LOCAL AIR QUALITY MANAGEMENT

ENVIRONMENT ACT 1995 PART IV
ANNUAL PROGRESS REPORT 2007

May 2007
EXECUTIVE SUMMARY

This is South Gloucestershire’s Annual Progress Report on air quality. It summarises the air pollution monitoring carried out during 2006.

Annual progress reports are published in the years between full reviews of air quality, which are carried out every three years.

Nationally 2006 saw a general increase in air pollution levels compared to the previous year. The air pollution monitoring carried out in South Gloucestershire reflected this however the pollutants benzene, carbon monoxide, lead and particulate matter continue to comply with the government’s air pollution objectives. For nitrogen dioxide however, potential exceedences of the annual average target level are indicated at one location - the cross roads of the A4017 and A4175 at Staple Hill. Two sites are also showing levels nearing the annual mean objective for nitrogen dioxide. These are the Cribbs Causeway/M5 roundabout and Regent Street in Kingswood.

If in an annual progress report a potential exceedence of a pollutant is identified, the local authority is required to undertake a “Detailed Assessment” to determine whether an Air Quality Management Area should be designated.

It will be necessary to undertake a “Detailed Assessment” of the Staple Hill area over the next 12 months and produce a report for submission to the Department for Environment, Food and Rural Affairs (DEFRA) by May 2008. Although the Regent St and Cribbs causeway sites are not currently predicted to exceed the objective they are very close to it. It is therefore proposed to also undertake a detailed assessment of these sites.

Local Authorities have a duty under section 83(1) of the Environment Act 1995 to designate those areas where air quality objectives are “unlikely” to be met as an “Air Quality Management Area” (AQMA). These areas have to be designated formally by means of an order. Following the Detailed Assessments, a decision will be made as to whether to declare any AQMAs. If any areas are designated, the local authority will have to draw up and implement plans to improve the air quality in any AQMA.
### PREVIOUS AIR QUALITY REPORTS PUBLISHED BY SOUTH GLOUCESTERSHIRE COUNCIL

<table>
<thead>
<tr>
<th>Report</th>
<th>Publication Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 1 Review and Assessment</td>
<td>February 1999</td>
</tr>
<tr>
<td>Stage 2 &amp; 3 Review and Assessment Consultation Draft</td>
<td>November 2000</td>
</tr>
<tr>
<td>Stage 4 Review and Assessment – Consultation Draft</td>
<td>November 2002</td>
</tr>
<tr>
<td>Stage 4 Review and Assessment – Final Report</td>
<td>July 2003</td>
</tr>
<tr>
<td>Updating and Screening Assessment</td>
<td>May 2003</td>
</tr>
<tr>
<td>Annual Progress Report</td>
<td>May 2004</td>
</tr>
<tr>
<td>Annual Progress Report</td>
<td>April 2005</td>
</tr>
<tr>
<td>Updating and Screening Assessment</td>
<td>May 2006</td>
</tr>
</tbody>
</table>

### LOG OF AIR QUALITY MANAGEMENT AREAS DECLARED AND REVOKED

<table>
<thead>
<tr>
<th>Area</th>
<th>Declared/Revoked</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>110 m either side of the M4, M5, M32 &amp; M49 motorways, declared with respect to the annual mean objective for nitrogen dioxide.</td>
<td>Declared</td>
<td>November 2001</td>
</tr>
<tr>
<td>110 m either side of the M4, M5, M32 &amp; M49 motorways, revoked with respect to the annual mean objective for nitrogen dioxide.</td>
<td>Revoked</td>
<td>March 2004</td>
</tr>
</tbody>
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INTRODUCTION

This report is the 2007 annual progress report on Air Quality Management required under the Environment Act 1995. It summarises the air pollution monitoring undertaken during 2006 and assesses whether any air quality objectives are exceeded in South Gloucestershire.

The air quality management regime is one of many areas of the Council’s work contributing to improved air quality. It contributes to the aims and objectives of the Community Strategy, the Corporate Service Plan, and the Joint Local Transport Plan.

Air quality has also been highlighted as one of the five national priorities for local authority enforcement in the recent “Rogers” review of local authority regulatory priorities.

Background

Developments in air pollution policy during the 1990s resulted in the UK Government introducing the Environment Act 1995 and the first National Air Quality Strategy in 1997. A new approach to improving air quality was established in the UK. The act established Local Air Quality Management as a way of addressing local areas of poor air quality, through a series of national air quality standards and objectives.

The air quality objectives are health-based standards which take account of the human exposure to each pollutant. The objectives have been set by combining pollution levels, with a target date and a maximum number of days in the year they are allowed to be exceeded.

In 2000 there was an extensive review of the original air quality strategy and a revised strategy was published. Standards for eight pollutants were set with objectives for seven of them being regulated through the Air Quality Management system. The pollutants included, nitrogen dioxide (NO₂), particulate matter (dust particles smaller than 10 microns in diameter) (PM₁₀), sulphur dioxide (SO₂), carbon monoxide (CO), lead, benzene and 1,3 butadiene. Ozone was not included in regulations as it was considered to be a regional and transboundary pollutant rather than a local one.

The Local Air Quality Management regime requires local authorities to periodically assess air quality in their areas and identify locations where the national air quality objectives may be exceeded. Where exceedences are predicted, and where there is relevant public exposure, local authorities have a duty to declare an Air Quality Management Area (AQMA). Following any designation, local authorities have to draw up and implement action plans to improve air quality in the locality. Collaboration with other organisations and stakeholders (for example the highways agency, the environment agency and transport organisations) is essential in drawing up these action plans.

The air quality objectives are summarised in tables 1 and 2.

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1 The UK Air Quality Strategy, DETR March 1997
Table 1: Air quality Objectives Applicable to Local Authorities

<table>
<thead>
<tr>
<th>POLLUTANT</th>
<th>OBJECTIVES</th>
<th>CONCENTRATION MEASURED AS</th>
<th>DATE TO BE ACHIEVED BY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzene</td>
<td>16.25 µg/m³ (5 ppb)</td>
<td>Running annual mean</td>
<td>31 December 2003</td>
</tr>
<tr>
<td>Benzene (new objective)</td>
<td>5 µg/m³ (1.54 ppb)</td>
<td>Annual Average</td>
<td>31 December 2010</td>
</tr>
<tr>
<td>1, 3-Butadiene</td>
<td>2.25 µg/m³ (1 ppb)</td>
<td>Running annual mean</td>
<td>31 December 2003</td>
</tr>
<tr>
<td>Carbon Monoxide</td>
<td>10 mg/m³ (8.6 ppm)</td>
<td>Maximum daily running 8 hour mean</td>
<td>31 December 2003</td>
</tr>
<tr>
<td>Lead</td>
<td>0.5 µg/m³</td>
<td>Annual mean</td>
<td>31 December 2004</td>
</tr>
<tr>
<td></td>
<td>0.25 µg/m³</td>
<td>Annual mean</td>
<td>31 December 2008</td>
</tr>
<tr>
<td>Nitrogen Dioxide</td>
<td>200 µg/m³ (105 ppb)</td>
<td>1 hour mean not to be exceeded more than 18 times a year</td>
<td>31 December 2005</td>
</tr>
<tr>
<td></td>
<td>40 µg/m³ (21 ppb)</td>
<td>Annual mean</td>
<td>31 December 2005</td>
</tr>
<tr>
<td>Particles (PM10)</td>
<td>50 µg/m³</td>
<td>24 hour mean not to be exceeded more than 35 times a year</td>
<td>31 December 2004</td>
</tr>
<tr>
<td></td>
<td>40 µg/m³</td>
<td>Annual mean</td>
<td>31 December 2004</td>
</tr>
<tr>
<td>Sulphur Dioxide</td>
<td>350 µg/m³ (132 ppb)</td>
<td>1 hour mean not to be exceeded more than 24 times a year</td>
<td>31 December 2004</td>
</tr>
<tr>
<td></td>
<td>125 µg/m³ (47 ppb)</td>
<td>24 hour mean not to be exceeded more than 3 times a year</td>
<td>31 December 2004</td>
</tr>
<tr>
<td></td>
<td>266 µg/m³ (100 ppb)</td>
<td>15 minute mean not to be exceeded more than 35 times a year</td>
<td>31 December 2005</td>
</tr>
</tbody>
</table>
Table 2: Air Quality Objectives Not for Local Authority Control

<table>
<thead>
<tr>
<th>OBJECTIVES NOT CURRENTLY FOR LOCAL AUTHORITY CONTROL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Particles (PM10)</strong></td>
</tr>
<tr>
<td>Reason:</td>
</tr>
<tr>
<td>50 µg/m³ 24 hour mean not to be exceeded more than 7 times a year</td>
</tr>
<tr>
<td>20 µg/m³ Annual mean</td>
</tr>
<tr>
<td>May be set in regulations once EU has decided its new limit value</td>
</tr>
<tr>
<td><strong>Ozone</strong></td>
</tr>
<tr>
<td>Reason:</td>
</tr>
<tr>
<td>100 µg/m³ (50 ppb) 8 hour mean not to be exceeded more than 10 times a year</td>
</tr>
<tr>
<td>Ozone is a national rather than a local problem</td>
</tr>
<tr>
<td><strong>Nitrogen Dioxide</strong></td>
</tr>
<tr>
<td>Reason:</td>
</tr>
<tr>
<td>30 µg/m³ (16 ppb) Annual mean</td>
</tr>
<tr>
<td>Vegetation based directive. Targets have been met</td>
</tr>
<tr>
<td><strong>Polycyclic Aromatic Hydrocarbons</strong></td>
</tr>
<tr>
<td>Sulphur Dioxide</td>
</tr>
<tr>
<td>Reason:</td>
</tr>
<tr>
<td>0.25 ng/m³ B[a]P annual average</td>
</tr>
<tr>
<td>20 µg/m³ (8 ppb) 1 hour mean not to be exceeded more than 24 times a year</td>
</tr>
<tr>
<td>20 µg/m³ (8 ppb) Winter mean (October – March)</td>
</tr>
<tr>
<td>Vegetation based directive. Targets have been met</td>
</tr>
</tbody>
</table>

In February 2003, an addendum to the national air quality strategy was published. This introduced tighter objectives for benzene and carbon monoxide, and for the first time, introduced an objective for polycyclic aromatic hydrocarbons (PAHs). As with ozone however, for the time being, local authorities will not have a statutory responsibility for the PAH objective.

The main reasons for tackling poor air quality are the link between air quality and the quality of life, and the need to minimise the risk of poor air quality on human health. Some policies to improve local air quality can often have the added benefit of producing additional carbon savings in relation to climate change.

The National Air Quality Strategy is currently being reviewed again and is due for publication in the summer of 2007.

The Local Air Quality Management Process

A review and assessment of air quality was the first step in the local air quality management process. Part IV of the Environment Act required each local authority to review air quality from time to time. For each air quality objective, local authorities have

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to consider present and likely future air quality, and assess whether the objectives are likely to be met on time.

