Bristol City Council
A Short Report on Air Quality: 2013
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1 Introduction

This report is intended as a concise summary of the most recent air quality measurements, policies and plans in Bristol. The report summarises the key air quality monitoring data from 2012. The full, detailed information is contained within the 2013 Progress Report. More information, including live air quality data and historic reports on air quality is available on our website: www.bristol.gov.uk/airquality.

1.1 Background Information

For the last 60 years Bristol has striven to improve air quality. First controlling smoke and sulphur dioxide from coal burning in the 1950’s and 60’s, restricting pollutants such as lead and fluoride from industry in the 1970’s and 80’s and from then till now controlling pollution from road vehicles.

The UK Government introduced strategic air quality management with the National Air Quality Strategy in 1997. This placed a duty on local authorities to measure and report on air quality and to declare an Air Quality Management Area (AQMA) and publish an Air Quality Action Plan for those areas where air quality did not meet objectives. When that system was developed the Government assumed that only small parts of urban areas would not comply with the standards. Subsequent monitoring in all major UK cities has shown that much larger areas than anticipated are non-compliant.

Bristol City Council (BCC) is constrained by limited local powers and controls on emissions from traffic. Air quality is a material consideration in planning and BCC provides guidance to developers and planners to deal with air quality in the development process. BCC only manages part of the road network in the West of England sub-region and relies on Government finance, mainly through the regional Local Transport Plan (LTP) for major transport schemes to deliver air quality improvements. BCC is actively managing air quality in the city within the limited budgets available.
1.2 Environmental Situation

The geography of Bristol has a major influence on air quality in the city. The basin in which Bristol is located means that when weather conditions are calm, pollution does not disperse well. However, the weather is dominated by prevailing south - westerly winds, which dilute and disperse pollution from traffic in the city.

![Windrose for 2012: Bristol St. Pauls.](image)

Industrial pollution from Avonmouth has declined significantly in recent years and does not impact on the city centre. The vast majority of pollution experienced by citizens is from road traffic. The M4, M5 and M32 motorways enhance Bristol's economic status but are major pollution sources.

Most of the city has good air quality and meets the EU and UK standards for a range of pollutants, including particulates.

In the central part of the city and along main radial roads concentrations of NO$_2$ regularly exceed UK and European air quality objectives. This area is the Air Quality Management Area (AQMA). The city centre is subject to high flows of buses, which contributes significantly to localised elevated concentrations of NO$_2$. This situation is similar to many other large UK and European cities.
The City Council constantly monitors air pollution, and data from our network is reported online at http://www.bristol.airqualitydata.com/. Data from the network are used to support statutory reporting under the Local Air Quality Management regime.

Actions to reduce congestion and pollution are being pursued through the Local Transport Plan including smarter choices to promote less car use. These are citywide and should therefore benefit air quality within the AQMA. More detail on these measures is provided in section 3.

1.3 Air Quality and Health

Poor air quality causes illness and premature death to people; injury and death to ecosystems; and physical damage to buildings and structures of value. It also affects perceptions of the local area and quality of life for residents. Poor air quality has a greater public health impact than road traffic accidents and passive smoking combined. The health impacts are twice that of physical inactivity and the costs are comparable with the costs of alcohol misuse to society. It is estimated that 29,000 people in the UK are dying 11 years early every year because of air pollution. In Bristol this means that around 500 people are dying early each year. Bristol City Council will be commissioning a study in 2013 (subject to funding) to more accurately quantify where the impact falls in the local population.
2 Air Quality Assessment

BCC has published various assessments of air quality, many of which are available through Bristol City Council's [web site](#). As a result of these assessments, an Air Quality Management Area (AQMA) has been declared and a map is shown in Figure 1. The AQMA is regularly updated through the statutory [Local Air Quality Management (LAQM)](#) process. The AQMA is the area inside which the UK government's objective for annual mean nitrogen dioxide (NO\textsubscript{2}) in 2005 was not met.

The most recent air quality assessment - The [2013 Progress Report](#) showed that the NO\textsubscript{2} objective was not met at roadside locations in the city in 2012. Concentrations of other pollutants were below relevant objectives.

