



2012 Air Quality Updating and
Screening Assessment for
Cheltenham Borough Council

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

June 2012

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Executive Summary

During 2010 Cheltenham Borough Council identified several locations within the town where exceedance of the National Objective for nitrogen dioxide (annual mean) had occurred. This resulted in the declaration of a new Air Quality Management Area (AQMA) in 2011 to cover the whole of the Borough area.

Continued monitoring during 2011 showed a slight decrease in nitrogen dioxide levels compared to 2010 levels although the reasons for this are unclear since overall average traffic counts increased slightly. The annual mean nitrogen dioxide levels at five locations were still being exceeded in 2011 which means the existing AQMA declaration remains justified.

A real-time roadside monitoring instrument was installed in August 2011 to record nitrogen dioxide levels at a location with relevant exposure. Data from this will be compared with data obtained from co-located diffusion tubes.

The Council is in the process of developing an Action Plan for dealing with the elevated nitrogen dioxide levels across the Borough.

No detailed assessment is required for any other pollutants.

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1 Introduction

1.1 Description of Local Authority Area

Cheltenham Borough Council is situated in central Gloucestershire. It is bordered by Tewkesbury Borough Council and Cotswold District Council (Figure 1). Cheltenham Borough Council has a population of approximately 111,700 and lies some five kilometres to the east of the M5 motorway mid-way between Bristol and Birmingham on the edge of the Cotswold Hills.

The Borough is based on the town of Cheltenham and is mainly urban with some areas of surrounding countryside. It covers an area of approximately 4,680 hectares of which 17 percent is designated as green belt and 22 percent as an area of outstanding natural beauty.

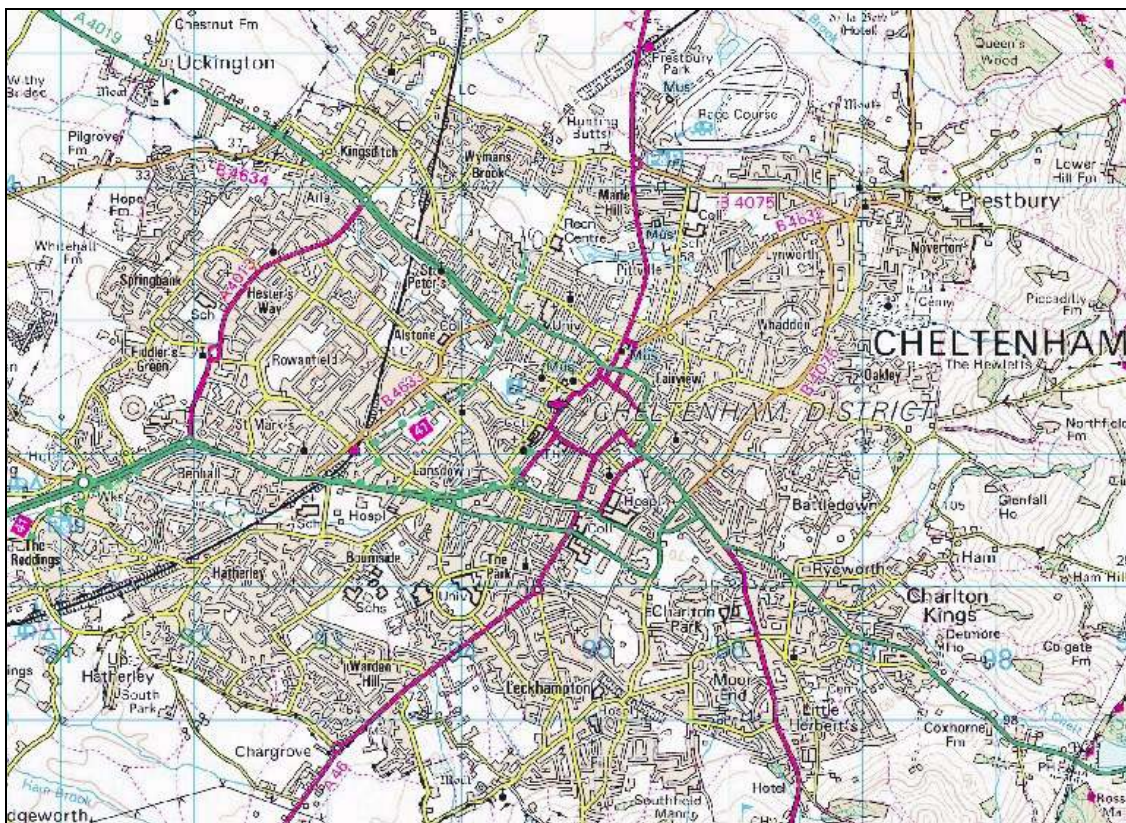


Figure 1. 1 Map of Cheltenham Borough Council Area

NW Cheltenham Extension: There is a proposal currently under consideration for the development of 5000 new houses to the north-west of Cheltenham. This development will primarily impact on Tewkesbury Road, Cheltenham and on Junction 10 of the M5. Cheltenham Borough Council and Tewkesbury Borough Council are working closely together to ensure that air quality is adequately considered for this development.

1.2 Purpose of Report

This report fulfils the requirements of the Local Air Quality Management process as set out in Part IV of the Environment Act (1995), the Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007 and the relevant Policy and Technical Guidance documents. The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where exceedences are considered likely, the local authority must then declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives.

The objective of this Updating and Screening Assessment is to identify any matters that have changed which may lead to risk of an air quality objective being exceeded. A checklist approach and screening tools are used to identify significant new sources or changes and whether there is a need for a Detailed Assessment. The USA report should provide an update of any outstanding information requested previously in Review and Assessment reports.

1.3 Air Quality Objectives

The air quality objectives applicable to LAQM in England are set out in the Air Quality (England) Regulations 2000 (SI 928), The Air Quality (England) (Amendment) Regulations 2002 (SI 3043), and are shown in Table 1.1. This table shows the objectives in units of microgrammes per cubic metre $\mu\text{g}/\text{m}^3$ (milligrammes per cubic metre, mg/m^3 for carbon monoxide) with the number of exceedences in each year that are permitted (where applicable).

Table 1. 1 Air Quality Objectives included in Regulations for the purpose of LAQM in England

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene	16.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2003
	5.00 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2010

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1,3-Butadiene	2.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2003
Carbon monoxide	10.0 mg/m^3	Running 8-hour mean	31.12.2003
Lead	0.5 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2004
	0.25 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2008
Nitrogen dioxide	200 $\mu\text{g}/\text{m}^3$ not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2005
Particles (PM₁₀) (gravimetric)	50 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	40 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2004
Sulphur dioxide	350 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

1.4 Summary of Previous Review and Assessments

In recent years Cheltenham Borough Council has submitted the following reports:

- 2005: Progress Report
- 2006: Updating and Screening Assessment
- 2007: Progress Report
- 2007: Detailed Assessment of Bath Road for Nitrogen Dioxide
- 2008: Progress Report
- 2009: Updating and Screening Assessment
- 2010: Progress Report
- 2011: Progress Report
- 2011: Detailed Assessment for Cheltenham for Nitrogen Dioxide

A Detailed Assessment was completed for Bath Road and High Street in 2007 where an exceedance of the annual mean objective for NO₂ occurred with relevant exposure. In December 2008 an Air Quality Management Area (AQMA) was declared along a section of Bath Road and High Street in Cheltenham. The area was designated in relation to a likely breach of the nitrogen dioxide (annual mean) objective as specified in the Air Quality Regulations (England) 2000.

Following a review of diffusion tube monitoring locations within Cheltenham, further monitoring of NO₂ occurred during 2010 at a reduced number of locations within and surrounding the designated AQMA as well at new locations with high traffic flows and congestion. Annualised bias adjusted data indicated that the declared AQMA was justified due to continuing exceedance of the annual mean objective for NO₂. However monitoring at several other new locations during 2010 indicated exceedance of the national objective for nitrogen dioxide and justified the decision to declare a much wider area of Cheltenham as an AQMA in November 2011, following completion of a Detailed Assessment. The old AQMA in Bath Road was therefore revoked as this area is included within the new AQMA.

