



# CHEL TENHAM

## BOROUGH COUNCIL

# 2017 Air Quality Annual Status Report (ASR)

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

June 2017

**Cheltenham Borough Council**

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## Executive Summary: Air Quality in Our Area

### Air Quality in Cheltenham

Air pollution is associated with a number of adverse health impacts. It is recognised as a contributing factor in the onset of heart disease and cancer. Additionally, air pollution particularly affects the most vulnerable in society: children and older people, and those with heart and lung conditions. There is also often a strong correlation with equalities issues, because areas with poor air quality are also often the less affluent areas<sup>1,2</sup>.

The annual health cost to society of the impacts of Particulate Matter alone in the UK is estimated to be around £16 billion<sup>3</sup>.

The main air quality issues within the borough of Cheltenham are almost exclusively as a result of vehicular emissions in distinct town centre locations.

There are limited sources of emissions from permitted industrial/commercial processes within the borough but these are located outside the town centre and are not a contributory factor regarding those areas coming near to, or failing, the air quality objective limit values. There have been no new major sources of emissions.

The principal pollutant of concern is Nitrogen Dioxide (NO<sub>2</sub>), from vehicle emissions. Other pollutants, for example Particulate Matter and Ozone, have historically been measured by roadside monitoring equipment, but protracted measurement over many years has shown that those pollutants come well below the limit values. For that reason measurement of those pollutants has been discontinued.

Nitrogen Dioxide has been measured in Cheltenham since 1996. This was carried out by affixing passive measuring devices (commonly known as “diffusion tubes”) throughout the borough, at various roadside locations. The Council was then able to build up a picture of the worst air pollution areas in Cheltenham as a result of vehicular traffic.

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<sup>1</sup> Environmental equity, air quality, socioeconomic status and respiratory health, 2010

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

<sup>3</sup> Defra. Abatement cost guidance for valuing changes in air quality, May 2013



In addition to the passive measuring devices around the town, 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 installation is compared with data obtained from co-located diffusion tubes.

Each year the Council is obliged to report its annual findings to DEFRA, in particular to state how many of its annualised readings breached the air quality objective limits.

The annual monitoring of Nitrogen Dioxide over previous years has shown marginal fluctuation in those results. This is mainly due to differing temperature and weather conditions from year to year (particularly cold spells increase NO<sub>2</sub> results) whilst vehicular traffic flows have remained fairly constant.

The Council decided at the end of 2015 to reduce the number of diffusion tubes for measurement in 2016; some locations exhibited year-on-year low results (and where it was reasonable to presume that at some point in the future the limit values would not be breached), and some locations had several tubes located near to each other in already poor areas of air quality (again it was reasonable to presume that those areas would not see an improvement in air quality). It was decided to leave diffusion tubes in areas of known poor air quality (either previously breached, or come close to, air quality limit values), where there was a change in traffic flow (two-way traffic as

a result of Traffic Regulation Order), or where new housing became located near to the above.

Bias adjusted measurements obtained in 2016 indicate that only three sites breached the air quality limit value for Nitrogen Dioxide.

The poor air quality in central Cheltenham resulted in the declaration of the whole Borough, in 2011, as an Air Quality Management Area (AQMA).

The poor air quality is almost solely as a result of vehicular activity within the town centre area, which cannot be easily addressed. Areas outside of the town centre consistently meet the air quality objectives.

In order to address the failures of the air quality objectives at a small number of distinct locations an Air Quality Action Plan was required.

Continued monitoring during 2016 showed a slight decrease in Nitrogen Dioxide levels compared to 2015 levels. The annual mean Nitrogen Dioxide levels at three locations were still being exceeded in 2016 which means the existing AQMA declaration remains justified.

## **Actions to Improve Air Quality**

The Cheltenham Air Quality Action Plan was released in April 2014 and proposed 20 separate initiatives. These mainly consisted of promoting alternative modes of travel, various traffic/highway measures, and a change to Planning Policy.

Some of the above initiatives are currently being addressed both separately and jointly at County and District level. Gloucestershire County Council's Sustainable Transport Plan & Fund aims to achieve a modal shift to public transport, cycling & walking. The Cheltenham Transport Plan aims to reduce vehicle use leading to improved air quality. The Gloucestershire initiative *Thinktravel* provides information & resources for sustainable travel in Gloucestershire. The initiative can be found here [www.thinktravel.info](http://www.thinktravel.info). More detailed information regarding these initiatives is given below, within the main body of the report.

## Local Priorities and Challenges

The Local Priority is to continue working with the County Council and other partners to continually look at further ways to bring air quality within limit values. Various traffic schemes are proposed for 2017 which may have a measureable effect on the worst air quality areas within the town centre.

There are funding and resource challenges to overcome before some initiatives can be implemented.

## How to Get Involved

Members of the public can do their bit by choosing alternative means of transport, particularly in the winter months. Firstly, think...

“Can I get into town without using the car?” Perhaps dig out that old bike?

“It’s a nice day, I think I’ll walk”. In fact at some times of the day your walk can almost take the same time as it does to drive. You’ll get fitter and feel better for it.

How about taking the bus and let somebody else do the driving whilst you relax?

Do you have any work colleagues who live nearby and would like to share the cost of taking the car? You’ll not only reduce your costs at least by half (the more who share, the greater the savings), but save on wear and tear, and mileage increases on your vehicles.

If living outside Cheltenham then perhaps think of our Park and Ride facilities (pay for the bus fare and receive free parking).

How about walking your child to school? Not only will the reduction in vehicles bring improved air quality, but you and your child will have the added benefit from the exercise.

Local schools can continue their work in persuading the parents of their students to encourage their children to walk or cycle to school and leave the car at home.

User greener and cleaner vehicles (Electric Vehicles, Hybrid, LPG, etc.)

Lead by example and champion better air quality.

# Table of Contents

<b>Executive Summary: Air Quality in Our Area</b> .....	<b>1</b>
<b>Air Quality in Cheltenham</b> .....	1
Actions to Improve Air Quality .....	3
Local Priorities and Challenges.....	4
How to Get Involved.....	4
<b>1 Local Air Quality Management</b> .....	<b>7</b>
<b>2 Actions to Improve Air Quality</b> .....	<b>8</b>
2.1 Air Quality Management Areas.....	8
2.2 Progress and Impact of Measures to address Air Quality in Cheltenham .....	12
2.3 PM <sub>2.5</sub> – Local Authority Approach to Reducing Emissions and or Concentrations.....	23
<b>3 Air Quality Monitoring Data and Comparison with Air Quality Objectives and National Compliance</b> .....	<b>24</b>
3.1 Summary of Monitoring Undertaken .....	24
3.1.1 Automatic Monitoring Sites .....	25
3.1.2 Non-Automatic Monitoring Sites.....	26
3.2 Individual Pollutants .....	27
3.2.1 Nitrogen Dioxide (NO <sub>2</sub> ).....	27
3.2.2 Particulate Matter (PM <sub>10</sub> ).....	30
3.2.3 Particulate Matter (PM <sub>2.5</sub> ) .....	30
<b>Appendix A: Monitoring Results</b> .....	<b>31</b>
<b>Appendix B: Full Monthly Diffusion Tube Results for 2016</b> .....	<b>35</b>
<b>Appendix C: Annual Mean Diffusion Tube Results for 2012 - 2016</b> .....	<b>37</b>
<b>Appendix D: Supporting Technical Information / Air Quality Monitoring Data QA/QC</b> .....	<b>39</b>
<b>Ratified data from NO<sub>2</sub> analyser on St Georges Road - Swindon Road junction</b> .....	<b>43</b>
<b>Appendix E: Map(s) of Monitoring Locations</b> .....	<b>44</b>
<b>Appendix F: Summary of Air Quality Objectives in England</b> .....	<b>46</b>
<b>Glossary of Terms</b> .....	<b>47</b>
<b>References</b> .....	<b>48</b>

