations (Staple Hill)	Traffic Management	UTC, Congestion management, traffic reduction	2012-13	2013/14	South Gloucestershire Council	Defra Air Quality Grant funding/ LTCP	YES	Funded		Completed	No specific target emissions reduction.	Improved traffic speeds and reduced congestion	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 AQ Grant funding.	
SL4	Review of delivery bays (Staple Hill)	Freight and Delivery Management	Delivery and Service plans	2013/14	2013/14	South Gloucestershire Council	LTCP	NO	Funded		Completed	No specific target emissions reduction	Measured by • Number of reported issues with delivery bays • Reduced congestion	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.	
SL5	Restrict traffic turning movements at A4017 junction (Staple Hill)	Traffic Management	UTC, Congestion management, traffic reduction	n/a		South Gloucestershire Council	Unknown at Present	NO	Not Funded		Planning	No specific target emissions reduction	Measured by reduction in traffic volumes at A4017 junction	No progress. The measure is not proposed to be taken forward in the new Clean Air Action Plan.	
SL6	Controlled deliveries/ collections (Staple Hill)	Freight and Delivery Management	Freight Consolidation Centre	n/a		South Gloucestershire Council	Unknown at Present	NO	Not Funded		Planning	No specific target emissions reduction	Measured by number of delivery & collection agreements made with businesses	No progress. The measure is not proposed to be taken forward in the new Clean Air Action Plan.	
SL7	Reclassify strategic routes and signing strategy (Staple Hill)	Traffic Management	Other	n/a		South Gloucestershire Council	Unknown at Present	NO	Not Funded		Planning	No specific target emissions reduction	Measured by reduction in traffic volumes on and travelling towards A4017.	No progress. The measure is not proposed to be taken forward in the new Clean Air Action Plan.	

## 2.3 PM<sub>2.5</sub> – Local Authority Approach to Reducing Emissions and/or Concentrations

As detailed in Policy Guidance LAQM.PG22 (Chapter 8), local authorities are expected to work towards reducing emissions and/or concentrations of PM<sub>2.5</sub> (particulate matter with an aerodynamic diameter of 2.5µm or less). There is clear evidence that PM<sub>2.5</sub> has a significant impact on human health, including premature mortality, allergic reactions, and cardiovascular diseases. Short term exposure is known to exacerbate the impact of pre-existing cardiovascular and respiratory health conditions, whilst long term exposure is linked to cardiovascular and respiratory disease, cancer and dementia. There is no evidence of a safe limit for PM<sub>2.5</sub> exposure.

The inclusion of indicators related to PM<sub>2.5</sub> in the Public Health Outcomes Framework (PHOF) recognises the significance of this pollutant and its health impacts.

The detail of one of these indicators (formerly known as D01) changed in May 2022. It was previously described as:

*Fraction of all cause adult mortality attributable to anthropogenic (originating from human activity) particulate air pollution (measured as fine particulate matter PM<sub>2.5</sub>).*

This has now been amended to:

*Fraction of all cause adult mortality attributable to particulate air pollution (concentrations of total PM<sub>2.5</sub>) (new method)*

The previous indicator was based on estimates of mortality burden from modelled annual average concentrations of fine particulate matter (PM<sub>2.5</sub>) originating from human activities in each local authority area.

The indicator has been amended based on recommendations made by the Committee on the Medical Effects of Air Pollutants (COMEAP). Total concentrations of PM<sub>2.5</sub>, referred to as fine particulate matter, are now used as the basis for this indicator. Modelled concentrations of the anthropogenic component of PM<sub>2.5</sub> (human-made only) are no longer used because of the uncertainty associated with the assignment to anthropogenic and non-anthropogenic sources, and because non-anthropogenic sources make only a small contribution to total concentrations.



The new indicator can be viewed as the mortality burden associated with long-term exposure to particulate air pollution at current levels, expressed as the percentage of annual deaths from all causes in those aged 30 and over.

The PHOF Indicator; Fraction of mortality attributable to particulate air pollution (new method) (2021)<sup>64</sup> for South Gloucestershire compared to the neighbouring West of England local authorities, the South West and England values are shown in Table 2.3.

**Table 2.3 – PHOF Indicator – Fraction of mortality attributable to particulate air pollution (new method) (2021)**

Area	Value (%)
England	5.5
South West Region	5.1
<b>South Gloucestershire</b>	5.7
Bristol	5.7
North Somerset	5.0
Bath and North East Somerset	5.2

Furthermore, the total concentration of PM<sub>2.5</sub> has been added as an additional PHOF indicator:

*Air Pollution: fine particulate matter (new method – concentrations of total PM<sub>2.5</sub>)*

The new PHOF indicator; Concentrations of total PM<sub>2.5</sub> (2021)<sup>65</sup> for South Gloucestershire, neighbouring local authorities, the South West and England are shown in Table 2.4.

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<sup>64</sup> [Public health profiles - Fraction of mortality attributable to particulate air pollution - OHID \(phe.org.uk\)](https://publichealthprofiles.org.uk/indicators/fraction-of-mortality-attributable-to-particulate-air-pollution/)

<sup>65</sup> [Public health profiles - Concentrations of total PM<sub>2.5</sub> - OHID \(phe.org.uk\)](https://publichealthprofiles.org.uk/indicators/concentrations-of-total-pm25/)



**Table 2.4 – PHOF Indicator – Concentrations of total PM<sub>2.5</sub> (2021)**

Area	Value (micrograms/m <sup>3</sup> )
England	7.4
South West Region	6.8
<b>South Gloucestershire</b>	7.7
Bristol	7.6
North Somerset	6.7
Bath and North East Somerset	7.0

### Public Health Intelligence Portal

In 2022, the Public Health Team in South Gloucestershire Council developed a Public Health Intelligence Portal<sup>66</sup> which is a one-stop shop for data and intelligence on the population of South Gloucestershire. The portal forms part of the South Gloucestershire Health and Wellbeing Board's Joint Strategic Needs Assessment (JSNA). Its purpose is to use data and intelligence to provide a current and comprehensive overview of the health and wellbeing of the South Gloucestershire population, framed in the context of health inequalities and local strategies. The portal utilises data from the Public Health Outcomes Framework, including the data on fine particulate matter detailed above. This ensures that this data is drawn to the attention of those using the portal and also provides a context in which the data can be used, to support a range of work both across and outside the council.

South Gloucestershire Council is taking the following measures to address PM<sub>2.5</sub>:

- The progress made in implementing measures in the existing Air Quality Action Plan, as detailed in Section 2.2, will contribute to reducing emissions and concentrations of PM<sub>2.5</sub> as while the measures are primarily aimed at reducing nitrogen dioxide, road

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<sup>66</sup> [Population Health Intelligence Portal | BETA - South Gloucestershire Council \(southglos.gov.uk\)](https://southglos.gov.uk/population-health-intelligence-portal/)

traffic is also a source of particulate matter so the implementation of measures will have co-benefits.

- Alongside measures to tackle nitrogen dioxide in the draft Clean Air Action Plan, reducing emissions and concentrations of PM<sub>2.5</sub> has been considered. The Council understands the potential co-benefits of action plan measures on multiple pollutants of concern and has followed appropriate guidance in developing the new CAAP to include measures that are likely to be beneficial in also reducing PM<sub>2.5</sub> levels.
  - The wider regional transport initiatives, such as Metrobus and the Cribbs Patchway Metrobus Extension, will contribute to reducing emissions and concentrations of PM<sub>2.5</sub>. 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<sub>2.5</sub> emissions, 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<sub>2.5</sub>.
  - Some of South Gloucestershire is covered by a Smoke Control Area<sup>67</sup> which allows only approved fuels and appliances to be used. Further expansion of the smoke control area is included as an action in the draft Clean Air Action Plan to better control particulate (and NOx) emissions from open fires and wood-burning stoves.
- Amendments to the Clean Air Act 1993 made under the Environment Act 2021, which came into force from 1 May 2022, introduced civil financial penalties as a means of enforcement in Smoke Control Areas. Enforcement in Smoke Control Areas through the Clean Air Act amendments is a key element of the Government's plan to reduce particulate pollution levels and the populations exposure to it. The Council's Environmental Health team will continue to investigate smoke complaints and are in the process of developing a financial penalties charging policy for breaches in our Smoke Control Areas.

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<sup>67</sup> [Smoke control areas | South Gloucestershire Council \(southglos.gov.uk\)](https://www.southglos.gov.uk/Smoke-control-areas)

- The Council will also continue to promote initiatives such as the “Ready to burn” scheme. Understanding the right fuels and the right way to use them is explained in the [“Open fires and wood-burning stoves”](#) guidance leaflet<sup>68</sup> issued by Defra. The measures outlined for reducing emissions include:
  - Choosing the right stove – consider using an ‘Eco-design’ stove as they produce lower emissions
  - 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 May 2021, the Air Quality (Domestic Solid Fuels Standards) (England) Regulations 2020<sup>69</sup> came into force. These regulations have been introduced to reduce particulate emissions from the residential burning of wood and other solid fuels in domestic heating appliances. The sale of traditional house (bituminous) coal has been phased out<sup>70</sup> and the burning of unseasoned “wet” wood has been limited, through tighter controls on the supply, distribution and sale of wood. Burning wet wood can result in at least twice the amount of smoke emissions produced than when seasoned or dry wood is burned. These regulations are being enforced by the Council where appropriate.

## PM<sub>2.5</sub> Targets

While the responsibility for meeting the PM<sub>2.5</sub> targets sits with national government; local authorities have a role to play in delivering reductions in PM<sub>2.5</sub>. Although there is no PM<sub>2.5</sub> regulatory standard for local authorities, the pre-existing annual mean limit value of 20 µg/m<sup>3</sup> and the exposure reduction target of 20% reduction in concentrations at urban background locations between 2010 and 2020, are a guide. The Environment Act 2021

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<sup>68</sup> [Open fires wood burning stoves - guide-A4-update-12Oct \(defra.gov.uk\)](#)

<sup>69</sup> [The Air Quality \(Domestic Solid Fuels Standards\) \(England\) Regulations 2020 \(legislation.gov.uk\)](#)

<sup>70</sup> [Selling coal for domestic use in England - GOV.UK \(www.gov.uk\)](#)

also introduced new PM<sub>2.5</sub> targets through The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023. These are:

- Annual mean concentration target of 10 µg/m<sup>3</sup> to be met by 2040 (with an interim target of 12 µg/m<sup>3</sup> by 2028). This is to be assessed at national AURN monitoring locations.
- A population exposure reduction target of 35% by 2040, compared to 2018 (with an interim target of 22% reduction in exposure compared to 2018, by 2028). This will be assessed by national modelling.

PM<sub>2.5</sub> monitoring started in August 2021 at the Stoke Gifford automatic monitoring site on the A4174 Ring Road near Coldharbour Lane and the University of the West of England (UWE). This site, which also monitors NO<sub>2</sub>, PM<sub>10</sub> and Ozone (O<sub>3</sub>), was set up as part of the Council's "Umbrella" Network for the air quality use case, to provide reference standard pollutant measurements for comparison with data from a network of low-cost indicative sensors located along the A4174 Ring Road from the Bristol and Bath Science Park at Lyde Green to the UWE Frenchay campus. Further information regarding the Umbrella Network is available on the Council website at [UMBRELLA network | BETA - South Gloucestershire Council \(southglos.gov.uk\)](https://southglos.gov.uk/umbrella-network-beta).

The PM<sub>2.5</sub> monitoring results from the Stoke Gifford A4174 automatic monitoring site are provided in Table A.8 in Appendix A and discussed in Section 3.2.3. In summary, the PM<sub>2.5</sub> annual mean for 2022 was 9 µg/m<sup>3</sup> which is below the pre-existing limit and new target annual means.

To provide an indication of the long-term trends, the local PM<sub>2.5</sub> concentrations have also been estimated from the PM<sub>10</sub> concentrations measured at the Yate automatic monitoring site, using the method specified in Technical Guidance LAQM TG16 Box 7.7 for 2010 to 2020, and from 2021, the concentrations have been estimated as per LAQM.TG22<sup>71</sup> using national roadside factor provided for each year. The estimated PM<sub>2.5</sub> values are compared to the monitored PM<sub>2.5</sub> concentrations at the nearest AURN monitoring station (Bristol St Paul's) and the results are presented in Table A.11 in Appendix A.

The estimated PM<sub>2.5</sub> concentration of 5.6 µg/m<sup>3</sup> in 2022 is also below the pre-existing annual mean limit and the new target annual means. The estimated PM<sub>2.5</sub> concentration shows a greater reduction (45%) in concentrations between 2010 and 2020 than the pre-

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<sup>71</sup> [Estimating PM2.5 from PM10 Measurements | LAQM \(defra.gov.uk\)](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/614441/Estimating_PM2.5_from_PM10_Measurements_LAQM.pdf)

existing 20% reduction target. A greater reduction (38.5%) in concentrations between 2018 to 2022 is also shown in a shorter time period than both the new targets of 35% reduction in exposure, compared to 2018, by 2040 and the interim target of 22% reduction by 2028.

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

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

#### 3.1 Summary of Monitoring Undertaken

##### 3.1.1 Automatic Monitoring Sites

South Gloucestershire Council undertook automatic (continuous) monitoring at three sites during 2022; Yate (NO<sub>2</sub> and PM<sub>10</sub>), Stoke Gifford on the A4174 Ring Road near Coldharbour Lane and the University of West England (NO<sub>2</sub>, PM<sub>10</sub>, PM<sub>2.5</sub> and Ozone (O<sub>3</sub>)) and at a new site on the A4174 Ring Road at Hambrook (NO<sub>2</sub>) from April 2022. Table A.1 in Appendix A shows the details of the automatic monitoring sites.

The [Air Quality in the United Kingdom \(ukairquality.net\)](https://ukairquality.net) website presents the automatic monitoring results for South Gloucestershire Council. National automatic monitoring results are available through the Defra UK-Air website<sup>72</sup>.

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

##### 3.1.2 Non-Automatic Monitoring Sites

South Gloucestershire Council undertook non- automatic (i.e. passive) monitoring of NO<sub>2</sub> at 92 sites during 2022. Table A.2 in Appendix A presents the details of the non-automatic sites.

Triplicate monitoring (using three diffusion tubes) was undertaken at the three automatic monitoring sites in Yate (Diffusion Tube ID 4A, B & C), Stoke Gifford (192A, B & C) and

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<sup>72</sup> [Home - Defra, UK-AIR](https://ukairquality.net)

Hambrook (191A, B & C) for the co-location studies during 2022. The triplicate monitoring co-location sites at Stoke Gifford and Hambrook were newly set up in 2022.

An additional new (single) site was set up in Kingswood - 2 Hill Street (site 189) at a potential worse-case location that better represents relevant exposure and to ensure continued spatial coverage within the Kingswood – AQMA on the cessation of Sites 96 & 98 in Kingswood (see below).

The following nine diffusion tube sites ceased operation early in 2022:

- Site 36 Hambrook – Whiteshill (M4 East of M32) because monitored concentrations have been consistently well below the annual mean objective.
- Site 96 Kingswood – 71 High Street SGYH Youth Housing because monitored concentrations have been consistently below the annual mean objective. Also the site has been replaced with new site 189 in 2022 at a potential worse case location that better represents relevant exposure.
- Site 98 Kingswood – High Street Sainsbury's Local façade because monitored concentrations have been consistently below the annual mean objective and there is no relevant exposure. This site has been replaced with new site 189 in 2022 at a potential worse case location that better represents relevant exposure.
- Site 101 Staple Hill – High Street Beech House because monitored concentrations have been consistently below the annual mean objective. Also the site suffered in recent years from missing tubes resulting in low data capture.
- Site 106 Stoke Gifford – 73 Hambrook Lane façade because monitored concentrations have been consistently well below the annual mean objective. The site was originally set up for a Detailed Assessment for moving railway locomotives in 2012 and was retained to monitor long-term trends but no longer serves any purpose following electrification of the London Paddington – Swansea line within South Gloucestershire.
- Site 144 Warmley – 8 Tower Road North façade because monitored concentrations have been consistently below the annual mean objective.
- Site 145 Warmley – 1 London Road/Cycle Path because monitored concentrations have been consistently below the annual mean objective.
- Site 171 Soundwell – 225 Soundwell Road façade because monitored concentrations have been consistently below the annual mean objective.

- Site 186 Warmley – High Street/Tower Road North Junction because monitored concentrations have been consistently below the annual mean objective. This site was previously a triplicate site which was co-located with an AQ Mesh monitor. The triplicate monitoring ceased following the removal of the AQ Mesh in early 2021 due to the unreliability of the instrument sensors, which resulted in insufficiently robust datasets to undertake comparison of the monitoring datasets. The single tube site remained in situ during 2021 but ceased operation in 2022 as there is another site (139) nearby at façade that better represents relevant exposure.

Two triplicate sites; Site 87A, B and C Cribbs Causeway – Blackhorse Hill Holly wood Cottage façade in the former Cribbs Causeway AQMA and site 147A, B and C Soundwell – 264 Soundwell Road façade, a previously borderline site, also ceased and operated as single tube sites from 2022 because concentrations have remained consistently below the annual mean objective at both sites. In 2022, the sites operated as single tube sites and monitoring will continue to ensure compliance is maintained.

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

## 3.2 Individual Pollutants

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

The results of the Ozone monitoring at the Stoke Gifford A4174 Ring Road automatic monitoring site are reported separately in Appendix F as the Ozone objective is not included in the local air quality management regime due to the transboundary nature of this pollutant.

### 3.2.1 Nitrogen Dioxide (NO<sub>2</sub>)

Table A.3 and Table A.4 in Appendix A compare the ratified and adjusted monitored NO<sub>2</sub> annual mean concentrations from the automatic and non-automatic (diffusion tube) sites respectively for the past five years with the air quality objective of 40µg/m<sup>3</sup>. Note that the



concentration data presented represents the concentration at the location of the monitoring site, following the application of bias adjustment and annualisation, as required (i.e. the values are exclusive of any consideration to fall-off with distance adjustment).

### **Automatic Monitoring Data**

The automatic monitoring results at the Yate, Stoke Gifford A4174 and Hambrook A4174 sites show the NO<sub>2</sub> concentrations were below the annual mean objective of 40 µg/m<sup>3</sup> in 2022 (Table A.3).

At Yate, the 2022 annual mean of 13 µg/m<sup>3</sup> was well below the objective and is a decrease on the 2020 and 2021 annual means of 14 µg/m<sup>3</sup> and 15 µg/m<sup>3</sup> respectively. It also shows a 31% decrease from the pre-pandemic 2019 annual mean of 19 µg/m<sup>3</sup>. This is similar to the trends observed across the national automatic urban and rural monitoring network (AURN) roadside sites where the average 2022 NO<sub>2</sub> annual mean concentration decreased slightly from the 2021 concentrations and remained 24% lower than the concentrations in 2019.

The trends in the annual mean NO<sub>2</sub> concentrations at the automatic monitoring sites are presented in Figure A.1 (Appendix A). The long-term trend data for Yate shows an overall continuing decline in annual mean nitrogen dioxide concentrations since 2012 when the monitored annual mean concentration was 27 µg/m<sup>3</sup>.

At the newer A4174 Ring Road automatic monitoring sites, the 2022 annual mean at the Stoke Gifford site near Coldharbour Lane was 21 µg/m<sup>3</sup> which is a marginal decrease on the 2021 annualised NO<sub>2</sub> mean of 21.4 µg/m<sup>3</sup>. At the Hambrook site, the annualised mean was 29.6 µg/m<sup>3</sup>. The higher concentrations at these sites compared to Yate is likely due to the much higher traffic volumes on the A4174 Ring Road.

Table A.5 in Appendix A compares the ratified continuous monitored NO<sub>2</sub> hourly mean concentrations for the past five years with the air quality objective of 200 µg/m<sup>3</sup>, not to be exceeded more than 18 times per year. In 2022, the maximum 1-hour mean at Yate was 80 µg/m<sup>3</sup> so the 1-hour mean objective was not exceeded.

At the Stoke Gifford A4174 Ring Road site, the maximum 1-hour mean was 128 µg/m<sup>3</sup> (with the peak occurring in January) and coincidentally at the Hambrook A4174 site, the maximum 1-hour mean was also 128 µg/m<sup>3</sup> (with the peak occurring in August). There were no exceedances of the 1-hour mean objective at either Ring Road site.

## **Non-Automatic (Diffusion tube) Monitoring Data**

The NO<sub>2</sub> annual mean concentrations from the diffusion tube monitoring sites are provided in Table A.4 in Appendix A. The reported data has been bias adjusted and annualised.

The full 2022 dataset of monthly mean values for the diffusion tubes is provided in Appendix B. Note that the concentration data presented in Table B.1 includes distance corrected values, only where relevant.

## **Discussion of 2022 Diffusion Tube Monitoring Data**

### **Exceeding sites**

In 2022, there were no exceedences of the annual mean objective at the LAQM diffusion tube monitoring sites in South Gloucestershire, including in the AQMAs. This was also the case in 2020 and 2021, mainly due to the Covid-19 pandemic restrictions on travel during 2020, which continued into 2021, although to a lesser degree.

In comparison, prior to the Covid-19-pandemic, there was an exceedance measured at one monitoring site in South Gloucestershire in both 2019 and 2018. The single exceeding site was located in the Kingswood – Warmley AQMA at site 146 Kingswood - 34 Hill Street and is at a façade with relevant residential exposure.

In the Staple Hill AQMA, the last exceedance was monitored at one site in 2017. However, relevant exposure was set back from the exceeding site (site 75) and the result at façade when adjusted for distance, was below the objective. A new site at façade (site 164) set up in 2017, which represented relevant exposure better than site 75, showed no exceedance. These two sites ran concurrently until monitoring ceased at site 75 at the end of 2019 when site 164 effectively replaced it.

In the former Cribbs Causeway AQMA, the monitored concentration (22.6 µg/m<sup>3</sup>) at the façade of the single residential property was well below the annual mean objective in 2022, demonstrating sustained compliance where there was relevant exposure and justifying the revocation of the AQMA in July 2020.

As there were no exceedences of the annual mean objective of 40 µg/m<sup>3</sup> in 2022 at the LAQM diffusion tube monitoring sites, consequently there were no annual means greater than 60 µg/m<sup>3</sup>, which indicates compliance with the 1-hour mean objective.

## Borderline Exceedances

There was one site (site 188) approaching the objective (i.e. within 10% of the objective at  $36 \mu\text{g}/\text{m}^3$  or above) in 2022. The same site was also borderline in 2021, the year in which it was set up. There were no borderline sites in 2020. This compares to a total of eight sites that were borderline in 2019 pre-pandemic; two of which were in the Kingswood – Warmley AQMA (sites 68 and 95), five were in the Staple Hill AQMA (sites 61, 62, 73, 75 and 165) and one was outside of the AQMAs (site 147B - part of a triplicate site) located in Soundwell.

Site 188 is located in the north Bristol fringe and is outside of the AQMAs. It is a roadside monitoring site adjacent to the A38 Gloucester Road in Patchway close to the junction with Hayes Way, which serves as a link to new development within the Cribbs Patchway new neighbourhood and retail and leisure facilities at Cribbs Causeway.

The annual mean  $\text{NO}_2$  concentration at Site 188 was the highest monitored in 2022 at  $38.7 \mu\text{g}/\text{m}^3$ , although this was marginally lower than in 2021 ( $38.8 \mu\text{g}/\text{m}^3$ ). However, as the site is not located at façade, the result has been distance adjusted using the Diffusion Tube Data Processing Tool<sup>73</sup>. Distance adjustment to the nearest façade of relevant exposure reduced the annual mean concentration to  $36.1 \mu\text{g}/\text{m}^3$ , so the site remained marginally above the borderline level of  $36 \mu\text{g}/\text{m}^3$ . Further information is provided in Appendix C and the distance adjustment calculation is shown in Table C.3. This site will continue to be closely observed and planning developments that may affect future nitrogen dioxide concentrations at this site will be carefully considered.

## Trends in Annual Mean Nitrogen Dioxide Concentrations

In 2022, annual mean nitrogen dioxide concentrations across the LAQM diffusion tube monitoring sites in South Gloucestershire very slightly increased by an average of 1% from the 2021 results. However, overall since 2019, the annual mean  $\text{NO}_2$  concentration across the long-term LAQM diffusion tube monitoring sites reduced by 17% on average. This compares reasonably well with the trend observed across the national automatic urban and rural monitoring network roadside sites where the average 2022  $\text{NO}_2$  annual mean concentration was 24% lower than in 2019.