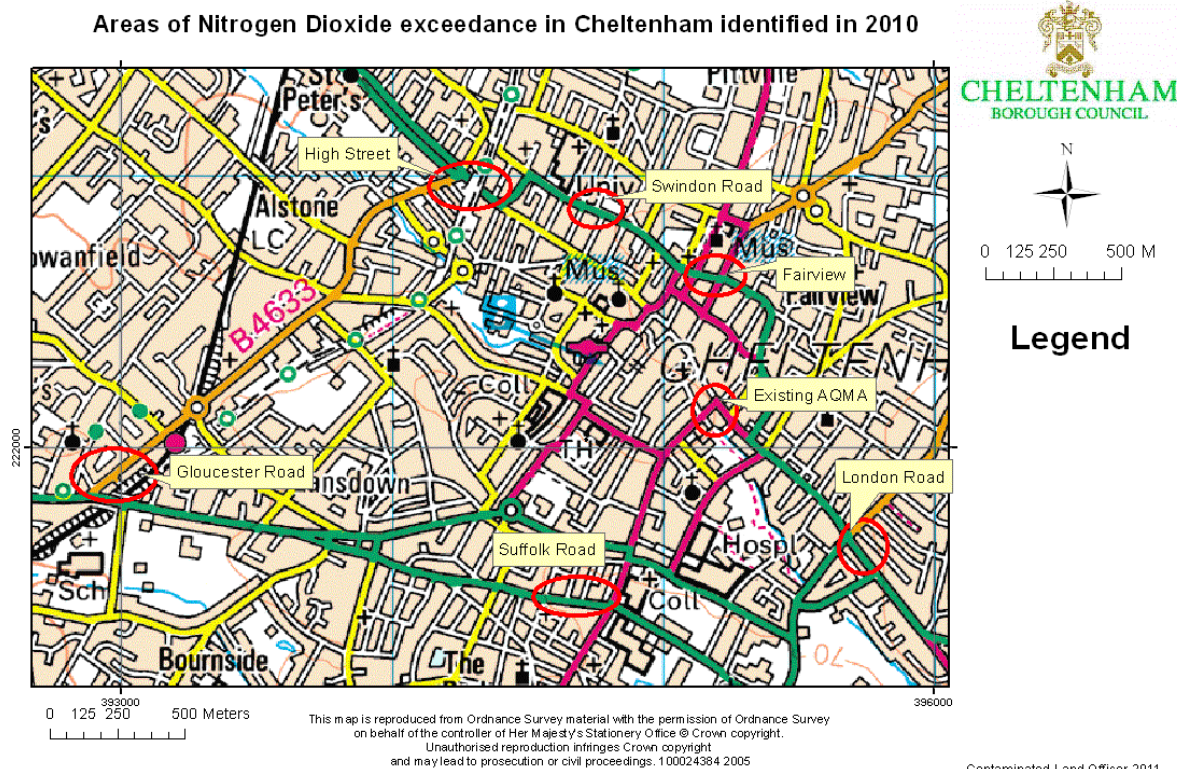
Figure 1. 2 Map of current AQMA Boundary



Figure 1. 3 Map of former AQMA on Bath Road/High Street



Figure 1. 4 Areas where exceedance of the NO₂ annual mean occurred in 2010



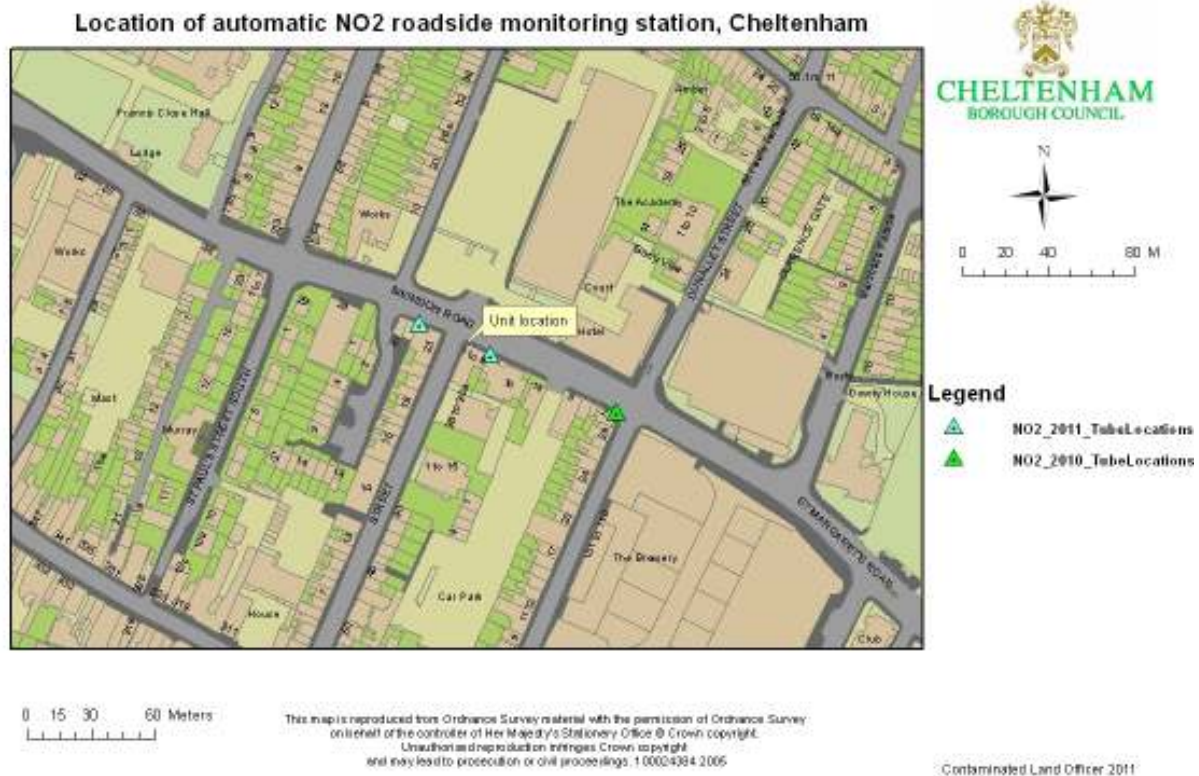
2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Sites

A new roadside monitoring unit was installed at the junction of Swindon Road and St Georges Street, Cheltenham where exceedance of nitrogen dioxide (annual mean) had been recorded nearby from 2010 diffusion tube monitoring data. The unit measures NO_x, NO₂ and NO and commenced operation in August 2011. Data is sent via telemetry to Enviro Technology limited and forwarded to AQDM for data validation and ratification purposes. Monthly routine calibration and maintenance is carried out by the equipment supplier, Enviro Technology Limited. The equipment is currently hired until January 2013 after which it may be removed unless further funding can be obtained to continue operation.

Figure 2. 1 Maps of Automatic Monitoring Sites



Location of automatic NO2 roadside monitoring station, Cheltenham - detailed plan



Figure 2. 2 Location of NO2 monitoring station in Cheltenham



Table 2. 1 Details of Automatic Monitoring Sites

Site Name	Site Type	X OS GridRef	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Monitoring Technique	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Does this location represent worst-case exposure?
St Georges Street	Kerbside	394760	228878	NO ₂	Y	Chemi-luminescence	Y (1m)	2m	Y