## List of Tables

Table 2.1 Declared Air Quality Management Areas.....	12
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Table 2.2	Progress on Measures to Improve Air Quality.....	15
Table A.1	Details of Automatic Monitoring Sites.....	31
Table A.2	Details of Non-Automatic Monitoring Sites.....	32
Table A.3	Annual Mean NO <sub>2</sub> Monitoring Results.....	34
Table A.4	1-Hour Mean NO <sub>2</sub> Monitoring Results.....	34
Table B.1	NO <sub>2</sub> Monthly Diffusion Tube Results – 2015.....	35
Table C.1	NO <sub>2</sub> Annual Mean Diffusion Tube Results – 5 years .....	37
Table E.1	Air Quality Objectives included in Regulations for the purpose of Local Air Quality Management in England.....	46

### List of Figures

Fig 2.1	Air Quality Management Area 2008 .....	8
Fig 2.2	Air Quality Management Area declared in 2011 .....	9
Fig 2.3	Locations of Nitrogen Dioxide exceedences in Cheltenham in 2016 .....	10
Fig 3.1	Trends in Annual Mean Nitrogen Dioxide Concentrations measured at Diffusion Tube Monitoring Sites .....	29
Fig D.1	Copy of Diffusion Tube Co-location study calculation of Precision and Bias Adjustment 2016 .....	42
Fig D.2	Air Quality Statistics 2016 .....	43
Fig D.3	Air Quality Exceedences 2016 .....	43
Fig E.1	Location of NO <sub>2</sub> Automatic Monitoring Station .....	44
Fig E.2	Roadside monitoring station at St Georges Street/Swindon Road .....	44
Fig E.3	Map of Non-Automatic Monitoring Sites 2016 .....	45
Fig E.4	Map of Town Centre non-automatic monitoring sites 2016 .....	45



# 1 Local Air Quality Management

This report provides an overview of air quality in Cheltenham during 2016. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) and the relevant Policy and Technical Guidance documents.

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

The statutory air quality objectives applicable to LAQM in England can be found in Table E.1 in Appendix E.

## 2 Actions to Improve Air Quality

### 2.1 Air Quality Management Areas

Air Quality Management Areas (AQMAs) are declared when there is an exceedance or likely exceedance of an air quality objective. After declaration, the authority must prepare an Air Quality Action Plan (AQAP) within 12-18 months setting out measures it intends to put in place in pursuit of the objectives.

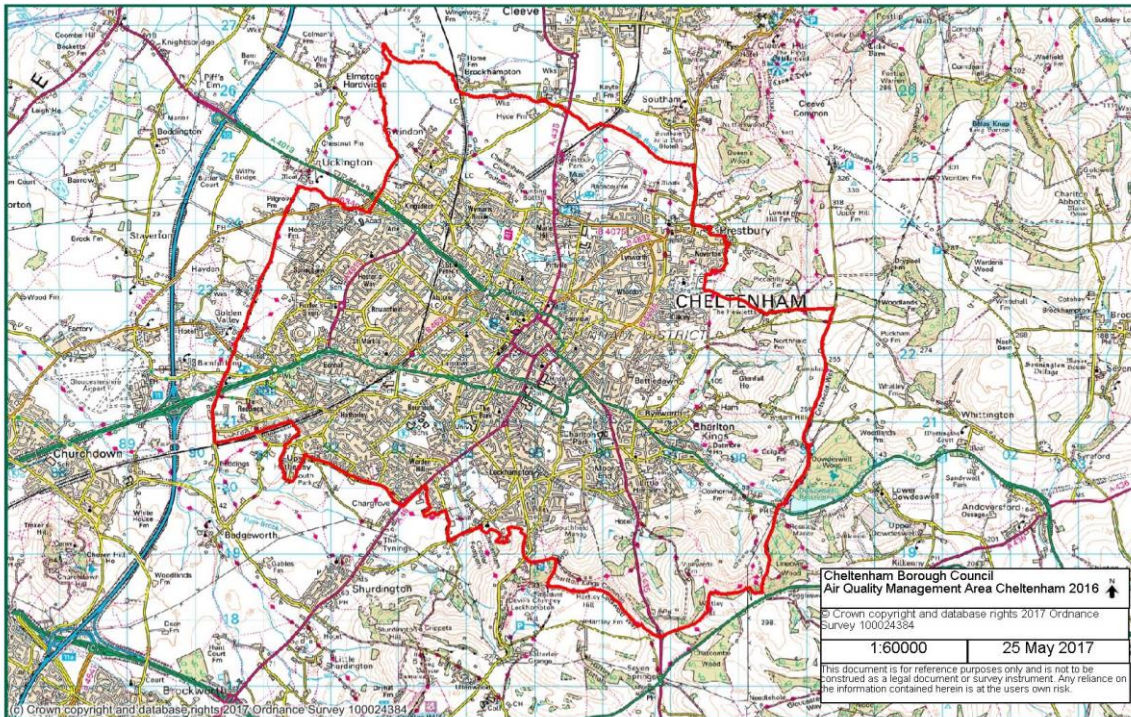
Subsequent monitoring since 1996 highlighted several distinct areas of exceedance of EU limit values in the town centre due to road traffic. This led to the declaration in 2008 of a section of Bath Road/High Street as an Air Quality Management Area (AQMA).

**Fig 2.1 Air Quality Management Area 2008**



It was decided in 2011, as several other distinct town centre locations were also requiring individual declaration as AQMAs, that instead of several small AQMAs the whole of the Borough Council area would be declared as an AQMA.

**Fig 2.2 Air Quality Management Area declared in 2011**



The declaration of the whole of the Borough does not mean that areas outside the town centre have poor air quality. Far from it. The levels are reasonably good and almost all monitoring of Nitrogen Dioxide levels in the Borough come well within EU limit values.