Local authorities carried out their first round of review and assessments to initially determine the need for designation of any air quality management areas (AQMAs - areas where the objectives look unlikely to be met). The first round resulted in over 100 local authorities designating air quality management areas, mostly in relation to road transport. These local authorities have been working to produce and implement action plans to improve air quality in the declared areas.

The second round of local authority reviews and assessments was carried out in 2003 when local authorities produced their first “Updating and Screening Assessment” (USA). The aim of that review was to identify those aspects that had changed since the first round of assessments. Where any pollutants and specific locations were identified as requiring further work in the USA, a detailed assessment of these locations was required.

Updating and Screening Assessments are required every three years. In the intervening years Local Authorities produce Annual Progress Reports. Last year local authorities produced their third complete review of air quality.

The whole local air quality management process is summarised in table 3 below. The current timetable of subsequent reviews takes the process to the year 2010.

Table 3: Summary of Local Air Quality Management Process

<table>
<thead>
<tr>
<th>Stage</th>
<th>Summary of work undertaken</th>
<th>Date Completed/due for completion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 1</td>
<td>Identification of main sources of pollution which may have a significant impact on air quality</td>
<td>February 1999</td>
</tr>
<tr>
<td>Stage 2</td>
<td>Additional screening of pollutant concentrations.</td>
<td>November 2000</td>
</tr>
<tr>
<td>Stage 3</td>
<td>Detailed appraisal of potential impacts of significant sources of pollution and predictions of levels to future dates</td>
<td></td>
</tr>
<tr>
<td>Declaration of Air Quality Management Area</td>
<td>Area declared where predictions indicate objectives will not be met.</td>
<td>1st November 2001</td>
</tr>
<tr>
<td>Stage 4</td>
<td>More detailed assessment work inside the declared area to provide confidence in the original decision to declare the area.</td>
<td>July 2003</td>
</tr>
<tr>
<td>Updating and Screening Assessment</td>
<td>Identify relevant changes since first round</td>
<td>May 2003</td>
</tr>
<tr>
<td>Annual Progress Report</td>
<td>Report on progress over the previous year.</td>
<td>May 2004</td>
</tr>
<tr>
<td>Annual Progress Report</td>
<td>Report on progress over the previous year.</td>
<td>April 2005</td>
</tr>
</tbody>
</table>
Updating and Screening Assessment | Identify relevant changes since previous round | Due end April 2006
---|---|---
**Annual Progress Report** | Report on progress over the previous year | Due end April 2007 (this report)

Shaded boxes denote future assessments

| Detailed assessment | If locations are identified in the updating and screening assessment, where further work is needed. | Due end April 2008
---|---|---
Or | If detailed assessment not required. |

| Updating and Screening Assessment | Identify relevant changes since previous round | Due end April 2009
---|---|---

| Detailed assessment | If locations are identified in the updating and screening assessment, where further work is needed. | Due end April 2010
---|---|---
Or | If detailed assessment not required. |

**Note:** Where it is identified that there is a risk of an air quality objective being exceeded, there is a requirement to, within 12 months, undertake a detailed assessment. This should identify with reasonable certainty, whether or not there is an exceedence. If any air quality management areas are declared during the process, within 12 – 18 months of the declaration, the local authority must produce action plans to improve air quality within the declared area.

### Appraisal of South Gloucestershire’s Updating and Screening Assessment 2006

Last year’s “Updating and Screening Assessment” did not identify any areas at risk of exceeding any of the air quality objectives. The report was accepted by the Department for Environment, Food and Rural Affairs (DEFRA).

### What Has Been Happening in the Last 12 Months

In addition to maintaining data collection from the various monitoring sites across South Gloucestershire, work has continued with our neighbouring Unitary Councils through the CUBA air quality technical group.

### Industrial Processes

South Gloucestershire currently has 11 Permitted Part A1 installations, 3 A2 installations and 88 Part B installations. Appendix I lists the installations. Although the total number of processes has changed since last year, there have been no significant changes in either the South Gloucestershire Council area, or in neighbouring local authority areas, which could have a significant impact on air quality.
Local Air Quality Strategy

Since the publication of the first National Air Quality Strategy in 1997, Bristol City Council, Bath & North East Somerset Council, North Somerset Council and South Gloucestershire Council have worked as a partnership and undertaken to improve air quality across the area.

The four unitary councils have worked collaboratively on various aspects of local air quality management. The “CUBA” (Councils that used to be Avon) air quality working group was set up to take forward air quality management work across the area with the aim of securing consistency, mutual benefits and share resources and experiences. This, combined with collaborative work with the Air Quality Management Resource Centre (AQMRC) at the University of the West of England (UWE), has provided scope for a wider perspective in project work.

Whilst not a statutory requirement of the Environment Act 1995, local authorities are strongly encouraged to develop an air quality strategy for their area. In March 2003 a draft strategy for the 4 Unitaries was produced. It is envisaged that the development of this strategy will provide a focus for the 4 Unitaries, other organisations, bodies and agencies involved in air quality. This will include the Highways Agency, the South West Regional Development Agency and the Government Office for the South West. In 2005, this Area Strategy was reviewed and updated.

Other joint projects that have been undertaken in conjunction with UWE include a report to assess the “Transboundary Issues” in relation to air quality, which was published in March 2004. This focussed in particular on issues in the Bristol City Council area which could potentially impact on the air quality in South Gloucestershire and vice versa. Table 4 below summarises the joint project work that has been carried out to date.

Table 4: Joint Project Work

<table>
<thead>
<tr>
<th>Date</th>
<th>Project</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>Policy Review of Council Departments relevant to LAQM</td>
<td>UWE &amp; 4 Unitaries</td>
</tr>
<tr>
<td>March 2003</td>
<td>An Area Based Strategy for the Former Avon Area</td>
<td>UWE &amp; 4 Unitaries</td>
</tr>
<tr>
<td>June 2004</td>
<td>Transboundary Issues within Air Quality Action Plans in the Former Avon Area</td>
<td>UWE, South Gloucestershire Council, Bristol City Council &amp; BANES</td>
</tr>
<tr>
<td>June 2005</td>
<td>A Review of the Area Based Strategy for the Former Avon Area</td>
<td>UWE &amp; 4 Unitaries</td>
</tr>
</tbody>
</table>
South Gloucestershire Council is working towards improving air quality and reducing greenhouse gases. Several policies and departments contribute to implementing and sustaining these improvements. An informal report summarising these policies was produced in the spring of 2006 by the Environmental Services Section. This will feed into the Community Strategy and Local Area Agreement under the lead of the Corporate Sustainability.

**Planning and Policies**

South Gloucestershire Councils Local Plan was adopted in January 2006. It includes requirements for appropriate and adequate mitigation measures to be expected to be incorporated into development proposals that have a potential to pollute. Development which generates traffic volumes that could adversely affect air quality will be assessed against Policy EP1. Policy T12 identifies air pollution as one of the criteria for assessing the transportation impact of new development.

As well as the local plan, there is a system where by all planning applications are screened by officers of the Environmental Protection team for relevant comment on pollution issues including air quality. In appropriate circumstances, an air quality assessment of the impacts of a proposed development may be required from the developer.

In recent years, the level of growth in the North Fringe of Bristol, particularly in terms of industrial and commercial development, has led to increased traffic congestion. These problems are likely to worsen in the short to medium term given the large areas of land remaining in the North Fringe which are committed in existing plans, to employment uses, but have yet to be developed.

In these circumstances the Council has reviewed existing employment allocations with a view to seeking to restrain future growth in jobs and traffic in the North Fringe and instead achieve a more balanced mix of development by exploring the possibility of switching some of these sites to housing development. Essential to this approach, however, will be the need to secure significant improvements to transportation infrastructure, not least with a view to encouraging alternatives to using the private car and ensuring good access to services and facilities.

Also on the north eastern fringes of Bristol there is the potential for land at Emersons Green to accommodate science based industries which complement existing activities and companies in the Bristol North Fringe. However, as with the northern fringe, the emphasis lies with creating a more ‘balanced’ pattern of development which encourages higher levels of residential development and the introduction of local facilities and enhanced public transport, cycling and walking measures.
Prior to the Planning and Compulsory Purchase Act 2004, South Gloucestershire Council was responsible for preparing and reviewing a Structure Plan jointly with Bath and North East Somerset, Bristol City, and North Somerset Councils. The Joint Replacement Structure Plan for the four authorities was adopted in September 2002. Its proposals have an end date of 2011, and it provides a strategic basis for the South Gloucestershire Local Plan.

Under the 2004 Act, the Joint Replacement Structure Plan remains a "saved" plan until September 2007. Future arrangements under the Act are for Regional Spatial Strategies (RSS) and Local Development Frameworks, with no requirement for an intermediate "structure plan" level of sub-regional planning policy. However a RSS for the South West, which will form part of the statutory development plan, will contain some sub-regional policy content. Responsibility for this rests with the South West Regional Assembly. As a unitary authority, South Gloucestershire Council has a duty to advise the Regional Assembly on the content of the RSS as it relates to its area. South Gloucestershire, with neighbouring unitary authorities and outside partners, has also established the West of England Partnership, which is responsible, among other matters, for undertaking studies and coordinating advice as a basis for the sub-regional content of RSS.

The Joint Replacement Structure Plan (JRSP) acknowledges the role of land at Severnside in providing development opportunities for economic expansion in the short and long term. The Council recognizes the area as a key strategic location of regional importance for a range of employment uses which require extensive areas of land and good links to the motorways, the rail network and dock facilities at Avonmouth. The JRSP also acknowledges the possible scope for residential or other uses on previously committed land at Severnside in accordance with the locational strategy, if a series of planning constraints affecting the area can be resolved. However, given the availability of alternative opportunities for meeting the housing need and the concerns in respect of flooding, there is currently no provision for housing development in the Severnside area over the Plan period to 2011.

**Large Sites Allocated for Residential Development**

Over recent years South Gloucestershire has seen a number of large scale housing developments including Emkers Green North and South. Further large scale housing developments are foreseeable in the future. Sites allocated for residential development include:

- 2,000 dwellings – Emersons Green, land east of A4174 Avon Ring Road
- 2,200 dwellings – North Field, Filton Aerodrome, Patchway
- 900 dwellings – Wallscourt Farm Stoke Gifford
- 500 dwellings – Land east of Coldharbour Lane, Stoke Gifford
- 1,200 dwellings – Land at Harry Stoke, Stoke Gifford

Regional planning may mean that more large sites are allocated in South Gloucestershire in coming years. Currently potential areas for future growth are being identified and initial screening sustainability appraisals carried out.
Proposed Developments in other Local Authority Areas

There is currently a proposal for a deep sea container port in the Avonmouth area. This development is within the Bristol City Council area, but could have an impact on the air quality in South Gloucestershire. There is the potential for increased HGV movements on the motorway network as containers are unloaded and distributed from the port. The Environmental Impact Assessment submitted in support of this application will consider the air quality impacts.