2.1.2 Non-Automatic Monitoring Sites

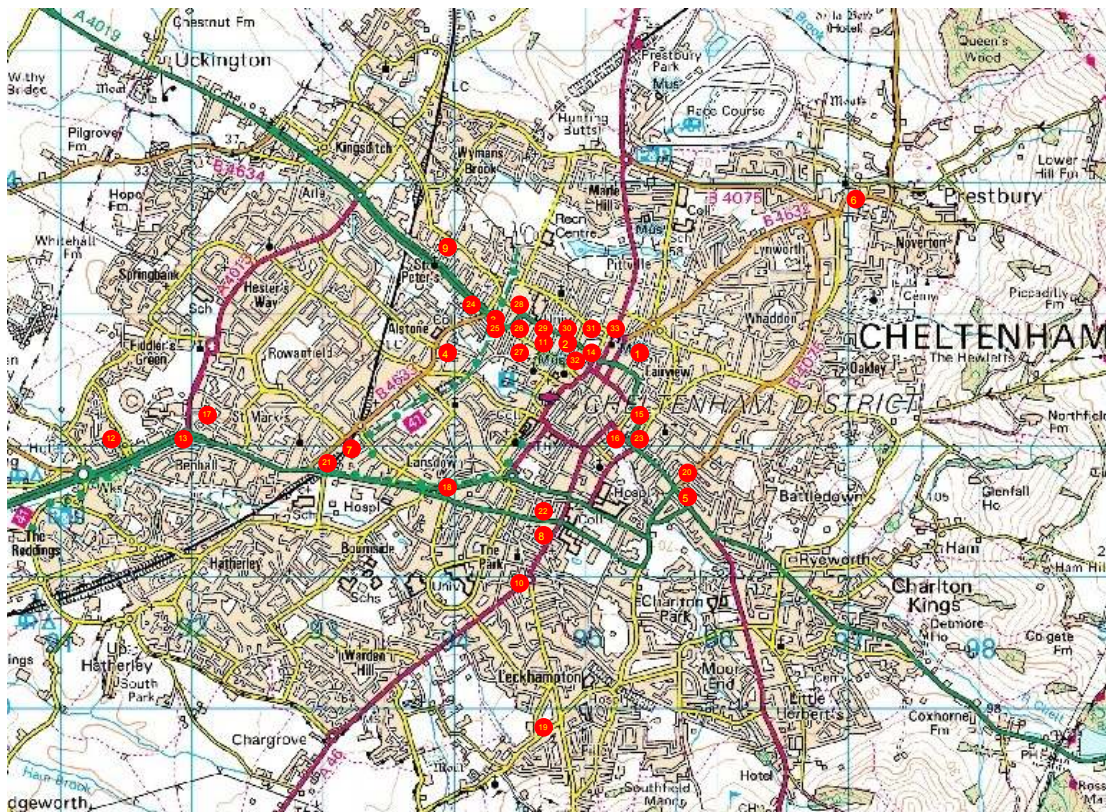
Cheltenham Borough Council has been undertaking NO₂ diffusion tube monitoring at a number of locations since 2003. Many of the monitoring locations have been consistently below the annual mean objective. Following a review at the beginning of 2010, several locations were replaced with new locations where there is relevant exposure and traffic congestion. Further monitoring tubes were installed in 2011 following exceedances of the nitrogen dioxide(annual mean) national objective levels at several new locations within the Borough with relevant exposure.

Figure 2.2 illustrates the approximate locations of all of the 2011 diffusion tube monitoring sites within Cheltenham Borough. Further following maps indicate these locations more precisely. Table 2.2 provides details of these locations.

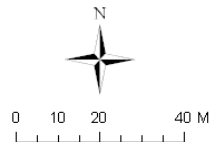
Details of Bias Adjustment

Nitrogen dioxide diffusion tubes used by Cheltenham Borough Council in 2011 were 20% TEA in water supplied and analysed by Bristol Scientific Services. It can be confirmed that the lab follows the procedures set out in the Harmonisation Practical Guidance Procedures under the DEFRA practical guidance. The tubes at all 40 locations throughout the Cheltenham Borough Council area have a monthly exposure period. For 2011 the Bias Adjustment factor applied to the diffusion tube data was a National Bias Adjustment Factor obtained from the Bias Adjustment Factor Spreadsheet.

Figure 2. 3 Maps of Non-Automatic Monitoring Sites

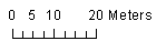


New NO2 monitoring locations on High Street with residential locations



Legend

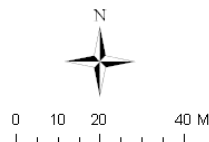
- * Residential Exposure
- ▲ NO2_2011_TubeLocations
- ▲ NO2_2010_TubeLocations



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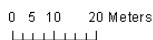
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New NO2 monitoring locations on Swindon Road with residential locations



Legend

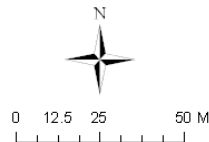
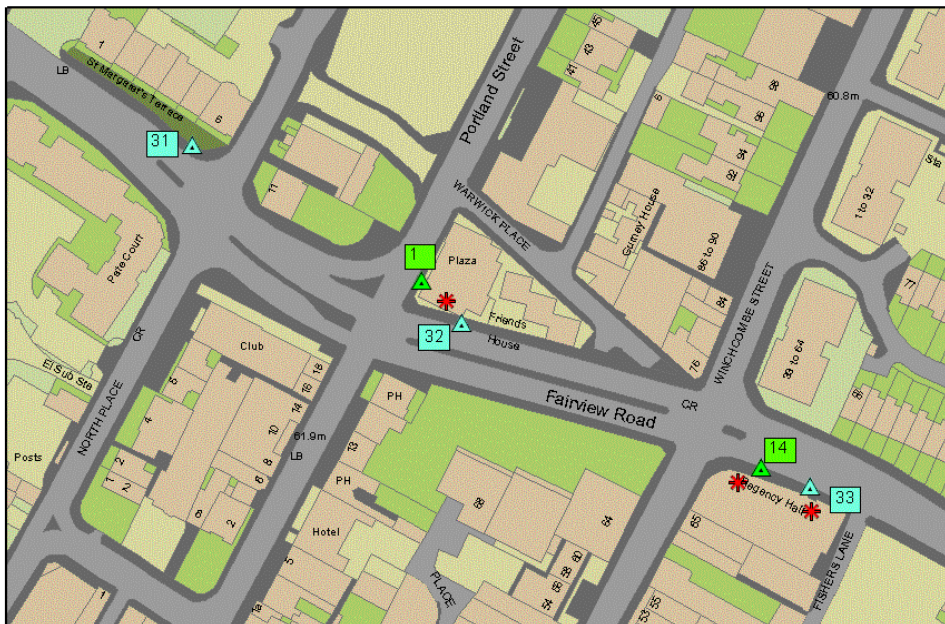
- * Residential Exposure
- ▲ NO2_2011_TubeLocations
- ▲ NO2_2010_TubeLocations



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New NO2 monitoring locations on Fairview Road with residential locations



Legend

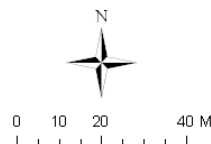
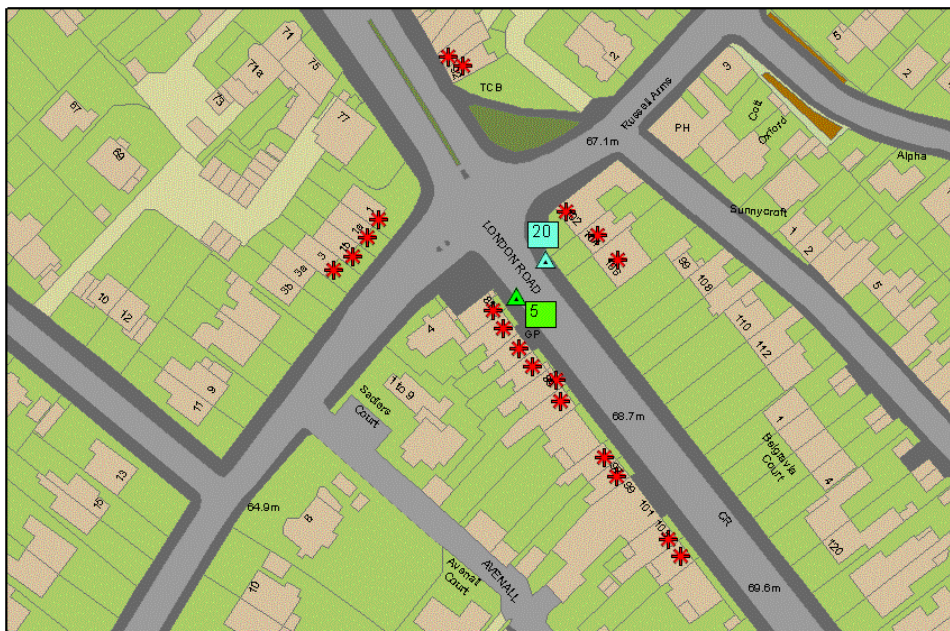
- * Residential Exposure
- ▲ NO2_2011_TubeLocations
- ▲ NO2_2010_TubeLocations