Information on the Air Quality Management Area in Cheltenham can be found here [https://www.cheltenham.gov.uk/info/66/environmental\\_protection\\_and\\_pollution/288/air\\_quality/3](https://www.cheltenham.gov.uk/info/66/environmental_protection_and_pollution/288/air_quality/3)

Of the areas monitored, approximately 4 distinct locations still give cause for concern, year-on-year, regarding annual failure of EU limit values for Nitrogen Dioxide. The other locations are used to monitor representative background levels in areas outside of the town centre, and also where the Council might see some change

in traffic load due to development or change in road layout and establish limits of failure.

The remaining air quality hotspots are

- the lower high street, from its junction with Poole Way up to and including the junction at Gloucester Road
- parts of the A4019 looping to the north perimeter of the town centre (in particular Swindon Road and Fairview)
- where the Upper High Street turns into Bath Road (towards the east of the town centre)
- the busy traffic light junction at the intersection of London Road, College Road, Hewlett Road and High Street

As can be seen this is the route of traffic from the west or east coming into and arriving at the town centre, either to park within the town centre area or skirting it to the north, and then leaving it at Tewkesbury Road or London Road.

**Fig 2.3 Locations of Nitrogen Dioxide exceedences in Cheltenham in 2016**



A summary of AQMAs declared by Cheltenham Borough Council can be found in Table 2.1. Further information related to declared or revoked AQMAs, including maps of AQMA boundaries are available online at

[https://www.cheltenham.gov.uk/info/66/environmental\\_protection\\_and\\_pollution/288/air\\_quality](https://www.cheltenham.gov.uk/info/66/environmental_protection_and_pollution/288/air_quality)

However at the beginning of 2017, having looked at year-on-year results (which are consistently below the limit values for almost the whole of the Borough), the Council is now considering revoking the current borough-wide AQMA in favour of a much smaller linear route across the north of the town centre, which has consistently given poor air quality results. It was felt that air quality initiatives undertaken outside the know area of poor air quality, whilst being credible and useful in reducing overall air quality in the borough (e.g. cycling/walking routes, etc.), was a diversion of resources to address the worst air quality areas.

The new AQMA would: -

- Illustrate to visitors, residents, and prospective purchasers of properties within Cheltenham that the whole of the Borough is NOT an area of poor air quality
- Allow more concerted and targeted action, by the District and County Councils and their partners, to address the known areas of poor air quality.

The proposed new AQMA is under consideration and will be subject to the necessary procedures before it can go to Council for approval.

It is intended that should the new AQMA be approved, and declared by Order, then the previous AQMA will be revoked at the same time. This would be followed by a new Air Quality Action Plan to address poor air quality in the new AQMA.

Once the new AQMA is declared then it will be easier to concentrate resources in that area in order to combat exceedences, hopefully leading to subsequent compliance with air quality limit values.

Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Pollutants and Air Quality Objectives	City / Town	One Line Description	Action Plan
Cheltenham Borough Council Air Quality Management Area	NO <sub>2</sub> annual mean	Cheltenham	The whole of the Cheltenham Borough Council area, amalgamating several earlier, separate AQMAs	Air Quality Action Plan 2014 <a href="https://www.cheltenham.gov.uk/downloads/file/3780/air_quality_action_plan_2014">https://www.cheltenham.gov.uk/downloads/file/3780/air_quality_action_plan_2014</a>

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

A range of proposals were highlighted within the Council's Air Quality Action Plan (AQAP) 2014, which included trying to encourage drivers to use alternative modes of travel (walking, cycling, etc.), or to alter traffic flow direction in order to ease congestion and thereby improve air quality.

Cheltenham Borough Council has taken forward a number of measures since 2014 and up to the reporting year of 2016 in pursuit of improving local air quality. Some of the measures in the AQAP have since been completed. Details of these can be found in previous air quality reports available from the Council's website. Details of the remaining measures in progress or planned are set out in Table 2.2. More detail on these measures can be found in the Cheltenham Air Quality Action Plan, here: [https://www.cheltenham.gov.uk/downloads/file/3780/air\\_quality\\_action\\_plan\\_2014](https://www.cheltenham.gov.uk/downloads/file/3780/air_quality_action_plan_2014)

Key completed measures are:

Highway improvements. A 2-way traffic scheme at Albion Street was completed in 2016. The Council is currently monitoring with a diffusion tube adjacent to residential premises on this highway, to assess whether the 2-way system will result in a breach of the NO<sub>2</sub> limit values. A breach is not expected at this location due to low traffic rate.

A Cheltenham Borough Council 20mph Cabinet Member Working Group was set up in 2016 to look at the potential for reducing the urban traffic speed limit to 20mph in some areas to reduce congestion and improve traffic flow on busier roads.

Phase 1 of the Wayfinding Initiative was completed 2016. Totems and signage were installed.

Increase Car Sharing. Parish Lift', a new community car sharing scheme was developed in 2016 to help support social inclusivity and rural accessibility across the Cotswolds Area of Outstanding Natural Beauty (AONB). The scheme compliments the current Carshare Gloucestershire initiative and is being funded by Communities Connected, a Community Interest Company (CIC).

Cheltenham Borough Council expects the following measures to be completed over the course of the next reporting year:

Highway Improvements. The Cheltenham Transport Plan is implemented in four phases. Phase 2 will be completed in the Spring of 2017, Phase 3 and 4 in Autumn 2017.

Further Park and Ride schemes are proposed and will include the new Elmbridge scheme on the outskirts of Gloucester due to completed in 2017, which will assist in reducing car travel to and from Cheltenham.

Promotion of greener vehicles will continue. Electric car charging points are due to be installed on the Promenade in 2017.

Wayfinding Initiative. Phase 2 of this initiative will commence in the Spring of 2017.

HGV & LGV restrictions. As part of the Cheltenham Transport Plan Ph4 (Boots Corner) there will be HGV & LGV restrictions to encourage deliveries during the quieter footfall periods of the day to reduce the pedestrian – HGV interface and reduce congestion during peak traffic hours.

In subsequent years the following proposals are tabled for commencement and/or completion:

The Cheltenham High Street Project will commence in the Spring of 2018 and will involve environmental improvements such as planting, drainage work under SUDS, and additional street furniture to encourage walking, such as cycle parking, etc.

There is a Bath Road Safety Scheme also tabled which will look to fund tree planting and SUDS, and will incorporate an enhanced cycle infrastructure.

A further Park and Ride scheme at Elms Park, Tewkesbury Road (to the west of Cheltenham) forms part of the Bloor Homes/Persimmon Homes Development, which should come on-line in 2018.

The Cheltenham Borough Council Staff Travel Plan has been adopted in 2016, implementation to take place between 2016 and 2019.

Planning Policy for Air Quality - An Air Quality Policy will be adopted as part of the emerging Cheltenham Local Plan (due 2017-2018), to ensure that air quality impacts of all significant developments are properly assessed and mitigation actions taken where necessary. This will integrate with Cheltenham's Air Quality Action Plan.

