2010 Air Quality Progress Report and Further Assessment for *Cheltenham Borough Council*

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

Date (October 2010)

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Executive Summary

This Progress Report summarises the results from air quality monitoring that Cheltenham Borough Council has completed during 2009. It also provides further information on further assessment that has occurred within Cheltenham's designated Air Quality Management Area (AQMA).

Since April 2009, Cheltenham Borough Council has monitored air quality for one pollutant - Nitrogen Dioxide (NO_2). All other air quality pollutants that can be assessed under our Local Air Quality Management obligations, such as sulphur dioxide and PM_{10}, have been assessed during previous monitoring periods and were found to be within national objective limits. The Council's Air Quality Monitoring Station, that previously measured Urban Background air quality, has now been switched off.

The main source of NO_2 is from vehicle emissions and seems to be a particular problem in narrow 'corridor' streets where stationary or slow moving traffic occurs. The AQMA in Cheltenham was monitored in detail during 2009 and the results indicate that the designation remains justified. As such an Air Quality Action Plan will need to be produced to ensure that the levels of NO_2 are brought within National Objective limits. At present human health could be at risk at locations where the NO_2 limit is being breached.

The number of NO_2 monitoring tubes has been reduced within the AQMA but are sufficient to provide information on the efficacy of any control measures that may be implemented as part of any Action Plan.

Since January 2010 further NO_2 monitoring tubes have been installed at several other locations within Cheltenham where there is known traffic congestion and potential exposure to nearby residential property. Results will be collated at the end of 2010 to determine whether detailed assessment or designation of further AQMA's may be necessary.

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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.

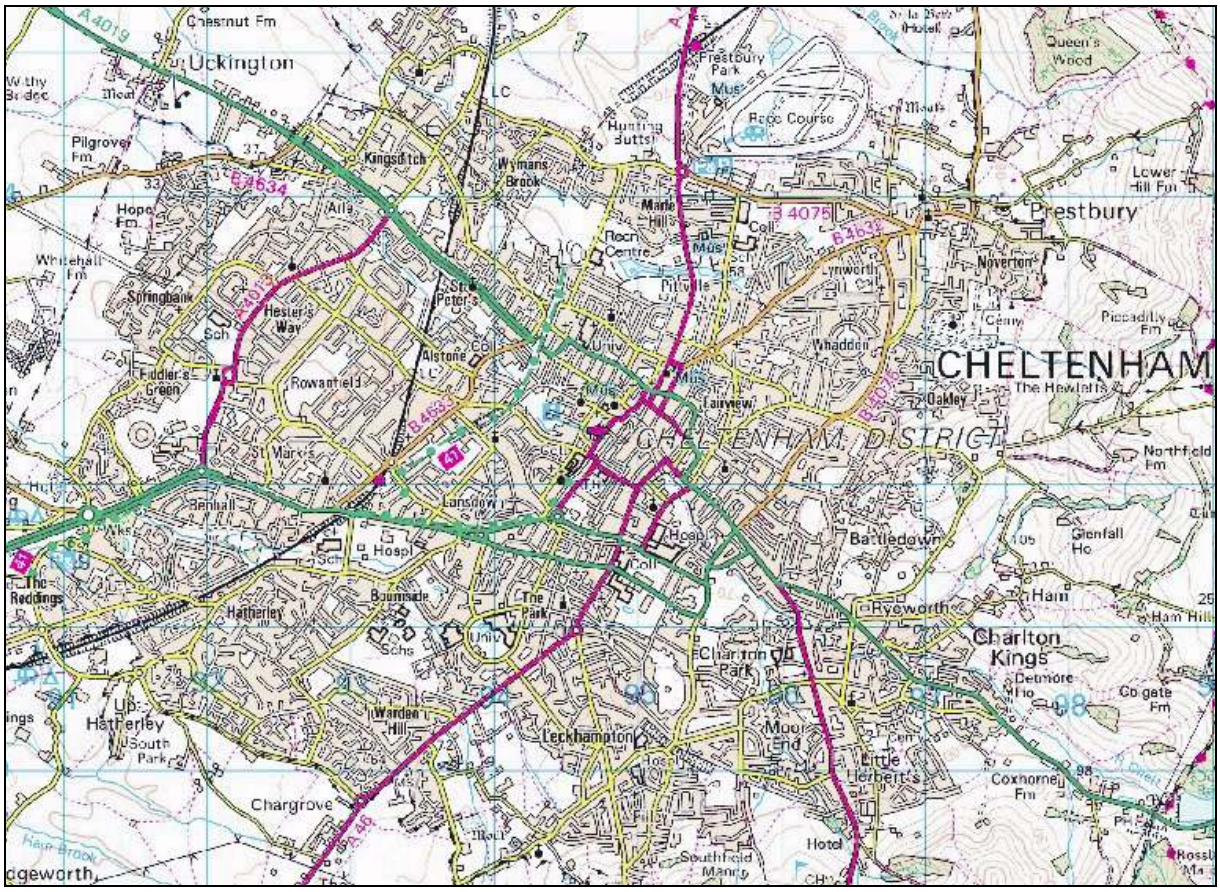


Figure 1.1 Map of Cheltenham Borough Council area

NW Cheltenham Extension: There is a proposal currently under consideration for the development of 5000 new houses to the north-west of Cheltenham (Appendix D). 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 Progress Report

Progress Reports are required in the intervening years between the three-yearly Updating and Screening Assessment reports. Their purpose is to maintain continuity in the Local Air Quality Management process.

They are not intended to be as detailed as Updating and Screening Assessment Reports, or to require as much effort. However, if the Progress Report identifies the risk of exceedence of an Air Quality Objective, the Local Authority (LA) should undertake a Detailed Assessment immediately, and not wait until the next round of Review and Assessment.

1.3 Air Quality Objectives

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

Table 1.1 Air Quality Objectives included in Regulations for the purpose of Local Air Quality Management in England.

Pollutant	Concentration	Measured as	Date to be achieved by
Benzene	16.25 $\mu g/m^3$	Running annual mean	31.12.2003
	5.00 $\mu g/m^3$	Running annual mean	31.12.2010
1,3-Butadiene	2.25 $\mu g/m^3$	Running annual mean	31.12.2003
Carbon monoxide	10.0 mg/m^3	Running 8-hour mean	31.12.2003
Lead	0.5 $\mu g/m^3$	Annual mean	31.12.2004
	0.25 $\mu g/m^3$	Annual mean	31.12.2008
Nitrogen dioxide	200 $\mu g/m^3$ not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 $\mu g/m^3$	Annual mean	31.12.2005
Particles (PM_{10}) (gravimetric)	50 $\mu g/m^3$, not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	40 $\mu g/m^3$	Annual mean	31.12.2004
Sulphur dioxide	350 $\mu g/m^3$, not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 $\mu g/m^3$, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 $\mu g/m^3$, 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:

- 2003: Updating and Screening Assessment
- 2004: Progress Report
- 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

The 2003 Updating and Screening Assessment did not identify any exceedances of the UK air quality objectives. In 2004 Cheltenham Borough Council proceeded to a Progress Report. In this report the authority identified the need to proceed to a Detailed Assessment for Nitrogen Dioxide at (lower) Bath Road. A Detailed Assessment was required in 2005 but due to delays in compiling this report the authority proceeded in the interim to a Progress Report in 2005. This report again identified concerns for nitrogen dioxide at the same locations but also reported that there were no new locations of concern. Cheltenham Borough Council undertook a Detailed Assessment for NO_2 at (lower) Bath Road (following on from the 2004 Progress Report).

A Detailed Assessment was completed for Bath Road and High Street in 2007 where an exceedance of the annual mean objective for NO_2 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 Cheltneham. The area is designated in relation to a likely breach of the nitrogen dioxide (annual mean) objective as specified in the Air Quality Regulations (England) 2000. The designated area incorporates High Street from the junction at Grosvenor Street following through to the lower part of Bath Road where it meets the junction with Bath Street and Vernon Place. This includes the residential properties at 2A, 2B and 8A Bath Road, Flats 1-4 at 63A High Street, Flats 1-5 at 65 High Street and Flats 1 & 2 at 68 High Street.

A network of duplicate NO_2 monitoring tubes was installed in January 2009 which gave a total of thirteen monitoring locations with 26 tubes along the lower end of Bath Road including the designated AQMA.

There have been no significant changes to the traffic flows in the Borough since the last round of Review and Assessment. One new industrial source was reported within the Borough in 2006. This is Kohler Mira (Kingsville Trading Estate, Cheltenham) a copper and alloy process established for the casting of gunmetal shower components. The process was permitted in October 2005, the emission limits as per PG 2/08 and the nearest significant receptor is 330 metres away. It is not considered that this process will have a significant influence on local air quality within the Borough.

The Updating and Screening Assessment for 2009 did not identify any new sources of pollution with the exception of a new biomass burner which was granted planning permission at the University of Gloucestershire. An air pollution screening assessment will be carried out if the system goes ahead to determine whether or not a detailed assessment may be necessary. At present the system has been shelved and no timescales have been submitted.