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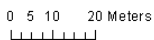
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New NO2 monitoring location on London Road with residential locations



Legend

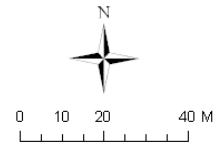
- * Residential Exposure
- ▲ NO2_2011_TubeLocations
- ▲ NO2_2010_TubeLocations



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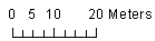
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New NO2 monitoring location on Gloucester Road with residential locations



Legend

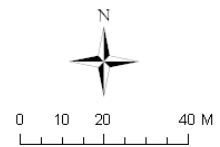
- * Residential Exposure
- ▲ NO2_2011_TubeLocations
- ▲ NO2_2010_TubeLocations



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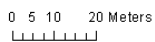
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NO2 monitoring location on Suffolk Road with residential locations



Legend

- * Residential Exposure
- ▲ NO2_2011_TubeLocations
- ▲ NO2_2010_TubeLocations



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Table 2. 2 Details of Non-Automatic Monitoring Sites

Site Name	Map Ref:	Site Type	X - OS Grid Ref	Y - OS Grid Ref	Pollutants Monitored	In AQMA?	Is monitoring collocated with a Continuous Analyser (Y/N)	Relevant Exposure?	Distance to kerb of nearest road	Does this location represent worst-case exposure?
Portland St/Fairview Rd	1	Roadside	395110	222670	NO2	N	N	Y	2m	Y
2 Swindon Road	2	Kerbside	394830	222845	NO2	N	N	Y	1m	Y
443 High Street	3	Roadside	394330	222955	NO2	N	N	Y	3m	Y
124 Gloucester Road	4	Roadside	393802	222595	NO2	N	N	Y	10m	Y
81 London Road	5	Roadside	395660	221670	NO2	N	N	Y	5m	Y
Old Bakery - Prestbury	6	Roadside	397009	223888	NO2	N	N	Y	2m	Y
338 Gloucester Road	7	Roadside	392940	221880	NO2	N	N	Y	2m	Y
179 Bath Road	8	Roadside	394614	221153	NO2	N	N	Y	2m	Y
91Tewkesbury Road	9	Roadside	393880	223390	NO2	N	N	Y	5m	Y
19 Shurdington Road	10	Roadside	394495	220960	NO2	N	N	Y	2m	Y
St Georges Street	11	Kerbside	394695	222733	NO2	N	N	Y	2m	Y
Telstar Road - GCHQ	12	Kerbside	391527	221930	NO2	N	N	Y	1m	Y
Miserden Road	13	Roadside	391997	222051	NO2	N	N	Y	5m	Y
Winchcombe St/Fairview	14	Roadside	395210	222618	NO2	N	N	Y	2m	Y
132 Albion Street	15	Roadside	395400	222235	NO2	N	N	Y	2m	Y
7 Berkeley Place	16	Roadside	395340	222075	NO2	N	N	Y	2m	Y
P.E. Roundabout	17	Roadside	391996	222133	NO2	N	N	Y	15m	Y

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Site Name	Map Ref:	Site Type	X - OS Grid Ref	Y - OS Grid Ref	Pollutants Monitored	In AQMA?	Is monitoring collocated with a Continuous Analyser (Y/N)	Relevant Exposure?	Distance to kerb of nearest road	Does this location represent worst-case exposure?
Westal Green	18	Roadside	393924	221608	NO2	N	N	Y	2m	Y
56 Church Road	19	Roadside	394577	219728	NO2	N	N	Y	2m	Y
104 London Road	20	Roadside	395672	221680	NO2	N	N	Y	2m	Y
340 Gloucester Road	21	Roadside	392912	221862	NO2	N	N	Y	2m	Y
7 Suffolk Road	22	Roadside	394640	221460	NO2	N	N	Y	2m	Y
1 Hewlett Road	23	Roadside	395355	222055	NO2	N	N	Y	2m	Y
2 Gloucester Road	24	Roadside	394235	223055	NO2	N	N	Y	2m	Y
Opp. White Hart Street	25	Roadside	394268	222988	NO2	N	N	Y	2m	Y
452 High Street	26	Roadside	394305	222960	NO2	N	N	Y	2m	Y
422 High Street	27	Roadside	394350	222923	NO2	N	N	Y	2m	Y
Church Hill Court	28	Roadside	394378	222925	NO2	N	N	Y	3m	Y
New Rutland - Swindon Rd	29	Roadside	394738	222888	NO2	N	N	Y	2m	Y
Saracens Court	30	Roadside	394771	222874	NO2	N	N	Y	2m	Y
5 St Margarets Terrace	31	Roadside	395040	222715	NO2	N	N	Y	3m	Y
Millenium Plaza - Fairview	32	Kerbside	395117	222658	NO2	N	N	Y	1m	Y
Regency Hall - Fairview	33	Roadside	395225	222610	NO2	N	N	Y	2m	Y
The Swan	34	Roadside	395240	222112	NO2	N	N	Y	2m	Y
Pisa Pizza	35	Roadside	395212	222130	NO2	N	N	Y	2m	Y
The Restoration	36	Roadside	395202	222160	NO2	N	N	Y	2m	Y
Cutting Room	37	Roadside	395176	222169	NO2	Y	N	Y	2m	Y

Cheltenham Borough Council

Site Name	Map Ref:	Site Type	X - OS Grid Ref	Y - OS Grid Ref	Pollutants Monitored	In AQMA?	Is monitoring collocated with a Continuous Analyser (Y/N)	Relevant Exposure?	Distance to kerb of nearest road	Does this location represent worst-case exposure?
YMCA Shop	38	Roadside	395182	222183	NO2	Y	N	Y	2m	Y
8a Bath Road	39	Roadside	395146	222149	NO2	Y	N	Y	2m	Y
15a Bath Road	40	Roadside	395097	222124	NO2	N	N	Y	2m	Y

2.2 Comparison of Monitoring Results with AQ Objectives

During 2011, Cheltenham Borough Council monitored 40 nitrogen dioxide diffusion tube locations across the Borough of which 7 were located in the vicinity of the former Bath Road/High Street AQMA as part of the further assessment required for elevated nitrogen dioxide levels. Further monitoring tubes were added to the monitoring network at the beginning of 2011 to enable more detailed assessment of locations where elevated levels of nitrogen dioxide were identified during 2010. These were the subject of detailed assessment towards the end of 2011 and justified the decision to declare a new AQMA for Cheltenham to cover the entire Borough area.

2.2.1 Nitrogen Dioxide

Automatic Monitoring Data

In 2011 Cheltenham Borough Council decided that the installation of a roadside monitoring box would be useful to help validate elevated levels of nitrogen dioxide being measured in the area from diffusion tubes. The location of the roadside monitoring box was selected on the basis of relevant exposure being present and proximity to nearby diffusion tube monitoring points where elevated levels of nitrogen dioxide had been recorded. It was also located at a road junction where traffic congestion is a problem.

The data obtained between 7th August 2011 (date of installation) and 31st December 2011 indicated an annual mean (annualised) level slightly below the National Objective limit at 35ug/m³. This measurement during 2011 is below the nearby annual mean results of the nearby diffusion tubes which recorded 44.0 ug/m³ and 40.2 ug/m³ respectively. The reasons for this are unclear but it is important to note that elevated NO₂ results were recorded from all diffusion tubes in Cheltenham during the early months of 2011 – which will have probably caused the increase in annual average results. Although not within the scope of this report, the latest data from the air monitoring station (using data from 1st January to 31st March 2012) indicate an increase in the mean level of NO₂ to 44ug/m³. This indicates that NO₂ levels tend to be greater during the winter months than at other times of the year, possibly due to temperature effects and greater car use.

The annualised results from the automatic monitoring station are identified in Table 2.3 below.

Table 2. 3 Results of Automatic Monitoring of Nitrogen Dioxide: Comparison with Annual Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for period of monitoring % ^a	Valid Data Capture 2011 % ^b	Annual Mean Concentration $\mu\text{g}/\text{m}^3$				
					2007	2008	2009	2010	2011 ^c
St Georges Street	Roadside	Y	99.9	41	n/a	n/a	n/a	n/a	35

^a The monitoring period was 7th August to 31st December 2011 (from the date the unit was installed)

^b percentage data capture for the full calendar year (146 days)

^c This mean has been annualised using data from two long-term continuous monitoring sites forming part of the national network (St Paul's in Bristol and St Ebbes in Oxford).