Vehicle Management Signage - Through the Cheltenham Transport Plan and the CBC Car Parking Strategy the Borough Council will work with the County Council on the implementation of electronically operated Vehicle Management Signage to inform drivers of the nearest available car parking spaces and alert drivers of possible congestion. The County and District Councils in 2016 jointly bid for funding for the above works.

Certain measures are ongoing and need to adapt to changing local conditions. The Borough Council will continue to provide up to date Air Quality Information, will promote Park & Ride schemes, encourage the development of Workplace Travel Plans, promote green planting in urban areas, and continue to provide Cycle Safety Improvements, the latest project being "Barriers to Cycling" due to commence in 2017.



Table 2.2 – Progress on Measures to Improve Air Quality

Measure No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
1	Highways improvements	Transport Planning and Infrastructure	Strategic highway improvements, Re-prioritising road space away from cars, including Access management, Selective vehicle priority, bus priority, high vehicle occupancy lane	Gloucestershire County Council	2013-14	2016-17	Reduction in through traffic and improved access to car parks. Reduced congestion at key junctions	1-2%	A range of highway amendments have taken place are others planned, subject to traffic regulation orders. In 4 phases.	2017	Phase 2 will be completed in the Spring of 2017, Phases 3 and 4 in Autumn 2017. MOVA traffic lights will be installed with 27 sensors across town monitoring traffic flow.
2	Air Quality Information	Public Information	Via the Internet	Cheltenham Borough Council	2014-2015	2015-16	Hit counter on webpage	< 0.1%	Up to date Air Quality information available on CBC website	Ongoing	Emission reductions directly attributable to this action cannot be measured
3	Promotion of Park & Ride	Alternatives to private vehicle use	Bus based Park & Ride	Gloucestershire County Council	2014-15	2014-16	Reduced car travel into & out of Cheltenham	0.1-1%	Improved signage installed at Arle Court.	2018	Elmbridge scheme on the outskirts of Gloucester due to complete in 2017, which will assist in reducing car travel to and from Cheltenham. A further scheme at Elms Park, Tewkesbury Road (to the west of Cheltenham) forms part of the Bloor Homes/Persimmon Homes Development, which should come on-line in 2018.

## Cheltenham Borough Council

Measure No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
4	Promotion of greener vehicles	Promoting low emission transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging	Gloucestershire County Council	2012	2013-2015	Charge point usage data	< 0.5%	Electric charging points (fast) are installed at Regent Arcade, Montpellier Street and Arle Court Park and Ride site. Rapid chargers are installed at Cheltenham Chase Hotel (Brockworth) and Compass Holidays (Cheltenham Railway Station). Promenade due 2017.	2017	The Borough and County Councils continue to encourage electric vehicle use through the installation of charging points in car parks or on-street. Cheltenham and Gloucestershire County councils will also investigate the potential for differential parking charges for electric and hybrid vehicles on street and in car parks. The Borough currently provide energy free of charge at its car park charging points.
5	HGV Restrictions	Freight and delivery management	Route Management Plans/ Strategic routing strategy for HGV's	Gloucestershire County Council	2014	2015	Traffic count data	< 0.5%	None	2017	As part of the Cheltenham Transport Plan Ph4 (Boots Corner) there will be HGV & LGV restrictions to encourage deliveries during the quieter footfall periods of the day to reduce the pedestrian – HGV interface and reduce congestion during peak traffic hours.

## Cheltenham Borough Council

Measure No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
6	Increased car sharing	Alternatives to private vehicle use	Car & lift sharing schemes	Gloucestershire County Council	2013	2015	Traffic count data	0.1%	A new website has been launched with promotional work taking place at businesses and on street across Cheltenham via flyers and face to face discussions. New road signage is installed.	2016	'Parish Lift', a new community car sharing scheme was developed in 2016 to help support social inclusivity and rural accessibility across the Cotswolds Area of Outstanding Natural Beauty (AONB). The scheme compliments the current Carshare Gloucestershire initiative and is being funded by Communities Connected, a Community Interest Company (CIC). Parish Lift is an online platform designed to help match registered users, whether they be drivers or people seeking a 'lift'.
7	Business Travel Grants	Promoting low emission transport	Other	Gloucestershire County Council	2013	2014-15	Uptake of grants	< 0.1%	Grants completed in 2015	2016	Although the grant process was completed in 2015, a business engagement programme was undertaken in 2016 to promote sustainable travel to businesses and encourage a reduction in car trips.

## Cheltenham Borough Council

Measure No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
8	Wayfinding Initiative	Promoting travel alternatives	Promotion of walking	Gloucestershire County Council	2013	2014-15	None	< 0.1%	Signage installed	2017	Phase 1 of the Wayfinding Initiative completed 2016. Totems and signage installed. Work is ongoing. Phase 2 of this initiative will commence in the Spring of 2017.
9	Promote workplace travel plans	Promoting travel alternatives	Personalised travel planning	Cheltenham Borough Council	2014	2015	Whether or not a plan is implemented	< 0.1%	None	2015-16	Cheltenham Borough Council will develop its own workplace 'smarter' travel plan where resources allow and encourage larger businesses in Cheltenham to develop and implement similar plans. This will encourage more sustainable transport choices such as bus travel, car-sharing, cycling and walking.
10	Air Quality Planning Policy	Policy guidance and development	Air Quality planning and policy guidance	Cheltenham Borough Council	2013	2015	Air Quality Planning Policy adopted	Unknown but potentially significant - >1%	Planning for Air Quality A good practice guide for Planners and Developers published in March 2013	2017	An Air Quality Policy will be adopted as part of the emerging Cheltenham Local Plan (due 2017-2018), to ensure that air quality impacts of all significant developments are properly assessed and mitigation actions taken where necessary. This will integrate with the Council's AQAP.

## Cheltenham Borough Council

Measure No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
11	Traffic light appraisal	Traffic Management	Strategic highway improvements, Re-prioritising road space away from cars, including Access management, Selective vehicle priority, bus priority, high vehicle occupancy lane	Gloucestershire County Council	2014	2015-17	Number of traffic lights removed & traffic count/speed data	Potentially significant at current areas of poor air quality	Under the Cheltenham Transport Plan 2 sets of traffic lights have been removed.	2017	Evidence suggests that where traffic lights have been removed, traffic often flows better with less congestion thereby reducing air pollution.
12	Bus and Taxi quality partnership	Promoting low emission transport	Other	Gloucestershire County Council	2014	2015-16	Anecdotal	Unknown	None	2016	The Council's AQAP proposed a Bus and Taxi Quality Partnership, to obtain an agreement with the main taxi and bus operators to encourage fuel efficient driving, no-idling when stationary and training in safe driving practices. This was to assist in reducing vehicle emissions. The Council will also look at bus routing and location of bus stops in light of the proposed junction priority changes under the LSTF scheme.