This report will include further assessment of the AQMA and discuss the nitrogen dioxide readings that were obtained during 2009 from the duplicate monitoring tubes located in the vicinity of the AMQA (see Figure 3 for monitoring tube locations)

Figure 1.2 Map of AQMA Boundary

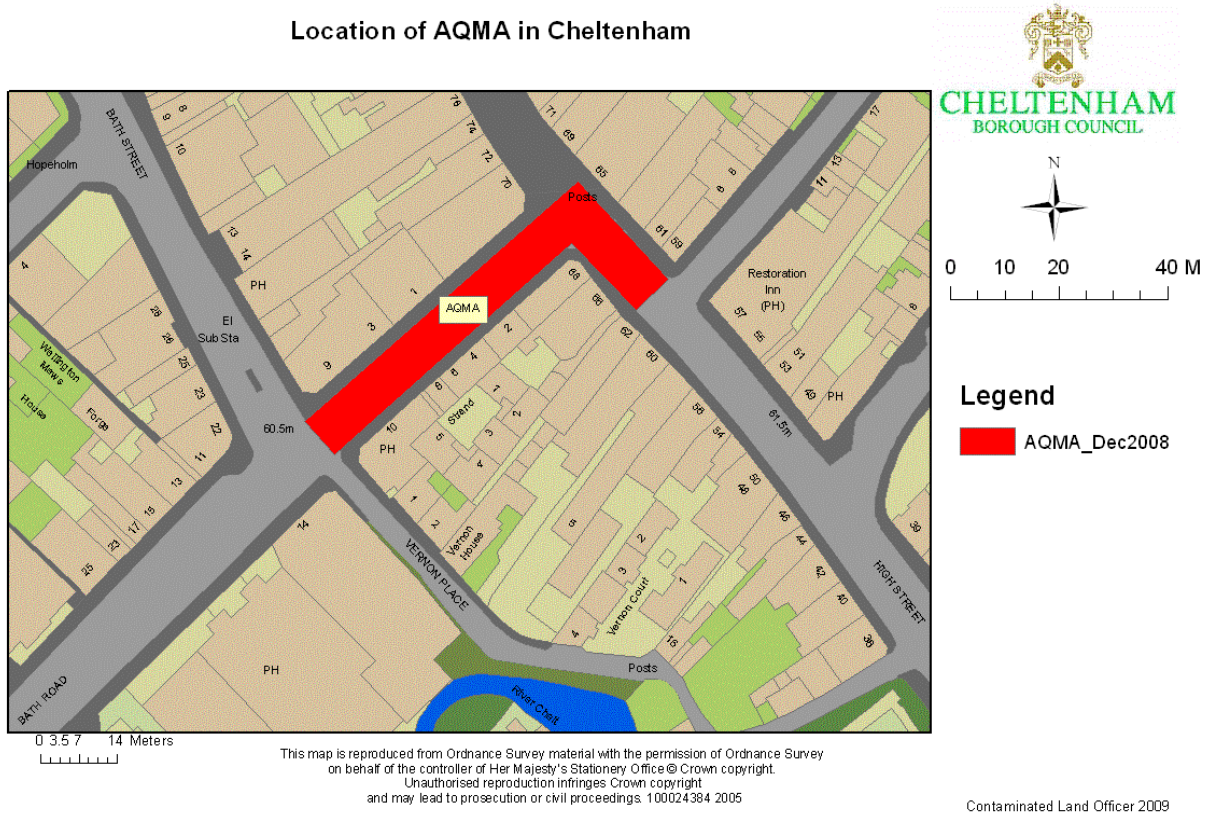
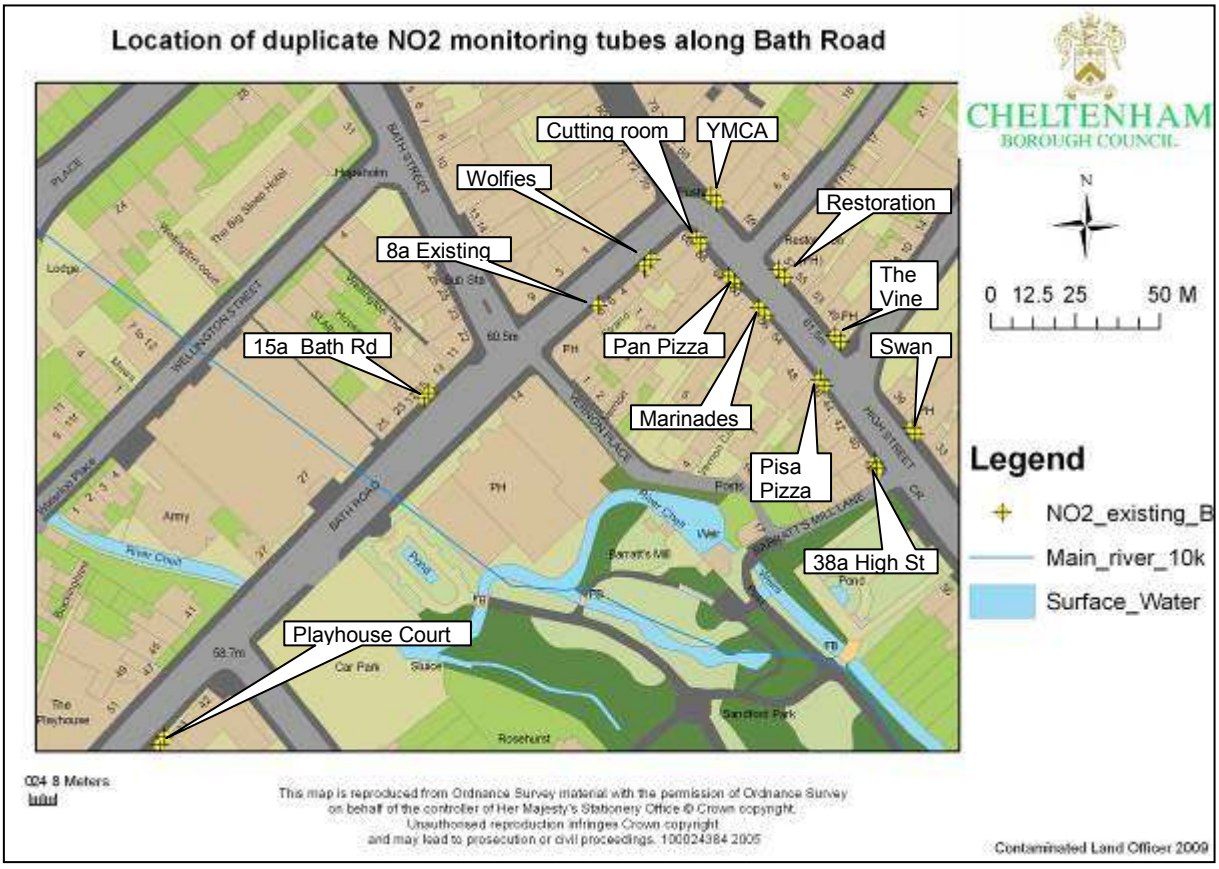


Figure 1.3 Monitoring locations near to the lower Bath Road AQMA



2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Sites

During January to April 2009, Cheltenham Borough Council managed a real-time air quality monitoring station (AQMS) for NO_x, NO, NO_2, SO_2, O_3 and PM_{10} (operated by Casella ETi). Cheltenham Borough Council decided to cease operation of the AQMS during 2009 due to economic constraints. The site is located near to the town centre within 200m of roads carrying between 12,000 and 18,000 vehicles per day (some of these roads form part of the A40 between Oxford and Gloucester). The monitoring site is within a Smoke Control Area and was chosen to represent urban background pollution in Cheltenham. See Figure 1.3 for location of the AQMS. The main local pollution source is road traffic and there are no significant polluting sources (Part A) within 5 miles of the site. There are a number of Part B processes within the area and a hospital boiler within 0.5 km. The data for Cheltenham AQMS is outlined in Table 2.3. One quarterly data report was produced for January to March 2009. Previous annual monitoring results from the AQMS have not indicated significant exceedances of any of the pollutants measured.