Local Transport Plan

Several transport policies have the potential to improve air quality such as reducing congestion, the implementation of green travel plans and road traffic reduction. The Local Transport Plan (LTP) for South Gloucestershire includes a local objective (target) “…..to reduce adverse environmental health impacts of transport and to meet air quality targets.” Data collected from the monitoring sites in South Gloucestershire is used to provide an air quality indicator for inclusion in the annual progress reports of the LTP.

South Gloucestershire Council produced a Local Transport Plan covering the period 2001 - 2006. A Joint Local Transport Plan (JLTP) has now been published (March 2006) to cover the whole of the Greater Bristol area to 2011. As transport issues are not confined to within the boundaries of local authorities, increased joint working will enable faster progress towards achieving significant improvements to the local transport system.

Four key priorities are highlighted in the JLTP. These are:

- Accessibility
- Air Quality
- Congestion
- Safer Roads

Air quality information and data will be provided as required for input into the development of this plan.

Although the JLTP concentrates in detail on the next five years. There are other studies that are looking further into the future and taking in some of the wider issues relating to transport. Their longer-term findings and visions can be developed in more detail through the JLTP.

The Greater Bristol Strategic Transport Study, commissioned by the Government Office for the South West, is studying current and future strategic transport needs within the Greater Bristol region up to 2031. This is looking at a wider area than the JLTP, including parts of Wiltshire, Somerset and Gloucestershire.

The Regional Transport Strategy, being developed by the South West Regional Assembly, identifies key issues that are relevant to the South West and what interventions or investments are required to deliver the region’s transport priorities and longer term objectives. There are also studies looking at spatial (land use) strategies for the region and sub region.
The objectives of the JLTP regarding air quality issues across the area are:-

- Improve air quality in the Air Quality Management Areas, (presently declared in Bristol and Bath).

- Ensure that air quality in all other areas remains better than the national standards.

Improving air quality is inextricably linked to tackling congestion. It is important therefore to provide more environmentally friendly alternatives to the car, influence travel behavior and manage the demand for travel. A proposed major scheme bid to improve the greater Bristol bus network will have a significant impact on both providing high quality alternatives to the car and at the same time replacing large parts of the existing bus fleet with modern cleaner vehicles.

The targets currently included in the JLTP include:

### Headline Target

- LTP8: Within Air Quality Management Areas (AQMAs) to meet the national objective for annual average Nitrogen Dioxide (NO2) concentrations of 40 micrograms per m³.

### Additional indicators

- LTP6: Changes in peak period traffic flows to urban centers.
- Local 4: Ensure air quality outside AQMAs remains better than the national average.

The main way the JLTP will tackle poor air quality is through

- Air Quality Management Areas and Action Plans.
- Promoting public transport through two major scheme bids.
- Exploring the potential to charge motorists to enter city centers and to park at work.
- Travel plans, car sharing, cycling and walking.
- Making better use of the road network.
- Reducing emissions from vehicles.
- Awareness and promotion.

### The West of England Partnership

The West of England partnership consists of the four unitary authorities (Bath and North East Somerset Council, Bristol City Council, North Somerset Council and South Gloucestershire Council) and a range of social, economic and environmental partners.

The partnership is driving forward action to sustain prosperity and quality of life and to enhance the confidence of public and private investors in the area. Particular attention is being given to transport, appropriate housing supply, economic competitiveness and inclusion, culture, leisure and tourism. An immediate priority for the partnership is to develop a vision and spatial strategy for the sub-region.
The West of England Partnership was set up to address jointly those matters that need to be dealt with by the sub-region as a whole in the best interests of its communities. The partnership aims to:

- Realise the potential of the sub-region and deliver improvements in infrastructure, environment and quality of life
- Set a vision and clear long-term direction to support the delivery of key sub-regional strategies
- Promote the interests of the sub-region regionally, nationally, and in Europe
- Add to the confidence in the sub-region that attracts public and private investment
- Work more holistically in the interests of the sub-region

The CUBA air quality group have written to the Strategic Partnership to inform them of the groups work and have provided the partnership with copies of the Area Strategy and Transboundary Issues reports.
AIR POLLUTION MONITORING

The following sections summarise the air pollution monitoring data collected during 2006 across South Gloucestershire by pollutant. South Gloucestershire has 4 operational continuous monitoring sites. Table 5 below summarises their locations and the pollutants monitored. In addition to these there are more than 60 passive diffusion tube sites monitoring nitrogen dioxide and/or benzene.

Table 5: Summary of Continuous Monitoring Sites

<table>
<thead>
<tr>
<th>Site Location</th>
<th>Pollutants Monitored</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conygre House</td>
<td>Nitrogen Oxides (NOₓ)</td>
</tr>
<tr>
<td>Conygre Rd</td>
<td>Particulate Matter (PM₁₀)</td>
</tr>
<tr>
<td>Filton</td>
<td></td>
</tr>
<tr>
<td>Grid Ref ST 607 795</td>
<td></td>
</tr>
<tr>
<td>City of Bristol College</td>
<td>Nitrogen Oxides (NOₓ)</td>
</tr>
<tr>
<td>High St</td>
<td>Particulate Matter (PM₁₀)</td>
</tr>
<tr>
<td>Kingswood</td>
<td>Carbon Monoxide (CO)</td>
</tr>
<tr>
<td>Grid Ref ST 656 738</td>
<td></td>
</tr>
<tr>
<td>Station Rd</td>
<td>Nitrogen Oxides (NOₓ)</td>
</tr>
<tr>
<td>Yate</td>
<td>Particulate Matter (PM₁₀)</td>
</tr>
<tr>
<td>Grid Ref ST 704 825</td>
<td></td>
</tr>
<tr>
<td>Badminton Village Hall</td>
<td>Ozone</td>
</tr>
<tr>
<td>Hayes Lane</td>
<td></td>
</tr>
<tr>
<td>Badminton</td>
<td></td>
</tr>
<tr>
<td>Grid Ref ST 805 825</td>
<td></td>
</tr>
</tbody>
</table>

Appendix II summarises the data collected and the instruments used at the continuous monitoring sites. Appendix III summarises the passive diffusion tube sites. Figure 1 below shows the distribution of the monitoring sites.
Figure 1: South Gloucestershire Air Pollution Monitoring Sites
Quality Assurance and Quality control

Continuous monitoring sites are calibrated monthly against nationally traceable standard gases. The monitoring stations are visited fortnightly as a minimum to change inlet filters and check for equipment malfunction. The data outputs are visually screened daily. Periodically the data is validated (checked for erroneous values) and scaled against the calibration data.

Status of Data Presented in this Report

The continuous monitoring data in this report has been screened, validated and adjusted against calibration data. Nitrogen dioxide diffusion tube data has been adjusted to take account of bias.
REVIEW OF CARBON MONOXIDE

<table>
<thead>
<tr>
<th>Objective</th>
<th>8.6 ppm (10.0mg/m³) as a maximum daily running 8-hour mean to be achieved by end 2003.</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Perspective</td>
<td>The main source of carbon monoxide is road transport. Due to improved engine technology, annual emissions have been falling steadily since the 1970’s and are expected to continue to do so. Modelling of concentrations adjacent to major roads at a national level suggest that existing policies will be sufficient to achieve the objective.</td>
</tr>
</tbody>
</table>

Local Monitoring Data

Carbon Monoxide is monitored continuously at one location in South Gloucestershire. This site is located close to the kerbside at the eastern end of the High Street in Kingswood. At this site, levels recorded in 2006 were well below the objective. The maximum running daily 8-hour mean was 1.29ppm (1.5 mg/m³) compared with the objective of 8.6ppm (10.0mg/m³). Data capture during 2006 was however only 77.8%. (See figure 2 below).

Figure 2: Carbon Monoxide During 2006 shown as an 8 hour running average
Trends in Carbon Monoxide

Carbon Monoxide has been monitored continuously at the Kingswood site since 1998. Figure 3 below shows the trends in annual average and maximum daily 8 hour concentrations over the last few years. There is no likelihood however that the objective will be exceeded.

Figure 3: Carbon Monoxide 1998 - 2006

Summary of Changes in South Gloucestershire

There have been no recent major significant changes in South Gloucestershire that would lead to significant changes in emissions of carbon monoxide.

Conclusion

The carbon monoxide objective is being met within South Gloucestershire.
BENZENE

<table>
<thead>
<tr>
<th>Objective</th>
<th>16.25 μg/m³ (5.0 ppb) as a running annual mean, to be achieved by the end of 2003, and 5.0 μg/m³ (1.5 ppb) annual mean to be achieved by the end of 2010.</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Perspective</td>
<td>The main sources of benzene in the UK are petrol engine vehicles, petrol refining and distribution. A number of policy measures already in place or planned for the future will continue to reduce emissions. National mapping suggests the 2003 objective is being met at most background and roadside location's but there may be a few exceedences of the 2010 objective.</td>
</tr>
</tbody>
</table>

Local Monitoring Data

During 2006, 26 sites across South Gloucestershire were monitored for benzene using diffusion tubes, most of these are located at the kerbside of roads. In 2006, the highest annual average roadside concentrations recorded were at three roadside sites; Station Road in Yate (2.3 μg/m³); Regent St, Kingswood (2.0 μg/m³) and on the A431 at Longwell Green (2.0 μg/m³). Using correction factors to predict levels in future years⁴, this would give an annual average of 2.0 μg/m³ in 2010 at the highest site. This is well below the objective level of 5.0 μg/m³. (Note correction applied = value x 0.647/0.738)

Figure 4 shows the annual average benzene results recorded in South Gloucestershire during 2006. No exceedances of the 2010 objective were recorded over this period.

The chart shows that (except for a few kerbside sites), benzene levels across the district have fallen to virtually background levels.

---

Figure 4: Annual Average Benzene Levels Recorded in 2006

Trends in Benzene

Figures 5, 6, & 7 show how the annual average benzene concentration has reduced since monitoring commenced in 1995. Over the years the number of sites monitored has increased.

In 2000, the amount of benzene permitted in petrol was reduced. This can be seen reflected in the monitoring results of benzene concentrations in the air in South Gloucestershire since that time.
South Gloucestershire has a petrol storage terminal located at Westerleigh. A diffusion tube was installed close to the nearest residential property adjacent to the terminal. Results obtained during 2003 and 2004 indicated compliance with the objective at this location (see figure 6, MURCO Terminal Westerleigh site ►).
Summary of Changes in South Gloucestershire

There have been no recent major significant changes in South Gloucestershire that would lead to significant changes in emissions of benzene.

Conclusion

There have been no exceedences of the 2003 objective and the 2010 objective is also predicted to be complied with.
1,3 – BUTADIENE

<table>
<thead>
<tr>
<th>Objective</th>
<th>2.25 μg/m³ as a maximum running annual mean to be achieved by the end of 2003.</th>
</tr>
</thead>
</table>

**National Perspective**

The main source of 1,3 – Butadiene in the UK is emissions from motor vehicle exhausts. It is also an industrial chemical and is handled in bulk at a small number of industrial premises.