## Cheltenham Borough Council

Measure No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
13	Twenty Is Plenty	Traffic management	Reduction of speed limits, 20mph zones	Cheltenham Borough Council	2014-15	2015-17	Traffic count / Speed data	< 0.5%	None	Ongoing	Cheltenham and Gloucestershire County Council will look at the potential for reducing urban traffic speed limit to 20mph in some areas to reduce congestion and improve traffic flow on busier roads, which may improve highway safety for cyclists and pedestrians as well as improve air quality. At Cheltenham Borough Council a 20mph Cabinet Member Working Group was set up in 2016 to look at such measures.
14	A lower emission bus fleet	Vehicle fleet efficiency	Promoting low emission public transport	Cheltenham Borough Council	2013	2014-16	Bus fleet data	0.5%	Initial funding bid to Government failed but received positive response.	Ongoing	The main bus fleet in Cheltenham and Gloucester has recently purchased 8 new Euro 6 buses.

## Cheltenham Borough Council

Measure No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
15	Green planting	Traffic management	Other	Cheltenham Borough Council	2014	2014-16	Number of urban planning applications with green planting schemes adopted	< 0.1%	None	Ongoing	Cheltenham Borough Council will seek to encourage green planting through planning control to help off-set potential pollution impacts where developments occur in areas of poorer air quality. Such measures include planting through planning controls, on CBC parks and property, and on Highways, which is ongoing and planting as part of street enhancement schemes (particularly through the Cheltenham Transport Plan) scheduled between 2016-2019.

## Cheltenham Borough Council

Measure No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
16	Vehicle management signage	Traffic management	Other	Cheltenham Borough Council	2014	2014-18	Traffic count data	< 0.1%	Air Quality Grant Scheme bid submitted in 2016	2018	Through the Cheltenham Transport Plan and the CBC Car Parking Strategy the Borough Council will work with the County Council on the implementation of Vehicle Management Signage. This proposal is for the installation of electronically operated signs to inform drivers of the nearest available car parking spaces and alert drivers of possible congestion. This may encourage more sustainable transport choices and reduce traffic queues which will improve air quality. This is likely to commence in 2018.
17	Cycle safety improvements	Transport planning and infrastructure	Cycle network	Cheltenham Borough Council	2014	2014-16	Number of cyclists and accident & injury statistics	< 0.1%	None	Ongoing	Improvements to cycle priorities at some junctions will be implemented with Measure 1 above. "Barriers to Cycling-Cheltenham" project due 2017.



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

As detailed in Policy Guidance LAQM.PG16 (Chapter 7), local authorities are expected to work towards reducing emissions and/or concentrations of PM<sub>2.5</sub> (Particulate Matter with an aerodynamic diameter of 2.5µm or less). There is clear evidence that PM<sub>2.5</sub> has a significant impact on human health, including premature mortality, allergic reactions, and cardiovascular diseases.

No PM<sub>2.5</sub> monitoring was carried out by Cheltenham Borough Council during the period covered by this report. Historical Urban Background monitoring up to 2009 did not identify any exceedance of PM<sub>10</sub> levels, which correlate closely with PM<sub>2.5</sub> levels, but it is possible that roadside locations near to busy roads and junctions could exhibit elevated levels of PM<sub>2.5</sub>.

Unfortunately there is no currently practical or affordable method for measuring PM<sub>2.5</sub> levels at roadside locations where there is potential exposure in Cheltenham.

This Local Authority will look at measures to include consideration of PM<sub>2.5</sub> for ASRs subsequent to this one.

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

### 3.1 Summary of Monitoring Undertaken

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

2011: Progress Report

2011: Detailed Assessment for Cheltenham for Nitrogen Dioxide

2012: Updating and Screening Assessment

2013: Progress Report

2014: Progress Report

2015: Updating and Screening Assessment

2016: Annual Status Report

A Detailed Assessment was completed for Bath Road and High Street in 2007 where an exceedance of the annual mean objective for NO<sub>2</sub> 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.

The 2010 Progress Report identified a number of new locations in Cheltenham which had exceeded the annual mean objective for NO<sub>2</sub>. Following submission of a detailed assessment report in 2011, the existing AQMA was revoked and a new AQMA covering the whole of Cheltenham Borough was declared in relation to a likely breach of the Nitrogen Dioxide (annual mean) objective at a total of seven locations, including the old AQMA area (see Figure 1.2).

During 2016 the number of locations in Cheltenham that breached the annual mean objective for NO<sub>2</sub> has decreased to three (see figure 1.3), down from eleven the year before. The AQMA designation nevertheless remains justified as a result of the continued breaches at these locations.

No other air pollutants are monitored in Cheltenham since previous rounds of review and assessment demonstrated that no breaches were likely.

### 3.1.1 Automatic Monitoring Sites

This section sets out what monitoring has taken place and how it compares with the air quality objectives (see Appendix E below).

A roadside monitoring unit is installed at the junction of Swindon Road and St Georges Street, Cheltenham where exceedance of Nitrogen Dioxide (annual mean) had been recorded nearby from previous diffusion tube monitoring data. The unit measures NO<sub>x</sub>, NO<sub>2</sub> 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.

Cheltenham Borough Council undertook automatic (continuous) monitoring at one site during 2016. Table A.1 in Appendix A shows the details of the site. National monitoring results are available at <https://uk-air.defra.gov.uk/networks/find-sites>

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

### 3.1.2 Non-Automatic Monitoring Sites

In 2016 Cheltenham Borough Council undertook non-automatic (passive) monitoring of NO<sub>2</sub> at thirty locations throughout the Borough, on a month-by-month basis. Maps showing the location of the monitoring sites are provided in Appendix D. Table A.2 in Appendix A shows the details of the sites. Further details on Quality Assurance/Quality Control (QA/QC) and bias adjustment for the diffusion tubes are included in Appendix C.

The previous year fifty three locations were chosen for monitoring purposes as they represented a mix of areas where

- higher levels of Nitrogen Dioxide were expected (almost exclusively as a result of vehicular traffic),
- normal levels of air quality are to be expected (to be able to make a comparison with the worst areas).

However it was clear from previous yearly results that some of the measurement locations came nowhere near the limits values for Nitrogen Dioxide, and there was no expectation that this situation would change in forthcoming years. For that reason it was decided to discontinue monitoring in those areas.

Further it could be seen that adjacent tubes in already known poor areas of air quality were not contributing their results to the overall picture in those areas. For that reason any tubes found to be duplicating nearby results were removed and amalgamated into single monitoring points.

Looking at the results of those monthly measurements of Nitrogen Dioxide, and ignoring those locations not breaching the annual air quality limit for that pollutant, one can clearly see that the measurements affecting the worst areas for Nitrogen Dioxide are located in a relatively short vehicular route skirting the town centre to the north.

The highest readings for any of our monitoring tubes occur in the winter months, generally between November and February. The results obtained from this monitoring have the effect of pushing the rest of the months' readings over the annual limit values. Monitoring in the summer months shows that readings can be almost half of what they are in the winter months.