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<sup>73</sup> <https://laqm.defra.gov.uk/air-quality/air-quality-assessment/diffusion-tube-data-processing-tool/>

The overall reducing trend in NO<sub>2</sub> concentrations since 2019 is likely to be due to the combination of the Covid-19 pandemic restrictions initially and ongoing change in travel behaviour since, along with a cleaner vehicle fleet as newer, cleaner vehicles replace older, more polluting vehicles. Pollutant concentrations can also vary significantly from one year to the next due to the influence of meteorological conditions.

In the Kingswood – Warmley AQMA, the annual mean NO<sub>2</sub> concentrations decreased by an average of 1.7% from 2021 to 2022 at the monitoring sites in the AQMA. From 2019 to 2022, the annual mean concentrations reduced by an average of 21.5% in the AQMA.

Until 2020, site 146 on Hill Street in the Kingswood – Warmley AQMA had consistently exceeded the annual mean objective since 2014, and it remained as the only exceeding LAQM site in South Gloucestershire in 2018 and 2019. The pre-pandemic exceedances were likely due to the property façade being very close to the road (approximately 1.6m from the kerb) and that it is on an uphill section of the A420 main road, so vehicles have to work harder to travel up the hill and produce more emissions. In 2022, the highest annual mean concentration in the AQMA was monitored at this site (32.8 µg/m<sup>3</sup>), however, this shows a 4% decrease from 34.1 µg/m<sup>3</sup> in 2021. In comparison to 2019 when the site last exceeded the objective with an annual mean concentration of 42.3 µg/m<sup>3</sup>, there has been an overall decrease of 23% in NO<sub>2</sub> concentrations.

In the Staple Hill AQMA, the annual mean NO<sub>2</sub> concentrations marginally increased by an average of 0.25% from 2021 to 2022 at the monitoring sites in the AQMA. Overall, from 2019 to 2022, the annual mean concentrations have reduced by an average of 18% in this AQMA. The 2022 concentrations were below the borderline level of 36 µg/m<sup>3</sup> at all the monitoring sites in the AQMA, with the highest concentration (31.9 µg/m<sup>3</sup>) monitored at site 61 – 1 Broad Street. However, as this site is not at façade, adjusting for distance reduces this to 30.3 µg/m<sup>3</sup> at façade. The highest monitored concentration at façade was 29.9 µg/m<sup>3</sup> at site 165 – 3 Soundwell Road.

The Kingswood – Warmley AQMA has been compliant with both the annual mean objective and borderline level for 3 years (2020 – 2022), and the Staple Hill AQMA has been compliant with the annual mean objective for 5 years (2018 – 2022) and borderline level for 3 years (2020 – 2022). For the reasons discussed previously in Section 2.1, it is not proposed to consider revocation of either AQMA at this point but the 2023 monitoring data will be reviewed and revocation considered in the 2024 Air Quality Annual Status Report, particularly in respect of the Staple Hill AQMA as it has been compliant for longer.

The trends in annual mean nitrogen dioxide concentrations measured at the diffusion tube monitoring sites in the Kingswood - Warmley and Staple Hill Air Quality Management Areas are shown in graphs in Appendix A. Aside from the significant decreases in concentrations in 2020 due to Covid-19 pandemic impacts, an overall gradual downward trend can be seen in nitrogen dioxide concentrations in the Kingswood – Warmley and Staple Hill AQMAs over the past decade. For ease of reference, the diffusion tube monitoring results for the Kingswood – Warmley and Staple Hill AQMAs can be found in Table A.9 and Table A.10 respectively.

With a borderline site in 2022 outside of the AQMAs at site 188 in Patchway (on A38 Gloucester Road near the junction with Hayes Way), this indicates a potential area of concern away from the AQMAs where efforts have previously focused. This further emphasises the need for the new Clean Air Action Plan which aims to improve air quality across the whole district.

### 3.2.2 Particulate Matter (PM<sub>10</sub>)

The PM<sub>10</sub> monitoring data has been adjusted to gravimetric equivalent using the appropriate factor depending on instrument type and annualised where relevant (see Appendix C).

Table A.6 in Appendix A compares the ratified and adjusted monitored PM<sub>10</sub> annual mean concentrations for the past five years with the air quality objective of 40µg/m<sup>3</sup>. In 2022, the PM<sub>10</sub> concentrations measured at the Yate and Stoke Gifford A4174 automatic sites were below the annual mean objective.

The 2022 PM<sub>10</sub> annual mean at Yate was 12 µg/m<sup>3</sup>, which is the same as the 2021 annual mean. It shows a slight decrease in comparison to pre-pandemic annual mean of 13 µg/m<sup>3</sup> in 2019 but remains slightly higher than the 2020 annual mean of 11 µg/m<sup>3</sup>. This is similar to the trend in annual average PM<sub>10</sub> concentrations observed at the national AURN roadside sites which have remained relatively stable between 2015 and 2022 but overall, roadside PM<sub>10</sub> pollution has reduced in the longer-term.

The trends in the annual mean PM<sub>10</sub> concentrations at the automatic monitoring sites are presented in Figure A.2 (Appendix A). The long-term trend data for Yate shows that overall, the annual mean PM<sub>10</sub> concentrations at Yate have been slowly declining over the last decade from 16 µg/m<sup>3</sup> in 2012.

At the newer automatic site Stoke Gifford A4174, the annual  $PM_{10}$  mean for 2022 was  $20 \mu\text{g}/\text{m}^3$ , which is a notable increase from the 2021 annual mean of  $15.5 \mu\text{g}/\text{m}^3$ , however this was an annualised mean as the site began operating in August 2021. The higher concentrations at this site than those monitored at Yate is likely to be due to the much greater volume of traffic on the A4174 Ring Road and the relative proximity of the M32 and M4 motorways.

Table A.7 in Appendix A compares the ratified continuous monitored  $PM_{10}$  daily mean concentrations for the past five years with the air quality objective of  $50 \mu\text{g}/\text{m}^3$ , not to be exceeded more than 35 times per year.

In 2022, at Yate, the maximum 24-hour mean was  $31 \mu\text{g}/\text{m}^3$  so the daily limit was not exceeded. At the Stoke Gifford A4174 site, the maximum 24-hour mean was  $64 \mu\text{g}/\text{m}^3$  and there were 3 exceedances of the 24-hour daily mean (on 13<sup>th</sup> January, 24<sup>th</sup> and 25<sup>th</sup> March). However there is an allowance of 35 days, so the objective was not exceeded.

### 3.2.3 Particulate Matter ( $PM_{2.5}$ )

South Gloucestershire Council started monitoring  $PM_{2.5}$  from August 2021 at the new automatic monitoring site in Stoke Gifford on the A4174 Ring Road near Coldharbour Lane and the University of the West of England. The  $PM_{2.5}$  measurements are made using a smart heated BAM 1020 and do not require correction.

Table A.8 in Appendix A presents the ratified and adjusted monitored  $PM_{2.5}$  annual mean concentrations for the past two years from the Stoke Gifford automatic monitoring site.

The  $PM_{2.5}$  annual mean for 2022 was  $9 \mu\text{g}/\text{m}^3$  which is a slight increase on the 2021 annualised mean of  $7.4 \mu\text{g}/\text{m}^3$ . However, this is below the pre-existing annual mean limit of  $20 \mu\text{g}/\text{m}^3$  and the new annual mean concentration target of  $10 \mu\text{g}/\text{m}^3$  to be met by 2040 (and the interim target of  $12 \mu\text{g}/\text{m}^3$  by 2028) introduced by The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023.

While these targets are not set as an LAQM standard because the responsibility for meeting  $PM_{2.5}$  targets sits with national government; local authorities have a role to play in delivering reductions in  $PM_{2.5}$  as discussed previously in Section 2.3.

## Appendix A: Monitoring Results

**Table A.1 – Details of Automatic Monitoring Sites**

Site ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) <sup>(1)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Inlet Height (m)
SG1	Yate Station Road	Roadside	370418	182525	NO <sub>2</sub> PM <sub>10</sub>	NO	Chemiluminescent Gravimetric (BAM 1020 Unheated)	N/A	6	NO <sub>2</sub> 1.6 PM <sub>10</sub> 1.8
SG2	Stoke Gifford A4174 Coldharbour Lane	Roadside	362384	178562	NO <sub>2</sub> PM <sub>10</sub> PM <sub>2.5</sub> O <sub>3</sub>	NO	Chemiluminescent Gravimetric (BAM 1020 Smart Heated) Gravimetric (BAM 1020 Smart Heated) Absorption	N/A	10.2	NO <sub>2</sub> 2.7 PM <sub>10</sub> 2.9 PM <sub>2.5</sub> 2.9 O <sub>3</sub> 2.7
SG3	Hambrook A4174 Old Gloucester Road	Roadside	363772	178501	NO <sub>2</sub>	NO	Chemiluminescent	N/A	6.3	1.5

**Notes:**

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

(2) N/A if not applicable



**Table A.2 – Details of Non-Automatic Monitoring Sites**

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) <sup>(1)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Tube Co-located with a Continuous Analyser?	Tube Height (m)
1	Yate - 88 Station Road The Candle	Roadside	370692	182499	NO2	No	4.6	2.5	No	2.7
4A, 4B, 4C	Yate - Station Road Co-location	Roadside	370418	182525	NO2	No	N/A	6.0	Yes	2.4
10	Filton - 152 Gloucester Road North Pizza Bello façade	Roadside	360266	179136	NO2	No	0.0	3.5	No	2.3
11	Thornbury - 48 High Street Uniq Family Wealth	Roadside	363654	189893	NO2	No	2.8	0.6	No	2.5
12	Stoke Gifford - Church Road rear of Aviva	Roadside	362161	179570	NO2	No	N/A	1.0	No	2.6
13	Filton – A4174 MOD roundabout	Roadside	361523	178732	NO2	No	N/A	1.0	No	2.3
21	Downend - Boscombe Crescent St Augustine's Church	Urban Background	365673	177475	NO2	No	N/A	1.5	No	2.5
27	Kingswood - 90 Regent Street Nat West façade	Roadside	364866	173835	NO2	Yes (Kingswood - Warmley)	0.0	2.0	No	2.8
29	Staple Hill - 123 High Street Backhouse Bet	Roadside	364822	175932	NO2	Yes (Staple Hill)	2.0	1.0	No	2.7
34	Bradley Stoke - 109 Ormonds Close (M4 East of Almondsbury Interchange)	Roadside	362395	182544	NO2	No	11.0	24.8 (M4 33)	No	2.5
35	Bradley Stoke - Woodlands Lane (M4 East of Almondsbury Interchange)	Roadside	362118	183031	NO2	No	9.8	3.3 (M4 22.5)	No	2.5



Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) <sup>(1)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Tube Co-located with a Continuous Analyser?	Tube Height (m)
37	Almondsbury - Old Aust Road (M4 West of Almondsbury Interchange)	Roadside	361147	184846	NO2	No	N/A	7 (M4)	No	2.3
38	Severn Beach - Ableton Lane Severn Beach Primary School façade	Urban Background	354282	184653	NO2	No	0.0	49.0	No	2.3
44	Stoke Gifford - Hatchet Road	Roadside	362061	180025	NO2	No	14.0	4.0	No	2.8
46	Winterbourne - High Street opp Winterbourne Academy	Roadside	364852	180758	NO2	No	16.5	1.3	No	2.6
53	Hambrook - Bristol Road rear of 17 Fenbrook Close	Roadside	363907	178389	NO2	No	16.0	6.5	No	1.9
54	Longwell Green - A431/Aldermoor Way	Roadside	365256	171656	NO2	No		1.5	No	2.7
57	Coalpit Heath - 225 Badminton Road GT Plumbing & Heating	Roadside	367742	181160	NO2	No	12.0	2.0	No	2.5
61	Staple Hill - 1 Broad Street William Hill	Roadside	364926	175926	NO2	Yes (Staple Hill)	1.0	2.3	No	2.5
62	Staple Hill - 2 Broad Street 501 Bar façade	Roadside	364909	175908	NO2	Yes (Staple Hill)	0.0	1.5	No	2.4
63	Patchway - 28 Park Leaze	Roadside	359487	182479	NO2	No	8.0	1.5	No	2.5
67	Kingswood - 40 Regent Street Hays Travel façade	Roadside	364671	173877	NO2	Yes (Kingswood - Warmley)	0.0	2.5	No	2.8
68	Kingswood - 26-32 Regent Street Store Twenty One façade	Roadside	364631	173886	NO2	Yes (Kingswood - Warmley)	0.0	2.5	No	2.6

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) <sup>(1)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Tube Co-located with a Continuous Analyser?	Tube Height (m)
69	Kingswood - 12 Regent Street Domino's Pizza façade	Roadside	364597	173892	NO2	Yes (Kingswood - Warmley)	0.0	2.5	No	2.6
70	Kingswood - Two Mile Hill Road Job Centre Plus façade	Roadside	364533	173896	NO2	Yes (Kingswood - Warmley)	0.0	2.5	No	2.5
71	Staple Hill - 11 The Square Bunch Florist	Roadside	365075	175918	NO2	Yes (Staple Hill)	0.5	6.5	No	2.7
72	Staple Hill - 25 Broad Street Westbury Inks	Roadside	364990	175920	NO2	Yes (Staple Hill)	6.5	1.5	No	2.7
74	Staple Hill - 29-31 Soundwell Rd opp Page Comm Assoc	Roadside	364885	175772	NO2	Yes (Staple Hill)	4.0	0.4	No	2.7
76	Staple Hill - 84-86 High Street Staple Hill Oak Pub façade	Roadside	364722	175926	NO2	Yes (Staple Hill)	0.0	2.0	No	2.7
83	Chipping Sodbury - 51A Broad Street façade	Roadside	372791	182241	NO2	No	0.0	4.7	No	2.2
87	Cribbs Causeway - Blackhorse Hill Hollywood Cottage facade	Roadside	357739	181334	NO2	No	0.0	13.0	No	1.7
92	Kingswood - Regent Street Entertainment & Sports Club	Roadside	364968	173836	NO2	Yes (Kingswood - Warmley)	0.0	2.0	No	2.7
93	Kingswood - Hanham Road Exchange Court Flats	Roadside	364979	173801	NO2	Yes (Kingswood - Warmley)	0.0	2.0	No	2.4
95	Kingswood - 45 High Street Adam Lee	Roadside	365078	173846	NO2	Yes (Kingswood - Warmley)	0.0	2.7	No	3.3

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) <sup>(1)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Tube Co-located with a Continuous Analyser?	Tube Height (m)
105	Staple Hill - 2 North Street	Roadside	364932	176147	NO2	Yes (Staple Hill)	2.5	2.0	No	2.9
113	Patchway - 5 Falcon Close façade	Roadside	359112	181909	NO2	No	0.0	7.5 (M5 45)	No	1.9
114	Pilning - 23 Keens Grove façade	Roadside	355263	185351	NO2	No	0.0	7.0	No	2.3
115	Pilning - 2 Wick Road façade	Roadside	355212	185360	NO2	No	0.0	8.5	No	2.3
117	Filton Northville - 29 Gloucester Rd Nth Rowe Vets	Roadside	359874	178259	NO2	No	2.5	2.9	No	2.5
119	Filton - 137 Gloucester Rd Nth	Roadside	360263	179250	NO2	No	0.5	3.6	No	2.5
122	Filton - 549 Filton Avenue	Roadside	360566	178229	NO2	No	4.5	4.0	No	2.1
124	Filton - 702a Filton Ave Way Ahead	Roadside	360918	178905	NO2	No	6.6	1.9	No	2.3
125	Filton - 71 Station Rd	Roadside	360891	179005	NO2	No	5.4	0.5 (A4174 9.3)	No	2.5
128	Kingswood - 109 Downend Road	Roadside	364587	174431	NO2	No	1.6	1.4	No	2.4
129	Cribbs Causeway – 1 Holly Cottages façade	Roadside	357508	181059	NO2	No	0.0	18 (M5 44)	No	2.1
132	Hanham - 66 High St Sassy Hair Studio	Roadside	364178	172337	NO2	No	0.6	2.7	No	2.5
133	Hambrook - 123 Old Gloucester Road façade	Roadside	363736	178507	NO2	No	0.0	10.4 (A4174)	No	1.9

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) <sup>(1)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Tube Co-located with a Continuous Analyser?	Tube Height (m)
134	Hambrook - Bristol Rd Old Bakery façade	Roadside	364048	178719	NO2	No	0.0	2.2	No	1.9
135	Frenchay - Harford Drive Dyrham Flats	Roadside	364029	178413	NO2	No	12.7	24.5 (A4174)	No	2.5
136	Little Stoke - 26 Gypsy Patch Lane	Roadside	361242	180544	NO2	No	0.0	12.0	No	3.0
137	Warmley - 35 High Street Ip at façade	Roadside	366984	173563	NO2	Yes (Kingswood - Warmley)	0.0	1.9	No	2.6
138	Warmley - 18 High Street façade	Roadside	366941	173558	NO2	Yes (Kingswood - Warmley)	0.0	2.0	No	2.8
139	Warmley - 14 High Street (former Webbs) façade	Roadside	366890	173560	NO2	Yes (Kingswood - Warmley)	0.0	2.3	No	2.1
141	Warmley - 41 Deanery Road façade	Roadside	366705	173581	NO2	Yes (Kingswood - Warmley)	0.0	7.7	No	2.7
142	Warmley - 33 Deanery Road Warmley Court façade	Roadside	366613	173597	NO2	Yes (Kingswood - Warmley)	0.0	8.9 (A4174 18.2)	No	2.1
143	Warmley - 1 High Street Ideal Pharmacy façade	Roadside	366815	173574	NO2	Yes (Kingswood - Warmley)	0.0	5.0	No	2.6
146	Kingswood - 34 Hill St façade	Roadside	365910	173680	NO2	Yes (Kingswood - Warmley)	0.0	1.6	No	2.2
147	Soundwell - 264 Soundwell Rd façade	Roadside	364586	174496	NO2	No	0.0	2.6	No	2.3
148	Filton - 109 Gloucester Road North facade	Roadside	360077	178900	NO2	No	0.0	10.2	No	1.9

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) <sup>(1)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Tube Co-located with a Continuous Analyser?	Tube Height (m)
149	Filton - 707 Southmead Road façade	Roadside	360050	179021	NO2	No	0.0	9.8	No	1.8
150	Soundwell - 296 Soundwell Road façade	Roadside	364528	174425	NO2	No	0.0	4.3	No	1.7
151	Hambrook - Bristol Road Old Bakery FP Signpost	Roadside	364049	178726	NO2	No	0.0	1.2	No	2.3
152	Bradley Stoke - 188 Oaktree Crescent	Roadside	360945	182831	NO2	No	0.3	9.0	No	2.8
153	Bradley Stoke - 141 Wheatfield Drive façade	Roadside	361842	182417	NO2	No	0.0	8.2	No	2.1
154	Bradley Stoke - 166 Ellan Hay Road façade	Roadside	363242	180724	NO2	No	0.0	9.7	No	1.8
155	Stoke Gifford - 3 Earl Close façade	Roadside	363324	179854	NO2	No	0.0	26.5 (SGTL)	No	2.2
156	Stoke Gifford - Lancelot Road	Roadside	362400	177624	NO2	No	21.2	1.8	No	2.4
157	Hambrook - Bristol Road Poplars House Garage façade	Roadside	363999	178505	NO2	No	14.5	20.2 (A4174 25.1)	No	1.9
158	Downend - 5 Wick Wick Close façade	Roadside	366157	178557	NO2	No	0.0	20.2 (A4174)	No	2.1
159	Wickwar - 21 High Street façade	Roadside	372395	188581	NO2	No	0.0	2.5	No	2.3
160	Staple Hill - 62 High Street	Roadside	364655	175931	NO2	Yes (Staple Hill)	0.4	1.6	No	2.9
161	Staple Hill - 13 Victoria Street façade	Roadside	364906	176022	NO2	Yes (Staple Hill)	0.0	4.4	No	2.0

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) <sup>(1)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Tube Co-located with a Continuous Analyser?	Tube Height (m)
162	Staple Hill - 28 Victoria Street façade	Roadside	364925	176062	NO2	Yes (Staple Hill)	0.0	4.8	No	1.9
163	Staple Hill - 2 Victoria Street façade	Roadside	364918	175979	NO2	Yes (Staple Hill)	0.0	4.8	No	1.9
164	Staple Hill - 102 High Street Jay Jays Hair façade	Roadside	364811	175919	NO2	Yes (Staple Hill)	0.0	3.5	No	2.2
165	Staple Hill - 3 Soundwell Rd Chinese Kitchen facade	Roadside	364906	175864	NO2	Yes (Staple Hill)	0.0	1.5	No	2.6
166	Kingswood - 12 Cecil Road	Roadside	364770	173695	NO2	No	2.1	1.5	No	2.7
167	Kingswood - 7 Downend Road	Roadside	364652	173957	NO2	No	2.9	2.3	No	2.4
168	Kingswood - 133 High Street façade	Roadside	365366	173805	NO2	Yes (Kingswood - Warmley)	0.0	3.1	No	2.4
169	Warmley - 20 Deanery Road Warmley Community Centre façade	Roadside	366714	173560	NO2	Yes (Kingswood - Warmley)	0.0	4.2	No	2.5
170	Patchway - 204 Gloucester Road front façade	Roadside	360606	181675	NO2	No	0.0	10.5	No	2.3
172	Downend - 31 Badminton Road Brownes façade	Roadside	365153	176812	NO2	No	0.0	5.4	No	2.2
173	Mangotsfield - 10 Cossham Street façade	Roadside	366459	176139	NO2	No	0.0	2.4	No	2.3
174	Charfield - 25 Wotton Road façade	Roadside	372011	192189	NO2	No	0.0	4.7	No	2.4

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) <sup>(1)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Tube Co-located with a Continuous Analyser?	Tube Height (m)
180	Wick - 70 High Street The Old Post Office façade	Roadside	370605	172681	NO2	No	0.0	1.6	No	2.3
181	Warmley - 16 London Road façade	Roadside	367298	173452	NO2	Yes (Kingswood - Warmley)	0.0	1.7	No	2.1
185	Staple Hill - High Street Pendennis Park Flats	Roadside	364634	175946	NO2	Yes (Staple Hill)	1.4	4.0	No	2.4
187	Thornbury - Rock Street Grace Lodge	Roadside	363785	189856	NO2	No	2.5	1.4	No	2.5
188	Patchway - 43 Gloucester Road nr Hayes Way	Roadside	360450	181066	NO2	No	2.3	3.6	No	2.8
189	Kingswood - 2 Hill St Premier Store	Roadside	365668	173738	NO2	Yes (Kingswood - Warmley)	0.0	2.6	No	2.3
191A, 191B, 191C	Hambrook - A4174 Old Gloucester Road Co- location	Roadside	363773	178500	NO2	No	N/A	6.7	Yes	2.1
192A, 192B, 192C	Stoke Gifford - A4174 Coldharbour Lane Co- location	Roadside	362384	178562	NO2	No	N/A	10.2	Yes	2.6

**Notes:**

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

(2) N/A if not applicable.

(3) Co-ordinates for sites 128, 147A, B, C and 150 are in South Gloucestershire – these sites are adjacent to SGC/Bristol CC boundary.

**Table A.3 – Annual Mean NO<sub>2</sub> Monitoring Results: Automatic Monitoring (µg/m<sup>3</sup>)**

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2022 (%) <sup>(2)</sup>	2018	2019	2020	2021	2022
SG1 Yate Station Road	370418	182525	Roadside	99	99	20	19	14	15	13
SG2 Stoke Gifford A4174 Coldharbour Lane	362384	178562	Roadside	98.7	98.7				21.4	21
SG3 Hambrook A4174 Old Gloucester Road	363772	178501	Roadside	98.5	73.4					29.6

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

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

#### Notes:

The annual mean concentrations are presented as µg/m<sup>3</sup>.

Exceedances of the NO<sub>2</sub> annual mean objective of 40µg/m<sup>3</sup> are shown in **bold**.