Table 2. 4 Results of Automatic Monitoring for Nitrogen Dioxide: Comparison with 1-hour mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for period of monitoring % ^a	Valid Data Capture 2011 % ^b	Number of Exceedences of Hourly Mean ($200 \mu\text{g}/\text{m}^3$)				
					2007	2008	2009	2010	2011
St Georges Street	Roadside	Y	99.9	41	n/a	n/a	n/a	n/a	0

^a The monitoring period was 7th August to 31st December 2011 (from the date the unit was installed)

^b percentage data capture for the full calendar year (146 days)

Diffusion Tube Monitoring Data

Additional diffusion tubes were added to the monitoring network in Cheltenham at the beginning of 2011 to enhance coverage in areas where exceedances had been recorded in 2010 and also to identify possible new locations where exceedance of the annual mean objective could be occurring. Detailed location maps can be seen in Fig 2.2.

Results for 2011 suggest that a significant fall in annual mean levels of NO₂ were recorded at most locations in 2011 when compared to 2010 results. The reasons for this are unclear but are likely to be attributable to a reduction in traffic flow and/or different weather patterns. Road traffic counts obtained from Gloucestershire Highways indicate an overall decrease in traffic counts in Cheltenham between 2010 and 2011.

Further monitoring during 2012 should indicate whether or not the reduction in NO₂ levels recorded during 2011 has been sustained or not.

The results for monitoring during 2011 are identified in Table 2.5 below.

Table 2. 5 Results of Nitrogen Dioxide Diffusion Tubes in 2011

Site ID	Location	Site Type	Within AQMA?	Triplicate or Collocated Tube	Data Capture 2011 (Number of Months) ^a	Data with less than 9 months has been annualised (Y/N) ^b	Confirm if data has been distance corrected (Y/N)	Annual mean concentration (Bias Adjustment factor = 0.83)
								2011 ($\mu\text{g}/\text{m}^3$)
Portland St/Fairview Rd	1	Roadside	N	N	12	n/a	N	38.2
2 Swindon Road	2	Kerbside	N	N	11	n/a	N	40.0
443 High Street	3	Roadside	N	N	12	n/a	N	34.8
124 Gloucester Road	4	Roadside	N	N	12	n/a	N	29.6
81 London Road	5	Roadside	N	N	12	n/a	N	42.5
Old Bakery - Prestbury	6	Roadside	N	N	12	n/a	N	35.7
338 Gloucester Road	7	Roadside	N	N	12	n/a	N	37.3
179 Bath Road	8	Roadside	N	N	9	n/a	N	33.2
91Tewkesbury Road	9	Roadside	N	N	12	n/a	N	27.6
19 Shurdington Road	10	Roadside	N	N	6	Y	N	29.2
St Georges Street	11	Kerbside	N	N	10	n/a	N	31.5
Telstar Road - GCHQ	12	Kerbside	N	N	12	n/a	N	33.9
Miserden Road	13	Roadside	N	N	12	n/a	N	28.2
Winchcombe St/Fairview	14	Roadside	N	N	12	n/a	N	37.1
132 Albion Street	15	Roadside	N	N	12	n/a	N	27.4

Cheltenham Borough Council

Site ID	Location	Site Type	Within AQMA?	Triplicate or Collocated Tube	Data Capture 2011 (Number of Months) ^a	Data with less than 9 months has been annualised (Y/N) ^b	Confirm if data has been distance corrected (Y/N)	Annual mean concentration (Bias Adjustment factor = 0.83)
								2011 ($\mu\text{g}/\text{m}^3$)
7 Berkeley Place	16	Roadside	N	N	12	n/a	N	29.6
P.E. Roundabout	17	Roadside	N	N	12	n/a	N	28.3
Westal Green	18	Roadside	N	N	12	n/a	N	30.3
56 Church Road	19	Roadside	N	N	12	n/a	N	22.2
104 London Road	20	Roadside	N	N	12	n/a	N	39.3
340 Gloucester Road	21	Roadside	N	N	12	n/a	N	39.7
7 Suffolk Road	22	Roadside	N	N	12	n/a	N	31.0
1 Hewlett Road	23	Roadside	N	N	12	n/a	N	38.9
2 Gloucester Road	24	Roadside	N	N	12	n/a	N	33.7
Opp. White Hart Street	25	Roadside	N	N	12	n/a	N	32.5
452 High Street	26	Roadside	N	N	11	n/a	N	43.5
422 High Street	27	Roadside	N	N	12	n/a	N	46.7
Church Hill Court	28	Roadside	N	N	12	n/a	N	28.3
New Rutland - Swindon Rd	29	Roadside	N	N	12	n/a	N	44.0
Saracens Court	30	Roadside	N	N	12	n/a	N	40.2
5 St Margarets Terrace	31	Roadside	N	N	8	Y	N	35.6
Millenium Plaza/Fairview	32	Kerbside	N	N	12	n/a	N	32.3
Regency Hall/Fairview	33	Roadside	N	N	12	n/a	N	41.8

Site ID	Location	Site Type	Within AQMA?	Triplicate or Collocated Tube	Data Capture 2011 (Number of Months) ^a	Data with less than 9 months has been annualised (Y/N) ^b	Confirm if data has been distance corrected (Y/N)	Annual mean concentration (Bias Adjustment factor = 0.83)
								2011 ($\mu\text{g}/\text{m}^3$)
The Swan	34	Roadside	N	N	11	n/a	N	30.8
Pisa Pizza	35	Roadside	N	N	12	n/a	N	32.8
The Restoration	36	Roadside	N	N	12	n/a	N	37.3
Cutting Room	37	Roadside	Y	N	12	n/a	N	39.9
YMCA Shop	38	Roadside	Y	N	12	n/a	N	37.0
8a Bath Road	39	Roadside	Y	N	12	n/a	N	43.1
15a Bath Road	40	Roadside	N	N	12	n/a	N	34.2

^a data capture for the full calendar year in months

^b Means have been “annualised” where monitoring was not carried out for a minimum of 9 months.

Table 2. 6 Results of Nitrogen Dioxide Diffusion Tubes (2007 to 2011)