## Details of Bias Adjustment

The 30 diffusion tubes monitored during 2016 across the Borough of Cheltenham have a monthly exposure period. Three of those tubes are located adjacent to the Council's St Georges Street roadside monitoring unit, in order to assess the difference in accuracy between the tubes and the monitoring device, which is calibrated monthly. This is termed a "co-location" study.

For 2016 the Bias Adjustment factor applied to the diffusion tube data was a Local Bias Adjustment Factor obtained from the co-location diffusion tube study. The bias adjustment value for 2016 was 1.01.

## 3.2 Individual Pollutants

The air quality monitoring results presented in this section are, where relevant, adjusted for "annualisation" and bias. Further details on adjustments are provided in Appendix C.

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

Cheltenham Borough Council currently only monitors for exceedance of the Nitrogen Dioxide limit values.

Table A.3 in Appendix A compares the ratified and adjusted monitored NO<sub>2</sub> annual mean concentrations for the past 5 years with the air quality objective of 40µg/m<sup>3</sup>.

The most recent trend, as indicated in Figure 3.1 below, saw a decrease in limit values compared to the previous year, which is encouraging. N.B. The locations used for the trend data are those expected to remain monitored for the foreseeable future, whilst some trend data in previous air quality reports used locations which have now been discontinued.

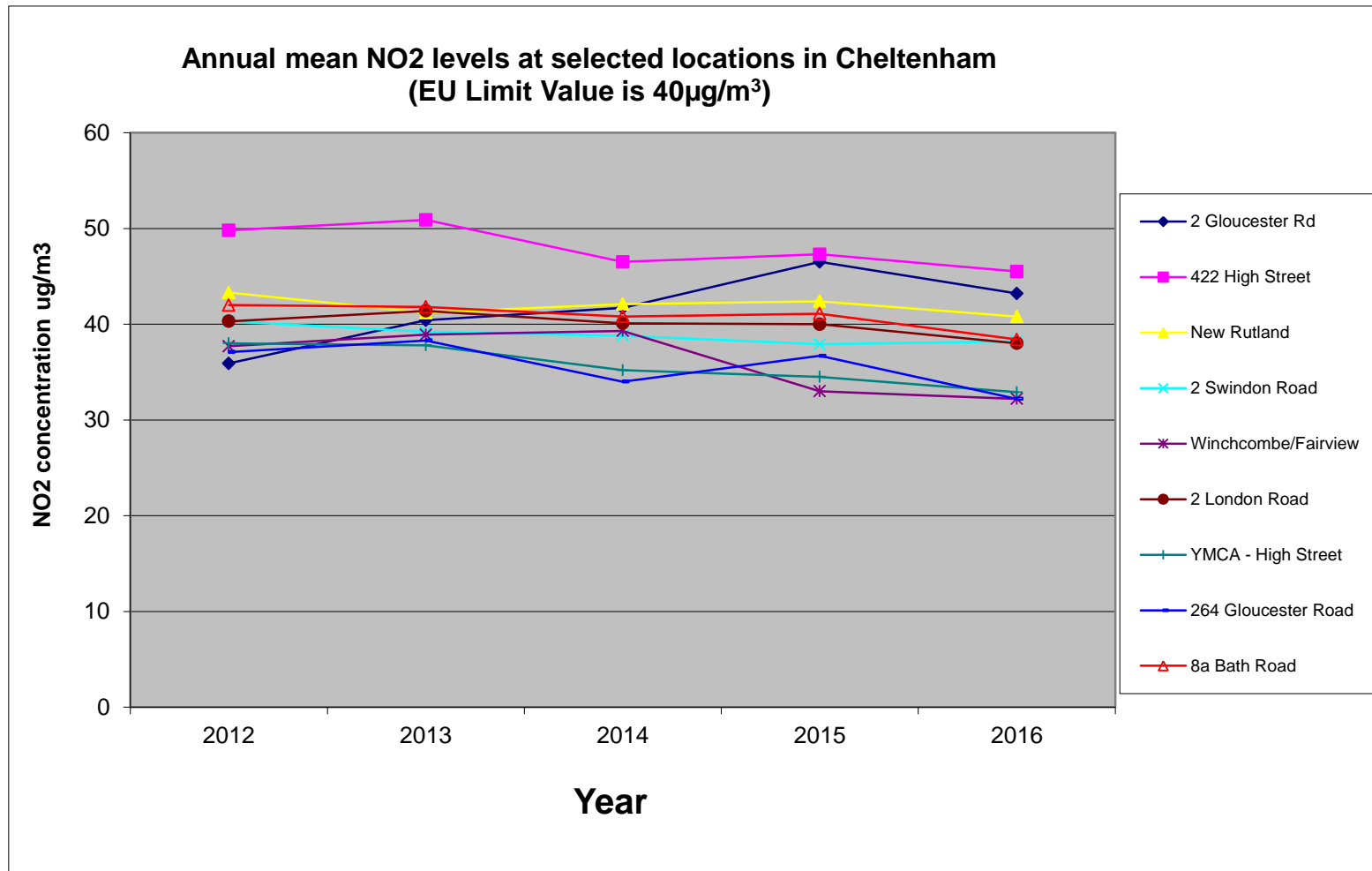
For diffusion tubes, the full 2016 dataset of bias-adjusted monthly mean values is provided in Appendix B. All diffusion tube measurements were within the AQMA of Cheltenham Borough Council and all were at locations of relevant exposure.

Whilst the trend data for 2016 indicates a downward trend in levels of Nitrogen Dioxide levels, this may be due to temperature fluctuations during the winter months. However it is likely that some of the reduction can be directly attributed to actions

taken in line with the Council's Air Quality Action Plan, for example encouraging alternative forms of travel (e.g. cycling) and highways improvements.

Table A.4 in Appendix A compares the ratified continuous monitored NO<sub>2</sub> hourly mean concentrations for the past 5 years with the air quality objective of 200µg/m<sup>3</sup>, not to be exceeded more than 18 times per year. No annual means were greater than 60µg/m<sup>3</sup>, which indicates that an exceedance of the 1-hour mean objective is also unlikely at these sites.

Fig 3.1 Trends in Annual Mean Nitrogen Dioxide Concentrations measured at Diffusion Tube Monitoring Sites



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

No PM<sub>10</sub> 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 PM<sub>10</sub> levels, it is possible that roadside locations near to busy roads and junctions could exhibit elevated levels of PM<sub>10</sub>.

Unfortunately there is no currently practical or affordable method for measuring PM<sub>10</sub> levels at roadside locations where there is potential exposure in Cheltenham.

### 3.2.3 Particulate Matter (PM<sub>2.5</sub>)

No Particulate Matter (PM<sub>2.5</sub>) monitoring was undertaken in 2016 as at that time no threshold limit values were stipulated. Cheltenham Borough Council will be considering the extent of monitoring required to satisfy subsequent Annual Status Reports.