Figure 2.1 Map of Automatic Monitoring Sites

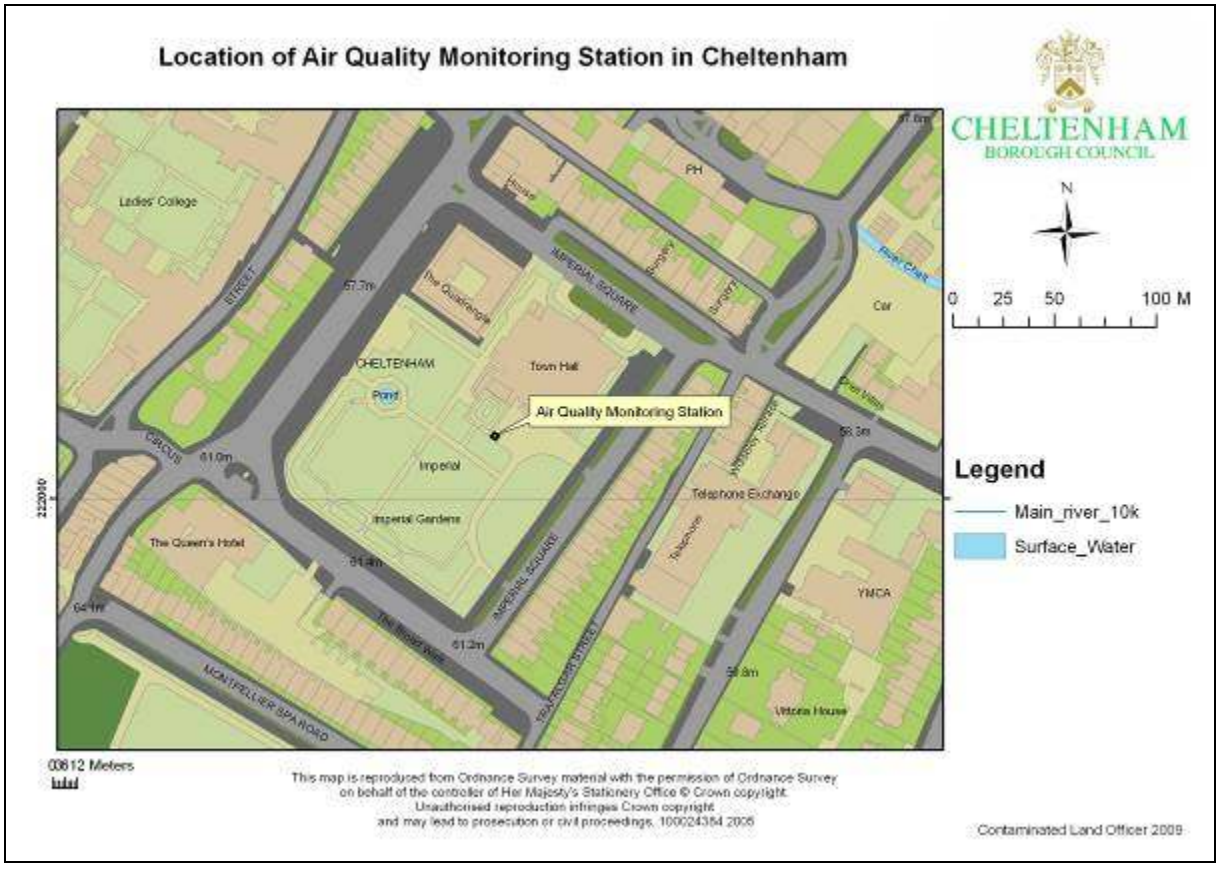


Table 2.1 Details of Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref	Pollutants Monitored	In AQMA ?	Relevant Exposure? *(Y/N with distance (m) to relevant exposure)*	Distance to kerb of nearest road *(N/A if not applicable)*	Worst-case Location ?
Town Hall	Urban Background	394715 222031	NO_2, SO_2, PM_{10}, O_3,	N	N	N/A	N

2.1.2 Non-Automatic Monitoring

Cheltenham Borough Council has been undertaking diffusion tube monitoring at a number of locations since 2003. The majority of the locations monitored have been consistently below the annual mean objective, however (lower) Bath Road, Tewkesbury Road, the Promenade and Boots Corner have exceeded the annual mean objective. Figure 2.2 illustrates the monitoring sites within the Cheltenham Borough Council area and Table 2.2 provides details of the locations.

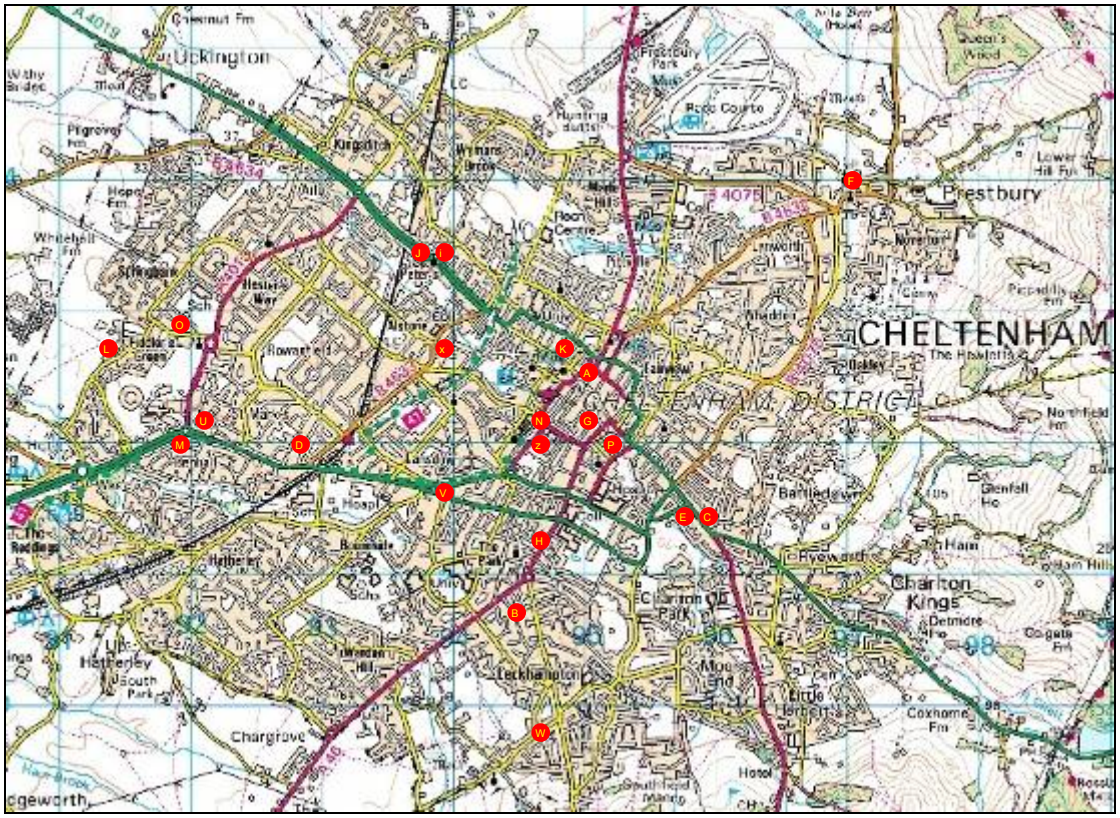


Figure 2.2 Map of Non-Automatic Monitoring Sites

Details of Bias Adjustment

Nitrogen dioxide diffusion tubes used by Cheltenham Borough Council are 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 21 locations throughout the Cheltenham Borough Council area have a monthly exposure period.

A triplicate co-location study at the automatic monitoring site generated a local 2008 bias adjustment factor of 0.87 which has been applied to all nitrogen dioxide diffusion tube data for 2008. However for 2009, with the closure of the automatic monitoring site and triplicate study, the Bias Adjustment factor applied to the diffusion tube data was a National Bias Adjustment Factor obtained from the Bias Adjustment Factor Spreadsheet. Bristol Scientific Services participates in the WASP scheme, the latest results show them as 'good' on the basis of RPI old and new criteria.

Table 2.2 Details of Non- Automatic Monitoring Sites

Map Ref.	Site Name	Site Type	OS Grid Ref	Pollutants Monitored	In AQMA?	Relevant Exposure ?	Distance to kerb of nearest road *(N/A if not applicable)*	Worst-case Location?
A	Boots Corner	Roadside	394950 - 222512	NO_2	N	N	5m	Y
B	54 Upper Norwood St	Urban Background	394494 - 220820	NO_2	N	Y	1m	Y
C	212 London Road	Roadside	395969 - 221349	NO_2	N	Y	5m	Y
D	Church Road Police Station	Urban Background	392819 - 221873	NO_2	N	Y	1m	Y
E	Chelsea Close	Urban Background	395791 - 221460	NO_2	N	Y	1m	Y
F	Old Bakery Prestbury	Roadside	397009 - 223888	NO_2	N	Y	2m	Y
G	Cambray	Urban Centre	395064 - 222264	NO_2	N	Y	5m	Y
H	179 Bath Road	Roadside	394614 - 221153	NO_2	N	Y	2m	Y
I	Off Tewkesbury Road	Roadside	393887 - 223444	NO_2	N	Y	2m	Y
J	Tewkesbury Road	Kerbside	393849 - 223400	NO_2	N	N	2m	Y
K	St Georges Street	Kerbside	394695 - 222733	NO_2	N	Y	1m	Y
L	Fiddlers Green Lane	Roadside	391354 - 222624	NO_2	N	Y	1m	Y
M	Miserden Road	Roadside	391997 - 222051	NO_2	N	Y	1m	Y
N	Promenade	Kerbside	394705 - 222183	NO_2	N	N	2m	Y
O	St Aidans Close	Urban Background	392084 - 222739	NO_2	N	Y	1m	Y
P	6 [lower] Bath Road	Roadside	395149 - 222151	NO_2	Y	Y	2m	Y
U	P.E.Way	Roadside	391996 - 222133	NO_2	N	Y	5m	Y
V	Westal Green	Roadside	393924 - 221608	NO_2	N	Y	2m	Y
W	56 Church Road	Roadside	394577 - 219728	NO_2	N	Y	2m	Y
X	124 Gloucester Road	Roadside	393802 - 222595	NO_2	N	Y	5m	Y
Z	Town Hall AQ Station	Urban Background	394715 - 222031	NO_2	N	N	50m	N

2.2 Comparison of Monitoring Results with Air Quality Objectives

During 2009, Cheltenham Borough Council maintained one continuous analyser (AQMS) for a period of three months from January to March inclusive, 21 nitrogen dioxide diffusion tube locations across the Borough and 26 co-location diffusion tubes in the vicinity of the AQMA as part of the further assessment required for elevated nitrogen dioxide levels.

2.2.1 Nitrogen Dioxide

Automatic Monitoring Data

Automatic air quality monitoring was carried out at the AQMS, located behind the Cheltenham Town Hall. This measures urban background levels of nitrogen dioxide. There were no exceedances of the annual mean or 1-hour air quality objectives during the monitoring period reported (January to March 2009 inclusive).

Table 2.3 Results of Automatic Monitoring for Nitrogen Dioxide: Comparison with Annual Mean Objective

Site ID	Location	Within AQMA?	Data Capture for monitoring period [a] %	Data Capture for full calendar year 2009 [b] %	Annual mean concentrations (µg/m^3)		
					2007 [c, d]	2008 [c,d]	2009 [c]
AQMS	Town Hall	N	100	25	23.4	21.5	25.8

Figure 2.3 Trends in Annual Mean Nitrogen Dioxide Concentration Measured at Automatic Monitoring Sites.