Bristol has one of the most comprehensive air quality monitoring networks in the UK. It is focused on monitoring the key road traffic pollutants of nitrogen dioxide and fine particles (PM\textsubscript{10}). Monitoring sites are located in worst–case locations where there is residential exposure, in line with national guidance. In 2012 BCC had 11 continuous sites, eight of which monitor oxides of nitrogen (NOx), and a network of over 100 diffusion tube sites monitoring nitrogen dioxide. In January 2013, the number of continuous sites was reduced to six, all monitoring oxides of nitrogen. The number of diffusion tube sites has remained constant. Their locations are shown in Figure 2 and Figure 3.
## 2.1 Air Quality Objectives

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Concentration</th>
<th>Measured as</th>
<th>Date to be achieved by</th>
<th>Achieved?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzene</td>
<td>16.25 µgm⁻³</td>
<td>Running annual mean</td>
<td>31.12.2003</td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td>5.00 µgm⁻³</td>
<td>Running annual mean</td>
<td>31.12.2010</td>
<td>YES</td>
</tr>
<tr>
<td>1,3-Butadiene</td>
<td>2.25 µgm⁻³</td>
<td>Running annual mean</td>
<td>31.12.2003</td>
<td>YES</td>
</tr>
<tr>
<td>Carbon monoxide (CO)</td>
<td>10.0 mg/m³</td>
<td>Running 8 hour mean</td>
<td>31.12.2003</td>
<td>YES</td>
</tr>
<tr>
<td>Lead</td>
<td>0.5 µgm⁻³</td>
<td>Annual mean</td>
<td>31.12.2004</td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td>0.25 µgm⁻³</td>
<td>Annual mean</td>
<td>31.12.2008</td>
<td>YES</td>
</tr>
<tr>
<td>Nitrogen dioxide (NO₂)</td>
<td>200 µgm⁻³, not to be exceeded more than 18 times a year</td>
<td>1-hour mean</td>
<td>31.12.2005</td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td>40 µgm⁻³</td>
<td>Annual mean</td>
<td>31.12.2005</td>
<td>NO</td>
</tr>
<tr>
<td>Particles (PM₁₀) gravimetric</td>
<td>50 µgm⁻³, not to be exceeded more than 35 times a year</td>
<td>24-hour mean</td>
<td>31.12.2004</td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td>40 µgm⁻³</td>
<td>Annual mean</td>
<td>31.12.2004</td>
<td>YES</td>
</tr>
<tr>
<td>Sulphur dioxide (SO₂)</td>
<td>350 µgm⁻³, not to be exceeded more than 24 times a year</td>
<td>1-hour mean</td>
<td>31.12.2004</td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td>125 µgm⁻³, not to be exceeded more than 3 times a year</td>
<td>24-hour mean</td>
<td>31.12.2004</td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td>266 µgm⁻³, not to be exceeded more than 35 times a year</td>
<td>15-minute mean</td>
<td>31.12.2005</td>
<td>YES</td>
</tr>
<tr>
<td>Ozone (O₃)</td>
<td>100 µgm⁻³, not to be exceeded more than 10 times a year</td>
<td>8 hour mean</td>
<td>31.12.2005</td>
<td>YES</td>
</tr>
<tr>
<td>Fine Particles (PM₂.₅)</td>
<td>25 µgm⁻³ and 15% reduction</td>
<td>Annual mean</td>
<td>2010 - 2020</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Table 1 Summary of UK air quality objectives and their status in Bristol

A comprehensive list, including European AQ objectives is available online.
2.2 What’s the Air Quality Like Where I Live?