1,3 – Butadiene is measured at a limited number of UK national network sites. Measured concentrations at these sites were well below the 2003 objective.

Increased use of 3-way catalysts on vehicles and improvements in fuel quality will continue to reduce emissions in the future.

**Local Monitoring Data**

1,3 – butadiene is not currently monitored in South Gloucestershire. Annual average background concentrations, determined from the national air quality archive indicate background concentrations of < 0.3 μg/m³ in 2001 and 2003.

**Industrial Processes**

There are presently no industrial processes in South Gloucestershire with the potential to emit significant quantities of 1,3 – butadiene.

**Summary of Changes in South Gloucestershire**

There have been no major significant changes in South Gloucestershire that would lead to significant changes in emissions of 1,3-butadiene.

**Conclusion**

The objective for 1,3 – butadiene is being met in South Gloucestershire.
LEAD

<table>
<thead>
<tr>
<th>Objective</th>
<th>0.5 μg/m³ annual mean to be achieved by the end of 2004, and 0.25 μg/m³ annual mean to be achieved by the end 2008.</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Perspective</td>
<td>The sale of leaded petrol was banned in the UK with effect from 1st January 2000. Emissions of lead are now restricted to certain industrial activities.</td>
</tr>
</tbody>
</table>

Local Monitoring Data

Lead is monitored at three sites in South Gloucestershire, at Yate; near the Cribbs Causeway/M5 roundabout; and in Pilning. The Cribbs Causeway and Pilning sites were selected to be downwind of the industrial processes at Avonmouth (although a significant potential source there has now closed) and the Yate site as a background site. Annual average levels at all the sites are below both the objectives for 2004 and 2008. Figure 8 shows the annual average lead concentrations recorded between 1999 and 2006.

Figure 8:

Annual Average Lead 1999 - 2006

* Data missing
Summary of Changes in South Gloucestershire

There have been no major significant changes in South Gloucestershire that would lead to significant changes in emissions of lead.

Conclusion

The objectives for lead for 2004 and 2008 will be met in South Gloucestershire.

OTHER METALS

Although not prescribed in the regulations for review by the local authority, other metals including cadmium, zinc and copper are measured at the same locations as lead. There are currently no air quality standards for these metals.

Concentrations of cadmium and copper are always very low and are often below the limits of detection of the method of analysis. Concentrations of zinc are low and have noticeably fallen in recent years, probably as a result of the closure of Britannia Zinc in 2002 just across the border in Bristol City Council. See figure 9.

Figure 9:

Annual Average Zinc 1999 - 2006
## SULPHUR DIOXIDE

| **Objective** | 266 $\mu$g/m$^3$ measured as a 15-minute mean not to be exceeded more than 35 times per year by the end of 2005.
And
350 $\mu$g/m$^3$ measured as a 1-hour mean not to be exceeded more than 24 times per year by the end of 2004.
And
125 $\mu$g/m$^3$ measured as a 24-hour mean not to be exceeded more than 3 times per year by the end of 2004. |
| **National Perspective** | The main sources of sulphur dioxide in the UK are power stations and other industrial combustion sources. |

### Local Monitoring Data

South Gloucestershire does not presently operate any monitoring sites for sulphur dioxide. Bristol City Council however, have undertaken a monitoring exercise in relation to one of their potential significant sources located just over the boundary at Sevalco. It was found that the objectives for sulphur dioxide were unlikely to be exceeded.

### Summary of Changes in South Gloucestershire

There have been no major significant changes in South Gloucestershire that would lead to significant changes in emissions of sulphur dioxide.

### Conclusion

There will be no exceedences of the objectives for 2004 and 2005 for sulphur dioxide.
# PARTICULATE MATTER (PM\textsubscript{10})

<table>
<thead>
<tr>
<th>Objective</th>
<th>40 (\mu g/m^3) annual mean by the end of 2004. And 50 (\mu g/m^3) measured as a 24-hour mean not to be exceeded more than 35 times per year by the end of 2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provisional non-Statutory Objectives for 2010 for England (Except London)</td>
<td>The Government have brought in provisional objectives to be achieved by the end of 2010, however these will not be incorporated into UK regulations until after the review of the first EU Air Quality Daughter Directive. The provisional objectives are:- 20 (\mu g/m^3) annual mean by the end of 2010. And 50 (\mu g/m^3) measured as a 24-hour mean not to be exceeded more than 7 times per year by the end of 2010.</td>
</tr>
<tr>
<td>National Perspective</td>
<td>There are a wide range of emission sources that contribute to PM\textsubscript{10} concentrations in the UK. Exceedences of the 2004 objective may be found near busy roads; in areas that have significant emissions from domestic burning of solid fuels; and near industrial plant with significant uncontrolled/fugitive emissions eg quarrying and materials handling facilities.</td>
</tr>
</tbody>
</table>

## Comparison of Methods of Measurement for PM\textsubscript{10}

A study has been carried out by DEFRA recently to compare the precision and accuracy of different methods of measuring particulate matter. This so called “equivalence programme” involved the comparison of six automatic and non-automatic instruments, with European reference samplers.

The six instruments tested were as follows:

- Tapered Element Oscillating Microbalance (TEOM) - PM\textsubscript{10}
- Filter Dynamics Measurement System (FDMS) - PM\textsubscript{10}
- Filter Dynamics Measurement System (FDMS) PM 2.5
- Partisol 2025 Sequential Sampler - PM\textsubscript{10}
- OPSIS SM200 (with both Beta and Mass configurations) - PM\textsubscript{10}
- Met-One Beta Attenuation Monitor (BAM) - PM\textsubscript{10}
The tests carried out were based on the Guidance for the Demonstration of Equivalence of Ambient Air Monitoring Methods issued by an EC Working Group. In simple terms, the Guidance sets out an approach whereby it is possible to test whether an instrument is able to comply with the Data Quality Objective for overall uncertainty as defined within the relevant Air Quality Directive - in the case of PM10 this is 25%. The tests were conducted at 4 sites within the UK, over both summer and winter seasons. The outcome of the study is summarised in the table below:

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Outcome of Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEOM</td>
<td>Fails the equivalence criteria</td>
</tr>
<tr>
<td>FDMS (PM10)</td>
<td>Meets the equivalence criteria</td>
</tr>
<tr>
<td>FDMS (PM2.5)</td>
<td>Meets the equivalence criteria</td>
</tr>
<tr>
<td>Partisol 2025</td>
<td>Meets the equivalence criteria</td>
</tr>
<tr>
<td>OPSIS SM200</td>
<td>Beta - Meets the equivalence criteria, Mass - Meets the equivalence criteria with correction for slope and intercept</td>
</tr>
<tr>
<td>BAM</td>
<td>Meets the equivalence criteria with correction for slope</td>
</tr>
</tbody>
</table>

Defra’s advice to Local Authorities using TEOMs is that generally it is not necessary to replace TEOM analysers immediately. But when the time does come to replace it, the replacement instrument should be something that meets the equivalence criteria. This could involve purchasing one of the analysers that has been shown to meet the equivalence criteria, or by upgrading the TEOM analyser to an FDMS instrument (at a cost of about £6,500 to £7,500). This equipment will be noted by the suppliers as "shown to meet equivalence criteria" set out in the report on UK equivalence programme for monitoring of particulate matter.

Previously a default correction factor of 1.3 was applied to TEOM PM10 data in order to provide a “gravimetric-equivalent result”. Although it has now been shown that the application of a simple adjustment factor is not sufficient to enable TEOM data to be considered equivalent to the European reference method, it is advised that TEOM data multiplied by 1.3 can still be used as an indicative measurement of gravimetric PM10 in the interim period. Defra and the Devolved Administrations consider that TEOM analysers remain suitable for the purpose of LAQM, using the default correction factor of 1.3. Where PM10 concentrations are a particularly sensitive issue however, measurements of this pollutant are likely to come under close scrutiny. For example, the issue is more critical where PM10 concentrations are close to the objective.

For the Met-One BAM instrument, it was previously recommended that concentrations should be divided by 1.2. It is advised that this correction factor is still relevant, and should continue to be used.

**Local Monitoring Data**

Particulate matter is monitored at three locations in South Gloucestershire by continuous analyser. A TEOM analyser is located at Conygre House in Filton and BAM monitors are installed at Station Road in Yate and The High Street in Kingswood.
Figures 10, 11 and 12 show the PM$_{10}$ concentrations recorded during 2006. The data gathered from the TEOM at Filton has been multiplied by 1.3 in line with the guidance on TEOMs. The BAM monitors used in South Gloucestershire are non-heated ones and the data has therefore been divided by 1.2 in line with the technical guidance on BAMs. The effect of bonfire night is evident in the peaks shown around the 5th November.

**Figure 10: 24-Hour Mean Particulate Matter Recorded at Filton 2006**

![Graph of PM$_{10}$ concentrations at Filton 2006]

**Figure 11: 24-Hour Mean Particulate Matter Recorded at Yate 2006**

![Graph of PM$_{10}$ concentrations at Yate 2006]
Table 6 gives the annual mean concentration and the number of exceedences of the 24-hour mean objective for the three continuous PM$_{10}$ sites. As data capture was less than 90% for the Kingswood site, the 90$^{th}$ percentile has been used for comparison with the objective. The 2004 objectives were not exceeded at all sites.

**Table 6: Summary of Data for 2006**

<table>
<thead>
<tr>
<th>Objective</th>
<th>Filton</th>
<th>Yate</th>
<th>Kingswood</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Annual Average</strong></td>
<td>40 μg/m$^3$</td>
<td>20.8 μg/m$^3$</td>
<td>28.8 μg/m$^3$</td>
</tr>
<tr>
<td><strong>90$^{th}$ Percentile</strong></td>
<td>Use if less than 90% data capture</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Number of periods Exceeding 50 μg/m$^3$</strong></td>
<td>No more than 35</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td><strong>% Data Capture</strong></td>
<td>93.8%</td>
<td>93.8%</td>
<td>75.0%</td>
</tr>
</tbody>
</table>

**Potential Exceedence of 24 - hour Mean in Yate**

The annual reports for 2003 and 2004 identified the Yate site as potentially exceeding the 24-hour mean objective. The continuous monitoring undertaken at the permanent
Yate site during 2005 & 2006 however does not indicate any exceedances of the 2004 objective. In 2005, two additional temporary continuous monitoring sites were installed to monitor PM$_{10}$ at two sites adjacent to Chipping Sodbury Quarry. This also indicated no exceedances of the 2004 objective. The results were reported in full in last years Updating and Screening Assessment.

**Trends in Particulate Matter**

Figure 13 shows the trend in annual mean particulate matter concentrations at the three continuous monitoring sites since 1999. The annual mean objective to be met from 2004 has not been exceeded.

**Figure 13: Annual Average Particulate Matter 1998 – 2006**

![Annual Average Particulate Matter 1998 - 2006](image)

**Assessment of Compliance with the Provisional 2010 Objectives**

English local authorities do not presently have a statutory duty to assess PM$_{10}$ against the 2010 objective. The guidance however recommends that local authorities should begin to look to the 2010 objectives.