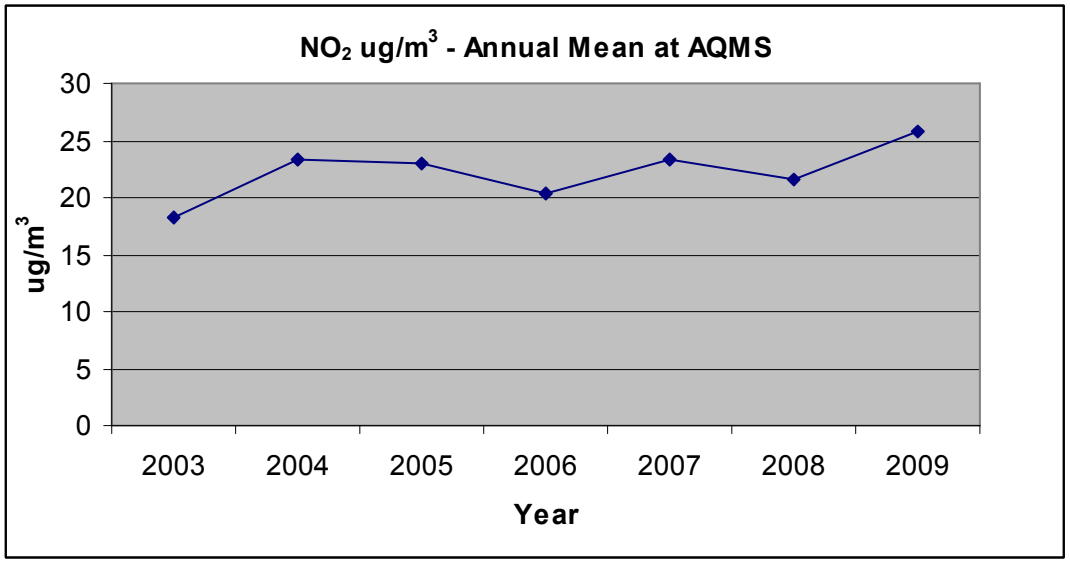


Table 2.4 Results of Automatic Monitoring for Nitrogen Dioxide: Comparison with 1-hour Mean Objective

Site ID	Location	Within AQMA?	Data Capture for monitoring period [a] %	Data Capture for full calendar year 2009 [b] %	Number of Exceedences of hourly mean (200 μg/m^3)		
					2007 [c]	2008 [c]	2009
AQMS	Town Hall	N	100	25	0	0	0

Diffusion Tube Monitoring Data

During 2009 Cheltenham Borough Council undertook NO_2 diffusion tube monitoring at 21 locations across their administrative area. The results are included in the table below. The only exceedance of the annual mean objective with relevant exposure is that identified on High Street & Bath Road (lower) which has since been declared an AQMA. No further detailed assessment will therefore be required in other areas of Cheltenham.

Table 2.5 Results of Nitrogen Dioxide Diffusion Tubes

Site ID	Location	Within AQMA?	Data Capture for monitoring period %	Data Capture for full calendar year 2009 %	Annual mean concentrations (μg/m^3)		
					2007	2008	2009
A	Boots Corner	N	100	100	**42.2**	**40.7**	35.6
B	54 Upper Norwood St	N	100	100	20.3	18.9	18.1
C	212 London Road	N	100	100	25.6	26.1	24.3
D	Church Road Police Stn	N	100	100	27.4	30.0	27.8
E	Chelsea Close	N	100	100	21.4	20.0	19.1
F	Old Bakery Prestbury	N	100	100	33.7	34.4	35.0
G	Cambray	N	100	100	26.1	27.8	25.7
H	179 Bath Road	N	91.7	91.7	34.5	32.7	32.2
I	off Tewkesbury Road	N	100	100	24.6	24.5	23.1
J	Tewkesbury Road	N	100	100	**41.1**	**41.5**	40.0
K	St Georges Street	N	100	100	30.5	31.6	30.4
L	Fiddlers Green Lane	N	100	100	24.1	25.6	23.0
M	Miserden Road	N	100	100	32.9	31.3	28.5
N	Promenade	N	100	100	**44.8**	**42.1**	**41.0**
O	St Aidans Close	N	83.3	83.3	27.0	25.4	24.2
P	6 [lower] Bath Road	Y	100	100	**44.6**	**44.0**	**43.5**
U	P.E.Way	N	100	100	32.0	30.0	29.3
V	Westal Green	N	91.7	91.7	35.2	31.6	33.9
W	56 Church Road	N	100	100	23.7	23.5	22.6
X	124 Gloucester Road	N	100	100	32.8	31.9	29.8
Z	Town Hall AQ Station	N	100	100	23.5	22.0	22.2

A: Bias adjustment factor for 2007 was 0.88

B: Bias adjustment factor for 2008 was 0.87

C: Bias adjustment factor for 2009 was 0.84

Further detailed monitoring of NO_2 has occurred during 2009 using duplicate tubes at 13 locations within and surrounding the designated AQMA along Bath Road and the adjoining High Street. The locations of the monitoring tubes are indicated in Figure 3. Annualised bias adjusted data indicates that the declared AQMA is justified due to continuing exceedance of the annual mean objective for NO_2. The highest readings within the AQMA correlate to the areas immediately adjacent to the two sets of traffic lights where traffic is sometimes stationary. An Air Quality Action Plan will need to be produced to identify and introduce measures to reduce the levels of NO_2 to below the National mean objective limit.

Table 2.6 Results of Nitrogen Dioxide Diffusion Tubes near AQMA

Site ID	Location	Within AQMA ?	Data Capture for monitoring period %	Data Capture for full calendar year 2009 %	Annual mean concentrations (μg/m^3)		
					2007	2008	2009
Site 1	The Swan	N	91.7	91.7	n/a	n/a	30.5
Site 1	The Swan	N	100	100			31.2
Site 2	38a	N	100	100			25.7
Site 2	38a	N	100	100			26.1
Site 3	Pisa Pizza	N	100	100			33.3
Site 3	Pisa Pizza	N	100	100			32.6
Site 4	The Vine	N	100	100			33.3
Site 4	The Vine	N	100	100			33.8
Site 5	The Restoration	N	100	100			35.8
Site 5	The Restoration	N	100	100			37.8
Site 6	Marinades	N	100	100			36.7
Site 6	Marinades	N	100	100			37.5
Site 7	Pan Pizza	N	100	100			39.3
Site 7	Pan Pizza	N	100	100			40.0
Site 8	Cutting Room	Y	100	100			**42.8**
Site 8	Cutting Room	Y	100	100			**44.0**
Site 9	YMCA Shop	Y	100	100			38.1
Site 9	YMCA Shop	Y	91.7	91.7			38.6
Site 10	Wolfies	Y	100	100			**43.9**
Site 10	Wolfies	Y	91.7	91.7			**43.8**
Site 11	8a Existing site	Y	91.7	91.7			**45.0**
Site 11	8a Existing site **	Y	100	100			**41.4**
Site 12	15a	N	100	100			32.3
Site 12	15a	N	100	100			34.0
Site 13	Playhouse Court	N	100	100			31.1
Site 13	Playhouse Court	N	100	100			30.1

A: Bias adjustment factor for 2007 was 0.88

B: Bias adjustment factor for 2008 was 0.87

C: Bias adjustment factor for 2009 was 0.84

Further NO_2 monitoring sites have since been established at other locations within Cheltenham due to concerns over traffic congestion and relevant exposure at these locations. Please see Section 3.1 for further details.

2.2.1 PM_{10}

PM_{10} monitoring was carried out at the AQMS. There were 2 exceedances of the 24 hour mean during the monitoring period (January to March 2009). The annualised mean was 19.1ug/m^3 and the two 24 hour exceedances of this air quality objective are not considered significant.

Table 2.7 Results of PM_{10} Automatic Monitoring: Comparison with Annual Mean Objective

Site ID	Location	Within AQMA?	Data Capture for monitoring period [a] %	Data Capture for full calendar year 2009 [b] %	Annual mean concentrations ($\mu g/m^3$)		
					2007	2008	2009
AQMS	Town Hall	N	100	25	15.3	13.6	19.1

Table 2.8 Results of PM_{10} Automatic Monitoring: Comparison with 24-hour Mean Objective

Site ID	Location	Within AQMA?	Data Capture for monitoring period [a] %	Data Capture 2009 [b] %	Number of Exceedences of daily mean objective (50 $\mu g/m^3$)		
					2007	2008	2009
AQMS	Town Hall	N	100	25	0	1	2

PM10 particle concentrations were measured by a Rupprecht & Patashnick tapered element oscillating microbalance (TEOM) series 1400a. This involves measuring the cumulative weight of articles collected on a filter. Pollution concentrations are expressed in microgram's per cubic metre.

The data was adjusted using the volatile correction model (VCM). This uses the Filter Dynamics Measurement System (FDMS) 'purge measurement' as an indicator of the volatile component of PM10 and is based on the assumption that the volatile component of PM10 lost during the heated sampling with a standard TEOM is consistent across a defined geographical area, such that the measurements of this component at one location may be used to correct measurements at another.

Calibration of the TEOM was undertaken during the six monthly services conducted by Casella ETi.

2.2.2 Sulphur Dioxide

Sulphur Dioxide monitoring was carried out at the AQMS during January to March 2009. There were no exceedances of the 15 minute mean, 1 hour mean or the 24 hour mean during the monitoring period.

Table 2.9 Results of SO_2 Automatic Monitoring: Comparison with Objectives

Site ID	Location	Within AQMA	Data Capture for monitoring period %	Data Capture 2009 %	Number of Exceedences of: (μg/m^3)		
					15-minute Objective (266 μg/m^3)	1-hour Objective (350 μg/m^3)	24-hour Objective (125 μg/m^3)
AQMS	Town Hall	N	100	25	0	0	0

2.2.3 Benzene

No benzene, carbon monoxide, 1,3-butadiene or lead monitoring was carried out by Cheltenham Borough Council during the last round of Review and Assessment.

2.2.4 Other pollutants monitored

No other air quality monitoring was carried out during the last round of review and assessment.