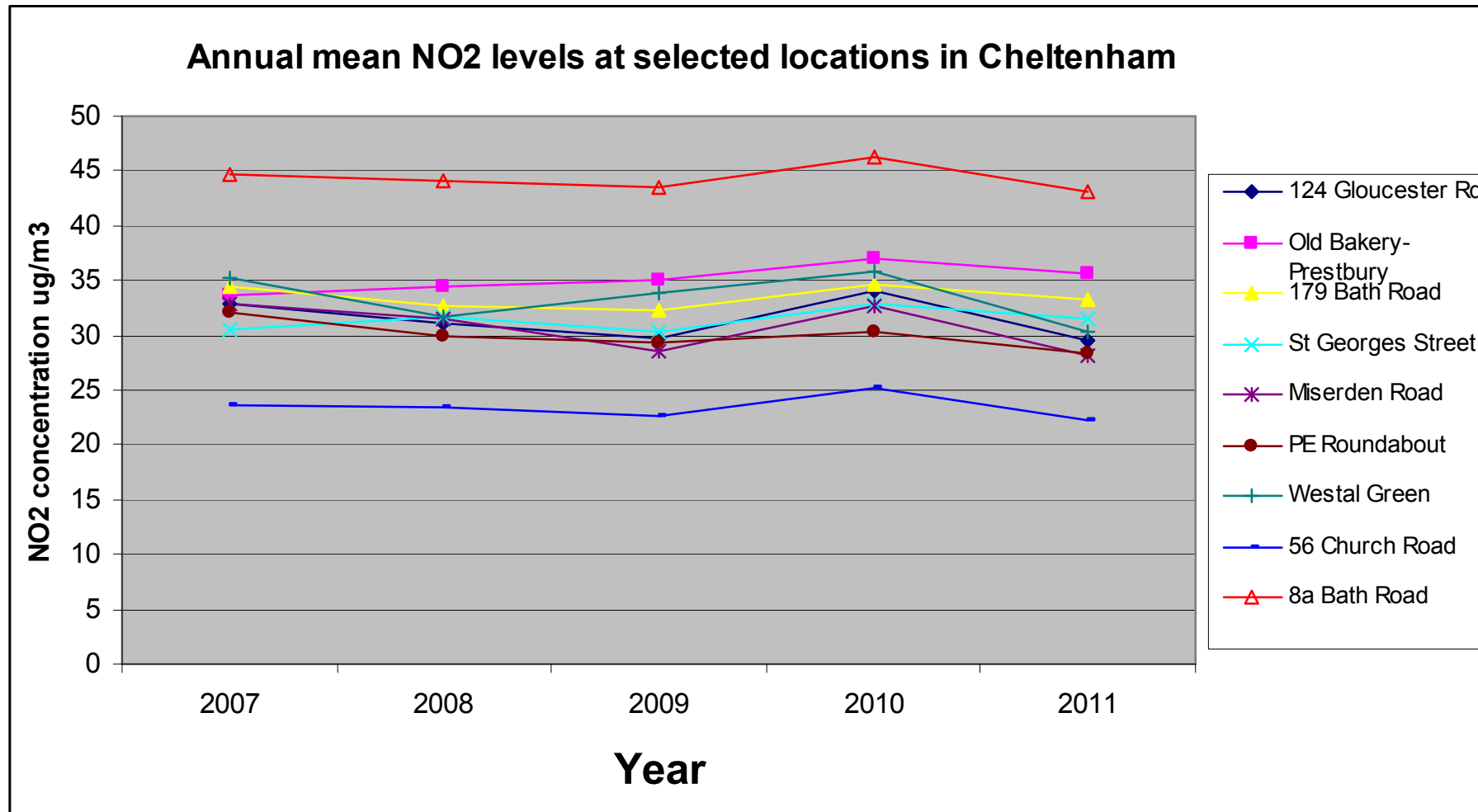
Site ID	Site Type	Within AQMA ?	Annual mean concentration (adjusted for bias) $\mu\text{g}/\text{m}^3$				
			2007* (Bias Adjustment Factor = 0.87)	2008* (Bias Adjustment Factor = 0.87)	2009* (Bias Adjustment Factor = 0.84)	2010* (Bias Adjustment Factor = 0.85)	2011 (Bias Adjustment Factor = 0.83)
Portland St/Fairview Rd	Roadside	N				41.8	38.2
2 Swindon Road	Kerbside	N				45.7	40.0
443 High Street	Roadside	N				41.4	34.8
124 Gloucester Road	Roadside	N	32.8	31.2	29.8	34.0	29.6
81 London Road	Roadside	N				45.5	42.5

Site ID	Site Type	Within AQMA ?	Annual mean concentration (adjusted for bias) $\mu\text{g}/\text{m}^3$				
			2007* (Bias Adjustment Factor = 0.87)	2008* (Bias Adjustment Factor = 0.87)	2009* (Bias Adjustment Factor = 0.84)	2010* (Bias Adjustment Factor = 0.85)	2011 (Bias Adjustment Factor = 0.83)
Old Bakery - Prestbury	Roadside	N	33.7	34.4	35.0	37.0	35.7
338 Gloucester Rd	Roadside	N					37.3
179 Bath Road	Roadside	N	34.5	32.7	32.2	34.7	33.2
91Tewkesbury Road	Roadside	N				31.9	27.6
19 Shurdington Road	Roadside	N				33.2	29.2
St Georges Street	Kerbside	N	30.5	31.6	30.4	32.8	31.5
Telstar Road - GCHQ	Kerbside	N				36.5	33.9
Miserden Road	Roadside	N	32.9	31.4	28.5	32.7	28.2
Winchcombe St/Fairview	Roadside	N				39.6	37.1
132 Albion Street	Roadside	N				30.6	27.4
7 Berkeley Place	Roadside	N				38.2	29.6
P.E. Roundabout	Roadside	N	32.0	30.0	29.3	30.4	28.3
Westal Green	Roadside	N	35.2	31.6	33.9	35.8	30.3
56 Church Road	Roadside	N	23.7	23.5	22.6	25.2	22.2
104 London Road	Roadside	N					39.3
340 Gloucester Road	Roadside	N				44.5	39.7
7 Suffolk Road	Roadside	N				40.1	31.0
1 Hewlett Road	Roadside	N				47.9	38.9

Site ID	Site Type	Within AQMA ?	Annual mean concentration (adjusted for bias) $\mu\text{g}/\text{m}^3$				
			2007* (Bias Adjustment Factor = 0.87)	2008* (Bias Adjustment Factor = 0.87)	2009* (Bias Adjustment Factor = 0.84)	2010* (Bias Adjustment Factor = 0.85)	2011 (Bias Adjustment Factor = 0.83)
2 Gloucester Road	Roadside	N					33.7
Opp. White Hart Street	Roadside	N					32.5
452 High Street	Roadside	N					43.5
422 High Street	Roadside	N					46.7
Church Hill Court	Roadside	N					28.3
New Rutland - Swindon Rd	Roadside	N					44.0
Saracens Court	Roadside	N					40.2
5 St Margarets Terrace	Roadside	N					35.6
Millenium Plaza/Fairview	Kerbside	N					32.3
Regency Hall/Fairview	Roadside	N					41.8
The Swan	Roadside	N			32.4	35.8	31.0
Pisa Pizza	Roadside	N			34.6	36.2	32.8
The Restoration	Roadside	N			38.6	42.0	37.3
Cutting Room	Roadside	Y			45.6	47.3	39.9
YMCA Shop	Roadside	Y			40.3	45.1	37.0
8a Bath Road	Roadside	Y	44.6	44.0	43.5	46.3	43.1
15a Bath Rd	Roadside	N			34.8	39.8	34.2

* blank results indicate that monitoring location was not included at the time

Figure 2. 4 Trends in Annual Mean Nitrogen Dioxide Concentrations measured at Diffusion Tube Monitoring Sites



2.2.2 PM₁₀

No PM₁₀ monitoring was carried out by Cheltenham Borough Council during the period covered by this report. Although historical Urban Background monitoring up to 2009 did not identify any exceedance of PM₁₀ levels, it is possible that roadside locations near to busy roads and junctions could exhibit elevated levels of PM₁₀.

Unfortunately there is no currently practical or affordable method for measuring PM₁₀ levels at roadside locations where there is potential exposure in Cheltenham.

2.2.3 Sulphur Dioxide

No Sulphur Dioxide monitoring was carried out by Cheltenham Borough Council during the period covered by this report.

2.2.4 Benzene

No Benzene monitoring was carried out by Cheltenham Borough Council during the period covered by this report.

2.2.5 Other pollutants monitored

No other pollutants were monitored by Cheltenham Borough Council during the period covered by this report.

2.2.6 Summary of Compliance with AQS Objectives

Cheltenham Borough Council has measured concentrations of nitrogen dioxide above the annual mean objective at relevant locations and produced a Detailed Assessment and declared an Air Quality Management Area in 2011 which covers all locations in exceedance. The Council is now progressing with development of an air quality Action Plan and undertaking Further Assessment.

3 Road Traffic Sources

3.1 Narrow Congested Streets with Residential Properties Close to the Kerb

Cheltenham Borough Council has continued to monitor locations where exceedances in annual mean nitrogen dioxide levels were observed during 2010. Further monitoring locations were installed in 2011 at these locations to obtain a better spatial coverage of the particular road junctions or sections of road where traffic congestion is an ongoing problem. Two new diffusion tube monitoring locations were installed at the beginning of 2012 due to recognised traffic congestion with properties close to the kerb.

Cheltenham Borough Council confirms that there are no new/newly identified congested streets with a flow above 5,000 vehicles per day and residential properties close to the kerb, that have not been adequately considered in previous rounds of Review and Assessment.

3.2 Busy Streets Where People May Spend 1-hour or More Close to Traffic

Cheltenham Borough Council confirms that there are no new/newly identified busy streets where people may spend 1 hour or more close to traffic.

Cheltenham Borough Council has assessed new/newly identified busy streets where people may spend 1 hour or more close to traffic, that were not assessed in previous rounds of Review and Assessment, and concluded that it will not be necessary to proceed to a Detailed Assessment.