**Annual Mean Concentrations in 2010**

Table 7 shows the calculations to correct the results of monitoring in 2006 to 2010 using the method provided in TG (03)$^5$.

---

$^5$ Department of Environment, Food and Rural Affairs, Technical Guidance Note LAQM. TG(03) 2003
Table 7: Correcting 2006 Measured Levels to 2010 – Permanent Monitoring Sites

<table>
<thead>
<tr>
<th></th>
<th>Filton</th>
<th>Yate</th>
<th>Kingswood</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measured (corrected) Annual Average in 2006 ($CT_{2006}$)</td>
<td>20.8 μg/m³</td>
<td>28.8 μg/m³</td>
<td>18.4 μg/m³</td>
</tr>
<tr>
<td>Local Secondary PM$<em>{10}$ in 2004 (maximum from maps) ($C</em>{Sec2004}$)</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Local Secondary PM$<em>{10}$ in 2006 (measurement year) ($C</em>{Sec2006}$)</td>
<td>9 x 0.9507 = 8.5563</td>
<td>9 x 0.9507 = 8.5563</td>
<td>9 x 0.9507 = 8.5563</td>
</tr>
<tr>
<td>Local Primary PM$<em>{10}$ in 2006 (measurement year) ($C</em>{Prim2006}$)</td>
<td>20.8 – 8.5563 – 5.8 = 6.44</td>
<td>28.8 – 8.5563 – 5.8 = 14.44</td>
<td>18.4 – 8.5563 – 5.8 = 4.04</td>
</tr>
<tr>
<td>Local Primary PM$<em>{10}$ 2010 ($C</em>{Prim2010}$)</td>
<td>6.44 x 0.9247/1.0016 = 5.9</td>
<td>14.44 x 0.9247/1.0016 = 13.3</td>
<td>4.04 x 0.9247/1.0016 = 3.7</td>
</tr>
<tr>
<td>Local Secondary PM$<em>{10}$ in 2010 ($C</em>{Sec2010}$)</td>
<td>9 x 0.8522 = 7.66</td>
<td>9 x 0.8522 = 7.66</td>
<td>9 x 0.8522 = 7.66</td>
</tr>
<tr>
<td>PREDICTED TOTAL ANNUAL AVERAGE 2010 ($CG_{2010}$)</td>
<td>5.9 + 7.66 + 5.8 = 19.4 μg/m³</td>
<td>13.3 + 7.66 + 5.8 = 26.8 μg/m³</td>
<td>3.7 + 7.66 + 5.8 = 17.2 μg/m³</td>
</tr>
</tbody>
</table>

Comparison with the Objectives

Table 8 compares the results of the predicted annual mean concentrations in 2010 with the objectives.
Table 8: Annual Mean

<table>
<thead>
<tr>
<th></th>
<th>Predicted Annual Mean 2010</th>
<th>Objective</th>
<th>Compliance in 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filton</td>
<td>19.4 μg/m³</td>
<td>20 μg/m³</td>
<td>Yes</td>
</tr>
<tr>
<td>Yate, Station Road (Permanent Site)</td>
<td>26.8 μg/m³</td>
<td>20 μg/m³</td>
<td>No</td>
</tr>
<tr>
<td>Kingswood</td>
<td>17.2 μg/m³</td>
<td>20 μg/m³</td>
<td>Yes</td>
</tr>
</tbody>
</table>

It can be seen from the above that the proposed annual mean objective for 2010 may be exceeded at the Yate site. This is an improvement from the calculations done last year as these predicted both the Yate and Kingswood sites to exceed the objective in 2010. The 2010 objective is currently provisional and not a statutory level.

Exceedences of 24 hour mean

From the guidance note TG (03), figure 8.1, the number of exceedences of the 24-hour objective can be predicted from the annual mean using:

\[ y = -18 + (0.00145 \times \text{annual mean}^3) + (206 / \text{annual mean}) \]

From the annual mean predictions for 2010 above, this gives the following number of predicted exceedences of the 24-hour average (see table 9 below).

Table 9: 24-Hour Mean

<table>
<thead>
<tr>
<th></th>
<th>Predicted Number of Exceedances 2010</th>
<th>Objective</th>
<th>Compliance in 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filton</td>
<td>3</td>
<td>7</td>
<td>Yes</td>
</tr>
<tr>
<td>Yate, Station Road (Permanent Site)</td>
<td>18</td>
<td>7</td>
<td>No</td>
</tr>
<tr>
<td>Kingswood</td>
<td>1</td>
<td>7</td>
<td>Yes</td>
</tr>
</tbody>
</table>

It can be seen that the 2010, 24-hour mean objective may also be exceeded in Yate. This objective is however also provisional and not a statutory level.
Summary of Changes in South Gloucestershire

There have been no major significant changes in South Gloucestershire that would lead to significant changes in emissions of particulate matter.

Conclusion

Monitoring carried out during 2006 indicates that there will not be any exceedences of the 2004 24-hour mean or the 2004 annual mean objective.

2010 Objective

The annual mean and 24-hour mean objectives for 2010 are predicted to be exceeded at Yate. These objectives are however only provisional and are not statutory. The advice at present is that local authorities should not as yet undertake detailed assessments in relation to the 2010 objectives, nor declare any AQMAs in relation to them, until the EU and the UK Government have decided the way forward on this matter.
NITROGEN DIOXIDE

<table>
<thead>
<tr>
<th>Objective</th>
<th>40 μg/m³ (21 ppb) measured as an annual mean by the end of 2005. And 200 μg/m³ (105 ppb) measured as a 1-hour mean not to be exceeded more than 18 times per year by the end of 2005.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provisional non-Statutory Objectives for 2010</td>
<td>The Government have brought in provisional objectives to be achieved by the end of 2010, however these will not be incorporated into UK regulations until after the review of the first EU Air Quality Daughter Directive, due for completion in 2004. 40 μg/m³ measured as an annual mean by the end of 2010. And 200 μg/m³ measured as a 1-hour mean not to be exceeded more than 18 times per year by the end of 2010.</td>
</tr>
<tr>
<td>National Perspective</td>
<td>The main sources of nitrogen oxide emissions (nitrogen dioxide, nitric oxide) are road transport. Motorways and primary roads are predominant sources, along with areas of congested traffic.</td>
</tr>
</tbody>
</table>

Quality Assurance and Control (QA/QC)

Details of QA/QC procedures for the diffusion tube monitoring sites are given in appendix IV. Triplicate nitrogen dioxide diffusion tubes are co-located alongside the continuous analyser at Yate to assess a local bias adjustment factor. Unfortunately during 2006 theft of tubes from site meant insufficient data could be collected to assess South Gloucestershire’s bias adjustment factor for this year. The overall factor for 2006 for analysis carried out by Bristol Scientific Services has therefore been used. This factor was 0.89

Local Monitoring Data

Nitrogen dioxide is monitored by continuous analyser at three sites in South Gloucestershire, and was measured at some 64 diffusion tube sites during 2006.
Results of Continuous Monitoring

Figures 14, 15 and 16 show the concentrations of nitrogen dioxide recorded during 2006 at Filton, Yate and Kingswood respectively. Filton can be described as an urban background site, whereas Kingswood and Yate are located at the roadside. Table 10 compares the annual mean and hourly mean results with the objective values.

Figure 14: Hourly Average Nitrogen Dioxide Recorded at Filton During 2006
Figure 15: Hourly Average Nitrogen Dioxide Recorded at Yate During 2006

Objective: Less than 18 exceedences of 105 ppb 1 hour mean from 31.12.05

Figure 16: Hourly Average Nitrogen Dioxide Recorded at Kingswood During 2006

Objective: Less than 18 exceedences of 105 ppb 1 hour mean from 31.12.05
Table 10: Comparison of Results of Continuous Monitors with the Objectives

<table>
<thead>
<tr>
<th></th>
<th>Filton (Urban background)</th>
<th>Yate (Roadside)</th>
<th>Kingswood (Roadside)</th>
<th>Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Annual Mean</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Recorded During 2006</strong></td>
<td>21.8 μg/m3 (11.4 ppb)</td>
<td>27.9 μg/m3 (14.6 ppb)</td>
<td>26.7 μg/m3 (14.0 ppb)</td>
<td>40 μg/m³ (21 ppb)</td>
</tr>
<tr>
<td><strong>Compliance with annual mean Objective</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td><strong>Number of Exceedences of 1-hour mean Recorded During 2004</strong></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>Less than 18</td>
</tr>
<tr>
<td><strong>Compliance with 1-hour Objective</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>

There were no exceedences of the annual mean or 1-hour objectives for nitrogen dioxide in 2006.

Figure 17 shows the annual average nitrogen dioxide concentrations recorded at the 3 continuous sites between 1999 and 2006. The annual mean objective is being complied with at all the continuous monitoring sites.

**Figure 17: Annual Average Nitrogen Dioxide Continuous Monitoring Sites 1998 – 2006**
Correction to 2010

The annual mean nitrogen dioxide concentrations recorded in 2006 at roadside and background locations can be projected forward to 2010 using the following equations.

Roadside……………… 2010 annual mean = 2006 annual mean x 0.734 ÷ 0.863
Background…………… 2010 annual mean = 2006 annual mean x 0.778 ÷ 0.884

The annual means predicted at Yate, Kingswood and Filton in 2010 are therefore

Yate - Roadside
27.9 x 0.734 ÷ 0.863 = 23.7 μg/m³

Kingswood - Roadside
26.7 x 0.734 ÷ 0.863 = 22.7 μg/m³

Filton - Background
21.8 x 0.778 ÷ 0.884 = 19.2 μg/m³

The annual mean objective is not predicted to be exceeded at these sites in 2010, although as with the 2010 particulate matter objective, this objective is provisional and non-statutory.

Table 11 below shows the annual mean nitrogen dioxide concentration measured at the diffusion tube sites during 2006. The results have been corrected for bias. Figures 18 and 19 following show the results graphically.