Summary of Compliance with AQS Objectives

Cheltenham Borough Council has examined the results from monitoring in the borough. Concentrations outside of the AQMA are all below the objectives at relevant locations, therefore there is no need to proceed to a Detailed Assessment.

3 New Local Developments

3.1 Road Traffic Sources

During late 2009, Cheltenham Borough Council identified a number of new locations within the Borough where there are congested roads and junctions with residential properties close to the kerb. Following a review of the locations of existing NO_2 diffusion monitoring tubes, it was decided to relocate a number of tubes which were not representing worst case urban NO_2 exposure, to areas where there was high traffic flow and congestion close to residential property. This was carried out in January 2010 and the new locations are identified below.

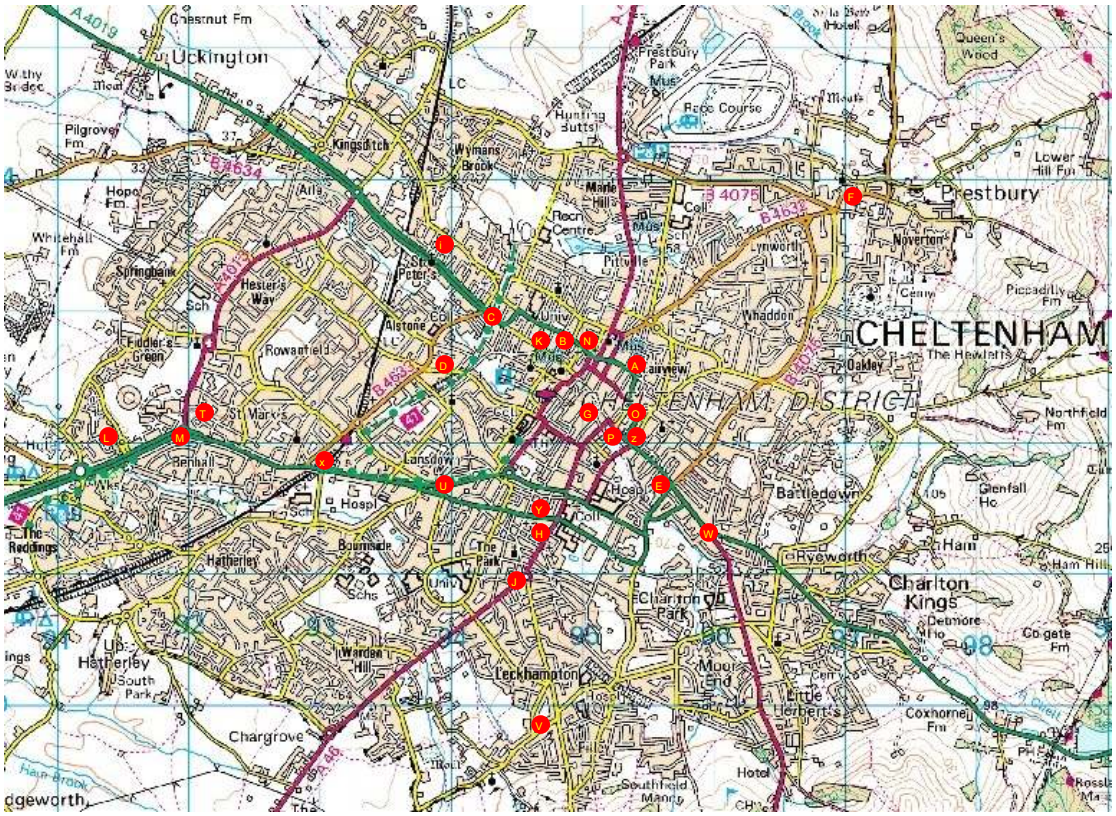


Figure 3.1 Map showing locations of NO2 diffusion tubes across Cheltenham

Ref	Site name	Monitor	Pollutants monitored	New location/ Existing/removed	Grid
A	Portland Street/Fairview Rd	Diffusion tube	NO2	New	395110 - 222670
B	2 Swindon Road	Diffusion tube	NO2	New	394830 - 222845
C	443 High Street	Diffusion tube	NO2	New	394330 - 222955
D	124 Gloucester Road	Diffusion tube	NO2	Existing	393802 - 222595
E	81 London Road	Diffusion tube	NO2	New	395660 - 221670
F	Old Bakery Prestbury	Diffusion tube	NO2	Existing	397009 - 223888
G	Cambray	Diffusion tube	NO2	Existing	395064 - 222264
H	179 Bath Road	Diffusion tube	NO2	Existing	394614 - 221153
I	91 Tewkesbury Road	Diffusion tube	NO2	New	393880 - 223390
J	19 Shurdington Road	Diffusion tube	NO2	New	394495 – 220960
K	St Georges Street	Diffusion tube	NO2	Existing	394695 - 222733

L	Telstar Road – GCHQ	Diffusion tube	NO2	New	391527 – 221930
M	Miserden Road	Diffusion tube	NO2	Existing	391997 – 222051
N	Winchcombe St/Fairview Rd	Diffusion tube	NO2	New	395210 – 222618
O	132 Albion Street	Diffusion tube	NO2	New	395400 – 222235
P	7 Berkeley Place	Diffusion tube	NO2	New	395340 – 222075
T	P.E.Way roundabout	Diffusion tube	NO2	Existing	391996 – 222133
U	Westal Green	Diffusion tube	NO2	Existing	393924 – 221608
V	54 Church Road	Diffusion tube	NO2	Existing	394577 – 219728
W	212 London Road	Diffusion tube	NO2	Existing	395969 - 221349
X	340 Gloucester Road	Diffusion tube	NO2	New	392912 – 221862
Y	7 Suffolk Road	Diffusion tube	NO2	New	394640 - 221460
Z	1 Hewlett Road	Diffusion tube	NO2	New	395355 - 222055
	Boots Corner	Diffusion tube	NO2	Removed	394950 - 222512
	54 Upper Norwood St	Diffusion tube	NO2	Removed	394494 - 220820
	Church Road P.S.	Diffusion tube	NO2	Removed	392819 - 221873
	Chelsea Close	Diffusion tube	NO2	Removed	395791 - 221460
	off Tewkesbury Road	Diffusion tube	NO2	Removed	393887 - 223444
	Tewkesbury Road	Diffusion tube	NO2	Removed	393849 - 223400
	Fiddlers Green Lane	Diffusion tube	NO2	Removed	391354 - 222624
	Promenade	Diffusion tube	NO2	Removed	394705 - 222183
	St Aidans Close	Diffusion tube	NO2	Removed	392084 - 222739
	6 [lower] Bath Road	Diffusion tube	NO2	Removed	395149 - 222151
	Town Hall AQ Station x3	Diffusion tube	NO2	Removed	394715 - 222031

The most recent diffusion tube data suggests that there are several new locations which may require progress to detailed assessment due to the high non-bias adjusted NO_2 results obtained from the laboratory analysis during January and February 2010. When the total bias adjusted data is obtained for 2010 it will be possible to determine those areas which require progress towards detailed assessment.

3.2 Other Transport Sources

There are no newly identified non-road traffic sources of air pollution in Cheltenham.

3.3 Industrial Sources

There are no newly identified industrial sources of air pollution in Cheltenham.

3.4 Commercial and Domestic Sources

In Cheltenham, there is a proposal to install a biomass heating system at the University of Gloucestershire's Hardwick campus. This facility is rated at 700KW. The Campus site and proposed boiler is in a Smoke Control Area and the boiler will need to be exempt under Section 21 of the Clean Air Act 1993. However the proposed development has been put on hold and there is currently insufficient information available to conduct an air quality assessment. Should the proposed development resume, then a screening assessment will be carried out at this time.

3.5 New Developments with Fugitive or Uncontrolled Sources

Cheltenham Borough Council confirms that there are no new or newly identified local developments which may have an impact on air quality within the Local Authority area.

4 Local / Regional Air Quality Strategy

Cheltenham Borough Council does not currently have a local air quality strategy.

Cheltenham has contributed to the current Gloucestershire Air Quality Strategy published in 2004. This document can be accessed via Gloucestershire County Council's website or via Cheltenham Borough Council's website www.cheltenham.gov.uk

Cheltenham Borough Council has recently submitted information for inclusion in the forthcoming review of the Gloucestershire Air Quality Strategy which is due to occur in 2010. The revised strategy will be incorporated into the 3rd Local Transport Plan for the County (2011-2026).

5 Planning Applications

There is a proposal currently under consideration for the development of 5000 new houses to the north-west of Cheltenham (termed the North-west extension area). This proposal is still in the early consultation phase. This development will primarily impact on Tewkesbury Road, Cheltenham and also on the M5 Junction 10. A map indicating the area of the proposed development is in Appendix C. To date there has been some consultation by the developer's agents with regards to the potential impact on air quality from this proposed development. Cheltenham Borough Council has agreed with the developer's agents for a number of NO_2 diffusion tubes to be placed in strategic positions in the vicinity of the proposed development to monitor current background NO_2 levels. These monitoring tubes should allow modelling of the likely increase in NO_2 as a result of the development and whether or not mitigation measures should be implemented. During forthcoming consultation periods it will be recommended that sufficient mitigation measures are adopted as part of the proposed development to ensure that traffic derived NO_2 levels do not exceed statutory limits.