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

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

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

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



**Table A.4 – Annual Mean NO<sub>2</sub> Monitoring Results: Non-Automatic Monitoring (µg/m<sup>3</sup>)**

Diffusion Tube ID	Site Name	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2022 (%) <sup>(2)</sup>	2018	2019	2020	2021	2022
1	Yate - 88 Station Road The Candle	370692	182499	Roadside	100	100.0	27.4	28.2	22.7	23.9	23.6
4A, 4B, 4C	Yate - Station Road Co-location	370418	182525	Roadside	100	100.0	20.2	20.3	15.9	16.8	17.0
10	Filton - 152 Gloucester Road North Pizza Bello façade	360266	179136	Roadside	100	100.0	34.7	35.9	30.0	28.0	27.7
11	Thornbury - 48 High Street Uniq Family Wealth	363654	189893	Roadside	92.3	92.3	24.7	24.2	14.7	13.3	13.0
12	Stoke Gifford - Church Road rear of Aviva	362161	179570	Roadside	92.3	92.3	27.7	25.1	19.3	19.9	20.6
13	Filton – A4174 MOD roundabout	361523	178732	Roadside	100	100.0	31.7	30.5	25.2	27.4	27.4
21	Downend - Boscombe Crescent St Augustine's Church	365673	177475	Urban Background	100	100.0	14.9	14.5	11.6	12.4	13.4
27	Kingswood - 90 Regent Street Nat West façade	364866	173835	Roadside	100	100.0	27.0	27.3	19.7	20.7	20.3
29	Staple Hill - 123 High Street Backhouse Bet	364822	175932	Roadside	100	100.0	28.1	28.0	20.8	23.4	24.8
34	Bradley Stoke - 109 Ormonds Close (M4 East of Almondsbury Interchange)	362395	182544	Roadside	100	100.0	26.1	24.0	19.2	20.2	20.8
35	Bradley Stoke - Woodlands Lane (M4 East of Almondsbury Interchange)	362118	183031	Roadside	100	100.0	26.5	25.8	21.0	22.0	22.9
37	Almondsbury - Old Aust Road (M4 West of Almondsbury Interchange)	361147	184846	Roadside	90.4	90.4	30.7	27.1	21.8	24.7	26.9

Diffusion Tube ID	Site Name	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2022 (%) <sup>(2)</sup>	2018	2019	2020	2021	2022
38	Severn Beach - Ableton Lane Severn Beach Primary School façade	354282	184653	Urban Background	100	100.0	13.6	12.3	9.8	10.8	12.4
44	Stoke Gifford - Hatchet Road	362061	180025	Roadside	100	100.0	30.6	30.4	24.1	21.6	23.2
46	Winterbourne - High Street opp Winterbourne Academy	364852	180758	Roadside	100	100.0	25.1	25.7	18.9	20.8	21.4
53	Hambrook - Bristol Road rear of 17 Fenbrook Close	363907	178389	Roadside	90.4	90.4	27.7	26.2	19.7	21.8	22.5
54	Longwell Green - A431/Aldermoor Way	365256	171656	Roadside	100	100.0	30.2	28.4	22.7	23.6	23.4
57	Coalpit Heath - 225 Badminton Road GT Plumbing & Heating	367742	181160	Roadside	100	100.0	23.6	23.6	19.9	20.5	19.6
61	Staple Hill - 1 Broad Street William Hill	364926	175926	Roadside	100	100.0	37.8	36.6	29.3	30.9	31.9
62	Staple Hill - 2 Broad Street 501 Bar façade	364909	175908	Roadside	100	100.0	33.6	36.3	26.8	28.6	29.2
63	Patchway - 28 Park Leaze	359487	182479	Roadside	100	100.0	22.2	19.0	15.2	16.3	16.7
67	Kingswood - 40 Regent Street Hays Travel façade	364671	173877	Roadside	100	100.0	34.0	35.6	25.8	25.8	26.3
68	Kingswood - 26-32 Regent Street Store Twenty One façade	364631	173886	Roadside	100	100.0	36.2	36.5	27.8	26.7	28.3
69	Kingswood - 12 Regent Street Domino's Pizza façade	364597	173892	Roadside	100	100.0	33.9	35.0	25.1	24.4	25.0
70	Kingswood - Two Mile Hill Road Job Centre Plus façade	364533	173896	Roadside	90.4	90.4	30.1	29.6	21.4	22.7	23.6

Diffusion Tube ID	Site Name	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2022 (%) <sup>(2)</sup>	2018	2019	2020	2021	2022
71	Staple Hill - 11 The Square Bunch Florist	365075	175918	Roadside	100	100.0	21.5	22.7	16.7	17.3	17.6
72	Staple Hill - 25 Broad Street Westbury Inks	364990	175920	Roadside	100	100.0	28.1	28.1	22.5	24.5	25.0
74	Staple Hill - 29-31 Soundwell Rd opp Page Comm Assoc	364885	175772	Roadside	100	100.0	27.0	25.6	18.9	20.8	20.6
76	Staple Hill - 84-86 High Street Staple Hill Oak Pub façade	364722	175926	Roadside	100	100.0	29.3	31.2	24.0	24.1	23.8
83	Chipping Sodbury - 51A Broad Street façade	372791	182241	Roadside	92.3	92.3	21.9	21.7	15.7	16.8	17.3
87	Cribbs Causeway - Blackhorse Hill Hollywood Cottage facade	357739	181334	Roadside	100	100.0	25.2	25.3	19.3	20.7	22.6
92	Kingswood - Regent Street Entertainment & Sports Club	364968	173836	Roadside	100	100.0	30.5	30.4	22.7	22.9	21.2
93	Kingswood - Hanham Road Exchange Court Flats	364979	173801	Roadside	100	100.0	26.6	24.4	19.1	21.0	20.0
95	Kingswood - 45 High Street Adam Lee	365078	173846	Roadside	100	100.0	37.8	37.0	25.7	25.0	24.2
105	Staple Hill - 2 North Street	364932	176147	Roadside	100	100.0	25.0	26.0	19.5	20.6	19.6
113	Patchway - 5 Falcon Close façade	359112	181909	Roadside	100	100.0	27.2	24.7	19.6	21.3	21.6
114	Pilning - 23 Keens Grove façade	355263	185351	Roadside	100	100.0	24.5	22.1	18.7	20.6	20.0
115	Pilning - 2 Wick Road façade	355212	185360	Roadside	100	100.0	23.0	22.9	19.6	21.1	20.9

Diffusion Tube ID	Site Name	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2022 (%) <sup>(2)</sup>	2018	2019	2020	2021	2022
117	Filton Northville - 29 Gloucester Rd Nth Rowe Vets	359874	178259	Roadside	92.3	92.3	29.7	29.2	24.0	25.5	25.7
119	Filton - 137 Gloucester Rd Nth	360263	179250	Roadside	92.3	92.3	30.1	29.1	23.3	24.0	23.7
122	Filton - 549 Filton Avenue	360566	178229	Roadside	100	100.0	29.0	28.0	21.9	22.3	23.0
124	Filton - 702a Filton Ave Way Ahead	360918	178905	Roadside	100	100.0	32.0	30.7	23.4	24.7	24.4
125	Filton - 71 Station Rd	360891	179005	Roadside	90.4	90.4	26.8	27.3	20.7	22.0	22.3
128	Kingswood - 109 Downend Road	364587	174431	Roadside	100	100.0	30.0	28.1	23.9	23.2	24.2
129	Cribbs Causeway – 1 Holly Cottages façade	357508	181059	Roadside	100	100.0	28.6	23.9	19.6	21.3	21.4
132	Hanham - 66 High St Sassy Hair Studio	364178	172337	Roadside	100	100.0	28.8	23.8	17.0	20.0	20.2
133	Hambrook - 123 Old Gloucester Road façade	363736	178507	Roadside	100	100.0	25.9	25.5	21.4	22.5	22.0
134	Hambrook - Bristol Rd Old Bakery façade	364048	178719	Roadside	100	100.0	28.3	29.5	22.8	23.2	23.9
135	Frenchay - Harford Drive Dyrham Flats	364029	178413	Roadside	92.3	92.3	24.0	23.8	19.1	20.7	21.5
136	Little Stoke - 26 Gypsy Patch Lane	361242	180544	Roadside	100	100.0	21.4	20.8	16.3	15.7	17.6
137	Warmley - 35 High Street Ip at façade	366984	173563	Roadside	100	100.0	37.2	34.5	26.1	29.4	27.7
138	Warmley - 18 High Street façade	366941	173558	Roadside	100	100.0	33.7	31.9	26.0	27.1	25.5

Diffusion Tube ID	Site Name	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2022 (%) <sup>(2)</sup>	2018	2019	2020	2021	2022
139	Warmley - 14 High Street (former Webbs) façade	366890	173560	Roadside	100	100.0	37.2	34.4	29.1	32.1	28.9
141	Warmley - 41 Deanery Road façade	366705	173581	Roadside	100	100.0	29.0	27.7	22.6	23.2	24.0
142	Warmley - 33 Deanery Road Warmley Court façade	366613	173597	Roadside	100	100.0	26.8	26.7	23.2	21.3	22.1
143	Warmley - 1 High Street Ideal Pharmacy façade	366815	173574	Roadside	100	100.0	23.1	22.5	17.1	19.0	18.9
146	Kingswood - 34 Hill St façade	365910	173680	Roadside	100	100.0	<b>40.8</b>	<b>42.3</b>	35.9	34.1	32.8
147	Soundwell - 264 Soundwell Rd façade	364586	174496	Roadside	100	100.0	35.3	35.3	28.5	31.3	32.2
148	Filton - 109 Gloucester Road North facade	360077	178900	Roadside	100	100.0	23.9	22.1	17.9	19.6	19.6
149	Filton - 707 Southmead Road facade	360050	179021	Roadside	100	100.0	27.8	25.1	21.0	22.8	22.6
150	Soundwell - 296 Soundwell Road façade	364528	174425	Roadside	100	100.0	26.3	24.1	18.2	20.0	22.3
151	Hambrook - Bristol Road Old Bakery FP Signpost	364049	178726	Roadside	100	100.0	29.8	29.2	23.2	23.4	25.1
152	Bradley Stoke - 188 Oaktree Crescent	360945	182831	Roadside	100	100.0	27.4	26.9	21.8	22.5	22.6
153	Bradley Stoke - 141 Wheatfield Drive façade	361842	182417	Roadside	100	100.0	18.2	17.5	13.8	14.0	14.9
154	Bradley Stoke - 166 Ellan Hay Road façade	363242	180724	Roadside	92.3	92.3	20.4	20.3	17.2	17.1	17.6
155	Stoke Gifford - 3 Earl Close façade	363324	179854	Roadside	100	100.0	19.2	18.0	13.8	14.5	15.3

Diffusion Tube ID	Site Name	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2022 (%) <sup>(2)</sup>	2018	2019	2020	2021	2022
156	Stoke Gifford - Lancelot Road	362400	177624	Roadside	100	100.0	21.1	21.6	16.3	17.9	17.6
157	Hambrook - Bristol Road Poplars House Garage façade	363999	178505	Roadside	100	100.0	23.0	26.5	21.4	21.1	23.3
158	Downend - 5 Wick Wick Close façade	366157	178557	Roadside	82.7	82.7	24.6	23.4	17.3	19.4	20.5
159	Wickwar - 21 High Street façade	372395	188581	Roadside	100	100.0	26.7	25.8	19.8	22.6	22.9
160	Staple Hill - 62 High Street	364655	175931	Roadside	100	100.0	29.3	30.0	23.7	24.1	23.4
161	Staple Hill - 13 Victoria Street façade	364906	176022	Roadside	100	100.0	26.8	29.1	23.1	24.1	24.3
162	Staple Hill - 28 Victoria Street façade	364925	176062	Roadside	100	100.0	25.5	25.4	20.5	22.0	22.6
163	Staple Hill - 2 Victoria Street façade	364918	175979	Roadside	100	100.0	26.4	26.9	21.0	23.1	22.8
164	Staple Hill - 102 High Street Jay Jays Hair façade	364811	175919	Roadside	100	100.0	28.2	28.2	22.1	23.0	22.5
165	Staple Hill - 3 Soundwell Rd Chinese Kitchen facade	364906	175864	Roadside	100	100.0	38.6	39.2	28.7	31.2	29.9
166	Kingswood - 12 Cecil Road	364770	173695	Roadside	100	100.0	28.8	27.5	21.1	22.3	22.2
167	Kingswood - 7 Downend Road	364652	173957	Roadside	100	100.0	30.4	29.5	22.8	24.3	23.4
168	Kingswood - 133 High Street façade	365366	173805	Roadside	100	100.0	28.1	25.6	19.7	21.6	20.4

Diffusion Tube ID	Site Name	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2022 (%) <sup>(2)</sup>	2018	2019	2020	2021	2022
169	Warmley - 20 Deanery Road Warmley Community Centre façade	366714	173560	Roadside	100	100.0	29.0	28.3	24.1	24.3	24.1
170	Patchway - 204 Gloucester Road front façade	360606	181675	Roadside	100	100.0	24.1	22.7	18.6	20.2	20.3
172	Downend - 31 Badminton Road Brownes façade	365153	176812	Roadside	92.3	92.3	30.6	30.8	25.3	25.2	24.9
173	Mangotsfield - 10 Cossham Street façade	366459	176139	Roadside	100	100.0	24.8	25.0	19.3	20.7	20.5
174	Charfield - 25 Wotton Road façade	372011	192189	Roadside	100	100.0	18.0	17.0	13.0	14.5	15.0
180	Wick - 70 High Street The Old Post Office façade	370605	172681	Roadside	100	100.0		26.8	20.1	22.6	22.5
181	Warmley - 16 London Road façade	367298	173452	Roadside	100	100.0		23.7	19.5	20.8	21.2
185	Staple Hill - High Street Pendennis Park Flats	364634	175946	Roadside	100	100.0			22.7	23.3	24.0
187	Thornbury - Rock Street Grace Lodge	363785	189856	Roadside	100	100.0				20.0	22.4
188	Patchway - 43 Gloucester Road nr Hayes Way	360450	181066	Roadside	100	100.0				38.8	38.7
189	Kingswood - 2 Hill St Premier Store	365668	173738	Roadside	100	100.0					24.1
191A, 191B, 191C	Hambrook - A4174 Old Gloucester Road Co-location	363773	178500	Roadside	100	100.0					28.5
192A, 192B, 192C	Stoke Gifford - A4174 Coldharbour Lane Co-location	362384	178562	Roadside	100	100.0					21.1

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

☒ Diffusion tube data has been bias adjusted.

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

**Notes:**

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

Exceedances of the  $\text{NO}_2$  annual mean objective of  $40\mu\text{g}/\text{m}^3$  are shown in **bold**.

$\text{NO}_2$  annual means exceeding  $60\mu\text{g}/\text{m}^3$ , indicating a potential exceedance of the  $\text{NO}_2$  1-hour mean objective are shown in **bold and underlined**.

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

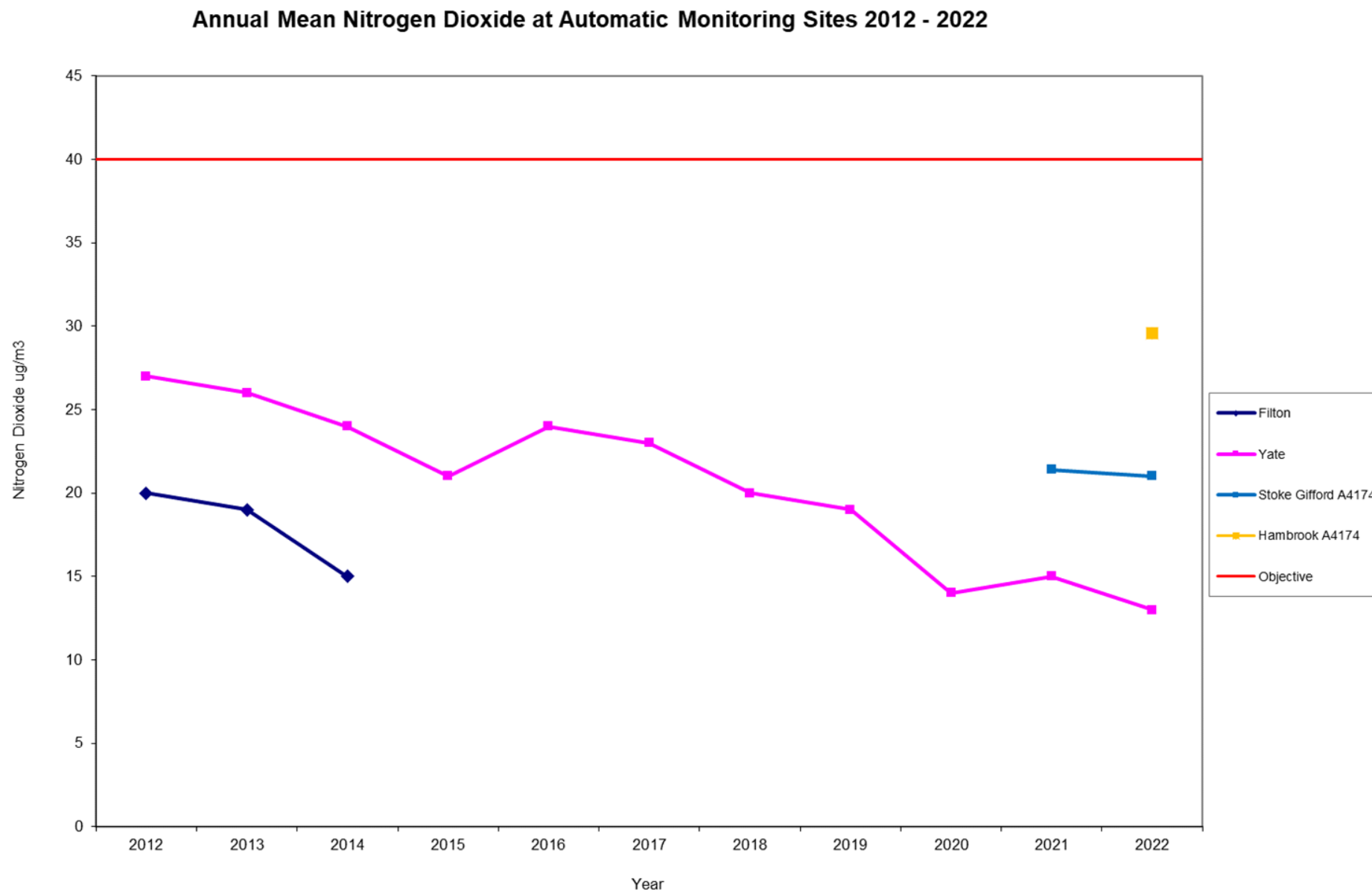
Concentrations are those at the location of monitoring and not those following any fall-off with distance adjustment.

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

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

(3) Aside from the triplicate co-located sites, sites 87 & 147 were also operating as triplicate sites 2018 – 2021 and Site 186 operated as triplicate site in 2020 so the triplicate average annual means are reported for the relevant years.



**Figure A.1 – Trends in Annual Mean NO<sub>2</sub> Concentrations**

**Table A.5 – 1-Hour Mean NO<sub>2</sub> Monitoring Results, Number of 1-Hour Means > 200µg/m<sup>3</sup>**

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2022 (%) <sup>(2)</sup>	2018	2019	2020	2021	2022
SG1 Yate Station Road	370418	182525	Roadside	99	99	0	0	0	0	0
SG2 Stoke Gifford A4174 Coldharbour Lane	362384	178562	Roadside	98.7	98.7				0 (90)	0
SG3 Hambrook A4174 Old Gloucester Road	363772	178501	Roadside	98.5	73.4					0 (103)

**Notes:**

Results are presented as the number of 1-hour periods where concentrations greater than 200µg/m<sup>3</sup> have been recorded.

Exceedances of the NO<sub>2</sub> 1-hour mean objective (200µg/m<sup>3</sup> not to be exceeded more than 18 times/year) are shown in **bold**.

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

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

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

**Table A.6 – Annual Mean PM<sub>10</sub> Monitoring Results (µg/m<sup>3</sup>)**

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2022 (%) <sup>(2)</sup>	2018	2019	2020	2021	2022
SG1 Yate Station Road	370418	182525	Roadside	95.7	95.7	13	13	11	12	12
SG2 Stoke Gifford A4174 Coldharbour Lane	362384	178562	Roadside	99.3	99.3				15.5	20

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

#### Notes:

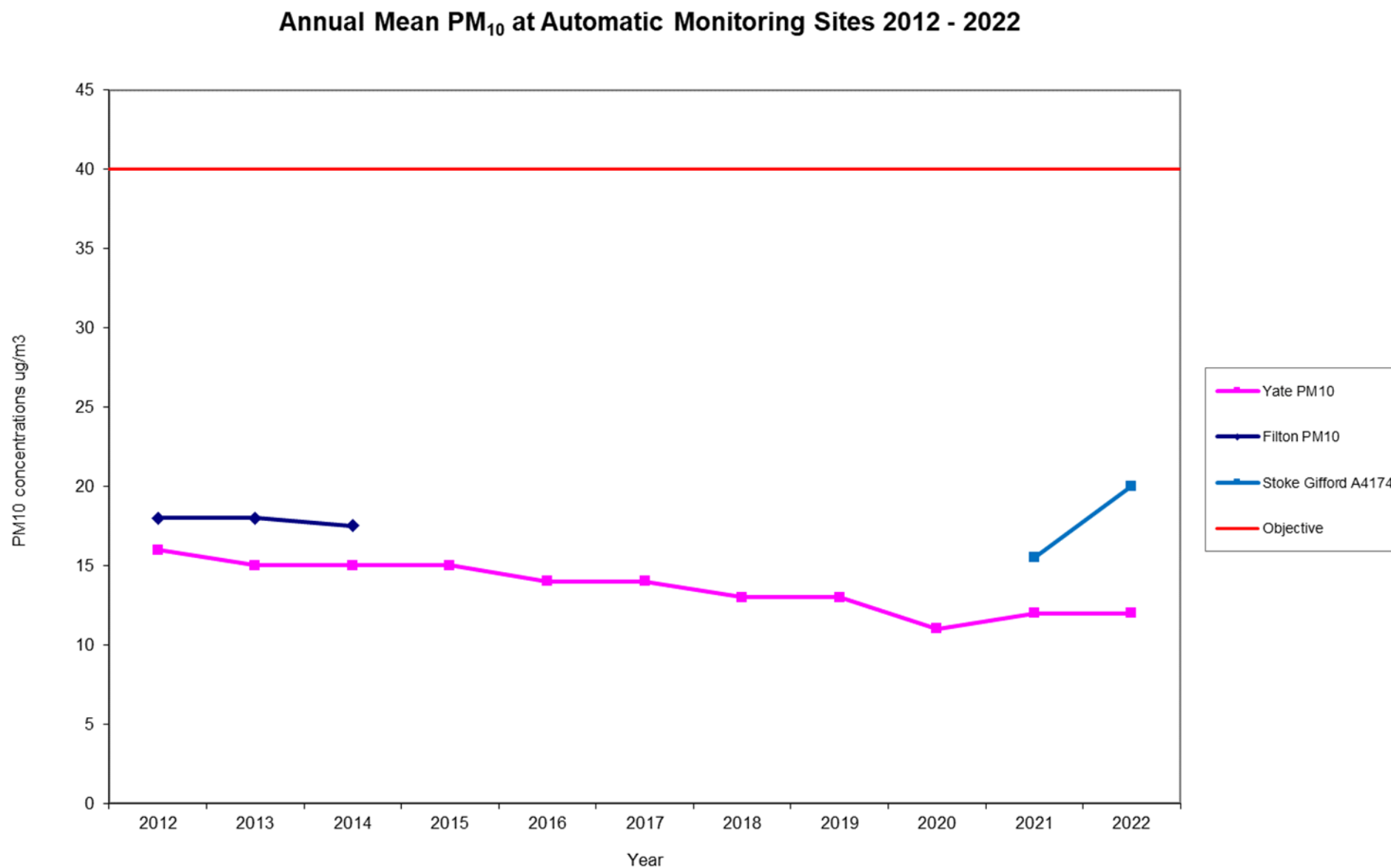
The annual mean concentrations are presented as µg/m<sup>3</sup>.

Exceedances of the PM<sub>10</sub> annual mean objective of 40µg/m<sup>3</sup> are shown in **bold**.

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

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

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

**Figure A.2 – Trends in Annual Mean PM<sub>10</sub> Concentrations**

**Table A.7 – 24-Hour Mean PM<sub>10</sub> Monitoring Results, Number of PM<sub>10</sub> 24-Hour Means > 50µg/m<sup>3</sup>**

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2022 (%) <sup>(2)</sup>	2018	2019	2020	2021	2022
SG1 Yate Station Road	370418	182525	Roadside	95.7	95.7	0	0	0	0	0
SG2 Stoke Gifford A4174 Coldharbour Lane	362384	178562	Roadside	99.3	99.3				0 (27)	3

**Notes:**

Results are presented as the number of 24-hour periods where daily mean concentrations greater than 50µg/m<sup>3</sup> have been recorded.

Exceedances of the PM<sub>10</sub> 24-hour mean objective (50µg/m<sup>3</sup> not to be exceeded more than 35 times/year) are shown in **bold**.