## Appendix A: Monitoring Results

Table A.1 – Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) <sup>(1)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Inlet Height (m)
CM1	St Georges Street	Kerbside	394760	228878	NO <sub>2</sub>	Y	Chemiluminescence	0	2.4	1.3

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

(2) N/A if not applicable.

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

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Height (m)	Pollutants Monitored	In AQMA ?	Tube collocated with a Continuous Analyser?	Relevant Exposure ?	Distance to kerb of nearest road (m) <sup>(2)</sup>	Does this Location Represent Worst-Case Exposure?
1	179 Bath Road	Roadside	394614	221153	3.0	NO2	Y	N	Y	2m	Y
2	261 London Road										
3	81 London Road	Roadside	395660	221670	2.7	NO2	Y	N	Y	5m	Y
4	Prestbury Post Office	Roadside	397009	223888	2.7	NO2	Y	N	Y	2m	Y
5	170 Prestbury Road	Roadside	395977	223320	2.7	NO2	Y	N	Y	2m	Y
6	113 Winchcombe Street	Roadside	395294	222815	2.7	NO2	Y	N	Y	2M	Y
7	Morris Hill Close	Roadside	393793	224622	2.6	NO2	Y	N	Y	2M	Y
8	Bus Stop - Tewkesbury Road	Roadside	393455	223697	2.6	NO2	Y	N	Y	2M	Y
9	264 Gloucester Road	Roadside	393296	222170	3.0	NO2	Y	N	Y	2m	Y
10	340 Gloucester Road	Roadside	392912	221862	2.9	NO2	Y	N	Y	2m	Y
11	P.E. Roundabout	Roadside	391996	222133	2.7	NO2	Y	N	Y	15m	Y
12	Ladies College	Roadside	394621	222215	2.8	NO2	Y	N	Y	3m	Y
13	50 St Georges St	Kerbside	394695	222733	2.9	NO2	Y	N	Y	2m	Y
14	2 Gloucester Rd	Roadside	394235	223055	3.0	NO2	Y	N	Y	2m	Y
15	422 High Street	Roadside	394350	222923	3.0	NO2	Y	N	Y	2m	Y
16	New Rutland - Swindon Rd	Roadside	394738	222888	3.0	NO2	Y	N	Y	2m	Y
17	2 Swindon Road	Kerbside	394830	222845	3.0	NO2	Y	N	Y	1m	Y
18	22 St Paul's Rd	Roadside	394902	223004	2.6	NO2	Y	N	Y	1.3m	Y
19	5 St Margaret's Terrace	Roadside	395040	222715	3.0	NO2	Y	N	Y	3m	Y

Cheltenham Borough Council

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Height (m)	Pollutants Monitored	In AQMA ?	Tube collocated with a Continuous Analyser?	Relevant Exposure ?	Distance to kerb of nearest road (m) <sup>(2)</sup>	Does this Location Represent Worst-Case Exposure?
20	Portland St/Fairview Rd	Roadside	395110	222670	2.9	NO2	Y	N	Y	2m	Y
21	Winchcombe St/Fairview	Roadside	395210	222618	3.1	NO2	Y	N	Y	2m	Y
22	21 All Saints Rd	Kerbside	395602	222428	2.6	NO2	Y	N	Y	0.2m	Y
23	40 Hewlett Road	Roadside	395479	222222	2.6	NO2	Y	N	Y	3.5m	Y
24	2 London Road	Roadside	395362	222000	2.9	NO2	Y	N	Y	2m	Y
25	YMCA Shop	Roadside	395182	222183	3.2	NO2	Y	N	Y	2m	Y
26	8a Bath Road	Roadside	395146	222149	3.1	NO2	Y	N	Y	2m	Y
27	15 College Road	Kerbside	395156	221865	2.5	NO2	Y	N	Y	0.1m	Y
28	Co-location – St Georges Street	Roadside	394760	222878	1.4	NO2	Y	Y	Y	2m	Y
29	Co-location – St Georges Street	Roadside	394760	222878	1.4	NO2	Y	Y	Y	2m	Y
30	Co-location – St Georges Street	Roadside	394760	222878	1.4	NO2	Y	Y	Y	2m	Y

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

N/A if not applicable.

Table A.3 – Annual Mean NO<sub>2</sub> Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2016 (%) <sup>(2)</sup>	NO <sub>2</sub> Annual Mean Concentration (µg/m <sup>3</sup> ) <sup>(3)</sup>				
					2012	2013	2014	2016	2016
St Georges Street	Roadside	Automatic	96.7	96.7	37	36	35	35	34
Cheltenham Borough Council	Roadside	Diffusion Tube	96.3	96.3	35	37	34	35	33

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

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

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

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

(3) Means for diffusion tubes have been corrected for bias. All means have been “annualised” as per Technical Guidance LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Table A.4 – 1-Hour Mean NO<sub>2</sub> Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2016 (%) <sup>(2)</sup>	NO <sub>2</sub> 1-Hour Means > 200µg/m <sup>3</sup> <sup>(3)</sup>				
					2012	2013	2014	2015	2016
St Georges Street	Roadside	Automatic	96.7	96.7	0	0	0	0	0

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

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

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

(3) If the period of valid data is less than 85%, the 99.8<sup>th</sup> percentile of 1-hour means is provided in brackets.