6 Air Quality Planning Policies

Cheltenham Borough Council does not have any specific air quality planning policies. However as part of the Council's standard planning consultation procedures, all planning proposals are scrutinised by the relevant Environmental Health Officer and assessed for potential Air Quality implications. Recommendations are made as appropriate to ensure that sufficient information is submitted by the applicant to demonstrate that the development will not have a significant negative impact on local air quality and will not contribute to exceedances of any national air quality objectives. The Officer will consider various aspects of the development such as scale of the development, affect on traffic flow, local conditions – for example existing air quality and exposure – and whether the proposal incorporates any biomass boilers or PPC regulated processes. If it is considered that there is the potential for a significant impact on air quality from a proposed development then an Air Quality Impact Assessment will be requested from the developer which must define the magnitude of changes to air quality and the impacts at specific receptors.

Where required, a screening assessment will be carried by Cheltenham Borough Council on those proposed developments that could significantly impact air quality such as Biomass Boilers. This will progress to a detailed assessment where necessary.

7 Local Transport Plans and Strategies

Cheltenham Borough Council's transport strategy derives from the Gloucestershire Local Transport Plan (http://www.gloucestershire.gov.uk/index.cfm?articleid=10987) and sets out how the county council, working with its agents in Cheltenham and Gloucester, proposes to achieve a key objective of controlling the growth in traffic on county roads below national forecasts. Each year Cheltenham Borough Council delivers approximately £1.3m of Local Transport funded transport schemes to support Local Transport Scheme objectives and targets.

The council and its partners are continuing to implement Local Transport Plan(LTP) schemes to deliver the integrated transport strategy and reduce CO2 emissions from transport. These include:

- improvements to bus services delivered through a Bus Quality Partnership with Stagecoach
- improvements to the pedestrian environment including good walking routes and areas free from motor traffic
- cycle network improvements designed to give cyclists advantage
- road safety measures such as improved lighting, signing and traffic calming
- reviewing the current LTP and preparing a second LTP to cover 2006-2011

However, it is unclear what impact the Local Transport Plan has had on traffic vehicle movements in Cheltenham. Anecdotal evidence together with traffic count data suggests that vehicle traffic within Cheltenham has increased during the period covered by the current LTP and consequently any reduction in CO2 emissions and improvements in air quality are likely to be limited. Current air quality measurements suggest that air quality, in terms of nitrogen dioxide levels, has not improved over the last five years.

Progress Reports of the Gloucestershire Local Transport Plan 2006-2011 are available on this link http://www.gloucestershire.gov.uk/index.cfm?articleid=7707

8 Climate Change Strategies

Cheltenham Borough Council produced a Climate Change Strategy in 2005 which can be found on the following link
http://www.cheltenham.gov.uk/site/scripts/download_info.php?fileID=955

The OVERARCHING AIM of this strategy is to make Cheltenham a carbon neutral borough.

The MAIN OBJECTIVES of the strategy are to:
• raise awareness of the potential impact of climate change;
• establish accurate data of greenhouse gas emissions from activities in Cheltenham;
• propose measures to help prevent the causes of climate change, by aiming to reduce CO2 emissions from activities in Cheltenham by 20% from 1990 levels by 2010 and by 60% by 2050;
• propose measures to help us adapt to the inevitable consequences of climate change;
• and engage with external agencies and other stakeholders to gain commitment to addressing climate change issues and delivering the climate change action plan.

Although it doesn't specifically detail improvements to Air Quality it does highlight the need to reduce the impact of road transport in terms of greenhouse gas emissions.

The Strategy accepts that the most effective tools to reduce CO2 emissions from vehicles are likely to be EU and national legislation and taxes. Car manufacturers are reducing average CO2 emissions from new cars by 25% from 1995 to 2008, and changes to vehicle tax bands and company car taxation are designed to encourage cleaner vehicles.

However there is minimal evidence to demonstrate a reduction in car usage in Cheltenham. Recent traffic count data suggests that car use and congestion has not decreased since Cheltenham adopted its Climate Change Strategy.

9 Implementation of Action Plans

Cheltenham Borough Council has not yet implemented an Action Plan for its AQMA. The data for 2009 justified the decision to declare the AQMA on lower Bath Road and High Street in Cheltenham. The data obtained suggests that the air quality in the AQMA area continues to exceed National Air Quality Objectives for Nitrogen Dioxide. Recent traffic count data has highlighted the frequent vehicle movements on this stretch of road with AADT figures in excess of 13,000.

Detailed traffic data for the AQMA has been provided by Gloucestershire County Council which can be found in Appendix B. This data has been split into vehicle type and movements along each section of roadway within the AQMA. Source apportionment by vehicle type has been carried out and the information is summarised below. It is clear that the majority of vehicle movements and emissions are attributable to cars.

Entering the AQMA along High Street the proportion of each vehicle type is as follows;
Buses/coaches(PSV) = 1.0%
Heavy Goods Vehicles (OGV 1&2) = 1.6%
Light Goods Vehicles(LGV) = 12.0%
Cars = 84.8%
Motorcycles = 0.6%

Leaving the AQMA down Bath Road:
Buses/coaches(PSV) = 0.9%
Heavy Goods Vehicles (OGV 1&2) = 1.5%
Light Goods Vehicles(LGV) = 11.2%
Cars = 85.8%
Motorcycles = 0.6%

The proportion of emissions per vehicle is summarised below

Vehicle Type	% of flow	% of total emissions at 5km/h	% of total emissions at 15km/h
Cars	84.8	47.5	43.8
LGV	12.0	19.2	17.1
HGV	1.6	15.0	19.2
Buses	1.0	18.2	19.8
Motorcycles	0.6	0.1	0.1
TOTAL	100	100	100

There may be a requirement to carry out detailed assessment in other areas within Cheltenham following the installation of nitrogen dioxide monitoring tubes in January 2010 at several newly identified new locations where there is known exposure and high traffic count. Initial results indicate exceedance of the National Air Quality Objective for Nitrogen Dioxide along parts of Swindon Road and Fairview Road where there is known exposure.

10 Conclusions and Proposed Actions

10.1 Conclusions from New Monitoring Data

New monitoring data indicates that nitrogen dioxide levels remain above the national objectives at several locations within the designated AQMA. Development and implementation of an Action Plan to control these levels is therefore required. However in advance of producing an Action Plan, it is deemed prudent to await monitoring data from new monitoring locations near to the existing AQMA – where initial results indicate exceedance of the national air quality objective for nitrogen dioxide. If this is confirmed following annualisation of results in January 2011, then it is likely that the existing AQMA may need to be extended or a new AQMA designated. In this occurs it would be more effective to deal with all AMQA's under one Action Plan for Cheltenham Borough rather than develop separate Action Plans for each AQMA.

This approach would also give the opportunity to tie into the Council's ongoing traffic management commitments under 'Civic Pride' which is aiming to pedestrianise part of the inner-ring road within Cheltenham. This has the potential to impact both positively and negatively on existing traffic flows within some of the current diffusion tube monitoring areas, therefore the Action Plan should take into account potential traffic issues that may arise through implementation of 'Civic Pride' scheme.

10.2 Conclusions relating to New Local Developments

There are no new local developments identified during the period covered by this report.

10.3 Other Conclusions

It is likely that Cheltenham will need to develop a new approach to traffic management if it intends to reduce traffic derived pollution levels to meet national objectives.

10.4 Proposed Actions

Assessment of Nitrogen Dioxide levels at several new locations within Cheltenham's inner ring road area has demonstrated that exceedance of national objectives is likely. More detailed assessment of nitrogen dioxide levels at these locations is currently being carried out with annual data available in January 2011.

Appendices

Appendix A: QA:QC Data

Diffusion Tube Bias Adjustment Factors

The diffusion tubes (20% TEA in Water) are supplied and analysed by Bristol Scientific Services Ltd. The tubes at all locations throughout the area have a monthly exposure period. A triplicate co-location study at Cheltenham's Automatic monitoring station (AQMS) generated a 'local' bias adjustment factor which was applied to all nitrogen dioxide diffusion tube data for 2007 and 2008. This data has been assessed using the Precision and Accuracy Bias Tool available on the Air Quality Archive Website. For 2009, 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 using the Bias Adjustment Factor Spreadsheet available at http://www.uwe.ac.uk/aqm/review/index.html The bias adjustment factors utilised were:

- 2007 bias adjustment factor: 0.88
- 2008 bias adjustment factor: 0.87
- 2009 bias adjustment factor: 0.84

Discussion of Choice of Factor to Use

The co-location study results have been checked for precision and accuracy to confirm the precision of the diffusion tube results, and the accuracy of the automatic monitoring results in relation to data capture. All results had good data capture and a coefficient of variation less than 15%, with the exception of one monitoring period where a variation of 23% was recorded. From these results, a bias adjustment factor of 0.87 was determined. A bias adjustment factor for 2008 was also estimated using the published Bias Adjustment Factors Spreadsheet (v04/08). A factor of 0.87 was estimated from four studies (excluding results from the Cheltenham co-location study). Although in many cases, using an overall correction factor derived from as many co-location studies as possible will provide the 'best estimate' of the 'true' annual mean concentration, it is important to recognise that uncertainty associated with this bias adjusted annual mean remains. One analysis has shown that the uncertainty for tubes bias adjusted in this way is ± 20% (at 95% confidence level). This compares with a typical value of ± 10% for chemiluminescence monitors subject to appropriate QA/QC procedures. Having studied both scenarios regarding which factor to use it has been decided use the 'local' co-location adjustment factor of 0.87 as it is more representative of the local situation.

QA/QC of automatic monitoring

Introduction

Cheltenham Borough Council's Air Quality Monitoring Station (AQMS) is operated and managed by Casella Eti Data Services. During 2008 they provided a service to Cheltenham Borough Council which included routine servicing and maintenance of the monitoring equipment together with calibration and reporting of results on a quarterly basis. They were also responsible for daily data checking and responding to alarms and replacement of calibration gases.