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

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

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

**Table A.8 – Annual Mean PM<sub>2.5</sub> Monitoring Results (µg/m<sup>3</sup>)**

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2022 (%) <sup>(2)</sup>	2018	2019	2020	2021	2022
SG2 Stoke Gifford A4174 Coldharbour Lane	362384	178562	Roadside	95	95				7.4	9

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

**Notes:**

The annual mean concentrations are presented as µg/m<sup>3</sup>.

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

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

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

**Table A.9 – Kingswood - Warmley AQMA Annual Mean NO<sub>2</sub> Non-Automatic Monitoring Results (µg/m<sup>3</sup>)**

Diffusion Tube ID	Site Name	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2022 (%) <sup>(2)</sup>	2018	2019	2020	2021	2022
27	Kingswood - 90 Regent Street Nat West façade	364866	173835	Roadside	100	100	27.0	27.3	19.7	20.7	20.3
67	Kingswood - 40 Regent Street Hays Travel façade	364671	173877	Roadside	100	100	34.0	35.6	25.8	25.8	26.3
68	Kingswood - 26-32 Regent Street Store Twenty One façade	364631	173886	Roadside	100	100	36.2	36.5	27.8	26.7	28.3
69	Kingswood - 12 Regent Street Domino's Pizza façade	364597	173892	Roadside	100	100	33.9	35.0	25.1	24.4	25.0
70	Kingswood - Two Mile Hill Road Job Centre Plus façade	364533	173896	Roadside	90.4	90.4	30.1	29.6	21.4	22.7	23.6
92	Kingswood - Regent Street Entertainment & Sports Club	364968	173836	Roadside	100	100	30.5	30.4	22.7	22.9	21.2
93	Kingswood - Hanham Road Exchange Court Flats	364979	173801	Roadside	100	100	26.6	24.4	19.1	21.0	20.0
95	Kingswood - 45 High Street Adam Lee	365078	173846	Roadside	100	100	37.8	37.0	25.7	25.0	24.2
137	Warmley - 35 High Street Ip at façade	366984	173563	Roadside	100	100	37.2	34.5	26.1	29.4	27.7
138	Warmley - 18 High Street façade	366941	173558	Roadside	100	100	33.7	31.9	26.0	27.1	25.5

Diffusion Tube ID	Site Name	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2022 (%) <sup>(2)</sup>	2018	2019	2020	2021	2022
139	Warmley - 14 High Street (former Webbs) façade	366890	173560	Roadside	100	100	37.2	34.4	29.1	32.1	28.9
141	Warmley - 41 Deanery Road façade	366705	173581	Roadside	100	100	29.0	27.7	22.6	23.2	24.0
142	Warmley - 33 Deanery Road Warmley Court façade	366613	173597	Roadside	100	100	26.8	26.7	23.2	21.3	22.1
143	Warmley - 1 High Street Ideal Pharmacy façade	366815	173574	Roadside	100	100	23.1	22.5	17.1	19.0	18.9
146	Kingswood - 34 Hill St façade	365910	173680	Roadside	100	100	<b>40.8</b>	<b>42.3</b>	35.9	34.1	32.8
168	Kingswood - 133 High Street façade	365366	173805	Roadside	100	100	28.1	25.6	19.7	21.6	20.4
169	Warmley - 20 Deanery Road Warmley Community Centre façade	366714	173560	Roadside	100	100	29.0	28.3	24.1	24.3	24.1
181	Warmley - 16 London Road façade	367298	173452	Roadside	100	100	N/O	23.7	19.5	20.8	21.2
189	Kingswood - 2 Hill St Premier Store	365668	173738	Roadside	100	100.0					24.1

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

☒ Diffusion tube data has been bias adjusted.



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

**Notes:**

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

Exceedances of the  $\text{NO}_2$  annual mean objective of  $40\mu\text{g}/\text{m}^3$  are shown in **bold**.

$\text{NO}_2$  annual means exceeding  $60\mu\text{g}/\text{m}^3$ , indicating a potential exceedance of the  $\text{NO}_2$  1-hour mean objective are shown in **bold and underlined**.

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

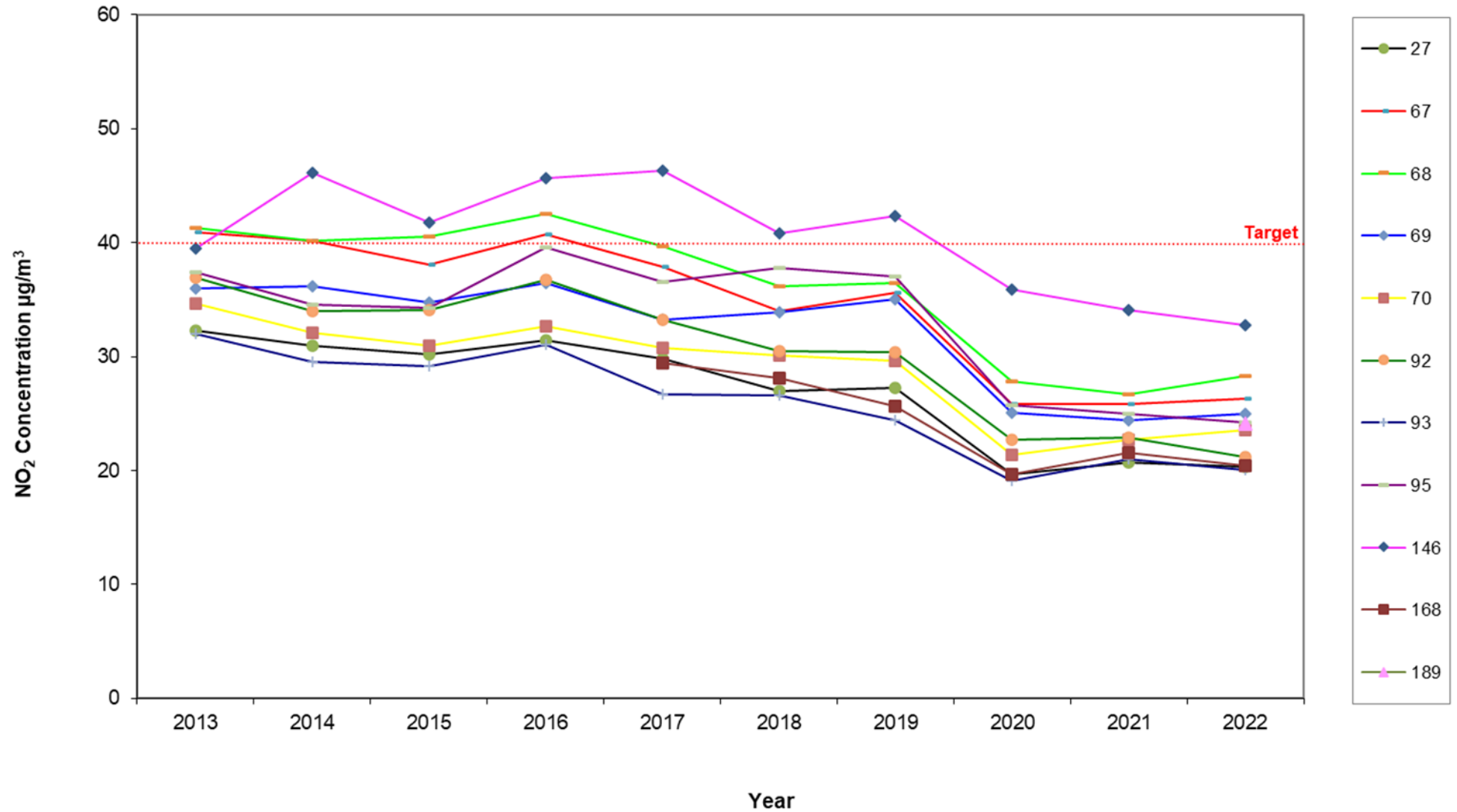
Concentrations are those at the location of monitoring and not those following any fall-off with distance adjustment.

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

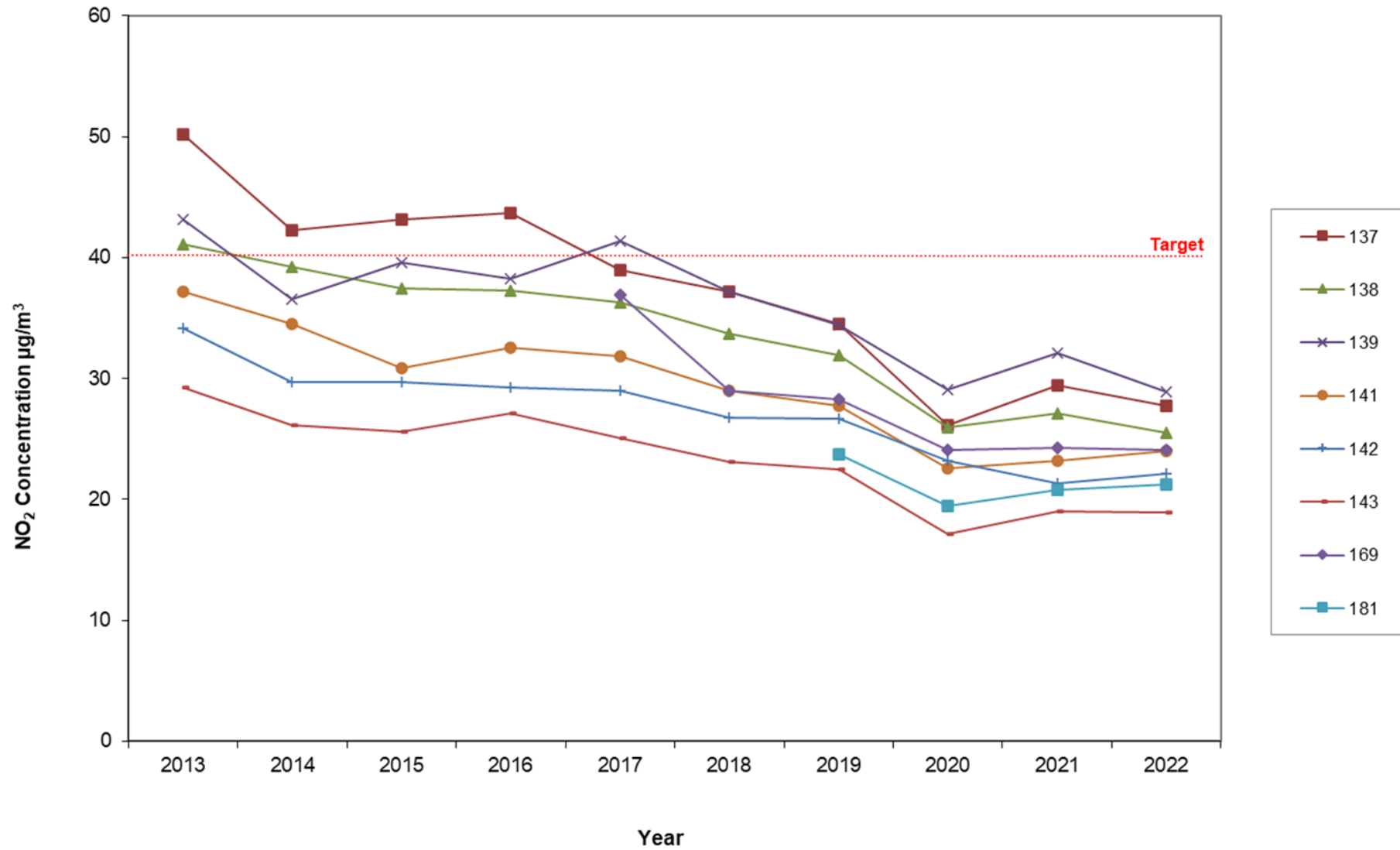
(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

N/O Site not operational

**Figure A.3 – Trends in Annual Mean NO<sub>2</sub> Concentrations in Kingswood Section of Kingswood - Warmley AQMA**



**Figure A.4 – Trends in Annual Mean NO<sub>2</sub> Concentrations in Warmley Section of Kingswood - Warmley AQMA**



**Table A.10 – Staple Hill AQMA Annual Mean NO<sub>2</sub> Non-Automatic Monitoring Results (µg/m<sup>3</sup>)**

Diffusion Tube ID	Site Name	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2022 (%) <sup>(2)</sup>	2018	2019	2020	2021	2022
29	Staple Hill - 123 High Street Backhouse Bet	364822	175932	Roadside	100	100.0	28.1	28.0	20.8	23.4	24.8
61	Staple Hill - 1 Broad Street William Hill	364926	175926	Roadside	100	100.0	37.8	36.6	29.3	30.9	31.9
62	Staple Hill - 2 Broad Street 501 Bar façade	364909	175908	Roadside	100	100.0	33.6	36.3	26.8	28.6	29.2
71	Staple Hill - 11 The Square Bunch Florist	365075	175918	Roadside	100	100.0	21.5	22.7	16.7	17.3	17.6
72	Staple Hill - 25 Broad Street Westbury Inks	364990	175920	Roadside	100	100.0	28.1	28.1	22.5	24.5	25.0
74	Staple Hill - 29-31 Soundwell Rd opp Page Comm Assoc	364885	175772	Roadside	100	100.0	27.0	25.6	18.9	20.8	20.6
76	Staple Hill - 84-86 High Street Staple Hill Oak Pub façade	364722	175926	Roadside	100	100.0	29.3	31.2	24.0	24.1	23.8
105	Staple Hill - 2 North Street	364932	176147	Roadside	100	100.0	25.0	26.0	19.5	20.6	19.6
160	Staple Hill - 62 High Street	364655	175931	Roadside	100	100.0	29.3	30.0	23.7	24.1	23.4
161	Staple Hill - 13 Victoria Street façade	364906	176022	Roadside	100	100.0	26.8	29.1	23.1	24.1	24.3

Diffusion Tube ID	Site Name	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2022 (%) <sup>(2)</sup>	2018	2019	2020	2021	2022
162	Staple Hill - 28 Victoria Street façade	364925	176062	Roadside	100	100.0	25.5	25.4	20.5	22.0	22.6
163	Staple Hill - 2 Victoria Street façade	364918	175979	Roadside	100	100.0	26.4	26.9	21.0	23.1	22.8
164	Staple Hill - 102 High Street Jay Jays Hair façade	364811	175919	Roadside	100	100.0	28.2	28.2	22.1	23.0	22.5
165	Staple Hill - 3 Soundwell Rd Chinese Kitchen facade	364906	175864	Roadside	100	100.0	38.6	39.2	28.7	31.2	29.9
185 <sup>(3)</sup>	Staple Hill - High Street Pendennis Park Flats AQ Mesh site	364634	175946	Roadside	100	100.0	N/O	N/O	22.7	23.3	24.0

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

☒ **Diffusion tube data has been bias adjusted.**

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

#### Notes:

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

Exceedances of the NO<sub>2</sub> annual mean objective of  $40\mu\text{g}/\text{m}^3$  are shown in **bold**.

NO<sub>2</sub> annual means exceeding  $60\mu\text{g}/\text{m}^3$ , indicating a potential exceedance of the NO<sub>2</sub> 1-hour mean objective are shown in **bold and underlined**.

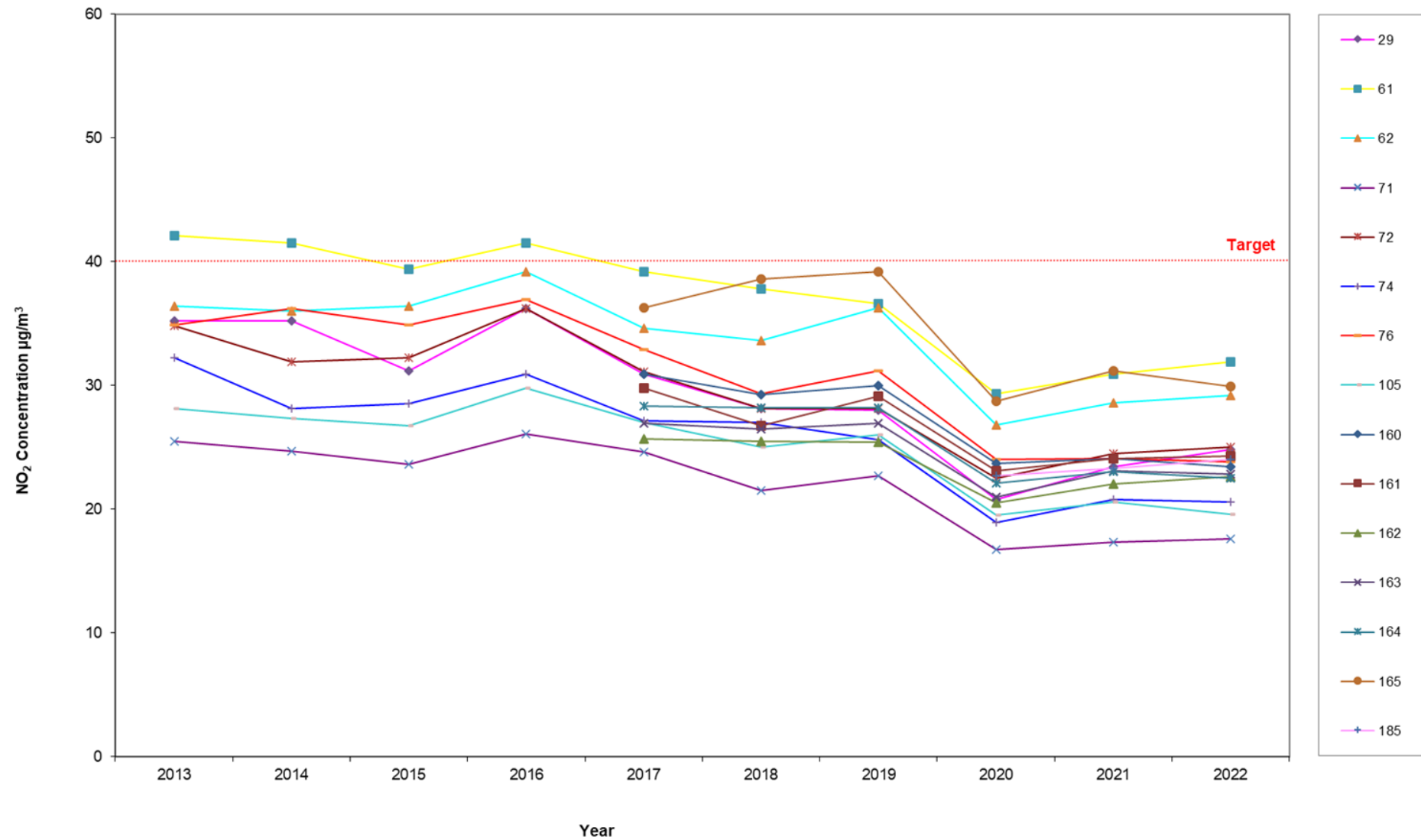
Means for diffusion tubes have been corrected for bias. All means have been “annualised” as per LAQM.TG22 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

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

- (1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.
- (2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).
- (3) Site 185 annual mean for triplicate tubes (185ABC) in 2020 and single tube from 2021 onwards.

N/O Site not operational

**Figure A.5 – Trends in Annual Mean NO<sub>2</sub> Concentrations in Staple Hill AQMA**



**Estimated PM<sub>2.5</sub> Concentrations from Yate PM<sub>10</sub> Monitoring****Table A.11 – Estimation of PM<sub>2.5</sub> concentrations and % reductions**

<b>Year</b>	<b>Yate PM<sub>10</sub> Annual Means (µg/m<sup>3</sup>)</b>	<b>Yate Estimated PM<sub>2.5</sub> Annual Means <sup>(1) (2) (3)</sup> (µg/m<sup>3</sup>)</b>	<b>Bristol St. Pauls (AURN) Monitored PM<sub>2.5</sub> Annual Means <sup>(4)</sup> (µg/m<sup>3</sup>)</b>
2010	20	14	14
2011	18	12.6	15
2012	16	11.2	13
2013	15	10.5	13
2014	15	10.5	13
2015	15	10.5	10
2016	14	9.8	12
2017	14	9.8	10
2018	13	9.1	12
2019	13	9.1	11
2020	11	7.7	10
2021	12	6.3	8
2022	12	5.6	8
<b>% Reduction 2010 -2020 <sup>(5)</sup></b>		<b>45%</b>	<b>28.6%</b>
<b>% Reduction 2018 -2022 <sup>(6)</sup></b>		<b>38.5%</b>	<b>33.3%</b>

**Notes:**

(1) 2010 to 2020 PM<sub>2.5</sub> concentrations estimated as per LAQM.TG16 Box 7.7 (PM<sub>10</sub> x 0.7)



- (2) 2021 PM<sub>2.5</sub> concentrations estimated as per LAQM.TG22<sup>74</sup> using 2021 national roadside factor of 5.7 (PM<sub>10</sub> annual mean concentration – national factor = estimated PM<sub>2.5</sub> annual mean concentration).
- (3) 2022 PM<sub>2.5</sub> concentrations estimated as per LAQM.TG22 using 2022 national roadside factor of 6.4.
- (4) Data obtained from UK-AIR Data Archive<sup>75</sup>
- (5) Target of 20% reduction in concentrations (at urban background) between 2010 and 2020.
- (6) Target of 35% reduction in exposure compared to 2018 by 2040 (interim target of 22% reduction in exposure compared to 2018 by 2028).