3.3 Roads with a High Flow of Buses and/or HGVs.

Cheltenham Borough Council confirms that there are no new/newly identified roads with high flows of buses/HDVs.

3.4 Junctions

Cheltenham Borough Council undertook nitrogen dioxide diffusion tube monitoring at a number of new locations during 2010 as a result of the identification of a several busy road junctions and roadways where there was high traffic flow and congestion with potential residential exposure. Many of the newly identified locations subsequently exhibited exceedance of the nitrogen dioxide annual mean objective. This monitoring continued during 2011 with the addition of further monitoring locations within those areas of exceedance. Potential residential exposure locations were also identified and mapped to assist with targeting solutions for an Air Quality Action Plan (see Figure 2.2. for locations of new monitoring points and residential properties).

Cheltenham Borough Council confirms that there are no further new/newly identified busy junctions/busy roads in 2011.

Cheltenham Borough Council has already assessed the new/newly identified junctions meeting the criteria in Section A.4 of Box 5.3 in TG(09) during 2010, and produced a Detailed Assessment for nitrogen dioxide and declared a new AQMA.

3.5 New Roads Constructed or Proposed Since the Last Round of Review and Assessment

Cheltenham Borough Council confirms that there are no new/proposed roads.

3.6 Roads with Significantly Changed Traffic Flows

Cheltenham Borough Council confirms that there are no new/newly identified roads with significantly changed traffic flows.

3.7 Bus and Coach Stations

Cheltenham Borough Council confirms that there are no relevant bus stations in the Local Authority area.

4 Other Transport Sources

4.1 Airports

Cheltenham Borough Council confirms that there are no airports in the Local Authority area.

4.2 Railways (Diesel and Steam Trains)

4.2.1 Stationary Trains

Cheltenham Borough Council confirms that there are no locations where diesel or steam trains are regularly stationary for periods of 15 minutes or more, with potential for relevant exposure within 15m.

4.2.2 Moving Trains

Cheltenham Borough Council confirms that there are no locations with a large number of movements of diesel locomotives, and potential long-term relevant exposure within 30m.

4.3 Ports (Shipping)

Cheltenham Borough Council confirms that there are no ports or shipping that meet the specified criteria within the Local Authority area.

5 Industrial Sources

5.1 Industrial Installations

5.1.1 New or Proposed Installations for which an Air Quality Assessment has been carried out

Consideration has been given to any new or proposed industrial installations for which an Air Quality Assessment has been carried out.

Cheltenham Borough Council confirms that there are no new or proposed industrial installations for which planning approval has been granted within its area or nearby in a neighbouring authority.

5.1.2 Existing Installations where Emissions have Increased Substantially or New Relevant Exposure has been Introduced

Consideration has been given to any existing industrial installations where emissions have increased substantially or new exposure introduced.

Cheltenham Borough Council confirms that there are no industrial installations with substantially increased emissions or new relevant exposure in their vicinity within its area or nearby in a neighbouring authority.

5.1.3 New or Significantly Changed Installations with No Previous Air Quality Assessment

Consideration has been given to any new or significantly altered industrial installations for which no Air Quality Assessment has been produced.

Cheltenham Borough Council confirms that there are no new or proposed industrial installations for which planning approval has been granted within its area or nearby in a neighbouring authority.

5.2 Major Fuel (Petrol) Storage Depots

There are no major fuel (petrol) storage depots within the Local Authority area.

5.3 Petrol Stations

Petrol stations combined with nearby busy roads may potentially emit sufficient benzene to risk exceeding the 2010 objective. Consideration has been given to all petrol stations with an annual throughput of more than 2000m³ of petrol, with busy roads close by and relevant exposure with 10m of the pumps. This element of the Updating and Screening Assessment considers benzene only.

Cheltenham Borough Council confirms that there are no petrol stations meeting the specified criteria.

Details of all permitted petrol stations within the Borough are provided in Appendix B.

5.4 Poultry Farms

Consideration has been given to any farms housing in excess of 400,000 birds (mechanically ventilated), 200,000 birds (naturally ventilated) or 100,000 turkeys (any ventilation) where relevant exposure exists with 100m. This element of the Updating and Screening Assessment considers PM₁₀ only.

Cheltenham Borough Council confirms that there are no poultry farms meeting the specified criteria.

6 Commercial and Domestic Sources

6.1 Biomass Combustion – Individual Installations

Consideration has been given to large individual installations (50kW to 20MW in size) burning biomass. This element of the Updating and Screening Assessment considers PM10 and NO₂. Further information on the detailed criteria followed can be found in Section D1a, Box 5.8 of LAQM.TG(09). The proposal to install a biomass heating system at the University of Gloucestershire's Hardwick campus has been put on hold. Should the proposed development resume, then a screening assessment will be carried out and a detailed assessment as necessary.

Cheltenham Borough Council confirms that there are no biomass combustion plant in the Local Authority area.

6.2 Biomass Combustion – Combined Impacts

Cheltenham Borough Council confirms that there are no biomass combustion plant in the Local Authority area.

6.3 Domestic Solid-Fuel Burning

Cheltenham Borough Council has a Smoke Control Area which covers approximately 70% of the Borough. Within this area only exempt fuels or exempt appliances can be used in domestic fuel burning situations. Although anecdotal evidence points to an increase in the use of woodburners and multi-fuel stoves in Cheltenham, it is not thought that this is having a significant impact on air quality at present.

Cheltenham Borough Council confirms that there are no areas of significant domestic fuel use in the Local Authority area.

7 Fugitive or Uncontrolled Sources

Fugitive or uncontrolled sources may give rise to emissions of PM₁₀. This section considers numerous sources such as quarries, landfill sites, stockyards, construction work and waste management site. Consideration has been given to elements such as:

- the passage of vehicles over unpaved roads;
- handling of dust materials;
- process dust e.g. concrete cutting; and
- windblown dust from stockpiles and dusty surfaces.

This element of the Updating and Screening Assessment considers PM₁₀ only.

Further information on the detailed criteria followed can be found in Section E1, Box 5.10 of LAQM.TG(09).

Cheltenham Borough Council confirms that there are no potential sources of fugitive particulate matter emissions in the Local Authority area.

8 Conclusions and Proposed Actions

8.1 Conclusions from New Monitoring Data

The nitrogen dioxide monitoring data demonstrates that there was a noticeable reduction in the annual mean level at all previously monitored locations during 2011. It remains to be seen whether or not this is a long-term trend and whether or not it is a result of lower vehicle emissions, especially since traffic count data comparisons for 2010 and 2011 indicate a slight overall increase(0.4%) in traffic counts on the roads affected.

Areas identified as exceeding the annual mean objective for NO₂ in 2010, which resulted in the declaration of a new AQMA for Cheltenham in 2011, all continued to show elevated levels of nitrogen dioxide. However of the seven locations which showed exceedance in 2010 with relevant exposure, five continued to show exceedance during 2011. The Gloucester Road and Suffolk Road locations indicated a reduction in annual mean NO₂ to below the 40ug/m³ limit. The other five locations; London Road, Swindon Road, Fairview Road, High Street and Bath road (old AQMA area) all continued to exceed the annual mean objective. Therefore the designation of the existing AQMA remains justified and progress will continue with Further Assessment and development of an Air Quality Action Plan.

8.2 Conclusions from Assessment of Sources

Cheltenham Borough Council is satisfied that the main source of nitrogen dioxide in the Borough is from vehicle emissions. Following the screening criteria in LAQM.TG(09), there are no other significant air pollution sources of concern.

8.3 Proposed Actions

Cheltenham Borough Council has not identified any other pollutant of concern in the local authority area and will not be proceeding to any detailed assessments.

The existing AQMA for nitrogen dioxide exceedance remains justified according to diffusion tube monitoring data from 2011 despite an overall reduction across the Borough in measured NO₂ levels. Real-time monitoring data from the Swindon Road Air Quality Monitoring Station indicated levels of NO₂ below the national objective from annualised results. However ongoing monitoring through the beginning of 2012 has indicated an increase to above the national objective. Co-location diffusion tubes have since been installed at the location of the monitoring station to assist with obtaining a local bias adjustment factor for diffusion tube data.