Air quality away from the immediate vicinity of busy or congested streets is generally good. It complies with the objectives shown in Table 1. Nitrogen dioxide pollution falls off rapidly with distance from the kerbside of the road. So even if concentrations of NO\textsubscript{2} at the side of the road exceed the objective, the concentrations 20 metres away from the roadside are likely to comply with the objective. The AQMA boundary, shown in Figure 1, covers the entire contiguous area of the city where exceedences of the air quality objective for NO\textsubscript{2} are likely to be experienced. This does not mean that everywhere within the AQMA is polluted, just that some roadside locations within the boundary may experience exceedences of the annual mean objective for NO\textsubscript{2}. 
Figure 2 Bristol’s Air Quality Management Area
Figure 3 Map of continuous analysers in Bristol: 2012
2.3 Nitrogen Dioxide

The NOx continuous monitors are located in the AQMA to monitor the areas most likely to experience exceedences. Summary data from these are shown in Table 2. Underlined figures indicate a potential exceedence of the hourly mean objective, bold indicates an exceedence of the annual mean objective.

<table>
<thead>
<tr>
<th>Site ID</th>
<th>Valid Data Capture for Monitoring Period %</th>
<th>Valid Data Capture 2012 %</th>
<th>Annual Mean Concentration (µg/m³)</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>203 - Brislington Depot</td>
<td>89.9</td>
<td>89.9</td>
<td></td>
<td>34.8</td>
<td>34.7</td>
<td>37.1</td>
<td>34.5</td>
<td>35.7</td>
</tr>
<tr>
<td>206 - Rupert Street</td>
<td>88.4</td>
<td>88.4</td>
<td></td>
<td>101.5</td>
<td>98.5</td>
<td>94.3</td>
<td>86.2</td>
<td>89.3</td>
</tr>
<tr>
<td>213 - Old Market</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td>62.4</td>
<td>64.0</td>
<td>62.8</td>
<td>58.5</td>
<td>N/A</td>
</tr>
<tr>
<td>215 - Parson Street School</td>
<td>87.0</td>
<td>87.0</td>
<td></td>
<td>50.5</td>
<td>50.3</td>
<td>50.5</td>
<td>48.2</td>
<td>47.9</td>
</tr>
<tr>
<td>270 - Wells Road</td>
<td>83.0</td>
<td>83.0</td>
<td></td>
<td>49.2</td>
<td>50.2</td>
<td>47.3</td>
<td>42.3</td>
<td>41.2</td>
</tr>
<tr>
<td>375 - Newfoundland Road Police Station</td>
<td>99.7</td>
<td>99.7</td>
<td></td>
<td>58.4</td>
<td>59.1</td>
<td>54.3</td>
<td>53.8</td>
<td>52.7</td>
</tr>
<tr>
<td>395 - Shiner's Garage</td>
<td>99.4</td>
<td>99.4</td>
<td></td>
<td>40.8</td>
<td>40.7</td>
<td>44.3</td>
<td>40.7</td>
<td>42.1</td>
</tr>
<tr>
<td>447 - Bath Road</td>
<td>94.2</td>
<td>94.2</td>
<td></td>
<td>37.4</td>
<td>37.0</td>
<td>40.1</td>
<td>36.2</td>
<td>36.5</td>
</tr>
<tr>
<td>452 - AURN St. Pauls</td>
<td>98.6</td>
<td>98.6</td>
<td></td>
<td>32.5</td>
<td>30.5</td>
<td>30.6</td>
<td>27.2</td>
<td>31.5</td>
</tr>
<tr>
<td>463 - Fishponds Road</td>
<td>98.5</td>
<td>98.5</td>
<td></td>
<td>44.2</td>
<td>44.4</td>
<td>42.2</td>
<td>39.5</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Table 2 Results of automatic monitoring for nitrogen dioxide: comparison with annual mean objective
Figure 4 Map showing locations of NO$_2$ diffusion tube monitoring sites (central)
2.3.1 Trends in NO$_2$ concentrations

During the period 2006 – 2012 traffic flows in the central area declined and congestion reduced. These achievements should have resulted in improved air quality. However, national factors such as the increased penetration of diesel in the fleet and the under–performance of EURO standards for specific engine types mean that NO$_2$ levels have been static in the city and in the UK generally. A full explanation of the reasons behind the static trend for NO$_2$ is available in this report.

The trend for NO$_2$ derived from analysis of data from 22 roadside diffusion tube sites is shown below in Figure 4.