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<sup>74</sup> [Estimating PM2.5 from PM10 Measurements | LAQM \(defra.gov.uk\)](#)

<sup>75</sup> [Annual and Exceedance Statistics - Defra, UK](#)

## Appendix B: Full Monthly Diffusion Tube Results for 2022

**Table B.1 – NO<sub>2</sub> 2022 Diffusion Tube Results (µg/m<sup>3</sup>)**

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted (0.85)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
1	370692	182499	41.1	25.6	27.6	26.6	30.0	21.0	22.7	27.7	23.8	26.2	32.1	29.1	27.8	23.6	-	
4A	370418	182525	34.6	19.0	22.8	16.1	21.8	15.2	14.9	15.6	16.4	19.9	24.2	21.2	-	-	-	Triplicate Site with 4A, 4B and 4C - Annual data provided for 4C only
4B	370418	182525	33.5	21.0	21.6	15.9	20.9	14.4	15.4	15.6	15.7	18.7	26.2	23.3	-	-	-	Triplicate Site with 4A, 4B and 4C - Annual data provided for 4C only
4C	370418	182525	30.1	20.4	22.0	15.3	21.4	16.1	15.3	14.1	14.7	19.8	23.8	22.5	20.0	17.0	-	Triplicate Site with 4A, 4B and 4C - Annual data provided for 4C only
10	360266	179136	46.0	29.8	39.6	27.8	25.4	26.6	31.8	30.9	30.6	28.6	36.7	37.0	32.6	27.7	-	
11	363654	189893		12.8	18.8	14.1	16.5	11.4	9.0	11.8	13.5	16.8	20.2	23.7	15.3	13.0	-	
12	362161	179570	37.8	19.5	31.1	23.9	16.0	16.6		22.5	23.4	21.0	25.4	29.3	24.2	20.6	-	
13	361523	178732	45.5	22.4	40.6	33.7	26.7	22.3	30.1	34.7	32.7	27.8	35.8	35.1	32.3	27.4	-	
21	365673	177475	28.5	11.3	17.3	13.5	13.9	24.1	9.9	10.6	10.9	11.0	15.5	22.3	15.7	13.4	-	
27	364866	173835	38.7	22.2	25.6	22.2	28.5	18.9	20.7	18.9	18.9	21.9	24.0	25.8	23.9	20.3	-	
29	364822	175932	45.7	24.6	34.7	29.7	28.6	22.1	24.4	28.6	27.6	22.4	27.7	33.4	29.1	24.8	-	
34	362395	182544	35.7	20.7	32.5	25.2	24.3	16.5	20.2	26.6	19.7	19.8	24.2	27.6	24.4	20.8	-	
35	362118	183031	38.9	19.1	37.0	28.8	24.7	17.3	22.7	29.1	28.7	21.7	24.0	31.1	26.9	22.9	-	
37	361147	184846	34.1	17.8	46.6	36.2		20.2	24.7	33.3	34.3	30.8	35.3	35.3	31.7	26.9	-	
38	354282	184653	22.6	10.9	18.7	13.4	15.1	10.4	11.6	11.9	12.1	13.4	16.0	18.6	14.6	12.4	-	
44	362061	180025	41.3	26.4	33.3	23.9	22.2	21.1	19.2	24.0	25.8	26.1	29.1	34.6	27.3	23.2	-	
46	364852	180758	38.9	23.4	27.6	23.0	23.8	18.8	19.4	21.5	21.9	24.7	29.5	29.1	25.1	21.4	-	
53	363907	178389	40.1	16.4	36.5	27.3		18.2	21.1	30.3	27.1	20.4	23.9	30.2	26.5	22.5	-	

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted (0.85)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
54	365256	171656	41.4	26.4	28.5	27.1	27.2	21.8	22.0	26.2	24.6	25.2	28.1	31.2	27.5	23.4	-	
57	367742	181160	37.7	19.5	26.2	19.8	22.5	14.6	16.4	19.9	19.8	22.7	28.9	28.9	23.1	19.6	-	
61	364926	175926	58.5	37.6	38.1	36.0	34.9	30.4	31.9	31.7	36.3	34.5	40.6	40.3	37.6	31.9	-	
62	364909	175908	51.5	26.4	39.1	31.0	32.4	29.9	30.9	31.2	31.1	33.9	36.0	38.4	34.3	29.2	-	
63	359487	182479	34.1	19.7	20.4	18.0	20.5	14.4	15.0	17.2	18.2	16.2	19.2	22.7	19.6	16.7	-	
67	364671	173877	46.1	25.2	33.6	26.9	35.3	25.5	27.8	25.8	26.7	30.9	33.2	34.8	31.0	26.3	-	
68	364631	173886	46.3	32.5	38.1	27.5	33.9	25.8	30.4	26.2	29.4	33.4	38.3	37.3	33.3	28.3	-	
69	364597	173892	42.8	30.4	35.7	26.4	29.6	22.6	26.9	23.1	25.3	28.8	31.2	29.8	29.4	25.0	-	
70	364533	173896	43.4	21.5	34.1	24.9		21.5	23.3	23.8	24.4	27.2	29.9	31.5	27.8	23.6	-	
71	365075	175918	37.4	19.4	23.8	19.8	19.3	15.0	13.8	18.4	18.8	18.2	20.3	24.1	20.7	17.6	-	
72	364990	175920	40.8	26.5	31.4	29.8	28.0	23.1	26.3	30.4	28.3	26.1	27.5	34.6	29.4	25.0	-	
74	364885	175772	37.7	17.8	29.2	25.1	21.5	17.7	19.8	25.3	22.7	21.7	22.9	29.3	24.2	20.6	-	
76	364722	175926	42.9	26.8	30.1	24.7	30.6	23.7	24.1	23.7	22.9	26.2	28.6	31.9	28.0	23.8	-	
83	372791	182241	29.5	16.2	23.1	19.2	20.4	15.3		19.3	18.9	17.7	20.9	22.9	20.3	17.3	-	
87	357739	181334	37.7	22.2	36.7	23.5	25.5	19.7	20.6	18.7	23.1	29.4	31.6	29.8	26.5	22.6	-	
92	364968	173836	39.8	29.3	23.7	21.1	21.7	21.8	22.8	21.3	20.9	23.9	25.6	27.0	24.9	21.2	-	
93	364979	173801	37.7	18.2	31.9	24.9	17.4	17.2	19.4	22.0	21.9	20.8	24.0	27.6	23.6	20.0	-	
95	365078	173846	44.6	27.1	28.2	27.2	24.1	22.7	25.7	28.2	27.7	25.3	29.8	31.0	28.5	24.2	-	
105	364932	176147	39.8	20.5	21.1	21.4	20.4	16.7	17.2	18.9	21.3	21.9	26.8	31.3	23.1	19.6	-	
113	359112	181909	37.9	24.6	22.0	23.2	30.2	21.6	27.1	24.6	22.6	22.8	22.5	25.1	25.4	21.6	-	
114	355263	185351	34.4	18.4	25.0	25.5	22.0	18.1	21.2	23.6	22.5	19.4	26.1	26.1	23.5	20.0	-	

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted (0.85)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
115	355212	185360	32.6	23.8	27.8	21.1	25.8	19.0	19.7	21.2	18.6	25.1	29.8	30.0	24.5	20.9	-	
117	359874	178259	44.5	26.8	33.8	27.5	23.8	22.6	30.3		31.8	27.8	32.1	32.0	30.3	25.7	-	
119	360263	179250		24.4	35.8	26.2	23.1	20.3	29.5	25.6	28.9	25.3	31.9	35.1	27.8	23.7	-	
122	360566	178229	40.2	22.7	36.0	27.8	20.3	16.3	20.3	24.0	25.1	24.9	32.9	34.7	27.1	23.0	-	
124	360918	178905	40.2	20.5	34.9	29.6	19.9	17.6	26.9	31.6	28.9	25.9	33.7	34.4	28.7	24.4	-	
125	360891	179005	39.1	22.8	29.6	22.2		17.1	20.8	21.1	22.9	24.8	35.7	31.8	26.2	22.3	-	
128	364587	174431	42.3	27.4	29.2	27.5	31.1	20.6	22.4	25.6	26.0	25.7	29.2	34.6	28.5	24.2	-	
129	357508	181059	34.4	20.8	30.0	25.3	26.6	19.4	22.2	26.2	24.5	20.2	25.7	26.7	25.2	21.4	-	
132	364178	172337	38.9	23.6	28.3	23.3	23.6	16.4	19.7	20.6	20.3	19.2	22.7	28.0	23.7	20.2	-	
133	363736	178507	36.3	18.1	35.2	31.2	21.6	19.6	30.5	26.4	28.0	18.7	20.1	25.1	25.9	22.0	-	
134	364048	178719	37.4	22.9	30.8	27.0	29.7	23.0	25.3	28.6	28.7	24.9	31.1	28.5	28.2	23.9	-	
135	364029	178413	36.3	19.6	31.7	28.7	18.9		24.5	26.7	24.8	19.0	21.0	27.0	25.3	21.5	-	
136	361242	180544	31.3	17.1	23.1	16.7	14.9	15.1	24.0	15.9	18.6	19.0	26.2	27.2	20.8	17.6	-	
137	366984	173563	46.0	29.3	34.4	33.4	28.4	26.2	31.0	33.4	30.0	31.0	31.8	35.8	32.6	27.7	-	
138	366941	173558	40.7	31.3	33.8	17.9	32.2	26.7	26.7	24.4	27.0	30.5	37.2	31.8	30.0	25.5	-	
139	366890	173560	44.8	40.1	31.2	31.4	36.2	31.3	32.7	29.2	27.2	33.0	36.1	34.5	34.0	28.9	-	
141	366705	173581	42.6	29.2	28.6	25.6	29.0	23.1	24.0	25.2	24.0	25.4	32.7	29.8	28.3	24.0	-	
142	366613	173597	33.6	26.8	26.0	22.7	26.2	21.2	21.7	24.2	24.2	26.0	29.6	30.0	26.0	22.1	-	
143	366815	173574	35.0	20.0	27.5	20.6	22.1	17.9	16.9	18.2	19.2	21.3	24.5	23.8	22.2	18.9	-	
146	365910	173680	56.4	39.8	41.4	32.6	37.1	33.6	32.9	32.0	32.0	39.9	45.0	39.7	38.5	32.8	-	
147	364586	174496	61.9	30.3	38.6	34.6	37.4	30.7	32.1	33.4	35.6	37.9	40.3	41.9	37.9	32.2	-	

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted (0.85)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
148	360077	178900	35.9	17.9	30.7	23.9	17.9	16.2	18.4	22.9	22.7	20.7	21.3	28.8	23.1	19.6	-	
149	360050	179021	41.3	18.2	36.1	25.7	21.4	19.4	22.8	27.9	25.7	23.4	26.4	30.2	26.6	22.6	-	
150	364528	174425	35.9	17.4	30.5	28.6	24.9	19.4	20.9	27.0	27.4	23.8	24.2	34.5	26.2	22.3	-	
151	364049	178726	40.8	26.5	31.7	25.8	29.4	22.8	24.9	27.2	26.0	25.6	35.0	38.0	29.5	25.1	-	
152	360945	182831	41.4	20.5	33.6	29.5	24.2	17.0	22.8	25.9	23.8	21.5	25.6	33.2	26.6	22.6	-	
153	361842	182417	31.8	12.6	22.2	14.6	17.6	11.4	13.5	15.0	15.9	15.4	19.0	21.7	17.6	14.9	-	
154	363242	180724	35.5	18.9	27.6	17.3	19.5	13.7	14.5	15.4		19.7	20.4	24.7	20.7	17.6	-	
155	363324	179854	32.6	15.1	21.6	16.8	17.6	11.6	11.1	13.2	16.2	17.2	19.5	23.9	18.0	15.3	-	
156	362400	177624	35.2	15.3	28.6	18.2	13.6	11.7	15.7	15.7	19.1	24.5	23.4	27.9	20.8	17.6	-	
157	363999	178505	41.1	29.3	26.2	23.0	28.7	21.2	23.5	24.2	25.1	25.4	32.3	28.7	27.4	23.3	-	
158	366157	178557	39.5	18.1	24.4	23.5			22.4	25.6	23.0	17.1	22.0	25.9	24.1	20.5	-	
159	372395	188581	42.7	18.5	29.9	26.6	27.8	20.3	25.7	28.4	28.1	21.0	23.3	30.9	26.9	22.9	-	
160	364655	175931	44.2	27.3	29.5	24.6	28.2	21.3	24.3	23.9	23.5	24.9	27.7	30.9	27.5	23.4	-	
161	364906	176022	42.4	30.3	26.0	24.2	29.6	21.1	27.8	26.2	25.3	27.8	31.2	31.1	28.6	24.3	-	
162	364925	176062	43.1	20.6	32.4	23.1	24.4	17.9	21.5	22.4	25.4	27.2	27.6	32.8	26.5	22.6	-	
163	364918	175979	42.7	23.8	29.4	25.7	25.5	18.4	22.3	23.5	24.3	26.3	28.1	32.1	26.8	22.8	-	
164	364811	175919	42.0	18.9	31.9	23.1	25.9	23.0	22.3	22.7	22.6	27.9	27.6	30.4	26.5	22.5	-	
165	364906	175864	49.5	21.1	38.0	39.1	32.2	26.3	30.9	40.1	38.8	32.1	32.4	42.0	35.2	29.9	-	
166	364770	173695	39.5	26.0	30.7	25.7	26.3	21.2	22.7	21.1	21.8	25.4	25.0	28.3	26.1	22.2	-	
167	364652	173957	44.3	25.6	25.7	23.1	30.2	23.0	23.2	22.4	22.3	28.9	29.4	31.9	27.5	23.4	-	
168	365366	173805	37.2	19.3	28.0	26.6	20.4	17.1	19.1	22.6	24.4	21.2	24.7	28.0	24.1	20.4	-	

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted (0.85)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
169	366714	173560	37.1	29.8	24.0	26.0	31.1	25.3	24.9	24.3	24.2	28.0	33.6	32.5	28.4	24.1	-	
170	360606	181675	38.0	17.4	29.4	24.4	21.9	16.1	19.7	24.3	22.8	19.9	22.7	29.1	23.8	20.3	-	
172	365153	176812	44.7	32.5	27.1	23.5	30.8		25.4	25.7	25.1	26.3	31.1	29.4	29.2	24.9	-	
173	366459	176139	39.2	21.3	29.4	20.6	24.8	20.2	16.8	20.0	20.2	23.2	26.6	27.6	24.2	20.5	-	
174	372011	192189	27.1	15.1	20.1	15.4	18.3	13.9	13.8	16.9	15.4	13.8	19.5	22.2	17.6	15.0	-	
180	370605	172681	40.4	16.9	29.8	26.3	25.2	21.8	23.2	26.2	27.8	23.3	27.9	28.3	26.4	22.5	-	
181	367298	173452	34.9	24.7	21.8	22.1	29.3	20.0	22.0	22.2	22.4	23.2	28.0	29.1	25.0	21.2	-	
185	364634	175946	44.3	24.3	33.4	26.2	29.0	22.2	22.8	26.7	24.9	26.1	27.3	31.9	28.3	24.0	-	
187	363785	189856	35.4	16.6	35.3	25.2	23.1	15.7	20.1	21.9	25.3	21.5	42.2	34.1	26.4	22.4	-	
188	360450	181066	60.8	46.2	48.2	43.8	45.6	37.4	44.6	44.4	43.3	40.6	49.2	42.1	45.5	38.7	36.1	
189	365668	173738	45.7	27.4	27.7	23.0	26.3	22.0	22.2	21.8	21.9	21.5	38.7	41.6	28.3	24.1	-	
191A	363773	178500	44.9	22.7	47.9	37.7	25.4	24.3	33.4	43.4	35.6	22.6	25.7	29.4	-	-	-	Triplicate Site with 191A, 191B and 191C - Annual data provided for 191C only
191B	363773	178500	47.3	21.0	50.3	41.4	23.5	22.5	34.8	44.6	35.0	24.1	27.9	36.1	-	-	-	Triplicate Site with 191A, 191B and 191C - Annual data provided for 191C only
191C	363773	178500	48.7	22.5	49.3	37.8	27.2	23.7	38.0	38.5	36.5	24.4	25.8	35.3	33.6	28.5	-	Triplicate Site with 191A, 191B and 191C - Annual data provided for 191C only
192A	362384	178562	41.3	18.9	30.1	26.9	20.3	17.5	20.6	26.4	26.8	22.3	22.8	27.8	-	-	-	Triplicate Site with 192A, 192B and 192C - Annual data provided for 192C only
192B	362384	178562	41.6	21.1	27.2	27.6	16.1	16.4	21.1	21.4	25.3	20.4	22.8	30.3	-	-	-	Triplicate Site with 192A, 192B and 192C - Annual data provided for 192C only
192C	362384	178562	40.9	20.7	33.5	26.7	17.6	16.8	22.1	23.4	25.2	20.9	23.1	28.1	24.8	21.1	-	Triplicate Site with 192A, 192B and 192C - Annual data provided for 192C only

☒ All erroneous data has been removed from the NO<sub>2</sub> diffusion tube dataset presented in Table B.1.

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

☐ Local bias adjustment factor used.

☒ National bias adjustment factor used.

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

 **South Gloucestershire Council confirm that all 2022 diffusion tube data has been uploaded to the Diffusion Tube Data Entry System.**

**Notes:**

Exceedances of the NO<sub>2</sub> annual mean objective of 40µg/m<sup>3</sup> are shown in **bold**.

NO<sub>2</sub> annual means exceeding 60µg/m<sup>3</sup>, indicating a potential exceedance of the NO<sub>2</sub> 1-hour mean objective are shown in **bold and underlined**.

See Appendix C for details on bias adjustment and annualisation.

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

### **New or Changed Sources Identified Within South Gloucestershire During 2022**

South Gloucestershire Council has not identified any new sources relating to air quality that have not been otherwise assessed through the planning process within the reporting year of 2022.

### **Additional Air Quality Works Undertaken by South Gloucestershire Council During 2022**

South Gloucestershire Council has not completed any additional studies within the reporting year of 2022. However, there has been continued monitoring and management of the JAQU Air Quality scheme implemented on the A4174 at Hambrook. Further details are provided in Section 2.2 on this work.

### **QA/QC of Diffusion Tube Monitoring**

The diffusion tubes have been prepared and analysed by Somerset County Council Scientific Services since 2019, following a change from Gradko for the years 2017 and 2018. Somerset County Council Scientific Services also previously prepared and analysed the diffusion tubes for the period 2012 – 2016. The tubes are prepared by the laboratory using 20% triethanolamine (TEA) in water and the method follows the Diffusion Tubes for Ambient NO<sub>2</sub> Monitoring: Practical Guidance document<sup>76</sup>.

While the laboratory is not UKAS accredited, it participates in the AIR NO<sub>2</sub> Proficiency Testing (PT) scheme. The latest available AIR PT report indicates the laboratory performance is generally satisfactory, although only includes two AIR PT testing rounds

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<sup>76</sup> [Practical Guidance: NO<sub>2</sub> Diffusion Tubes for LAQM | LAQM \(defra.gov.uk\)](https://www.defra.gov.uk/laqm/practical-guidance-no2-diffusion-tubes)



during 2022 (AR049 Jan – Feb and AR050 May – June)<sup>77</sup>. Laboratory performance in AIR PT is also assessed, by the National Physical Laboratory (NPL), alongside the laboratory's data from the monthly NPL Field Intercomparison Exercise carried out at the continuous monitoring station in Marylebone Road, central London.

The diffusion tube Precision Summary Results<sup>78</sup> also show Somerset County Council Scientific Services to have good tube precision (the ability for a measurement to be consistently reproduced) in 2022.

The tube changing frequency was completed in adherence with the Diffusion Tube Monitoring Calendar of suggested exposure periods for 2022<sup>79</sup> and was carried out by South Gloucestershire Council officers.

### **Diffusion Tube Annualisation**

In 2022, all the diffusion tube monitoring locations within South Gloucestershire recorded data capture of at least 75%, therefore it was not required to annualise any monitoring data.

### **Diffusion Tube Bias Adjustment Factors**

The diffusion tube data presented within the 2023 ASR have been corrected for bias using an adjustment factor. Bias represents the overall tendency of the diffusion tubes to under or over-read relative to the reference chemiluminescence analyser. LAQM.TG22 provides guidance with regard to the application of a bias adjustment factor to correct diffusion tube monitoring. Triplicate co-location studies can be used to determine a local bias factor based on the comparison of diffusion tube results with data taken from NO<sub>x</sub>/NO<sub>2</sub> continuous analysers. Alternatively, the national database of diffusion tube co-location surveys provides bias factors for the relevant laboratory and preparation method.

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<sup>77</sup> [QA QC Framework | LAQM \(defra.gov.uk\)](#)

<sup>78</sup> [Precision and Accuracy | LAQM \(defra.gov.uk\)](#)

<sup>79</sup> [NO<sub>2</sub> Diffusion Tube Monitoring Calendar | LAQM \(defra.gov.uk\)](#)

## National Bias Adjustment Factor

During 2022, the Council operated co-location studies at Yate, Stoke Gifford A4174 and Hambrook A4174 automatic monitoring sites. These three studies were included in the national database of co-location surveys for 2022<sup>80</sup>. The national bias adjustment factor (BAF) for 2022 was 0.85 (spreadsheet version 06/23) for Somerset County Council Scientific Services (14 studies), while the previous BAF (spreadsheet version 03/23) was 0.82 (6 studies).

## Local Bias Adjustment Factor

The Diffusion Tube Precision and Accuracy Bias spreadsheet<sup>81</sup> was used to compare the triplicate co-located diffusion tubes with the automatic monitoring data at the Yate, Stoke Gifford and Hambrook sites and calculate local bias adjustment factors of 0.63 (Yate), 0.87 (Stoke Gifford ) and 0.82 (Hambrook) for 2022, as shown in Figure C.1, Figure C.2 and Figure C.3 respectively. The Local Bias Adjustment Factors are also shown in Table C.1.

The Hambrook automatic site began operating on 4 April 2022, but a local BAF could be calculated using 9 periods of data as there was sufficient data capture (above 75%) in the first period it was operating (80.2%). Apart from one other period at Stoke Gifford where data capture was 89.3%, data capture was otherwise above 90% for all periods at the Hambrook, Yate and Stoke Gifford sites. The precision of the co-located triplicate tubes was classed as good for all sites in all months.

The three local BAFs were combined using the method in LAQM.TG22 Chapter 7 (p141) to calculate a South Gloucestershire Local BAF of 0.76.

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<sup>80</sup> [National Bias Adjustment Factors | LAQM \(defra.gov.uk\)](#)

<sup>81</sup> [Local Bias Adjustment Factors | LAQM \(defra.gov.uk\)](#)

Figure C.1 – 2022 Precision and Accuracy spreadsheet for Yate Co-location Study

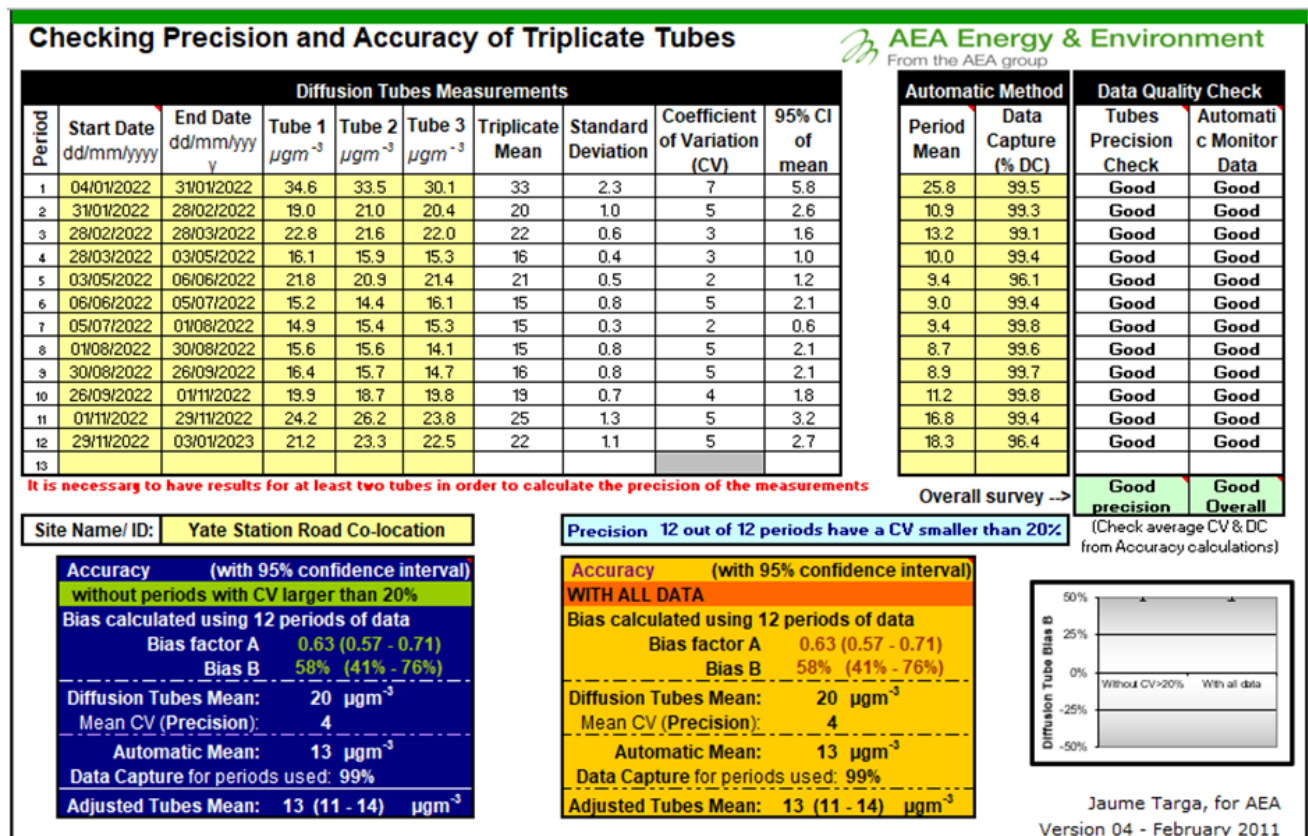
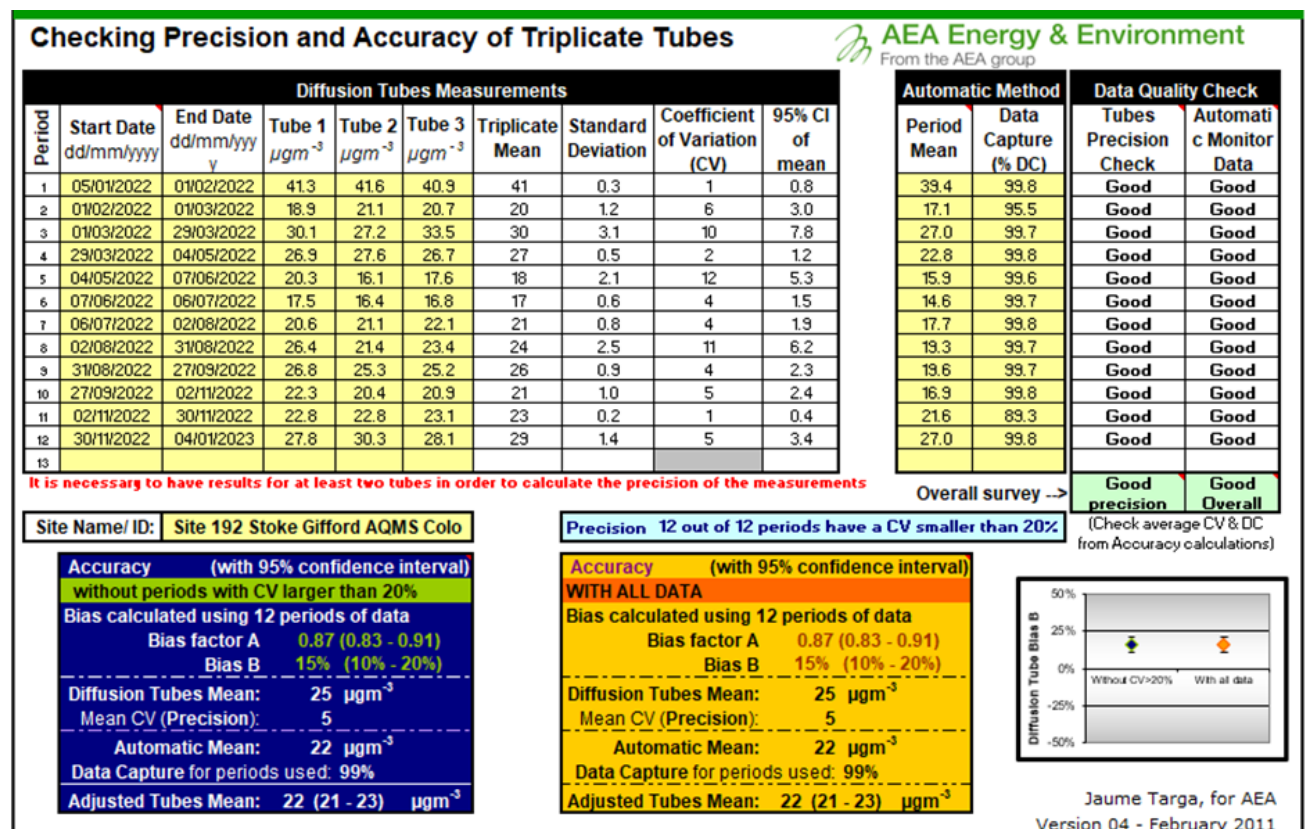
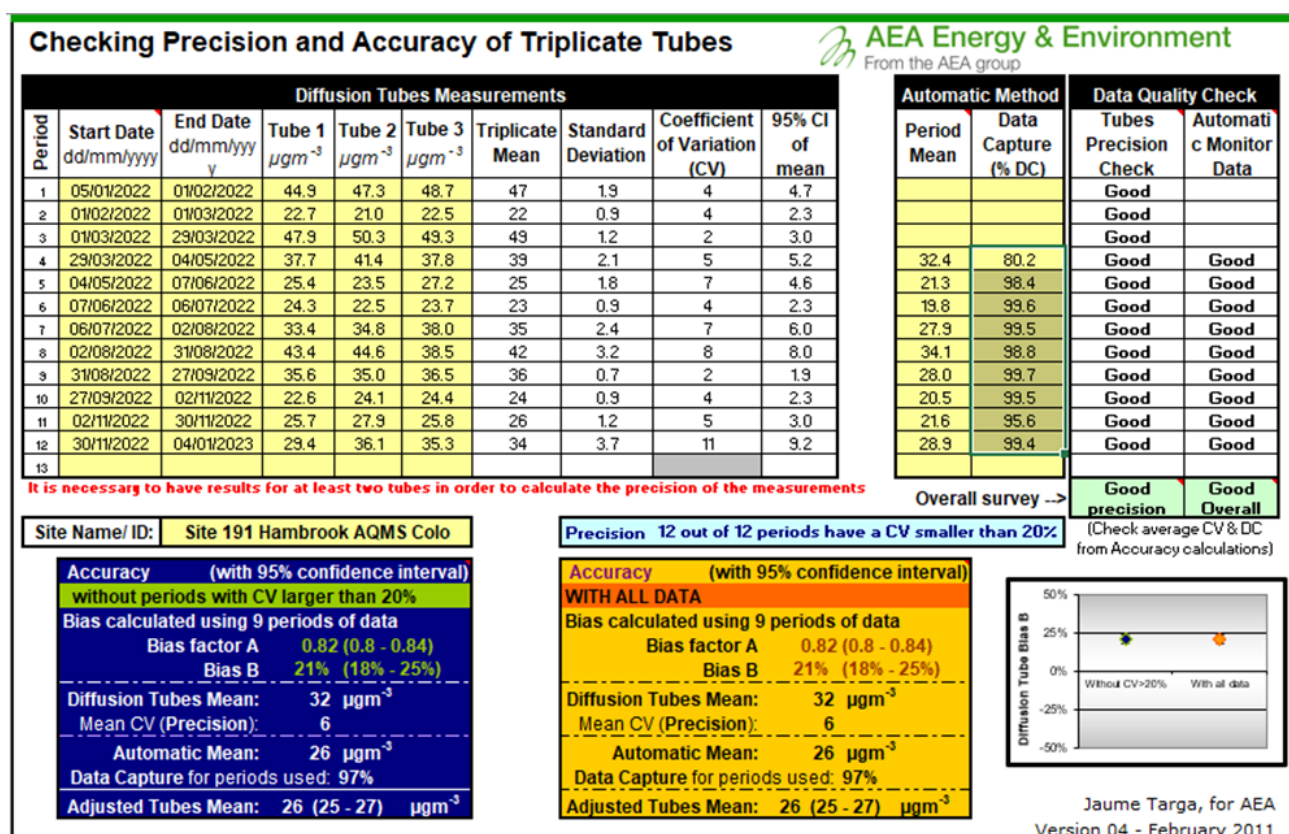