Table 11: Annual Mean Nitrogen Dioxide Measured by Diffusion Tubes in 2006

<table>
<thead>
<tr>
<th>Site</th>
<th>Roadside/ Background (R/B)</th>
<th>2006 Raw Diffusion Tube Data (μg/m³)</th>
<th>2006 Bias Adjusted Data (ie x 0.89)(6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>YATE(K) Taylors Station Rd</td>
<td>R</td>
<td>38.4</td>
<td>34.3</td>
</tr>
<tr>
<td>Filton Gloucester Rd</td>
<td>R</td>
<td>49.6</td>
<td>44.1</td>
</tr>
<tr>
<td>Filton Gloucester Rd Kerbside</td>
<td>R</td>
<td>42.2</td>
<td>37.6</td>
</tr>
<tr>
<td>Filton Gloucester Rd, building facades</td>
<td>R</td>
<td>43.0</td>
<td>38.3</td>
</tr>
<tr>
<td>Station Road, Yate Co-Location 1</td>
<td>R</td>
<td>31.7</td>
<td>28.2</td>
</tr>
<tr>
<td>Station Road, Yate Co-Location 2</td>
<td>R</td>
<td>30.9</td>
<td>27.5</td>
</tr>
<tr>
<td>Station Road, Yate Co-Location 3</td>
<td>R</td>
<td>32.3</td>
<td>28.7</td>
</tr>
<tr>
<td>Thornbury (1) High St</td>
<td>R</td>
<td>33.6</td>
<td>29.9</td>
</tr>
<tr>
<td>Sun Life Stoke Gifford</td>
<td>R</td>
<td>35.3</td>
<td>31.4</td>
</tr>
<tr>
<td>MOD Roundabout</td>
<td>R</td>
<td>32.2</td>
<td>28.7</td>
</tr>
<tr>
<td>Hambrook Ring Road</td>
<td>R</td>
<td>46.4</td>
<td>41.3</td>
</tr>
<tr>
<td>Cribbs Causeway</td>
<td>R</td>
<td>42.4</td>
<td>37.7</td>
</tr>
</tbody>
</table>

(6) www.uwe.ac.uk/aqm/review/no2dtbiasdatabase.xls
<table>
<thead>
<tr>
<th>Location</th>
<th>Type</th>
<th>PM10</th>
<th>PM2.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>80 Regent St Kingswood</td>
<td></td>
<td>35.6</td>
<td>31.7</td>
</tr>
<tr>
<td>79 Regent St Kingswood</td>
<td></td>
<td>28.1</td>
<td>25.0</td>
</tr>
<tr>
<td>High St Hanham</td>
<td></td>
<td>34.1</td>
<td>30.3</td>
</tr>
<tr>
<td>Bank/Cecil Rd Kingswood</td>
<td></td>
<td>32.8</td>
<td>29.2</td>
</tr>
<tr>
<td>Nat West Regent St Kingswood</td>
<td></td>
<td>46.3</td>
<td><strong>41.2</strong></td>
</tr>
<tr>
<td>Regent St Kingswood, Building Facades</td>
<td></td>
<td>42.4</td>
<td><strong>37.7</strong></td>
</tr>
<tr>
<td>Regent St Kingswood, Kerbside</td>
<td></td>
<td>46.0</td>
<td><strong>40.9</strong></td>
</tr>
<tr>
<td>High St Staple Hill</td>
<td></td>
<td>42.1</td>
<td><strong>37.5</strong></td>
</tr>
<tr>
<td>Richmond Rd Mangotsfield</td>
<td></td>
<td>30.0</td>
<td>26.7</td>
</tr>
<tr>
<td>Cribbs Causeway M5 Roundabout</td>
<td></td>
<td>57.2</td>
<td><strong>50.9</strong></td>
</tr>
<tr>
<td>M4 East of Almondsbury Interchange, Ormonds Close</td>
<td></td>
<td>38.0</td>
<td>33.8</td>
</tr>
<tr>
<td>M4 East of Almondsbury Interchange, Trench Lane</td>
<td></td>
<td>43.7</td>
<td><strong>38.9</strong></td>
</tr>
<tr>
<td>M4 East of M32 whiteshill, Hambrook</td>
<td></td>
<td>25.7</td>
<td>22.9</td>
</tr>
<tr>
<td>M4 West of Almondsbury Interchange, Old Aust Road</td>
<td></td>
<td>31.5</td>
<td>28.0</td>
</tr>
<tr>
<td>Highwood Rd Filton</td>
<td></td>
<td>41.4</td>
<td>36.8</td>
</tr>
<tr>
<td>Hatchet Rd Stoke Gifford</td>
<td></td>
<td>37.4</td>
<td>33.3</td>
</tr>
<tr>
<td>Bradley Stoke Way</td>
<td></td>
<td>44.2</td>
<td><strong>39.3</strong></td>
</tr>
<tr>
<td>High St Winterbourne</td>
<td></td>
<td>38.4</td>
<td>34.2</td>
</tr>
<tr>
<td>A4174 Bromley Heath</td>
<td></td>
<td>51.4</td>
<td><strong>45.7</strong></td>
</tr>
<tr>
<td>Aztec West Roundabout</td>
<td></td>
<td>53.4</td>
<td><strong>47.5</strong></td>
</tr>
<tr>
<td>Old Gloucester Rd Hambrook</td>
<td></td>
<td>37.0</td>
<td>32.9</td>
</tr>
<tr>
<td>A4174 Hambrook</td>
<td></td>
<td>47.5</td>
<td><strong>42.3</strong></td>
</tr>
<tr>
<td>A431 / Aldermoor Way Longwell Green</td>
<td></td>
<td>36.0</td>
<td>32.0</td>
</tr>
<tr>
<td>Ringroad Site Entrance Hanham/Kingswood</td>
<td></td>
<td>41.0</td>
<td>36.5</td>
</tr>
<tr>
<td>Frog Lane Coalpit Heath</td>
<td></td>
<td>31.4</td>
<td>27.9</td>
</tr>
<tr>
<td>Kingsfield Lane, Aspects Leisure Site</td>
<td></td>
<td>28.4</td>
<td>25.3</td>
</tr>
<tr>
<td>The Willows, Siston Common, ring road</td>
<td></td>
<td>25.3</td>
<td>22.5</td>
</tr>
<tr>
<td>North St Downend (Busy Junction Site)</td>
<td></td>
<td>43.6</td>
<td><strong>38.8</strong></td>
</tr>
<tr>
<td>Broad St, Staple Hill Cross Roads (Busy Junction Site)</td>
<td></td>
<td>49.2</td>
<td><strong>43.8</strong></td>
</tr>
<tr>
<td>Soundwell Road, Staple Hill Cross Roads</td>
<td></td>
<td>47.2</td>
<td><strong>42.0</strong></td>
</tr>
<tr>
<td>Parkleaze Development Patchway</td>
<td></td>
<td>35.8</td>
<td>31.9</td>
</tr>
<tr>
<td>Holly Cottage Cribbs Causeway</td>
<td></td>
<td>44.3</td>
<td><strong>39.4</strong></td>
</tr>
<tr>
<td>Dean Ave thornbury</td>
<td></td>
<td>23.1</td>
<td>20.6</td>
</tr>
</tbody>
</table>

**Figures in red denote sites exceeding the objective.**
**Figures in blue denote sites approaching the objective.**
<table>
<thead>
<tr>
<th>Site</th>
<th>Roadside/Background (R/B)</th>
<th>2006 Raw Diffusion Tube Data (μg/m³)</th>
<th>2006 Bias Adjusted Data (ie x 0.89)</th>
</tr>
</thead>
<tbody>
<tr>
<td>YATE(I) The Avenue</td>
<td>B</td>
<td>24.3</td>
<td>21.6</td>
</tr>
<tr>
<td>YATE(B1) Hatherley</td>
<td>B</td>
<td>18.5</td>
<td>16.5</td>
</tr>
<tr>
<td>Frampton Cotterell The Spinney</td>
<td>B</td>
<td>21.1</td>
<td>18.8</td>
</tr>
<tr>
<td>Cade Close Kingswood</td>
<td>B</td>
<td>20.5</td>
<td>18.2</td>
</tr>
<tr>
<td>St Augustines Church Downend</td>
<td>B</td>
<td>22.8</td>
<td>20.3</td>
</tr>
<tr>
<td>Stourton Drive Kingswood</td>
<td>B</td>
<td>22.1</td>
<td>19.7</td>
</tr>
<tr>
<td>Oakhill Ave Kingswood</td>
<td>B</td>
<td>19.2</td>
<td>17.1</td>
</tr>
<tr>
<td>Gilbert Rd Kingswood</td>
<td>B</td>
<td>26.2</td>
<td>23.3</td>
</tr>
<tr>
<td>Teewell Hill Kingswood</td>
<td>B</td>
<td>26.2</td>
<td>23.3</td>
</tr>
<tr>
<td>Court Rd Kingswood</td>
<td>B</td>
<td>23.1</td>
<td>20.6</td>
</tr>
<tr>
<td>Almondsbury Depot</td>
<td>B</td>
<td>37.2</td>
<td>33.1</td>
</tr>
<tr>
<td>Severn Beach Primary School</td>
<td>B</td>
<td>23.2</td>
<td>20.6</td>
</tr>
<tr>
<td>Marshfield Primary School</td>
<td>B</td>
<td>18.1</td>
<td>16.1</td>
</tr>
<tr>
<td>Hawkesbury Primary School</td>
<td>B</td>
<td>12.5</td>
<td>11.1</td>
</tr>
<tr>
<td>Wick</td>
<td>B</td>
<td>12.9</td>
<td>11.5</td>
</tr>
<tr>
<td>21 Braydon Ave Little Stoke</td>
<td>B</td>
<td>31.0</td>
<td>27.6</td>
</tr>
<tr>
<td>38 Firework Close Kingswood</td>
<td>B</td>
<td>25.0</td>
<td>22.3</td>
</tr>
<tr>
<td>Rear of 96 Old Gloucester Rd Hambrook</td>
<td>B</td>
<td>36.9</td>
<td>32.8</td>
</tr>
<tr>
<td>17 Fenbrook Close Hambrook</td>
<td>B</td>
<td>36.7</td>
<td>32.7</td>
</tr>
<tr>
<td>Barley Close Primary School</td>
<td>B</td>
<td>22.0</td>
<td>19.6</td>
</tr>
</tbody>
</table>

7www.uwe.ac.uk/aqm/review/no2dtbiasdatabase.xls
Table 12 below shows the locations where the annual mean is close to, or exceeds the 2005 objective. For those sites where there may be relevant exposure an adjustment has been made to predict the concentration at the receptor. The adjustment factors applied were:

<table>
<thead>
<tr>
<th>Distance From Kerbside to Receptor</th>
<th>Factor applied</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 – 5 m</td>
<td>0.95</td>
</tr>
<tr>
<td>5 – 10 m</td>
<td>0.90</td>
</tr>
<tr>
<td>10 – 20 m</td>
<td>0.75</td>
</tr>
</tbody>
</table>
### Table 12: Diffusion Tube Locations Close to or Exceeding the 2005 Annual Mean Objective