![Figure 4 Trend of roadside NO$_2$ at 22 diffusion tube sites](image)

**Figure 5 Trend of roadside NO$_2$ at 22 diffusion tube sites**

The trends in roadside nitrogen dioxide concentrations from 1999 – 2012 at continuous analyser sites are shown in Figure 5.
Figure 6 Trends in annual mean nitrogen dioxide concentration measured at automatic monitoring sites
2.4 PM$_{10}$

Bristol has not exceeded annual mean or daily EU limit values for PM$_{10}$ in 2012 or recent years. Annual mean concentrations are shown in Table 3 and compliance with the daily mean objectives in Table 4.

<table>
<thead>
<tr>
<th>Site ID</th>
<th>Site Type</th>
<th>Valid Data Capture for Monitoring Period %</th>
<th>Valid Data Capture 2012 %</th>
<th>Annual Mean Concentration (µg/m$^3$) gravimetric</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2008</td>
</tr>
<tr>
<td>Old Market - 213</td>
<td>Roadside</td>
<td>92.6</td>
<td>92.6</td>
<td>22.2</td>
</tr>
<tr>
<td>AURN St. Pauls – 452</td>
<td>Urban Background</td>
<td>84.3</td>
<td>84.3</td>
<td>20.5</td>
</tr>
</tbody>
</table>

Table 3 Results of PM$_{10}$ automatic monitoring: comparison with annual mean objective

<table>
<thead>
<tr>
<th>Site ID</th>
<th>Site Type</th>
<th>Valid Data Capture 2012 %</th>
<th>Number of Daily Means &gt; 50 µg/m$^3$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>2008</td>
</tr>
<tr>
<td>Old Market - 213</td>
<td>Roadside</td>
<td>92.6</td>
<td>16</td>
</tr>
<tr>
<td>AURN St. Pauls – 452</td>
<td>Urban Background</td>
<td>84.3</td>
<td>16</td>
</tr>
</tbody>
</table>

Table 4 Results of PM$_{10}$ automatic monitoring: comparison with daily mean objective. Numbers in brackets are the 90.4 percentile.

2.5 PM$_{2.5}$

Under the UK Air Quality Strategy, local authorities have no duty to manage or report PM$_{2.5}$. In the UK it is considered as a regional pollutant and is managed nationally. However it is an important pollutant in terms of health.

PM$_{2.5}$ is measured at one location in Bristol, the national (AURN) site at St. Pauls. The annual mean concentration at this site in 2011 was 13.2 µg/m$^3$. Data from this site are summarised in Figure 6.
Figure 7 Summary plot of PM$_{2.5}$ at Bristol St. Pauls (AURN): 2012
2.6 Ozone

Bristol has not exceeded the EU limit values for ozone in 2011 or recent years. Local authorities are not responsible for the monitoring or management of ozone.

<table>
<thead>
<tr>
<th>Site Id</th>
<th>Location</th>
<th>Within AQMA?</th>
<th>Data Capture 2012 (%)</th>
<th>Number of Exceedences of 100 µg/m³ (max daily 8 hour running mean)</th>
</tr>
</thead>
<tbody>
<tr>
<td>452</td>
<td>AURN St. Pauls</td>
<td>Y</td>
<td>97.3</td>
<td>5</td>
</tr>
<tr>
<td>481</td>
<td>CREATE</td>
<td>N</td>
<td>100</td>
<td>5</td>
</tr>
</tbody>
</table>

Table 5 Summary data for ozone monitoring in Bristol: 2012

Figure 8 Summary plot of ozone in Bristol: 2012
3 Action on Air Quality

Bristol's Air Quality Action Plan is now part of the Joint Local Transport Plan, and covers the whole of Bristol. The plan aimed to reduce traffic pollution by strategic management of the road network and encouraging residents and commuters to shift to more sustainable travel modes.