Figure C.2 – 2022 Precision and Accuracy spreadsheet for Stoke Gifford A4174 Co-location Study



**Figure C.3 – 2022 Precision and Accuracy spreadsheet for Hambrook A4174 Co-location Study**



**Table C.1 – Local Bias Adjustment Calculation**

	Local Bias Adjustment Input 1 Yate	Local Bias Adjustment Input 2 Stoke Gifford	Local Bias Adjustment Input 3 Hambrook
Periods used to calculate bias	12	12	9
Bias Factor A	0.63 (0.57 - 0.71)	0.87 (0.83 - 0.91)	0.82 (0.8 - 0.84)
Bias Factor B	58% (41% - 76%)	15% (10% - 20%)	21% (18% - 25%)
Diffusion Tube Mean ( $\mu\text{g}/\text{m}^3$ )	20	25	32
Mean CV (Precision)	4%	5%	6%
Automatic Mean ( $\mu\text{g}/\text{m}^3$ )	13	22	26
Data Capture	99%	99%	97%
Adjusted Tube Mean ( $\mu\text{g}/\text{m}^3$ )	13 (11 - 14)	22 (21 - 23)	26 (25 - 27)

**Note:**

A combined local bias adjustment factor of 0.76 was calculated using the method in LAQM.TG22 (Chapter 7 p141). However the combined local BAF was **not** used to bias adjust the 2022 diffusion tube results and is included for information only.

## Discussion of Choice of Factor to use

South Gloucestershire Council have applied a national bias adjustment factor of 0.85 to the 2022 monitoring data following consideration of the guidance on the choice of bias adjustment factor included in LAQM.TG22 Box 7.13.

The national bias adjustment factor of 0.85 (v06/23) is more conservative than the local bias adjustment factor (0.76) as it is a higher value. The national factor is also more robust in terms of number of studies (14) compared to the local BAF (3 studies) and it represents a wider range of monitoring locations which better reflects the range of South Gloucestershire monitoring locations. Consequently, it was considered it would be more robust and precautionary to use the more conservative national BAF (0.85) as opposed to the local BAF (0.76).

It should be noted that the June (v06/23) revision of the national BAF spreadsheet for Somerset Scientific Services is usually more conservative in value and significantly more robust in terms of the number of studies compared to the March (v03/23) version. This was demonstrated again in 2022 with a March BAF of 0.82 from 6 studies, while the June BAF was 0.85 with 14 studies. The difference usually is the contribution of Bristol City Council's co-location studies, of which there were 8 in 2022, and when these are incorporated, it provides the most conservative, robust and consistent BAF for adjusting our data.

LAQM Helpdesk and Defra advice (Helpdesk Reference: 8696) was sought regarding this issue for the 2022 data bias adjustment, as the stipulated deadline for the 2023 ASR was 30 June 2023 so the June release of the national BAF spreadsheet could not necessarily be considered and the revised BAF used. In light of this, it was agreed by Defra that the data could be processed using the revised June national BAF to ensure the reported data was robust and the report deadline was extended to accommodate this.

A summary of bias adjustment factors used by South Gloucestershire Council over the past five years is presented in Table C.2. The bias adjustment factor used in these years has been the more conservative and robust bias adjustment factor to give the most robust annual means.



**Table C.2 – Bias Adjustment Factor**

Monitoring Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor	Laboratory
2022	National	06/23	0.85	Somerset CC
2021	National	06/22	0.86	Somerset CC
2020	National	06/21	0.85	Somerset CC
2019	National	06/20	0.83	Somerset CC
2018	Local	–	0.94	Gradko

**NO<sub>2</sub> Fall-off with Distance from the Road**

Wherever possible, monitoring locations are representative of exposure. However, where this is not possible, the NO<sub>2</sub> concentration at the nearest location relevant for exposure has been estimated using the Diffusion Tube Data Processing Tool available on the LAQM Support website. Where appropriate, non-automatic annual mean NO<sub>2</sub> concentrations corrected for distance are presented in Table B.1.

Distance correction has been considered for monitoring sites where the annual mean concentration is greater than 36µg/m<sup>3</sup> and the monitoring site is not located at a point of relevant exposure (taking the limitations of the calculator into account). The required 2022 background NO<sub>2</sub> concentrations were taken from the Defra Background Mapping Data<sup>82</sup>. There was one site in 2021 (site 188) in Patchway that was above 36µg/m<sup>3</sup> (at 38.7 µg/m<sup>3</sup>) and not at a façade of relevant exposure. This site is located at roadside on the A38 Gloucester Road near the junction with Hayes Way, but the façades of the nearest residential properties are set back further from the road. The distance adjusted result remained marginally borderline at 36.1 µg/m<sup>3</sup>.

The NO<sub>2</sub> Fall off with Distance calculations are shown in Table C.3.

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<sup>82</sup> [Background Mapping data for local authorities - 2018 - Defra, UK](#)

**Table C.3 – NO<sub>2</sub> Fall off With Distance Calculations (concentrations presented in µg/m<sup>3</sup>)**

Site ID	Distance (m): Monitoring Site to Kerb	Distance (m): Receptor to Kerb	Monitored Concentration (Annualised and Bias Adjusted)	Background Concentration	Concentration Predicted at Receptor	Comments
188	3.6	5.9	38.7	19.3	36.1	<i>Predicted concentration at Receptor within 10% the AQS objective.</i>

## 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 by Air Quality Data Management (AQDM) under contract to South Gloucestershire Council
- Monthly Local Site Operator (LSO) duties, including site inspections and calibration checks on the analysers using certified traceable standard gases, by Bristol City Council (BCC) at Yate and Enviro Technology Services at Stoke Gifford and Hambrook, under contract to South Gloucestershire Council
- Ad-hoc site inspections to check equipment operational status, site safety and security and investigate equipment malfunction as necessary by SGC Environmental Protection Officers
- Planned six monthly servicing and re-calibration of the analysers and repairs as necessary by Enviro Technology Services under contract to South Gloucestershire Council.

### Calibration methods

Calibration procedures are carried out monthly. 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.

The two point calibration is conducted on the NO<sub>x</sub> analysers using a zero air scrubber and a reference nitric oxide (NO) mixture at a concentration of approximately 470 ppb. 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 re-calibrated at six monthly intervals following manufacturers' instructions by the equipment suppliers, Enviro Technology Services. For the NO<sub>x</sub> analysers, this includes multi-point recalibrations as detailed above and a check on the efficiency of the molybdenum converter. The service 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.

The results of all service, maintenance and calibrations checks are held and used in the data scaling and ratification process by AQDM.

### **Data Processing, Validation and Ratification**

From 2022, Air Quality Data Management (AQDM) have been collecting and managing the automatic monitoring data on behalf of the Council as SGC no longer directly collects the data itself. AQDM undertake the subsequent validation, scaling and ratification of the data in accordance with LAQM.TG22.

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 monthly 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.

The real-time automatic monitoring data for South Gloucestershire is available on the [Air Quality in the United Kingdom \(ukairquality.net\)](https://ukairquality.net) website. Historic data for the automatic monitoring stations that have ceased operation; Filton (NO<sub>2</sub> and PM<sub>10</sub>), Kingswood (NO<sub>2</sub> and PM<sub>10</sub>) and Badminton (O<sub>3</sub>), is also available on this website.

### **PM<sub>10</sub> and PM<sub>2.5</sub> Monitoring Adjustment**

The PM<sub>10</sub> data measured by the unheated Beta Attenuation Monitor (BAM) at the Yate automatic monitoring site have been adjusted to gravimetric equivalent by using a factor of 0.833. The PM<sub>10</sub> measurements are made using a smart heated BAM 1020 at the Stoke Gifford A4174 automatic monitoring site so have been adjusted to gravimetric equivalent using a factor of 0.96618.

The PM<sub>2.5</sub> measurements are made at the Stoke Gifford A4174 automatic monitoring site using a smart heated BAM 1020 and do not require the application of a correction factor.

### **Automatic Monitoring Annualisation**

The 2022 NO<sub>2</sub> monitoring data from the Hambrook A4174 automatic monitoring site required annualisation as the site operated from 4 April 2022, so the data capture for the year (73.4%) was less than 75%, but greater than 25%.

Following guidance in LAQM.TG22 Chapter 7, the annualised mean was estimated using 2022 NO<sub>2</sub> data from the following four AURN monitoring sites with a minimum of 85% data capture; Bristol St. Paul's, Cwmbran Crownbridge, Swindon Walcot and Charlton Mackrell. All these AURN sites are within a 50 mile radius of the Hambrook A4174 automatic monitoring site (Site ID SG3) as required by LAQM.TG22 Box 7.9. The annualisation data is presented in Table C.4.

The Yate and Stoke Gifford A4174 automatic monitoring sites recorded data capture greater than 75% in respect of all monitored pollutants so annualisation was not required.

**Table C.4 – Annualisation Summary (concentrations presented in  $\mu\text{g}/\text{m}^3$ )**

Site ID	Annualisation Factor Bristol St Paul's	Annualisation Factor Cwmbran Crownbridge	Annualisation Factor Swindon Walcot	Annualisation Factor Charlton Mackrell	Average Annualisation Factor	Raw Data Annual Mean	Annualised Annual Mean
SG3 Hambrook	1.0980	1.1620	1.1616	1.1305	1.1380	26	29.6

**NO<sub>2</sub> Fall-off with Distance from the Road**

Wherever possible, monitoring locations are representative of exposure. However, there is no relevant exposure in relation to the Yate, Stoke Gifford A4174 or Hambrook A4174 automatic monitoring sites, so distance adjustment of the data is not appropriate or possible.

## Appendix D: Maps of Monitoring Locations and AQMAs

Figure D.1 – Staple Hill AQMA (Amended 2012)

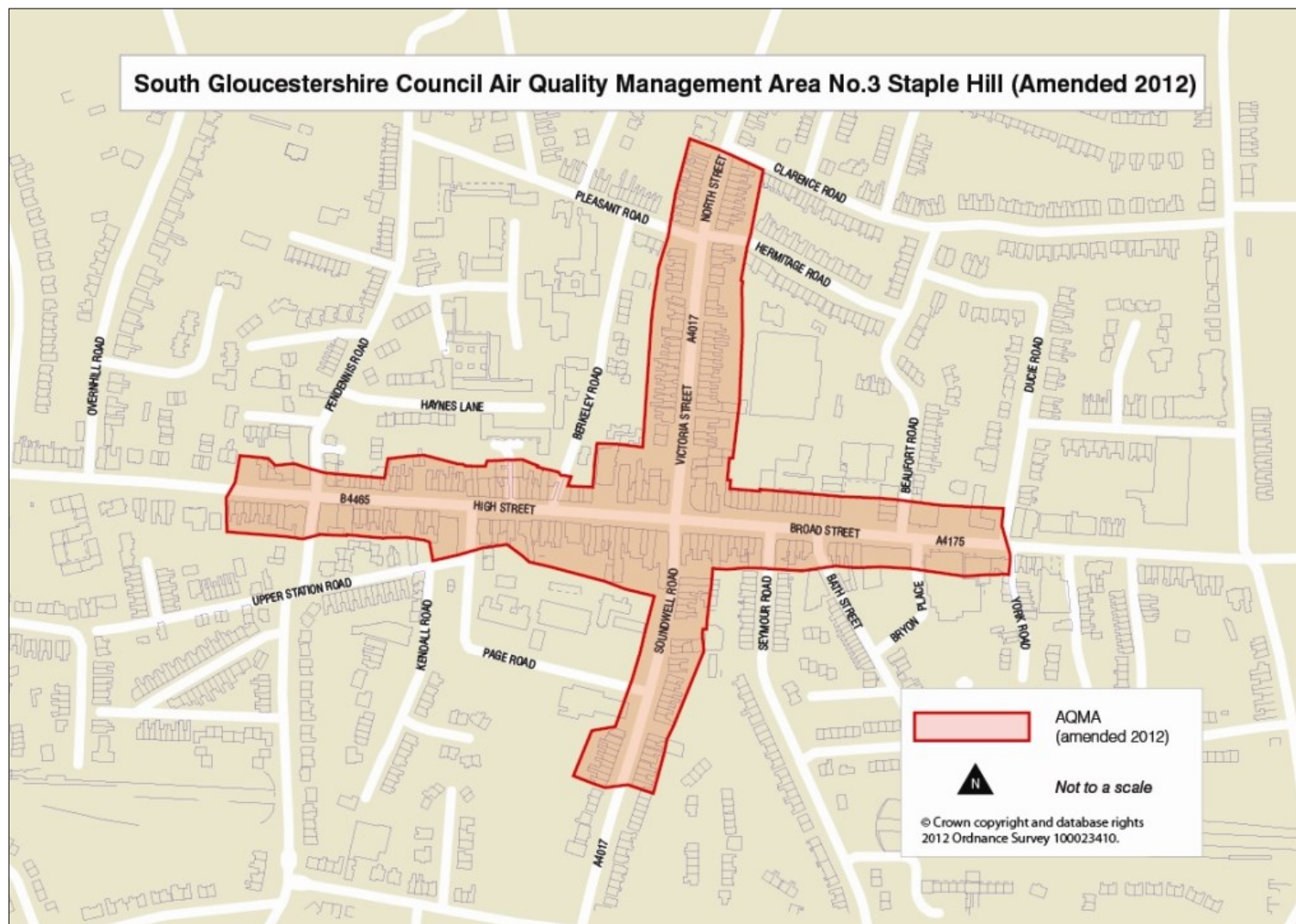




Figure D.2 – Kingswood – Warmley AQMA (Amended 2015)

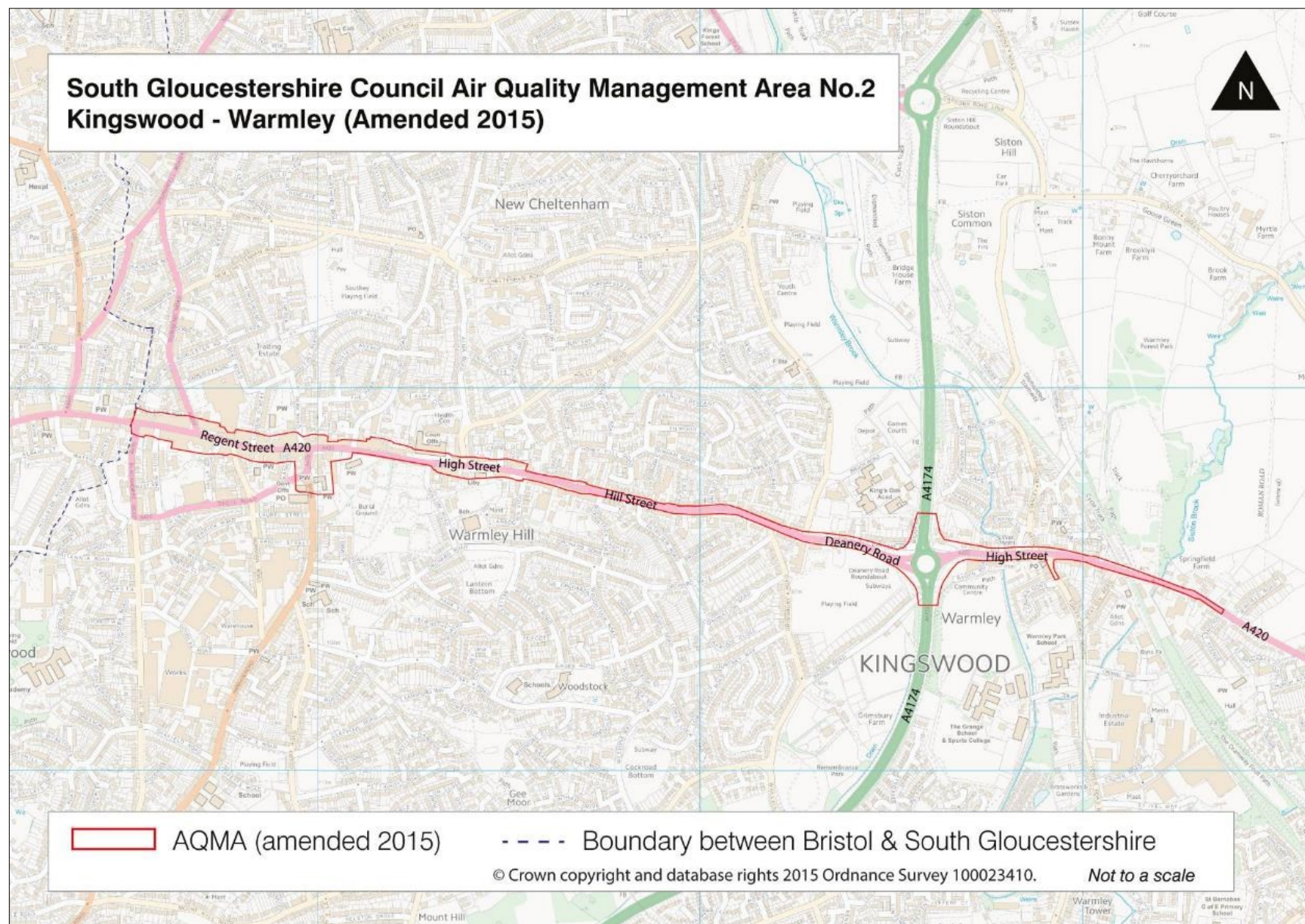
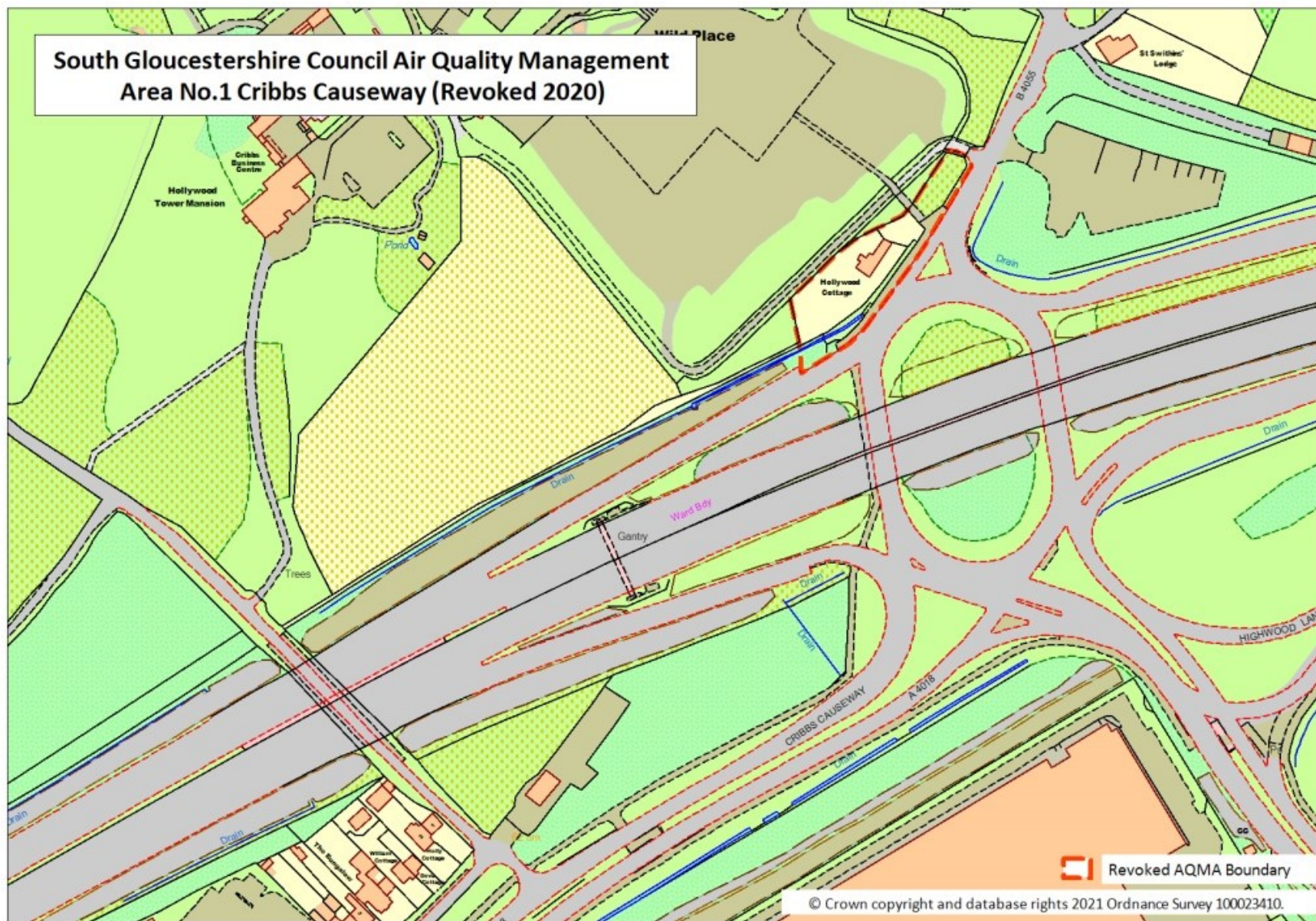