The AQMS at Cheltenham uses daily automatic calibration checks to validate the data for O3, NOx and SO2. An automatic daily calibration check is conducted to verify the response of the analyser in reference to the 'zero' and 'span' by introducing a high known concentration of a calibration gas. The daily calibration check produces an actual zero and actual span response value which is stored on a calibration file on the logger. The calibration results are then used to create a calibration factor, which is used to rescale the data. The analysers are serviced every six months by Cassella ETI to ensure correct functioning of the instruments.

1.1 NOx Analyser
The Monitor Labs 9841B NOx analysers measure nitric oxide and oxides of nitrogen in total. These analysers use 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).

1.2 SO2 Analyser
The Monitor Labs 9850B SO2 analyser employs ultra-violet fluorescence (UVF). SO2 molecules are excited to higher but unstable energy states by UV radiation at 212 nm. These energy states decay, causing an emission of secondary fluorescent radiation with an intensity proportional to the concentration of SO2 in the sample. The fluorescent radiation is incident upon a photomultiplier tube (PMT), which converts the wavelength to an analogue voltage. The PMT and photodetector outputs produce a compensated voltage proportional to the ambient SO2 concentrations.

1.3 Ozone Analyser
The Monitor Labs ML9810 Ozone analyser is a Ultra-violet photometer which measures ozone concentrations in ambient air. Ozone is converted to oxygen by a catalyst and passed through an absorption cell where the amount of transmitted UV radiation at 254nm is measured. This is termed the reference measurement. Another sample of ambient air is passed directly into the absorption cell, without being catalysed, and the UV reading is compared to the reference measurement using the Beer-Lambert relationship to calculate the ozone concentration, which is also compensated for temperature and pressure.

1.4 TEOM
PM10 particle concentrations are measured by a Rupprecht & Patashnick tapered element oscillating microbalance (TEOM) series 1400a. This involves measuring the cumulative weight of articles collected on a filter. Pollution concentrations are expressed in microgram's per cubic metre.

TEOM Operation and data adjustment
The TEOM operates differently from the gas analysers, with differing data ratification requirements.
The two main requirements when operating the TEOM are:-
(i) Ensure that the TEOM filter is changed correctly, and within the lifespan of the filter i.e. before the filter reaches 90%.
(ii) The data produced from the TEOM is checked on a daily basis ensuring that any faults in the operation of the TEOM are detected quickly.

Calibration of the TEOM is undertaken during the six monthly services conducted by Casella ETi.

The UK PM10 Objectives (and EU limit values) are based upon measurements carried out using the European reference sampler, which is a gravimetric device where the particle mass is collected onto a filter and subsequently weighed. This method has a number of disadvantages in that only 24-hour mean concentrations are recorded and the data cannot be disseminated to the public in real time and the operation is labour intensive. Historically TEOM analysers have been predominantly used in the UK. A significant problem with instruments using heated inlets, such as TEOM analysers, is the loss of semi-volatile components when heated to drive off excess moisture. A default correction factor of 1.3 was recommended to be applied to the data of analysers using heated inlets in order to generate a nominal 'gravimetric-equivalent' result. However for TEOM data the guidance is now to use the volatile correction model (VCM) which uses the Filter Dynamics Measurement System (FDMS) 'purge measurement' as an indicator of the volatile component of PM10 and is based on the assumption that the volatile component of PM10 lost during the heated sampling with a standard TEOM is consistent across a defined geographical area, such that the measurements of this component at one location may be used to correct measurements at another. A VCM web portal now allows local authorities to download geographically specific correction factors to apply to TEOM PM10 results. The VCM correction factor was applied by Casella ETi to the PM10 results obtained from Cheltenham's AQMS between January and March 2009.

QA/QC of diffusion tube monitoring

The diffusion tube monitoring carried out within Cheltenham's AQMA during 2009 utilised duplicate tubes at each monitoring location. The precision of the tubes were assessed using the Precision and Accuracy Bias Tool available on the Air Quality Archive Website and were assessed as having 'good' precision. See below for an example of precision assessment for one of the locations within our AQMA.

Adjustment of DUPLICATE or TRIPLICATE Tubes

Diffusion Tubes Measurements									
Period	Start Date	End Date	Tube 1 µgm^{-3}	Tube 2 µgm^{-3}	Tube 3 µgm^{-3}	Triplicate	Standard	CV	95% CI mean
1	14/01/2009	10/02/2009	59.9	62.8		61.4	2.05	3.34	18.42
2	10/02/2009	10/03/2009	52.3	57.7		55.0	3.82	6.94	34.31
3	10/03/2009	15/04/2009	48.0	53.9		51.0	4.17	8.19	37.48
4	15/04/2009	13/05/2009	48.0	52.6		50.3	3.25	6.47	29.22
5	13/05/2009	10/06/2009	47.1	48.3		47.7	0.85	1.78	7.62
6	10/06/2009	15/07/2009	50.1	49.4		49.8	0.49	0.99	4.45
7	15/07/2009	19/08/2009	47.9	51.9		49.9	2.83	5.67	25.41
8	19/08/2009	16/09/2009	41.1	42.6		41.9	1.06	2.53	9.53
9	16/09/2009	14/10/2009	53.0	49.9		51.5	2.19	4.26	19.69
10	14/10/2009	18/11/2009	63.4	63.6		63.5	0.14	0.22	1.27
11	18/11/2009	16/12/2009	68.4	69.4		68.9	0.71	1.03	6.35
12	16/12/2009	20/01/2010	63.3	58.5		60.9	3.39	5.57	30.49
13									

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

Data Quality Check
Diffusion Tubes Precision Check
Good
Good
Good
Good
Good
Good
Good
Good
Good
Good
Good
Good
Good

Site Name/ ID:	Cutting Shop

Jaume Targa
jaume.targa@aeat.co.uk

Version 03 - November 2006

Adjusted measurement (95% confidence level)
Without periods with CV larger than 20%
Bias calculated using 3 periods of data
Tube Precision: 4 Automatic DC: 100%
Bias factor A: 0.8 (0.7 - 0.95)
Bias B: 25% (6% - 44%)
Information about tubes to be adjusted
Diffusion Tube average: 54 µgm^{-3}
Average Precision (CV): 4
Adjusted Tube average: 43 +/- 8 µgm^{-3}

Adjusted measurement (95% confidence level)
with all data
Bias calculated using 3 periods of data
Tube Precision: 4 Automatic DC: 100%
Bias factor A: 0.8 (0.7 - 0.95)
Bias B: 25% (6% - 44%)
Information about tubes to be adjusted
Diffusion Tube average: 54 µgm^{-3}
Average Precision (CV): 4
Adjusted Tube average: 43 +/- 8 µgm^{-3}

Bristol Scientific Services participates in the WASP scheme, the latest results show them as 'good' on the basis of RPI old and new criteria.

Appendix B: Detailed Traffic Count data within AQMA

Section 1	High Street / Grosvenor Street junction, Cheltenham	Ref no: 550245
Gazeteer Ref:	Grid ref: 395190222164	Wednesday, 24/3/2010

All motor vehicles

	High St west					High St east					Grosvenor Street					Total In
	Left	Ahead	In	Out	2-Way	Ahead	Right	In	Out	2-Way	Left	Right	In	Out	2-Way	
06:00-07:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
07:00-08:00	-	-	-	883	883	874	-	874	-	874	-	9	9	-	9	883
08:00-09:00	-	-	-	1391	1391	1379	3	1382	-	1382	-	12	12	3	15	1394
09:00-10:00	-	-	-	1074	1074	1051	2	1053	-	1053	-	23	23	2	25	1076
10:00-11:00	-	-	-	945	945	923	6	929	-	929	-	22	22	6	28	951
11:00-12:00	-	-	-	942	942	923	6	929	-	929	-	19	19	6	25	948
12:00-13:00	-	-	-	961	961	937	6	943	-	943	-	24	24	6	30	967
13:00-14:00	-	-	-	980	980	958	7	965	-	965	-	22	22	7	29	987
14:00-15:00	-	-	-	1015	1015	987	4	991	-	991	-	28	28	4	32	1019
15:00-16:00	-	-	-	1035	1035	1010	6	1016	-	1016	-	25	25	6	31	1041
16:00-17:00	-	-	-	1163	1163	1141	11	1152	-	1152	-	22	22	11	33	1174
17:00-18:00	-	-	-	1122	1122	1098	6	1104	-	1104	-	24	24	6	30	1128
18:00-19:00	-	-	-	899	899	890	7	897	-	897	-	9	9	7	16	906
19:00-20:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20:00-21:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21:00-22:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12hr	-	-	-	12410	12410	12171	64	12235	-	12235	-	239	239	64	303	12474
Est AADT			-	13651	13651			13459	-	13459			263	70	333	

Heavy goods 6 or more tyres (excluding PSVs & Coaches)

	High St west					High St east					Grosvenor Street					Total In
	Left	Ahead	In	Out	2-Way	Ahead	Right	In	Out	2-Way	Left	Right	In	Out	2-Way	
06:00-07:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
07:00-08:00	-	-	-	14	14	14	-	14	-	14	-	-	-	-	-	14
08:00-09:00	-	-	-	18	18	18	-	18	-	18	-	-	-	-	-	18
09:00-10:00	-	-	-	32	32	31	-	31	-	31	-	1	1	-	1	32
10:00-11:00	-	-	-	25	25	24	-	24	-	24	-	1	1	-	1	25
11:00-12:00	-	-	-	25	25	24	-	24	-	24	-	1	1	-	1	25
12:00-13:00	-	-	-	16	16	16	-	16	-	16	-	-	-	-	-	16
13:00-14:00	-	-	-	18	18	18	-	18	-	18	-	-	-	-	-	18
14:00-15:00	-	-	-	16	16	16	-	16	-	16	-	-	-	-	-	16
15:00-16:00	-	-	-	21	21	21	-	21	-	21	-	-	-	-	-	21
16:00-17:00	-	-	-	6	6	6	-	6	-	6	-	-	-	-	-	6
17:00-18:00	-	-	-	5	5	5	-	5	-	5	-	-	-	-	-	5
18:00-19:00	-	-	-	2	2	2	-	2	-	2	-	-	-	-	-	2
19:00-20:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20:00-21:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21:00-22:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12hr	-	-	-	198	198	195	-	195	-	195	-	3	3	-	3	198
Est 16hr			-	216	216			213	-	213			3	-	3	