Proposed actions for 2012 and 2013 will be to continue with Further Assessment in relation to the AQMA and implementation of an Air Quality Action Plan.

9 References

1. Local Air Quality Management – Technical Guidance LAQM.TG(09) – DEFRA (2009)
2. Updated Screening Assessment (2009) - Cheltenham Borough Council
3. Progress Report (2010) - Cheltenham Borough Council

Appendices

Appendix A: QA:QC Data

Diffusion Tube Bias Adjustment Factors

During the period covered by this report, the diffusion tubes (20% TEA in Acetone) were supplied and analysed by Bristol Scientific Services Ltd. The tubes at all locations throughout the area have a monthly exposure period. For 2009, 2010 and 2011 due to closure of the council's air quality monitoring station, a local bias adjustment was not available. Instead a National Bias Adjustment factor was calculated in March each year using the Bias Adjustment Factor Spreadsheet available at <http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html>. The bias adjustment factors utilised were:

- 2009 bias adjustment factor: 0.84
- 2010 bias adjustment factor: 0.85
- 2011 bias adjustment factor: 0.83

Discussion of Choice of Factor to Use

A local Bias Adjustment factor was not available so the National Bias Adjustment spreadsheet was used to calculate a Bias Adjustment Factor.

Short-term to Long-term Data adjustment

The annualised data obtained for the NO₂ monitoring station on St Georges St/Swindon Road was calculated using two stations as identified in the table below.

Site	Site Type	Annual Mean	Period Mean	Ratio am/pm
Bristol	Urban background	44.23	47.43	0.932532153
Oxford	Urban background	30.73	31.13	0.987150659
			average	0.959841406
				0.96
Period = 07/08/2011 to 31/12/2011				
				36.00
				34.56

QA/QC of automatic monitoring

Cheltenham Borough Council's new nitrogen dioxide Air Quality Monitoring Station (AQMS) on St Georges Street/Swindon Road junction is operated and managed by Enviro Technology Services plc. The unit was installed in August 2011 and Enviro Technology Services undertake routine monthly calibration visits and data download services. Data received is ratified by Geoff Broughton from Air Quality Data Management (AQDM). Ratified data is provided to us every quarter in a .pdf format (see Appendix C)

The M200E NO_x analyser is MCERTS approved and measures nitric oxide and oxides of nitrogen in total. The analyser uses a technique called chemiluminescence to detect the gases. The analytical technique used can be broadly explained by stating that a beam of light is directed onto the molecules of gases as they enter the analyser. As a result, the gas molecules themselves either emit or absorb light, and it is the intensity of the emitted or absorbed light that is measured by the analysers, and the concentrations of the pollutants are then calculated. The concentrations of the gases are then expressed in parts per billion (parts of gas per billion parts of air).

QA/QC of diffusion tube monitoring

Bristol Scientific Services participates in the WASP scheme. The WASP performance testing scheme uses artificially spiked Palmes type diffusion tubes to test each participating laboratory's analytical performance on a quarterly basis. At the completion of the round, laboratories receive a report detailing how they have performed and how their results relate to those of their peers.

A summary of the WASP performance for Bristol Scientific Services laboratory is provided in Table 1. This table provides the percentage of results where the z score was between -2 and +2 which is deemed to be a satisfactory z-score. Performance scores are currently based upon the z-score statistic, a widely used scoring system employed in chemical proficiency testing.

Table 1

The following table lists those UK laboratories undertaking LAQM activities that have participated in recent HSL WASP NO2 PT rounds and the percentage (%) of results submitted which were subsequently determined to be satisfactory based upon a z-score of $< \pm 2$ as defined above.

WASP round	WASP R105	Wasp R106	WASP R107	WASP R108	WASP R109	WASP R110	WASP R111	WASP R112	WASP R113
Period	Apr-Jun 2009	Jun-Aug 2009	Oct-Dec 2009	Jan – Mar 2010	Apr-Jun 2010	Jun – Aug 2010	Oct – Dec 2010	Jan – Mar 2011	Apr – Jun 2011
Bristol City Council	100%	100%	100%	75%	100%	100%	100%	100%	100%

Appendix B: List of Service Stations

Table 1: List of Service Stations

IPC ID	Location	Post Code	Process Guidance
EPR 1/14(06)2.01	Wm Morrisons Filling Station, Greatfield Park, Up Hatherley, Cheltenham	GL51 5BW	Petroleum PG1/14
EPR 1/14(06)2.02	Shell Cheltenham, 352-35 Gloucester Road, Cheltenham	GL51 7AY	Petroleum PG1/14
EPR 1/14(06)2.03	Shell Arle, Princess Elizabeth Way, Cheltenham	GL51 7PA	Petroleum PG1/14
EPR 1/14(06)2.04	Tesco Petrol Filling Station, Colletts Drive, Cheltenham	GL51 8JQ	Petroleum PG1/14
EPR 1/14(06)2.05	Sainsbury's Petrol Filling Station, Tewkesbury Road, Cheltenham	GL51 9AA	Petroleum PG1/14
EPR 1/14(06)2.06	Waitrose Petrol Filling Station, Honeybourne Way, Cheltenham	GL50 3QW	Petroleum PG1/14
EPR 1/14(06)2.07	ASDA, Hatherley Lane, Cheltenham	GL51 0EU	Petroleum PG1/14
EPA 1 / 14.01 V1	394 Gloucester Road, Cheltenham	GL51 7AT	Petroleum PG1/14
EPA 1 / 14.04 V1	Sixways Service Station, London Road, Cheltenham	GL52 6HZ	Petroleum PG1/14
EPA 1 / 14.07 V1	Cheltenham Service Station, Bouncers Lane, Prestbury, Cheltenham	GL52 4JF	Petroleum PG1/14
EPA 1 / 14.09 V1	East End Service Station, London Road, Cheltenham	GL52 6YY	Petroleum PG1/14
EPA 1 / 14.10 V1	Tewkesbury Road, Cheltenham	GL51 9SG	Petroleum PG1/14
EPA 1 / 14.12 V1	Star Cheltenham Service Station, Westal Green, Cheltenham	GL50 2JA	Petroleum PG1/14
EPA 1 / 14.17 V1	Budgens (Jet) Petrol Station, 80-86 Prestbury Road, Cheltenham, GL52 2DJ	GL52 2DJ	Petroleum PG1/14

Appendix C: Ratified data and graphs from NO₂ analyser on St Georges Road – Swindon Road junction

Produced by AQDM on behalf of Cheltenham B.C.

CHELtenham SWINDON ROAD 7 August to 31 December 2011

These data have been fully ratified by AQDM to LAQM TG(09) standards

Site Description

Junction of Swindon Road and St George St

Air Quality Statistics

Pollutant	NO	NO ₂	NO _x
Number Very High #	-	0	-
Number High #	-	0	-
Number Moderate #	-	0	-
Number Low #	-	3523	-
Maximum 15-minute mean	333 µg m ⁻³	143 µg m ⁻³	651 µg m ⁻³
Maximum hourly mean	295 µg m ⁻³	134 µg m ⁻³	584 µg m ⁻³
Maximum running 8-hour mean	132 µg m ⁻³	97 µg m ⁻³	297 µg m ⁻³
Maximum running 24-hour mean	103 µg m ⁻³	78 µg m ⁻³	235 µg m ⁻³
Maximum daily mean	71 µg m ⁻³	65 µg m ⁻³	173 µg m ⁻³
Average	24 µg m ⁻³	36 µg m ⁻³	73 µg m ⁻³
Data capture	99.9 %	99.9 %	99.9 %

Daily Air Quality Index (DAQI) as defined by COMEAP 1st January 2012

Mass units for the gases are at 20°C and 1013mb

NO_x mass units are NO_x as NO₂ µg m⁻³

Air Quality Exceedences

Pollutant	Air Quality (England) Regulations 2000 & (Amendment) Regulations 2002	Max Conc	Number	Days	Allowed	Exceeded
Nitrogen Dioxide	Annual mean > 40 µg m ⁻³	36 µg m ⁻³	-	-	-	No
Nitrogen Dioxide	Hourly mean > 200 µg m ⁻³	134 µg m ⁻³	0	0	18 hours	No