<table>
<thead>
<tr>
<th>Location</th>
<th>Annual Mean in 2006 (μg/m³)</th>
<th>Relevant Exposure &amp; Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sites Exceeding the Objective</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Broad St, Staple Hill Cross Roads</td>
<td>43.8</td>
<td>Relevant exposure is at 4m from the centre of the road. Applying the multiplication factor of 0.95 would give a corrected level of $41.6\mu g/m^3$. It is therefore predicted that the annual mean objective could be exceeded at the facades of residential buildings.</td>
</tr>
<tr>
<td>Soundwell Road, Staple Hill Cross Roads</td>
<td>42.0</td>
<td>Relevant exposure is at 4m from the centre of the road. Applying the multiplication factor of 0.95 would give a corrected level of $39.9\mu g/m^3$. It is therefore predicted that the annual mean objective may be exceeded at the facades of residential buildings.</td>
</tr>
<tr>
<td>Cribbs Causeway M5 Roundabout</td>
<td>50.9</td>
<td>Relevant exposure is at 20m from the centre of the road. Applying the multiplication factor of 0.75 would give a corrected level of $38.2\mu g/m^3$ at 20m. No exceedences are therefore predicted at the facades of residential buildings, though the concentration is beginning to approach the objective.</td>
</tr>
<tr>
<td>Nat West Bank Regent St Kingswood</td>
<td>41.2</td>
<td>Relevant exposure is at 6m from the centre of the road. Applying the multiplication factor of 0.9 would give a corrected level of $37.1\mu g/m^3$. No exceedences are therefore predicted at the facades of residential buildings, though the concentration is beginning to approach the objective.</td>
</tr>
<tr>
<td>Regent St Kingswood, Kerbside</td>
<td>40.9</td>
<td>Relevant exposure is at 8m from the centre of the road. Applying the multiplication factor of 0.9 would give a corrected level of $36.8\mu g/m^3$. No exceedences are therefore predicted at the facades of residential buildings, though the concentration is beginning to approach the objective.</td>
</tr>
<tr>
<td>Aztec West Roundabout</td>
<td>47.5</td>
<td>Relevant exposure is at 20m from the centre of the road. Applying the multiplication factor of 0.75 would give a corrected level of $35.6\mu g/m^3$ at 20m. No exceedences are therefore predicted at the facades of residential buildings.</td>
</tr>
<tr>
<td>Road Location</td>
<td>Value</td>
<td>Relevant Exposure Details</td>
</tr>
<tr>
<td>---------------</td>
<td>-------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>A4174 Bromley Heath</td>
<td>45.7</td>
<td>Relevant exposure is at 42m from the centre of the road. Applying the multiplication factor of 0.75 would give a corrected level of $34.3 \mu g/m^3$. No exceedences are therefore predicted at the facades of residential buildings.</td>
</tr>
<tr>
<td>Filton, Gloucester Road, St Peters Church</td>
<td>44.1</td>
<td>Relevant exposure is at 12m from the centre of the road. Applying the multiplication factor of 0.75 would give a corrected level of $33.1 \mu g/m^3$. No exceedences are therefore predicted at the facades of residential buildings.</td>
</tr>
<tr>
<td>A4174 Hambrook</td>
<td>42.3</td>
<td>Relevant exposure is at 20m from the centre of the road. Applying the multiplication factor of 0.75 would give a corrected level of $31.7 \mu g/m^3$. No exceedences are therefore predicted at the facades of residential buildings.</td>
</tr>
<tr>
<td>Hambrook, Ring Road Junction</td>
<td>41.3</td>
<td>Relevant exposure is at 18m from the centre of the road. Applying the multiplication factor of 0.75 would give a corrected level of $31.0 \mu g/m^3$. No exceedences are therefore predicted at the facades of residential buildings.</td>
</tr>
<tr>
<td>Sites Approaching the Objective</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regent St Kingswood building facades</td>
<td>37.7</td>
<td>Tube is located at the building façade.</td>
</tr>
<tr>
<td>High St Staple Hill</td>
<td>37.5</td>
<td>Relevant exposure is at 6m from the centre of the road. Applying the multiplication factor of 0.9 would give a corrected level of $33.8 \mu g/m^3$. No exceedences are therefore predicted at the facades of residential buildings.</td>
</tr>
<tr>
<td>Holly Cottage Cribbs Causeway</td>
<td>39.4</td>
<td>Relevant exposure is at 45m from the centre of the road. Applying the multiplication factor of 0.75 would give a corrected level of $29.6 \mu g/m^3$. No exceedences are therefore predicted at the facades of residential buildings.</td>
</tr>
<tr>
<td>Bradley Stoke Way</td>
<td>39.3</td>
<td>Relevant exposure is at 11m from the centre of the road. Applying the multiplication factor of 0.75 would give a corrected level of $29.5 \mu g/m^3$. No exceedences are therefore predicted at the facades of residential buildings.</td>
</tr>
<tr>
<td>M4 East of Almondsbury Interchange, Trench Lane</td>
<td>38.9</td>
<td>Relevant exposure is at 10m from the centre of the road. Applying the multiplication factor of 0.75 would give a corrected level of $29.2 \mu g/m^3$. No exceedences are therefore predicted at the facades of residential buildings.</td>
</tr>
<tr>
<td>Location</td>
<td>Relevant Exposure</td>
<td>Calculation</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>-------------------</td>
<td>------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>North St Downend</td>
<td>38.8</td>
<td>Relevant exposure is at 14m from the centre of the road. Applying the multiplication factor of 0.75 would give a corrected level of 29.1 μg/m³. No exceedences are therefore predicted at the facades of residential buildings.</td>
</tr>
<tr>
<td>Filton, Gloucester Road, building facades near shops</td>
<td>38.3</td>
<td>Relevant exposure is at 12m from the centre of the road. Applying the multiplication factor of 0.75 would give a corrected level of 28.7 μg/m³. No exceedences are therefore predicted at the facades of residential buildings.</td>
</tr>
<tr>
<td>Cribbs Causeway road</td>
<td>37.7</td>
<td>Relevant exposure is at 25m from the centre of the road. Applying the multiplication factor of 0.75 would give a corrected level of 28.3 μg/m³. No exceedences are therefore predicted at the facades of residential buildings.</td>
</tr>
<tr>
<td>Filton, Gloucester Road kerbside by shops</td>
<td>37.6</td>
<td>Relevant exposure is at 12m from the centre of the road. Applying the multiplication factor of 0.75 would give a corrected level of 28.2 μg/m³. No exceedences are therefore predicted at the facades of residential buildings.</td>
</tr>
</tbody>
</table>

**Potential Exceedence of the Annual Mean Nitrogen Dioxide Objective**

The results of the nitrogen dioxide diffusion tube samples indicate a potential exceedence of the annual mean objective for nitrogen dioxide at the cross roads of the A4017 and A4175 at Staple Hill. (See figure 20). This was not indicated in last years Updating and Screening Assessment which showed compliance with the objective. Enquiries with the transport section have not revealed any particular reason for this such as long-term roadworks etc.
Local Authorities have a duty under section 83(1) of the Environment Act 1995 to designate those areas where air quality objectives are “unlikely” to be met, as an Air Quality Management Area (AQMA). These areas have to be designated formally by means of an order.

If in undertaking a Progress Report the local authority identifies a potential exceedence, then they are required to undertake a Detailed Assessment. This will determine whether an Air Quality Management Area is required. The Detailed Assessment should be completed and submitted in April of the following year.

It will be necessary to undertake a “Detailed Assessment” of this area of Staple Hill over the next 12 months and produce a detailed report for submission to the Department for Environment, Food and Rural Affairs (DEFRA) by May 2008.

Sites approaching the annual mean objective for nitrogen dioxide include the Cribbs Causeway/M5 roundabout and Regent Street in Kingswood. Although these sites are not currently exceeding the objective, it would seem prudent to undertake a detailed assessment of these sites also. Figures 21 and 22 below show the sites and the nearest residential receptors.
Figure 21: Cribbs Causeway/M5 roundabout

Figure 22: Regent Street, Kingswood
Historical Diffusion Tube Monitoring and Trends in Nitrogen Dioxide

Figures 23, 24 and 25 show the results of the nitrogen dioxide diffusion tube monitoring since 2003. Appendix V gives the data in table form for the results since 1995. Over the years, the number of sites monitored has greatly expanded, though some sites have only been monitored for short-term projects of a year or so.

**Figure 23: Historic diffusion Tube Results**

2003-2006 Annual Mean: Roadside Sites
Figure 24: Historic diffusion Tube Results

2003-2006 Annual Mean: Roadside Sites

Figure 23: Historic diffusion Tube Results

2003-2006 Annual Mean: Background
Background Monitoring - Energy from Waste Site

It has been proposed that an “Environment Park” including an energy from waste plant may be developed near Keynsham, in Bath and North East Somerset Councils’ area. As this is close to the border with South Gloucestershire (and the prevailing wind is towards South Gloucestershire), background monitoring for nitrogen dioxide and PAH’s is being carried out as a joint project in both areas. Results of the PAH monitoring are not yet available. Background monitoring for nitrogen dioxide however, has been carried out for four years now and the results are summarised in figure 26 below. If the development goes ahead, this monitoring will be compared with modelling undertaken for the proposal and monitoring undertaken post development.

Figure 26: Background Monitoring at Proposed energy from Waste Site

Summary of Changes in South Gloucestershire

There have been no major significant changes in South Gloucestershire since the first review and assessment, which would lead to significant changes in emissions of nitrogen dioxide.

Conclusion

The annual mean nitrogen dioxide objective is predicted to be exceeded at Staple Hill and is being approached at the Cribbs Causeway/M5 roundabout and Regent Street Kingswood. A “detailed assessment” must be carried out at these locations and submitted to DEFRA within 12 months.
OZONE

<table>
<thead>
<tr>
<th>Objective</th>
<th>No more than 10 exceedences of 100 $\mu$g/m$^3$ (50 ppb) measured as an 8-hour mean by the end of 2005. This objective has not however been incorporated into the regulations.</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Perspective</td>
<td>Ozone is a national rather than a local authority problem and has not been designated for local authority control</td>
</tr>
</tbody>
</table>

Local Monitoring Data

Ozone is a “secondary” pollutant formed by reactions between other directly emitted pollutants. In the presence of sunlight, nitrogen oxides and hydrocarbons produced from vehicle emissions or industrial sources react to produce ozone. Ozone (which is a constituent of photochemical smog) tends to be more of a problem in the summer, as the chemical reactions that are needed to produce ozone are accelerated by sunlight. Also, because the reactions are complex and take time, high levels of ozone are often found at some distance from congested urban areas. Ozone episodes can even occur in one country as a result of pollutants emitted in another.

Ozone is monitored continuously at one location in South Gloucestershire in Badminton. Figure 27 shows the results of monitoring during 2006. During 2006, there were 20 recorded exceedences of the 8-hour mean against an objective of 10. Data collection was 87%.
Figure 27: Ozone measured as an 8-hour mean during 2006

![Graph showing ozone levels from January 1, 2006 to December 31, 2006. The x-axis represents time, and the y-axis represents ozone concentration (ppb). The graph shows peaks and troughs throughout the year.]

Trends in Ozone

Figure 28 shows the annual average ozone concentration and the number of exceedences of the 50 ppb objective over the years 1999 to 2006. The objective is likely to be exceeded, however ozone is a national and international problem and has therefore not been designated for local authority control.
Figure 28: Annual Average Ozone 1999 – 2006 Showing the Number of Days Exceeding 100 μg/m$^3$ (50 ppb)

Conclusion

During 2006, the ozone objective was exceeded. National and international measures will be required to reduce ozone production across the UK.
RADIATION

Radiation does not fall under the umbrella of Air Quality Management, it is however monitored in South Gloucestershire so the results are reported here.