Percentage heavy goods

	High St west					High St east					Grosvenor Street					Total In
	Left	Ahead	In	Out	2-Way	Ahead	Right	In	Out	2-Way	Left	Right	In	Out	2-Way	
06:00-07:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
07:00-08:00	-	-	-	2	2	2	-	2	-	2	-	-	-	-	-	2
08:00-09:00	-	-	-	1	1	1	-	1	-	1	-	-	-	-	-	1
09:00-10:00	-	-	-	3	3	3	-	3	-	3	-	4	4	-	4	3
10:00-11:00	-	-	-	3	3	3	-	3	-	3	-	5	5	-	4	3
11:00-12:00	-	-	-	3	3	3	-	3	-	3	-	5	5	-	4	3
12:00-13:00	-	-	-	2	2	2	-	2	-	2	-	-	-	-	-	2
13:00-14:00	-	-	-	2	2	2	-	2	-	2	-	-	-	-	-	2
14:00-15:00	-	-	-	2	2	2	-	2	-	2	-	-	-	-	-	2
15:00-16:00	-	-	-	2	2	2	-	2	-	2	-	-	-	-	-	2
16:00-17:00	-	-	-	1	1	1	-	1	-	1	-	-	-	-	-	1
17:00-18:00	-	-	-	0	0	0	-	0	-	0	-	-	-	-	-	0
18:00-19:00	-	-	-	0	0	0	-	0	-	0	-	-	-	-	-	0
19:00-20:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20:00-21:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21:00-22:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12hr	-	-	-	2	2	2	-	2	-	2	-	1	1	-	1	2
Est 16hr			-	2	2			2	-	2			1	-	1	

Data input	
04/05/2010	Est AADT = 12hr all motor vehicles * 1.1
00:00:00	Est HGV 16hr = 12hr HGV * 1.09

Section 1	Bath Road / Bath Street junction, Cheltenham	Ref no: 550246
Gazeteer Ref:	Grid ref: 395123222136	Wednesday, 24/3/2010

All motor vehicles

	Bath Street						Vernon Place						Bath Rd south						Bath Rd north						Total In
	Left	Ahead	Right	In	Out	2-Way	Left	Ahead	Right	In	Out	2-Way	Left	Ahead	Right	In	Out	2-Way	Left	Ahead	Right	In	Out	2-Way	
06:00-07:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
07:00-08:00	-	-	49	49	5	54	-	-	-	-	-	-	-	-	-	-	899	899	-	850	5	855	-	855	904
08:00-09:00	-	1	98	99	33	132	2	-	-	2	1	3	-	-	-	-	1445	1445	-	1345	33	1378	-	1378	1479
09:00-10:00	-	1	127	128	35	163	2	-	-	2	4	6	-	-	-	-	1151	1151	3	1022	35	1060	-	1060	1190
10:00-11:00	-	1	163	164	33	197	1	-	-	1	2	3	-	-	-	-	1049	1049	1	885	33	919	-	919	1084
11:00-12:00	-	-	128	128	39	167	1	-	-	1	1	2	-	-	-	-	1031	1031	1	902	39	942	-	942	1071
12:00-13:00	-	1	144	145	32	177	2	-	-	2	3	5	-	-	-	-	1059	1059	2	913	32	947	-	947	1094
13:00-14:00	-	1	114	115	29	144	2	-	-	2	2	4	-	-	-	-	1074	1074	1	958	29	988	-	988	1105
14:00-15:00	-	2	136	138	35	173	7	-	-	7	7	14	-	-	-	-	1107	1107	5	964	35	1004	-	1004	1149
15:00-16:00	-	-	119	119	31	150	6	-	-	6	-	6	-	-	-	-	1115	1115	-	990	31	1021	-	1021	1146
16:00-17:00	-	1	151	152	35	187	3	-	-	3	3	6	-	-	-	-	1274	1274	2	1120	35	1157	-	1157	1312
17:00-18:00	-	-	169	169	17	186	3	-	-	3	2	5	-	-	-	-	1269	1269	2	1097	17	1116	-	1116	1288
18:00-19:00	-	1	112	113	16	129	-	-	-	-	3	3	-	-	-	-	938	938	2	826	16	844	-	844	957
19:00-20:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20:00-21:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21:00-22:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12hr	-	9	1510	1519	340	1859	29	-	-	29	28	57	-	-	-	-	13411	13411	19	11872	340	12231	-	12231	13779
Est AADT				1671	374	2045				32	31	63				-	14752	14752				13454	-	13454	

Heavy goods 6 or more tyres (excluding PSVs & Coaches)

	Bath Street						Vernon Place						Bath Rd south						Bath Rd north						Total In
	Left	Ahead	Right	In	Out	2-Way	Left	Ahead	Right	In	Out	2-Way	Left	Ahead	Right	In	Out	2-Way	Left	Ahead	Right	In	Out	2-Way	
06:00-07:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
07:00-08:00	-	-	2	2	-	2	-	-	-	-	-	-	-	-	-	-	15	15	-	13	-	13	-	13	15
08:00-09:00	-	-	1	1	-	1	-	-	-	-	-	-	-	-	-	-	17	17	-	16	-	16	-	16	17
09:00-10:00	-	-	3	3	-	3	1	-	-	1	1	2	-	-	-	-	32	32	1	28	-	29	-	29	33
10:00-11:00	-	-	1	1	-	1	-	-	-	-	-	-	-	-	-	-	21	21	-	20	-	20	-	20	21
11:00-12:00	-	-	3	3	2	5	-	-	-	-	1	1	-	-	-	-	26	26	1	23	2	26	-	26	29
12:00-13:00	-	-	2	2	-	2	-	-	-	-	-	-	-	-	-	-	18	18	-	16	-	16	-	16	18
13:00-14:00	-	-	3	3	2	5	1	-	-	1	-	1	-	-	-	-	21	21	-	17	2	19	-	19	23
14:00-15:00	-	-	2	2	2	4	-	-	-	-	-	-	-	-	-	-	16	16	-	14	2	16	-	16	18
15:00-16:00	-	-	1	1	1	2	-	-	-	-	-	-	-	-	-	-	18	18	-	17	1	18	-	18	19
16:00-17:00	-	-	1	1	1	2	-	-	-	-	-	-	-	-	-	-	6	6	-	5	1	6	-	6	7
17:00-18:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	6	-	6	-	6	-	6	6
18:00-19:00	-	-	2	2	1	3	-	-	-	-	-	-	-	-	-	-	3	3	-	1	1	2	-	2	4
19:00-20:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20:00-21:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21:00-22:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12hr	-	-	21	21	9	30	2	-	-	2	2	4	-	-	-	-	199	199	2	176	9	187	-	187	210
Est 16hr				23	10	33				2	2	4				-	217	217				204	-	204	

Percentage heavy goods

	Bath Street						Vernon Place						Bath Rd south						Bath Rd north						Total In
	Left	Ahead	Right	In	Out	2-Way	Left	Ahead	Right	In	Out	2-Way	Left	Ahead	Right	In	Out	2-Way	Left	Ahead	Right	In	Out	2-Way	
06:00-07:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
07:00-08:00	-	-	4	4	-	4	-	-	-	-	-	-	-	-	-	-	2	2	-	2	-	2	-	2	2
08:00-09:00	-	-	1	1	-	1	-	-	-	-	-	-	-	-	-	-	1	1	-	1	-	1	-	1	1
09:00-10:00	-	-	2	2	-	2	50	-	-	50	25	33	-	-	-	-	3	3	33	3	-	3	-	3	3
10:00-11:00	-	-	1	1	-	1	-	-	-	-	-	-	-	-	-	-	2	2	-	2	-	2	-	2	2
11:00-12:00	-	-	2	2	5	3	-	-	-	-	100	50	-	-	-	-	3	3	100	3	5	3	-	3	3
12:00-13:00	-	-	1	1	-	1	-	-	-	-	-	-	-	-	-	-	2	2	-	2	-	2	-	2	2
13:00-14:00	-	-	3	3	7	3	50	-	-	50	-	25	-	-	-	-	2	2	-	2	7	2	-	2	2
14:00-15:00	-	-	1	1	6	2	-	-	-	-	-	-	-	-	-	-	1	1	-	1	6	2	-	2	2
15:00-16:00	-	-	1	1	3	1	-	-	-	-	-	-	-	-	-	-	2	2	-	2	3	2	-	2	2
16:00-17:00	-	-	1	1	3	1	-	-	-	-	-	-	-	-	-	-	0	0	-	0	3	1	-	1	1
17:00-18:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	-	1	-	1	-	1	0
18:00-19:00	-	-	2	2	6	2	-	-	-	-	-	-	-	-	-	-	0	0	-	0	6	0	-	0	0
19:00-20:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20:00-21:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21:00-22:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12hr	-	-	1	1	3	2	7	-	-	7	7	7	-	-	-	-	1	1	11	1	3	2	-	2	2
Est 16hr				1	3	2				7	7	7				-	1	1				2	-	2	

Data input	
04/05/2010	Est AADT = 12hr all motor vehicles * 1.1
00:00:00	Est HGV 16hr = 12hr HGV * 1.09

Appendix C: Plan of proposed North West Cheltenham Extension