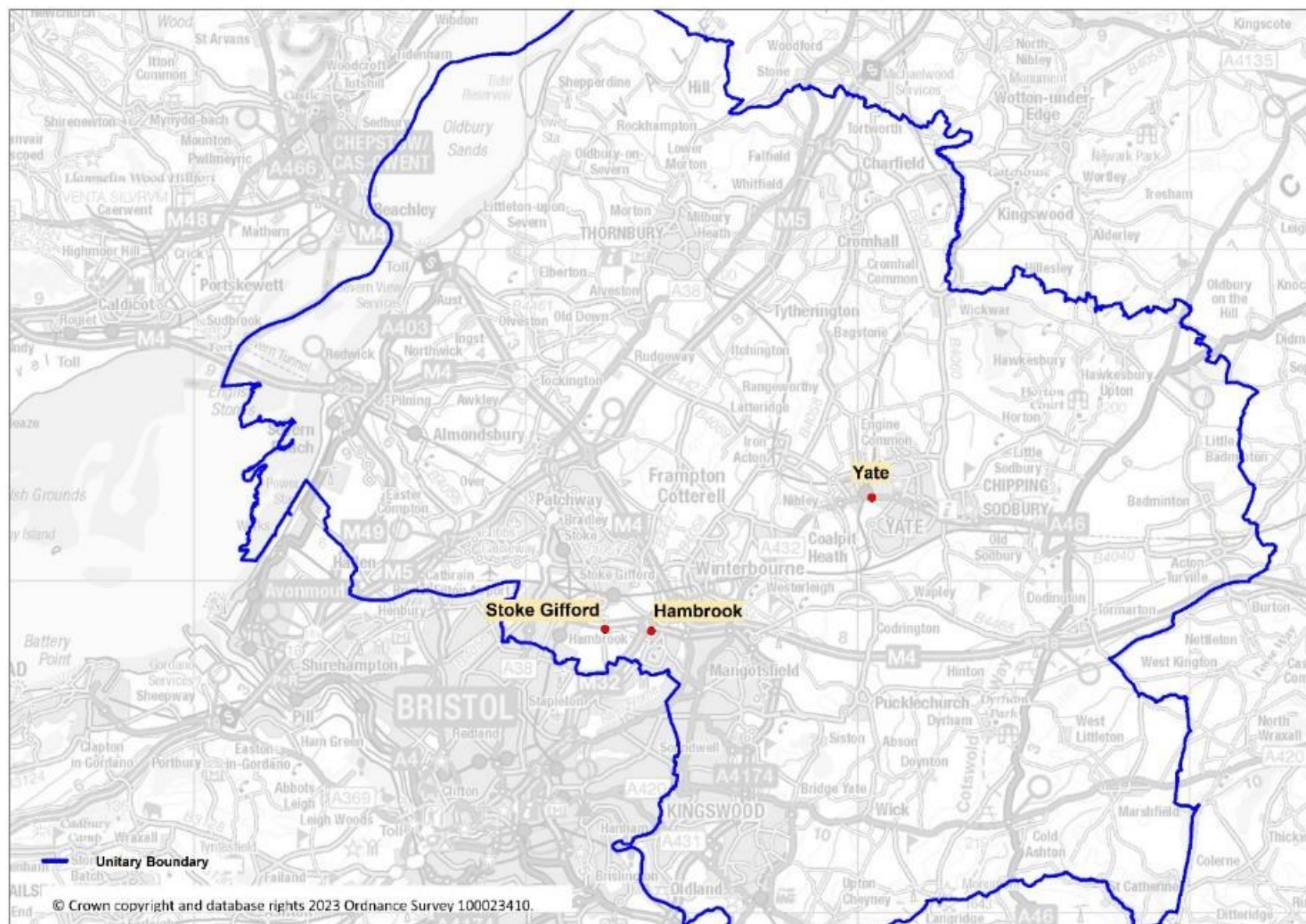


Figure D.3 – Cribbs Causeway AQMA (Revoked 2020)