85% of public exposure to radiation is from natural sources, in particular from radon gas. The greatest proportion of exposure to artificial sources is medical usage e.g. X-rays.

Figure 29 shows the average proportion of exposure to different sources of radiation in the UK.

Figure 29: Average Exposure to Different Sources of Radiation in the UK

![Pie chart showing average exposure to different sources of radiation in the UK](chart)

Background Gamma radiation

Continuous monitoring of background gamma radiation commenced in 2000 at the Council Offices building in Thornbury. Figure 30 shows the levels recorded at this site during 2006. The first alarm level of 150 nSv per hour (nano Sieverts per hour) was not reached.

For further information on radiation see Quarterly Gamma Radiation Dose Rates published by the Department of Environment, Food and Rural Affairs on the web at:- [www.defra.gov.uk/environment/radioactivity/index.htm](http://www.defra.gov.uk/environment/radioactivity/index.htm)
Radon

About half the radiation that most people are exposed to comes from the naturally occurring radioactive gas radon. Radon is produced from the radioactive decay of uranium that occurs naturally in certain rocks and soils. When soil gases carrying radon percolate up through the ground into properties, significantly raised radon levels can occur.

High levels of radon in homes can increase the risk of lung cancer. In order to avoid this risk the government has set an action level for radon in homes of 200 Bq/m³ (becquerels per cubic meter). From measurements that have been done in domestic homes, the Radiation Section of the Health Protection Agency (Formerly the National Radiological Protection Board (NRPB)) has drawn up a map of Britain showing the areas likely to be affected by radon. Grid squares of 5km have been classified according to the percentage of homes likely to have radon above the recommended level. About one quarter of South Gloucestershire is classified as unaffected by radon. The majority of the remaining three quarters fall into the class of 1 - 3% of homes above the action level, with small areas classified as 3 - 5% and 5 - 10% of homes above the action level.

Figure 31 shows the areas affected by radon in South Gloucestershire. For new build houses and extensions, precautions against radon gas are now required. Further details can be obtained from the Environmental Protection (Specialist) Team or Building Control section of South Gloucestershire Council.

Radon levels can vary considerably from house to house. Anyone concerned about radon can have their property tested by the Health Protection Agency or other
accredited laboratories. Tests are simple (involving small plastic detectors being placed in the home) but do take around three months and there is a charge for the service (currently around £37 per test). Contact the Health protection Agency free phone number on 0800 614529 for an information pack.

**Figure 31: Radon Areas in South Gloucestershire**

![Map of Radon Areas in South Gloucestershire](image)

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SUMMARY AND CONCLUSIONS

The annual review of air quality showed that the objectives for benzene, 1,3-butadiene, lead, carbon monoxide, sulphur dioxide and particulate matter are predicted to be met.

The annual mean nitrogen dioxide objective is predicted to be exceeded at Staple Hill and is being approached at the Cribbs Causeway/M5 roundabout and Regent Street Kingswood. A “detailed assessment” must be carried out at these locations and submitted to DEFRA within 12 months. If the detailed assessments confirm the objective is being exceeded, an Air Quality Management Area will need to be declared.
## APPENDIX I

### PERMITTED INSTALLATIONS IN SOUTH GLOUCESTERSHIRE

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<tr>
<th>Permit Reference</th>
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## PART A1 PROCESSES

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### APPENDIX II

#### SUMMARY OF DETAILS AND DATA COLLECTED FROM THE CONTINUOUS MONITORING STATIONS DURING 2006

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<td>14.0 ppb (26.7 ug/m³)</td>
<td>11.4 ppb 21.8 ug/m³</td>
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<td>20.8ug/m3</td>
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<td>21 ppb (40 ug/m³) by end 2005</td>
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<td>105 ppb (200 ug/m³) 1hour mean, 18 exceedences by end 2005</td>
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### APPENDIX III

**Summary of Passive Diffusion Tube sites**

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</tr>
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<td>364150</td>
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<td></td>
<td>2006</td>
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</table>
Appendix IV

Diffusion Tubes – Analytical Quality Control

The following information is provided in relation to the analysis of diffusion tubes undertaken by Bristol City Council Scientific Services (BCCSS).

1. BCCSS laboratory is accredited by UKAS for a variety of tests in areas such as food, consumer safety, microbiology and asbestos. They do not have UKAS accreditation for the analysis of diffusion tubes. Their current policy is to seek accreditation only when it is necessary. This is due not only to the expense of accreditation but also the lack of flexibility they have often found in the other areas.

2. BCCSS participate in the Workplace Analysis Scheme for Proficiency (WASP) for both nitrogen dioxide and benzene tubes. They also participate in other aspects of the WASP scheme including solvents on carbon tubes and metals on filters. The latest WASP reports for nitrogen dioxide and benzene is attached.

3. In the case of the nitrogen dioxide analysis BCCSS also analyse a solution supplied by Netcen as part of the QA/QC scheme that they run. The last annual report on this scheme is attached.

4. BCCSS also participate in a field inter-comparison scheme that started in November 2002. In this scheme, three tubes are co-located with a continuous analyzer, which provides a reference value.

5. Reference materials and equipment are obtained from BCCSS normal suppliers all of whom are approved to BS EN ISO 9001. All reference materials are of at least analytical grade or equivalent. Standards are prepared using equipment that is all within BCCSS normal quality system.

6. Each nitrogen dioxide tube is prepared by pipetting 30µl of a solution of 20% triethanolamine in water onto the metal grids in the end cap, then assembling the tube components. A fresh batch of tubes is prepared each month ready to dispatch in time for the required exposure date.

   Laboratory blanks are retained so that at least one is run alongside each batch of samples. Travel blanks are supplied three-monthly as required by the U.K. Survey procedure.

7. As well as participating in the field trials BCCSS are also carrying out some tests to compare tube preparation techniques. Those authorities that expose triplicate tubes alongside their continuous monitors in order to measure tube bias will have observed that the results sometimes are not as close to each other as would be expected, and in some cases markedly so. BCCSS are therefore carrying out trials
to establish whether they can improve the precision of the technique which they think may be due to variances in the tube preparation.

8. Benzene tubes are the Perkin Elmer type (length 89mm x 6.4mm o.d.) packed with Tenax TA. The uptake rate for benzene is taken to be 0.76 ng/ppm/minute.
NO₂ Results  Round: 94  Laboratory: 152
Date: 12 Mar 2007

Summary of your results and their ratios to the mean

<table>
<thead>
<tr>
<th>Your result</th>
<th>Assigned value</th>
<th>Standardised result</th>
<th>Z Score</th>
<th>Performance Classification</th>
</tr>
</thead>
<tbody>
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<td>2.39</td>
<td>2.39</td>
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<td>-0.2</td>
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<tr>
<td>2.24</td>
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<td>0.09</td>
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Your Laboratory's Performance Classification is: Good

Standard Uncertainty: 2.8922756

Results for All Participants:
Mean Performance Score: 30.07  Median Performance Score: 22.05
Mean Z Score: 0.01  Median Z Score: 0.00

Your laboratory is ranked 4 out of 24 labs. Standard Uncertainty 30.4%

Performance Score Plot

A participant should investigate any analytical measurement returning an 'AC' or 'WN' performance category in a single round or a second successive 'WARNING' performance category.
WASP Results

Round: 72  Laboratory: 152

Benzene on Tenax Tubes – Environmental

Frequency Count of Results for this Analyte

Results for this Laboratory

Summary of your results and their ratio to the mean

<table>
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<th>Sample Number</th>
<th>Your Result (ng/m³)</th>
<th>Relative Deviation</th>
<th>Standardized Result</th>
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<td>1.16</td>
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<td>4</td>
<td>179.6</td>
<td>0.68</td>
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Reference Value (ng/m³): 1.52

Results for Your Laboratory:
- Number of entries: 4
- Mean PI: 1.35
- Median PI: 1.34

Results for All Participants:
- Mean PI: 1.53
- Median PI: 1.50

Performance Category: 1

Your laboratory is ranked 4th out of 25 labs

Additional Information:
- Analysis of variance: 0.072256
- SSA: 0.848986
- Coefficient of variation: 0.371

RPI Plot for your Laboratory
# Checking Precision and Accuracy of Triplicate Tubes

## Diffusion Tubes Measurements

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<th>Start Date</th>
<th>End Date</th>
<th>Tube 1 $\mu$gm$^{-3}$</th>
<th>Tube 2 $\mu$gm$^{-3}$</th>
<th>Tube 3 $\mu$gm$^{-3}$</th>
<th>Triplicate Mean</th>
<th>Standard Deviation</th>
<th>Coefficient of Variation (CV)</th>
<th>95% CI of mean</th>
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## Automatic Method

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<th>95% CI of mean</th>
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## Data Quality Check

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</table>

### Overall Survey

- Good precision
- Good Overall DC

---

**Accuracy (with 95% confidence interval)**

- **Bias calculated using 12 periods of data**
  - Bias factor A: 0.96 (0.9 - 1.03)
  - Bias factor B: 4% (-3% - 12%)

### Bias calculated using 12 periods of data

- **Bias factor A:** 0.96 (0.9 - 1.03)
- **Bias factor B:** 4% (-3% - 12%)

### Mean CV (Precision): 5%

- **Automatic Mean:** 111 $\mu$gm$^{-3}$
- **Data Capture for periods used:** 97%
- **Adjusted Tubes Mean:** 111 (104 - 119) $\mu$gm$^{-3}$

---

**Automatic Mean:** 111 $\mu$gm$^{-3}$

---

**Jaume Targa**

jaume.targa@aeat.co.uk

Version 03 - November 2006
## Appendix V

### Trends on Nitrogen Dioxide

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<th>1996</th>
<th>1997</th>
<th>1998</th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002 Bias Adjusted (Data x 1.09)</th>
<th>2003 Bias Adjusted (Data x 0.92)</th>
<th>2004 Bias Adjusted (Data x 0.97)</th>
<th>2005 Bias Adjusted (Data x 0.95)</th>
<th>2006 Bias Adjusted (Data x 0.89)</th>
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N/O = Not Operational
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### Glossary

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<tr>
<th>Acronym</th>
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<tr>
<td>AADT</td>
<td>Annual Average Daily Traffic Flow</td>
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<tr>
<td>ADMS</td>
<td>Atmospheric Dispersion Modelling System</td>
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<td>AQMA</td>
<td>Air Quality Management Area</td>
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<td>BAM</td>
<td>Beta Attenuation Mass Monitor</td>
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<td>DEFRA</td>
<td>Department of Environment Food and Rural Affairs</td>
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<td>DMRB</td>
<td>Design Manual for Roads and Bridges</td>
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<td>EU</td>
<td>European Union</td>
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<tr>
<td>mg/m³</td>
<td>Milligrams per metre cubed</td>
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<td>nSv per hour</td>
<td>nano Sieverts per hour</td>
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<td>ppb</td>
<td>Parts per billion</td>
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<td>QA/QC</td>
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<td>TEOM</td>
<td>Tapered Element Oscillating Microbalance</td>
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