As the main source of pollution is road traffic, BCC decided to integrate the Air Quality Action Plan with the second Joint Local Transport Plan. This aimed to:

- Improve air quality in the AQMA and ensure air quality in all other areas remains better than the national standards
- Reduce congestion by reducing demand for and promoting alternatives to the private car
- Improve accessibility to employment, education and services
- Improve the quality of life by enhancing public spaces, community safety, and creating sustainable communities.

BCC has delivered a substantial programme of regulation, investment, highway management and promotional work to reduce pollution from transport in the city. In the last three years BCC has:

- Improved traffic management in the AQMA.
- Upgraded the traffic control system to improve traffic flow at critical intersections and improve the reliability of public transport.
- Reduced congestion at key points in the centre by restricting ‘waiting’ and by ‘green wave’ controlled traffic lights.
- Reduced speed limits on 5 kilometres of motorway access into the centre.
- Promoted good environmental driving and servicing with subsidised training and promotional material for fleet drivers
- Promoted and piloting alternative fuelled vehicles, with the BCC fleet having over 100 LPG and hybrid vehicles
- Developed electric vehicle infrastructure with 40 charging points installed by 2011
- Improved a network of cross city bus routes with improved passenger facilities, priority at traffic lights, bus lanes and real-time bus information.
- Improved cycling facilities and encouraging cycling through a £22m Cycling City project
- Introduced Residents’ Parking Zones to ease congestion by preventing commuter parking except in controlled places. Improving accessibility:
- Focused public transport and cycling improvements on key employment areas, education facilities and services such as hospitals. Improved quality of life and encouraged sustainable communities:
  - Created two pilot 20mph zones to engender cultural shift to lower speeds and create more liveable streets that encourage walking and cycling.
  - Developed the Frome Greenway walking and cycling route to access the city’s new city centre retail centre
  - Promoted ‘car sharing’ schemes enabling community car hire when a car is required.

BCC is committed to public engagement on environmental issues and disseminates information on air quality through the following channels:

- Real – time “live” data driven web site
- BCC web site
- National data.gov.uk web site
- European Air Quality Now (CITEAIR) web site
- Specific initiatives, e.g. consultation on AQ action plan \ AQMA changes, including questionnaires, focus groups and a web presence.

BCC’s websites provide real–time data from all of our continuous analysers and provide easy ways for citizens to access current and historic information on air quality, including FAQ’s and simple guides on pollution issues.

BCC contributes to the CITEAIR project by regularly uploading live data to the www.airqualitynow.eu web site, which collates air quality data from across Europe and expresses measurements through a Common Air Quality Index.

BCC regularly engages with citizens when changes are proposed to air quality action plans or when the Air Quality Management Area boundary is changed. BCC recently consulted on an AQMA boundary change using a new consultation web site called Citizen Space.

Targets for key transport measures will be included in annual delivery plans, which have yet to be published. The key transport measures planned for Greater Bristol are summarised below. BCC has committed funding to deliver the following:

- Effective air quality monitoring, reporting and engagement with the public.
- Completing the Greater Bristol Bus Network
- Completing reviews of speed limits to potentially reduce
- Roll-out of Residential Parking Zones and 20mph home zones in residential areas.
- An electric vehicle programme, which includes installing charging points in 40 public car parks by 2012 and developing a smart-phone application to check availability and location, together with information about routes and public transport connections across the city.
- Retrofitting 60 buses to Euro V standards, reducing NOx emissions by 6,700 Kg per year, and helping to reduce particulate emissions.
BCC has also secured an additional £5m of Government funding to improve sustainable transport options along key commuter routes through:

- Low cost targeted investment to improve pedestrian and cycle links to the Greater Bristol Bus Network
- Working in partnership with employers located along commuter corridors, to develop and implement bespoke packages to shift to more sustainable travel by their staff
- Delivering a targeted behaviour change communication campaign.

Together these elements increase sustainable commuting, reduce congestion, and reduce carbon emissions and emissions of local pollutants.

In addition to local plans, the UK Government has prepared air quality plans for cities to tackle the national issue of stable or rising NO₂ concentrations in cities. These are intended to secure compliance with the NO₂ EU limit values by 2015. The UK Government’s application to delay compliance with EU objectives has already been turned down by the EU.