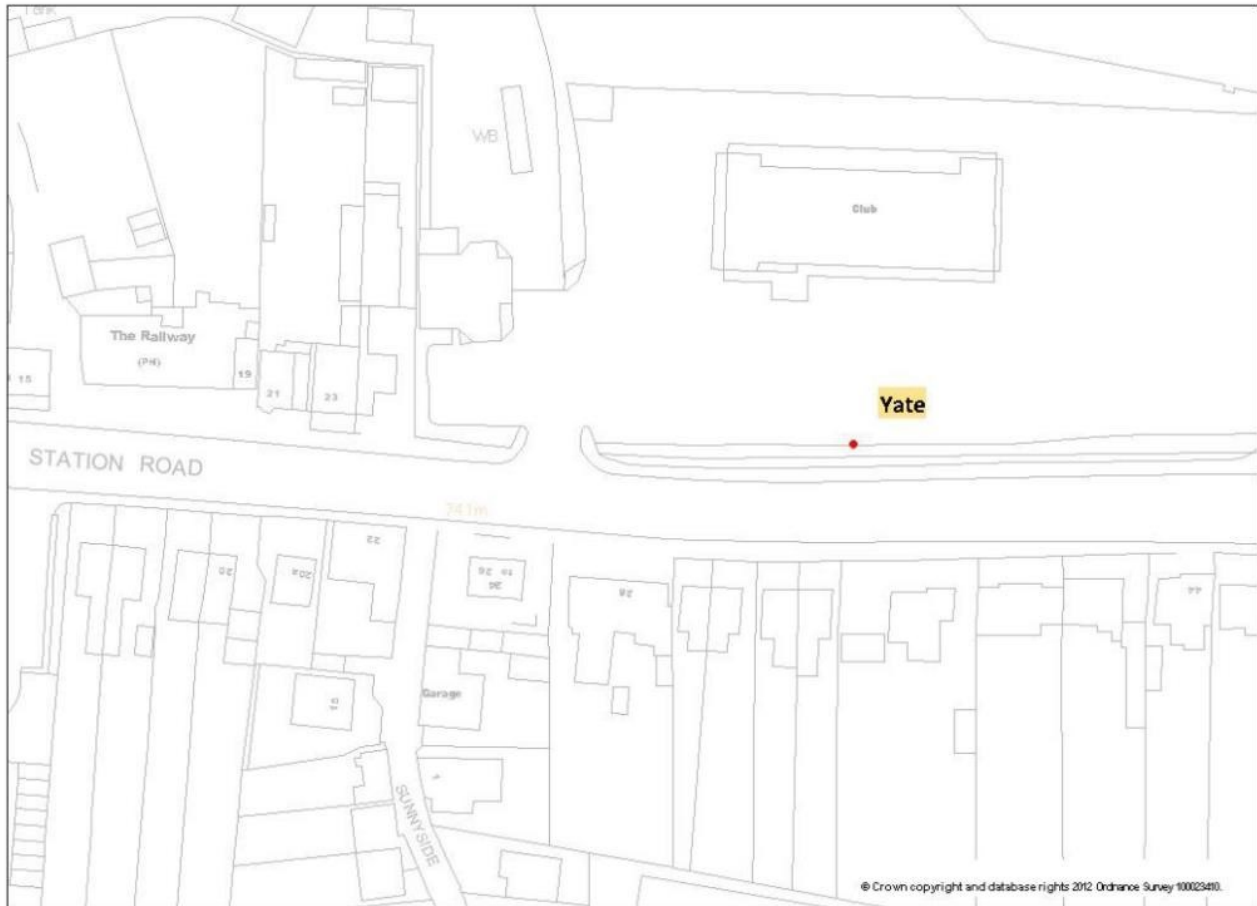




**Figure D.4 – Automatic Monitoring Sites in South Gloucestershire**



**Figure D.5 – Automatic Monitoring Site Yate - Station Road**



**Figure D.6 – Automatic Monitoring Site Stoke Gifford A4174 Ring Road**

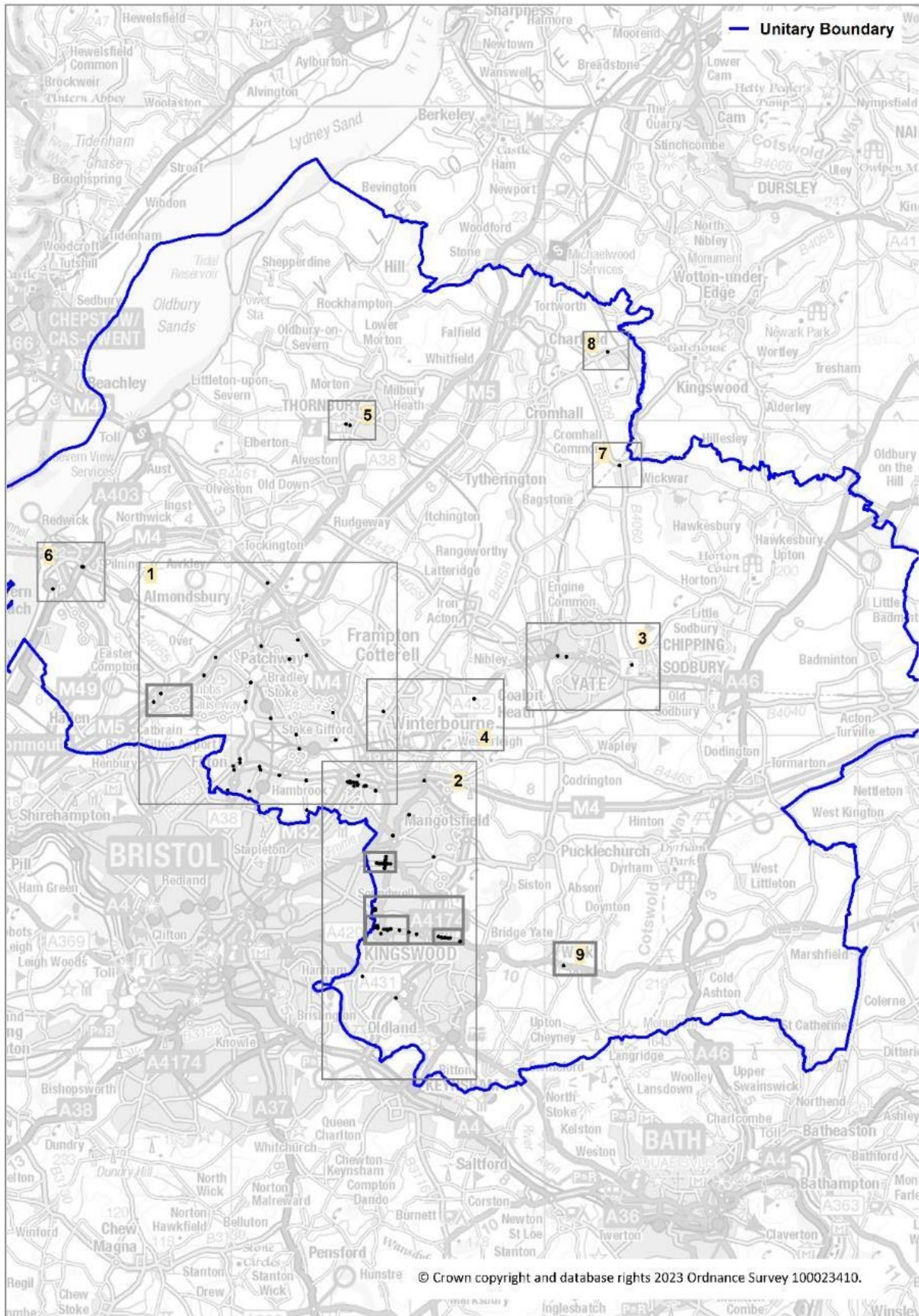


**Figure D.7 – Automatic Monitoring Site Hambrook A4174 Ring Road**



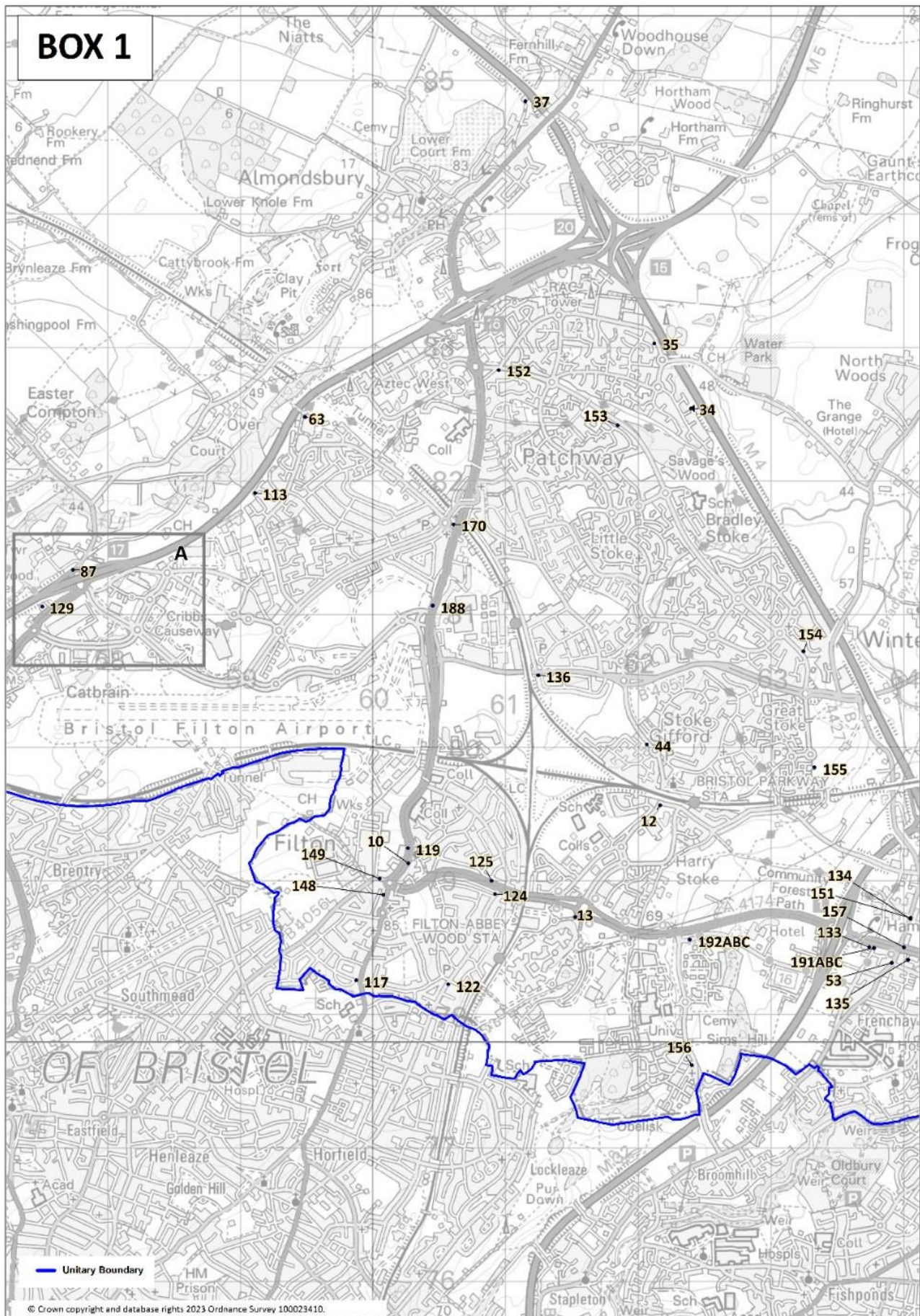


**Figure D.8 – All Diffusion Tube Sites showing locations of following Figures**

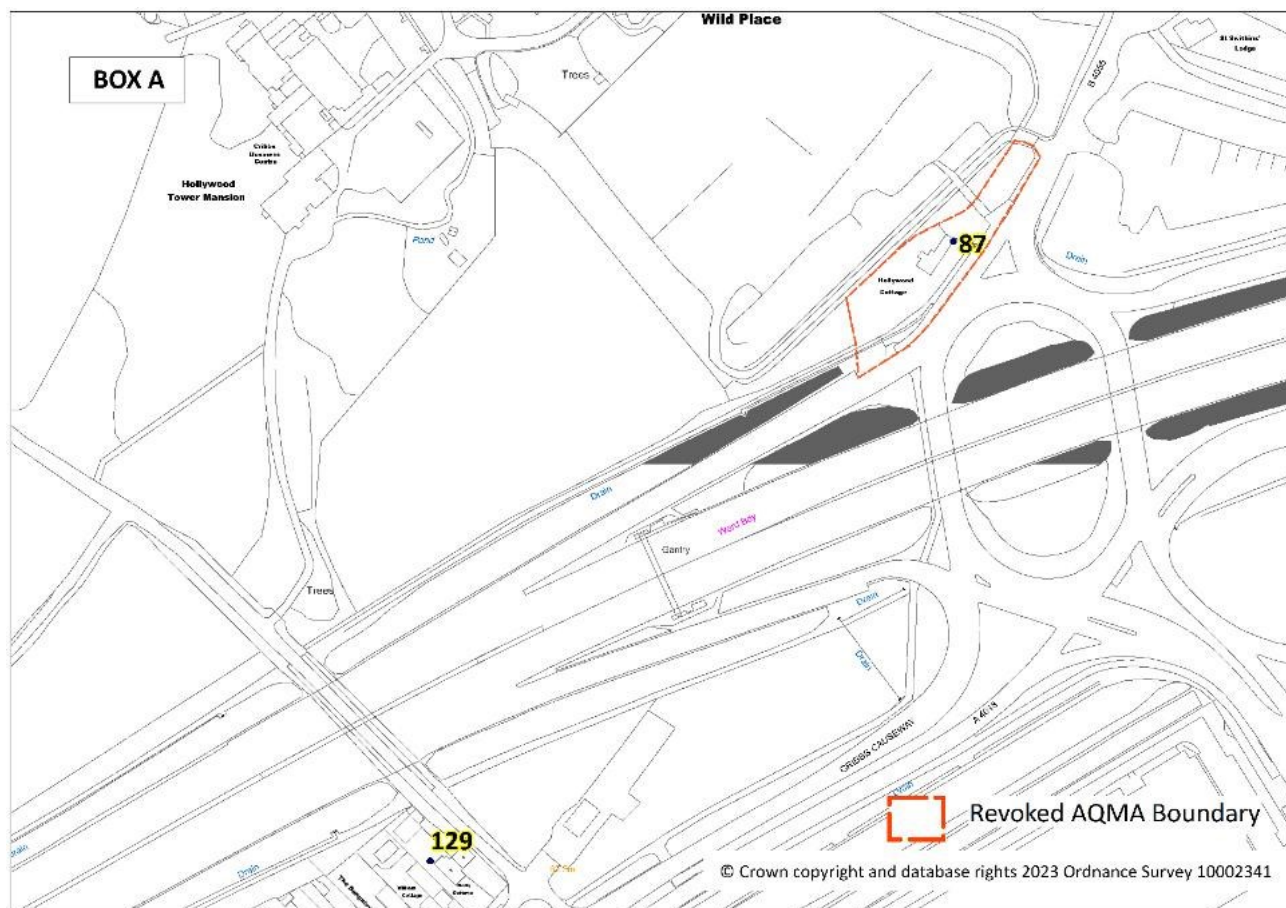




### Figure D.9 – Diffusion Tube Sites in Bristol North (Box 1 Figure D.8)

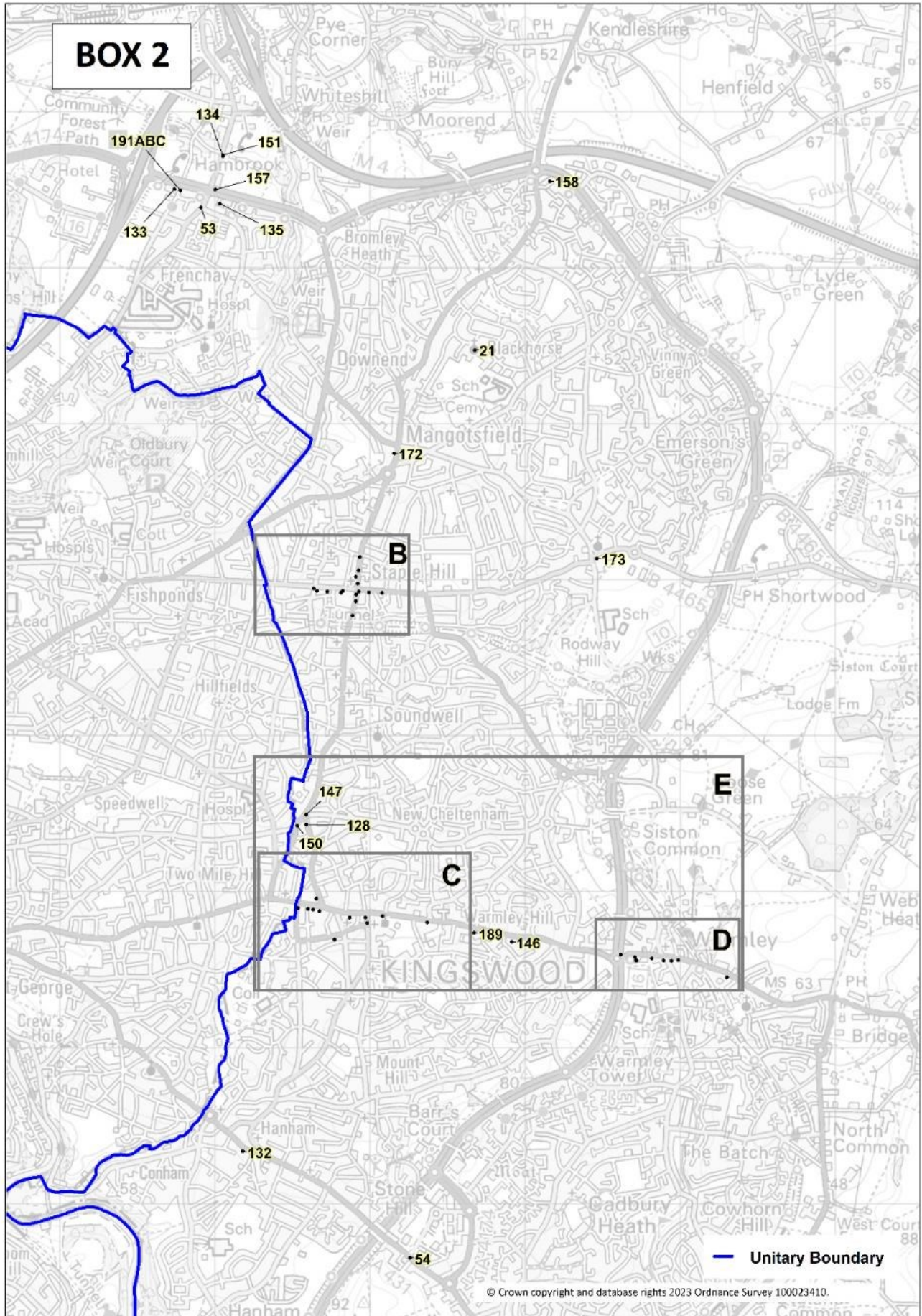


**Figure D.10 – Diffusion Tube Sites in Cribbs Causeway (Box A Figure D.9)**



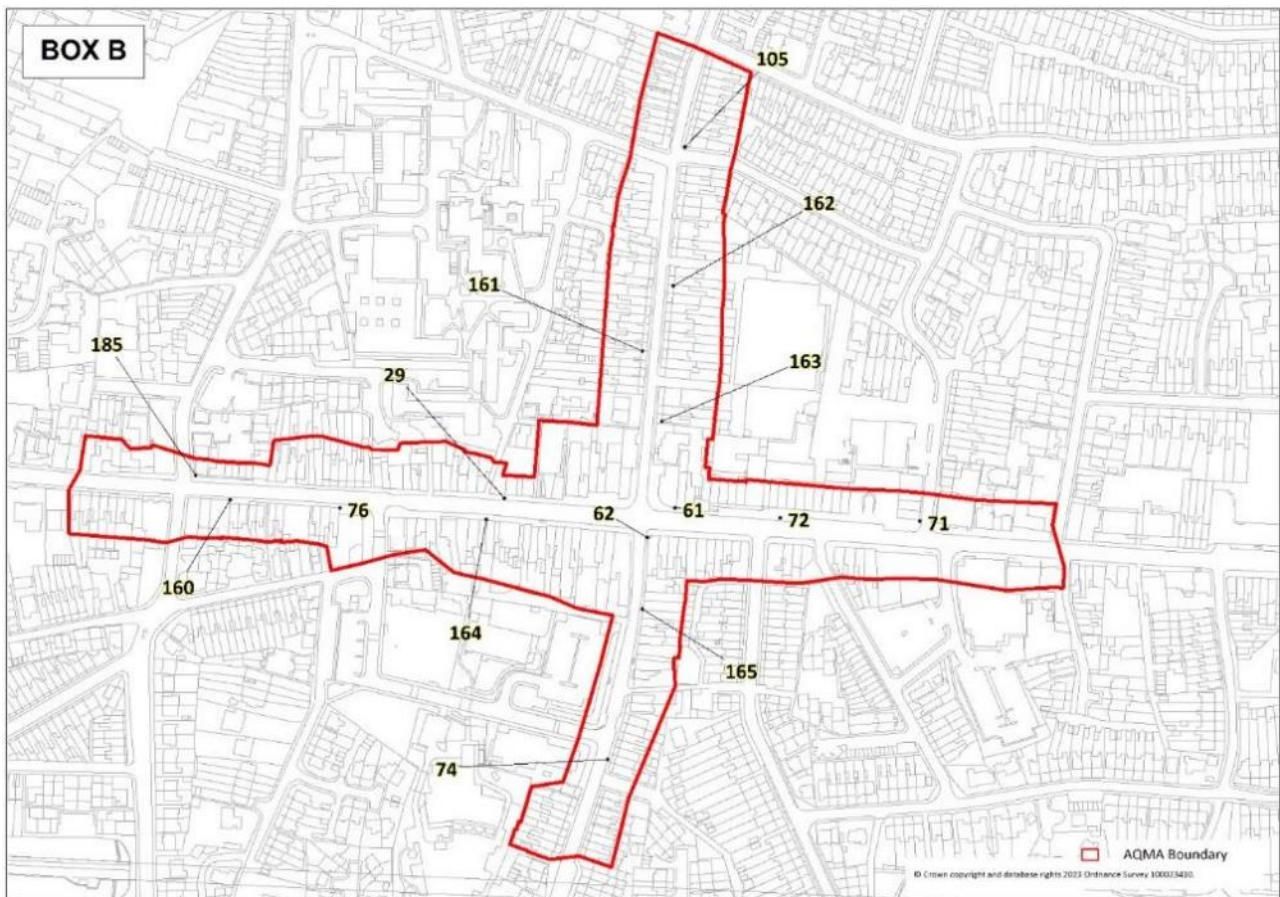


**Figure D.11 – Diffusion Tube Sites in Bristol East (Box 2 Figure D.8)**

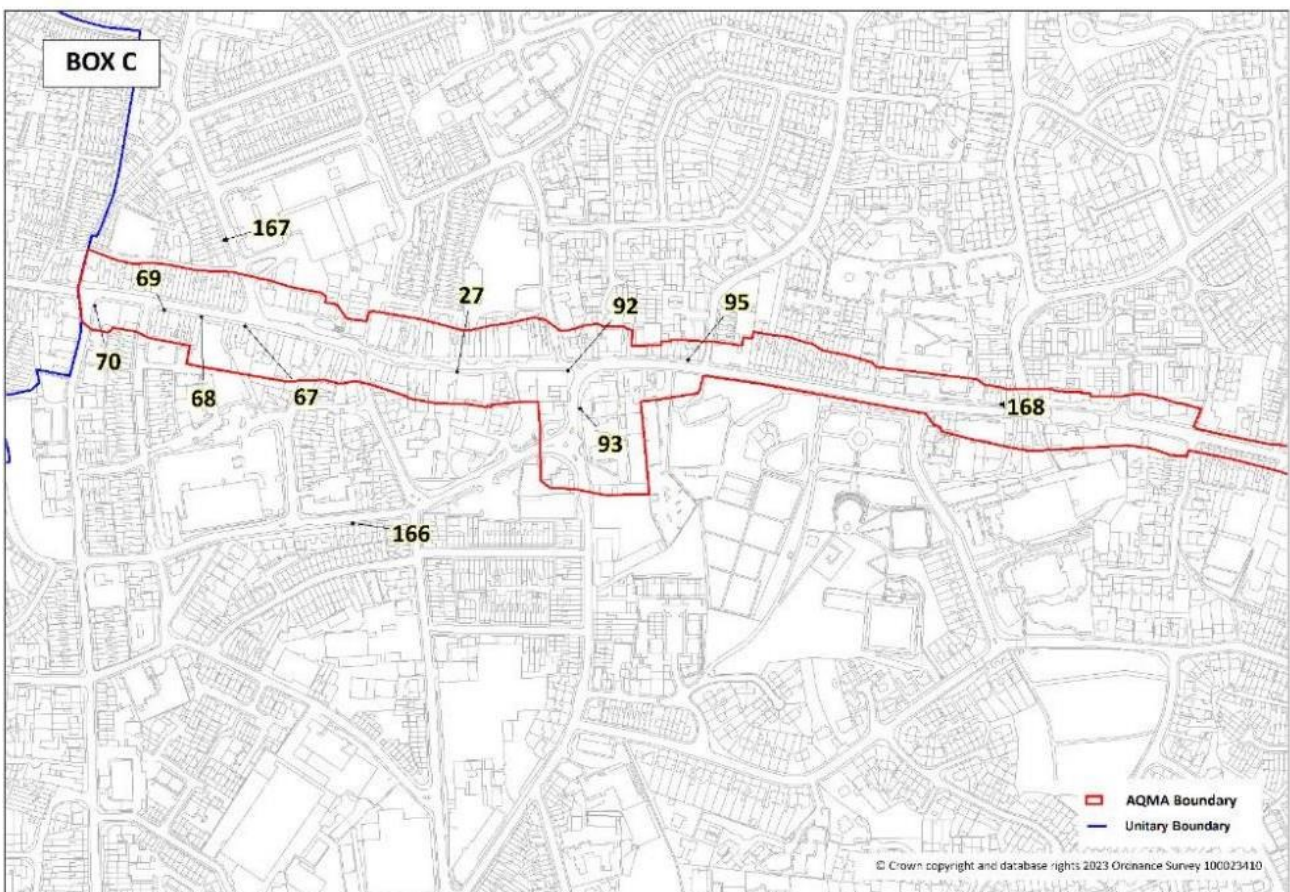




**Figure D.12 – Diffusion Tube Sites in Staple Hill (Box B Figure D.11)**



**Figure D.13 – Diffusion Tube Sites in Kingswood (Box C Figure D.11)**





**Figure D.14 – Diffusion Tube Sites in Warmley (Box D Figure D.11)**

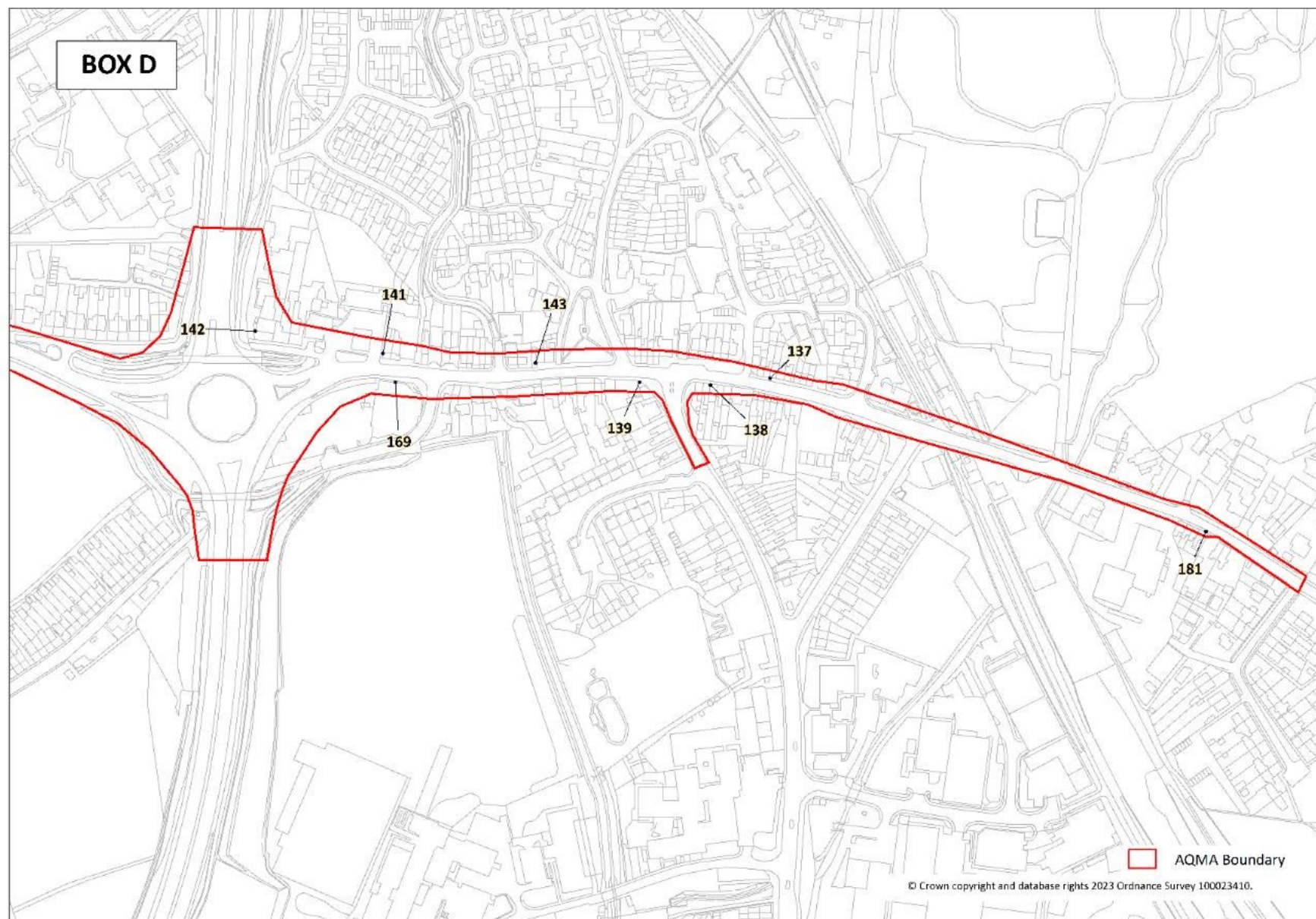
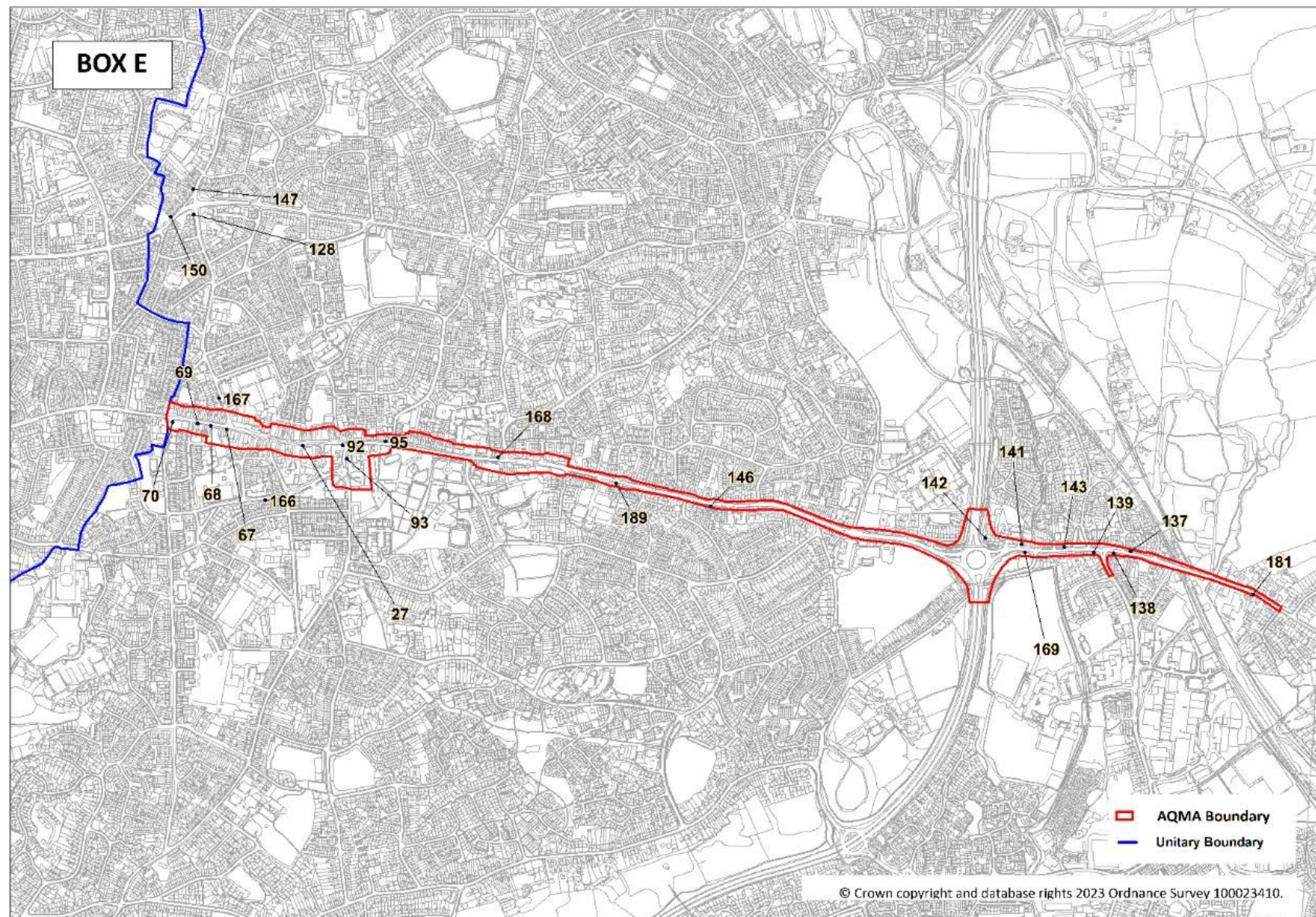




Figure D.15 – Diffusion Tube Sites in Kingswood & Warmley (Box E Figure D.11)





**Figure D.16 – Diffusion Tube Sites in Yate & Chipping Sodbury (Box 3 Figure D.8)**



**Figure D.17 – Diffusion Tube Sites in Winterbourne & Coalpit Heath (Box 4 Figure D.8)**





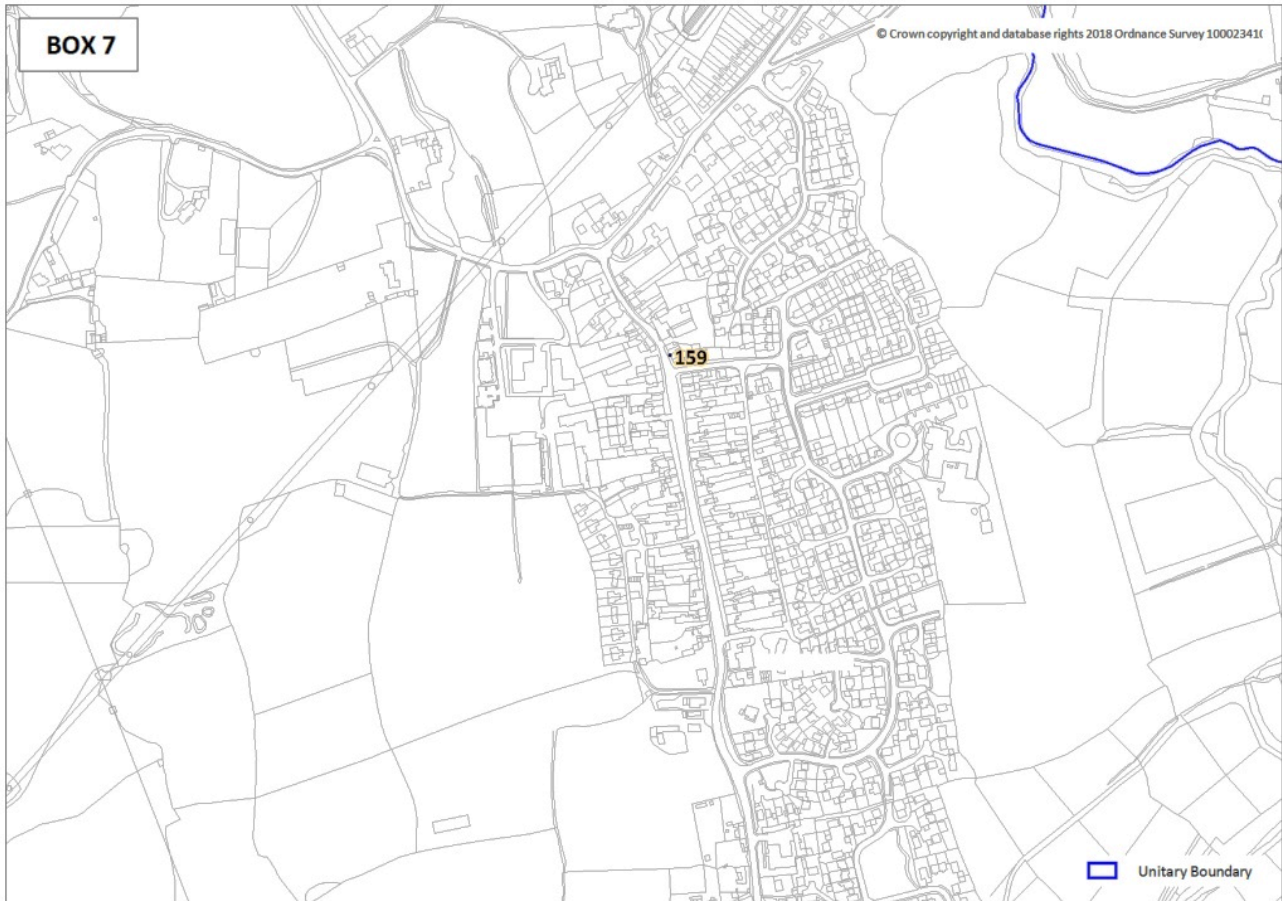
**Figure D.18 – Diffusion Tube Sites in Thornbury (Box 5 Figure D.8)**



**Figure D.19 – Diffusion Tube Sites in Severn Beach and Pilning (Box 6 Figure D.8)**



**Figure D.20 – Diffusion Tube Sites in Wickwar (Box 7 Figure D.8)**



**Figure D.21 – Diffusion Tube Sites in Charfield (Box 8 Figure D.8)**



**Figure D.22 – Diffusion Tube Sites in Wick (Box 9 Figure D.8)**



## Appendix E: Summary of Air Quality Objectives in England

**Table E.1 – Air Quality Objectives in England<sup>83</sup>**

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

<sup>83</sup> The units are in microgrammes of pollutant per cubic metre of air (µg/m<sup>3</sup>).



## Appendix F: Ozone Monitoring

Ozone at ground level is a secondary pollutant formed by the photochemical reaction of pollutants, such as nitrogen oxides (NO<sub>x</sub>) from vehicle and industry emissions and volatile organic compounds (VOCs) emitted by vehicles, solvents and industry, with sunlight. It is one of the major constituents of photochemical smog. Reducing NO<sub>x</sub> emissions and any resultant reduction in levels of nitrogen dioxide (NO<sub>2</sub>) are invariably accompanied by an increase in ozone levels. This is of concern due to the health impacts of ozone<sup>84</sup> and because ozone is also a greenhouse gas in the lower atmosphere.

South Gloucestershire Council monitored Ozone (O<sub>3</sub>) concentrations at automatic monitoring site (SG2) in Stoke Gifford on the A4174 Ring Road near Coldharbour Lane and UWE during 2022. The Council has previously monitored ozone at a more rural monitoring site in Badminton from 1998 until early 2015 when the site ceased operation.

The transboundary nature of ozone is recognised in the Government's UK Air Quality Strategy<sup>85</sup>. Consequently, the objective for ozone is not included in the Local Air Quality Management regime. However, the ozone objective (100 µg/m<sup>3</sup>, measured as a running 8-hour mean, not to be exceeded more than ten times a year) is a guide for the reporting of locally monitored ozone concentrations.

Table F.1 presents the ratified and adjusted monitored O<sub>3</sub> annual mean concentrations and Table F.2 compares the ratified continuous monitored O<sub>3</sub> daily maximum running 8-hour mean concentrations with the ozone objective.

In 2022, the annual mean ozone concentration was 51 µg/m<sup>3</sup>. During 2022, there were 22 days when the maximum running 8-hour mean objective of 100 µg/m<sup>3</sup> was exceeded. As the allowance is 10 days, this objective was exceeded. 20 of the 22 days were between 1<sup>st</sup> April and 30<sup>th</sup> September when ozone concentrations are likely to be at their highest. The maximum running 8-hour mean was 167 µg/m<sup>3</sup>.

Table A.1 in Appendix A shows the details of the automatic monitoring site and maps showing its location are provided in Appendix D. The automatic monitoring results for

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<sup>84</sup> [Ozone \(O3\) - GOV.UK \(www.gov.uk\)](https://www.gov.uk)

<sup>85</sup> [Air Quality Strategy Vol 1 \(publishing.service.gov.uk\)](https://publishing.service.gov.uk)

South Gloucestershire Council are presented on the [Air Quality in the United Kingdom \(ukairquality.net\)](https://ukairquality.net) website.

**Table F.1 – Annual Mean O<sub>3</sub> Monitoring Results (µg/m<sup>3</sup>)**

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2022 (%) <sup>(2)</sup>	2021	2022
SG2 Stoke Gifford A4174 Coldharbour Lane	362384	178562	Roadside	99.3	99.3	49.0	51

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

**Notes:**

The annual mean concentrations are presented as µg/m<sup>3</sup>.

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

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

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

**Table F.2 – 8-Hour Mean O<sub>3</sub> Monitoring Results, Number of O<sub>3</sub> Daily Maximum**

**Running 8-Hour Means > 100 µg/m<sup>3</sup>**

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2021 (%) <sup>(2)</sup>	2021	2022
SG2 Stoke Gifford A4174 Coldharbour Lane	362384	178562	Roadside	99.5	35.4	3	<b>22</b>

**Notes:**

Results are presented as the number of running 8-hour periods where daily mean concentrations greater than 100µg/m<sup>3</sup> have been recorded during the monitoring period. There is an annual allowance of 10 days. The ozone standard is not set in regulations.

Exceedances of the Ozone guideline objective of 100 µg/m<sup>3</sup> (not to be exceeded more than 10 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%).



## Glossary of Terms

Abbreviation	Description
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the local authority intends to achieve air quality limit values'
AQMA	Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives
ASR	Annual Status Report
BAM	Beta Attenuation Monitor (for Particulate Matter measurement)
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by National Highways
EU	European Union
Exceedance	A period of time where the concentration of a pollutant is greater than the appropriate air quality objective
JAQU	Joint Air Quality Unit between Defra and Department for Transport
JLTP	Joint Local Transport Plan
LAQM	Local Air Quality Management
NO <sub>2</sub>	Nitrogen Dioxide
NO <sub>x</sub>	Nitrogen Oxides
O <sub>3</sub>	Ozone
PM <sub>10</sub>	Airborne particulate matter with an aerodynamic diameter of 10µm or less
PM <sub>2.5</sub>	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO <sub>2</sub>	Sulphur Dioxide
µg/m <sup>3</sup>	Microgrammes per cubic metre
WECA	West of England Combined Authority

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