## Appendix B: Full Monthly Diffusion Tube Results for 2016

Table B.2 – NO<sub>2</sub> Monthly Diffusion Tube Results - 2016

Site ID		NO <sub>2</sub> Mean Concentrations (µg/m <sup>3</sup> ) – before bias adjustment												Annual Mean	
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Raw Data	Bias Adjusted <sup>(1)</sup>
1	179 Bath Road	34.75	28.06	31.05	28.23	26.83	Missing	Missing	22.97	26.52	29.96	34.78	38.43	30.2	30.5
2	261 London Road	Missing	22.58	25.87	22.93	23.93	21.37	20.71	21.21	Missing	26.28	31.31	Missing	24.0	24.3
3	81 London Road	42.73	32.41	36.74	39.10	37.35	33.49	34.12	34.28	43.03	40.91	41.79	54.80	39.2	39.6
4	Prestbury Post Office	40.57	27.43	30.25	31.79	31.48	27.71	33.13	29.65	32.04	34.36	42.19	41.52	33.5	33.8
5	170 Prestbury Road	25.56	24.65	21.71	22.51	19.17	16.88	17.03	17.56	18.17	27.06	30.22	34.09	22.9	23.1
6	113 Winchcombe St	33.37	28.33	27.78	26.63	25.88	22.67	21.61	21.65	25.43	23.05	34.76	Missing	26.5	26.7
7	Morris Hill Close	26.84	26.23	26.52	24.39	22.41	19.94	20.52	20.16	21.41	24.93	35.91	35.25	25.4	25.6
8	Bus Stop - Tewkesbury Road	29.95	Missing	25.85	30.06	27.05	24.27	20.51	25.49	26.26	29.75	34.12	35.93	28.1	28.4
9	264 Gloucester Road	33.80	30.94	34.17	30.05	28.64	27.03	31.10	28.98	30.91	34.35	40.74	Missing	31.9	32.2
10	340 Gloucester Road	38.91	35.58	32.97	33.94	31.30	30.31	31.11	32.32	36.73	32.61	43.94	47.17	35.6	35.9
11	P.E. Roundabout	29.13	26.56	24.58	17.38	22.62	21.12	22.81	23.90	24.43	25.88	33.44	33.58	25.5	25.7
12	Ladies College	36.46	31.98	31.85	33.24	30.46	27.58	29.28	32.40	35.25	34.94	38.40	39.30	33.4	33.8
13	50 St Georges St	34.46	28.01	29.60	30.92	28.52	24.93	24.96	25.04	28.23	31.21	38.91	39.89	30.4	30.7
14	2 Gloucester Rd	Missing	39.57	40.12	43.70	39.34	28.75	45.70	38.36	46.13	40.10	48.65	60.35	42.8	<b>43.2</b>
15	422 High Street	54.80	40.92	42.66	46.08	37.01	40.08	43.11	40.56	46.51	40.68	52.41	55.75	45.0	<b>45.0</b>
16	New Rutland - Swindon Rd	44.62	40.97	39.42	36.54	34.58	31.84	36.23	38.04	42.13	40.51	43.91	56.36	40.4	<b>40.4</b>
17	2 Swindon Road	43.88	37.09	36.93	35.98	34.62	27.81	30.00	34.51	39.41	39.68	45.91	48.54	37.9	37.9
18	22 St Paul's Rd	36.68	31.52	31.44	29.78	31.36	22.97	27.06	26.39	27.64	27.64	41.50	45.73	31.6	31.6
19	5 St Margaret's Terr.	34.67	28.34	38.68	33.78	30.17	28.82	Missing	Missing	28.47	31.33	40.62	40.27	33.5	33.5
20	Portland St/Fairview Rd	37.02	31.58	34.10	32.58	34.51	31.52	30.93	31.46	35.39	35.39	42.86	46.77	35.3	35.3

Cheltenham Borough Council

Site ID		NO <sub>2</sub> Mean Concentrations (µg/m <sup>3</sup> ) – before bias adjustment												Annual Mean	
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Raw Data	Bias Adjusted <sup>(1)</sup>
		21	Winchcombe St/Fairview	37.98	31.01	31.13	29.18	27.81	24.39	28.99	28.59	35.28	29.66	39.09	39.24
22	21 All Saints Rd	33.35	29.68	29.57	28.72	26.66	22.34	22.29	22.68	23.75	28.66	35.15	41.37	28.7	28.7
23	40 Hewlett Road	35.26	33.61	33.67	31.81	26.61	27.66	29.23	29.66	30.87	33.73	41.01	42.74	33.0	33.0
24	2 London Road	38.88	34.83	40.33	35.73	37.12	35.93	29.88	29.47	37.18	41.85	45.17	45.40	37.6	37.6
25	YMCA Shop	35.95	30.43	32.15	31.02	30.08	27.91	25.61	26.63	32.47	32.80	39.81	46.15	32.6	32.6
26	8a Bath Road	39.79	35.06	36.62	36.71	33.44	34.59	34.33	33.12	39.17	38.97	47.19	47.17	38.0	38.0
27	15 College Road	30.27	Missing	30.96	26.82	24.13	23.26	22.29	23.72	27.99	28.90	31.11	38.82	28.0	28.0
28	Co-location – St Georges Street	35.74	27.01	35.63	34.14	26.63	26.36	28.62	28.68	31.99	31.72	38.42	46.00	32.6	32.6
29	Co-location – St Georges Street	35.44	32.52	36.47	32.81	28.36	28.20	30.53	29.68	32.94	33.94	40.66	45.27	33.9	33.9
30	Co-location – St Georges Street	34.66	32.34	30.31	31.27	30.49	27.71	28.88	29.62	32.23	29.38	41.23	41.45	32.5	32.5

(1) See Appendix C for details on bias adjustment – Breaches of EU limit values (after bias adjustment) shown in **BOLD**

## Appendix C: Annual Mean Diffusion Tube Results for 2012 - 2016

Table C.3 – NO<sub>2</sub> Annual Mean Diffusion Tube Results – 5 years

Site ID		NO <sub>2</sub> Annual Mean Concentrations (µg/m <sup>3</sup> ) – after bias adjustment				
		2012	2013	2014	2015	2016
1	179 Bath Road	30.8	31.7	31.5	31.2	30.5
2	261 London Road	NM	NM	NM	NM	24.3
3	81 London Road	42.5	42.1	41.8	41.4	39.6
4	Prestbury Post Office	35.5	33.6	33.8	34.7	33.8
5	170 Prestbury Road	NM	NM	NM	NM	23.1
6	113 Winchcombe St	NM	NM	NM	NM	26.7
7	Morris Hill Close	NM	NM	NM	NM	25.6
8	Bus Stop - Tewkesbury Road	NM	NM	NM	NM	28.4
9	264 Gloucester Road	37.1	38.3	34.0	36.7	32.2
10	340 Gloucester Road	39.6	37.6	36.3	38.7	35.9
11	P.E. Roundabout	28.7	28.5	25.9	26.9	25.7
12	Ladies College	NM	NM	33.9	36.6	33.8
13	50 St Georges St	31.6	31.5	30.7	31.6	30.7
14	2 Gloucester Rd	35.9	40.4	41.7	46.5	43.2
15	422 High Street	49.8	50.9	46.5	47.3	45.0
16	New Rutland - Swindon Rd	43.3	41.2	42.1	42.4	40.4
17	2 Swindon Road	40.3	39.2	38.8	37.9	37.9
18	22 St Paul's Rd	NM	PM	30.9	31.4	31.6
19	5 St Margaret's Terr.	35.2	36.3	33.4	32.1	33.5
20	Portland St/Fairview Rd	37.7	38.5	35.2	36.8	35.3
21	Winchcombe St/Fairview	37.7	38.9	39.3	33.0	31.9
22	21 All Saints Rd	NM	PM	30.5	30.1	28.7

Site ID		NO <sub>2</sub> Annual Mean Concentrations (µg/m <sup>3</sup> ) – after bias adjustment				
		2012	2013	2014	2015	2016
23	40 Hewlett Road	NM	PM	34.2	35.7	33.0
24	2 London Road	40.3	41.4	40.1	40.0	37.6
25	YMCA Shop	38.0	37.8	35.2	34.5	32.6
26	8a Bath Road	42.0	41.8	40.8	41.1	38.0
27	15 College Road	NM	PM	27.7	29.6	28.0

NM = Not measured at this time

PM = Only Partially Monitored (4 months) therefore not representative



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

### Assessment of Monitoring Data:

There are continued exceedances of the Nitrogen Dioxide annual mean objective within the AQMA.

There are no other pollutants of concern within Cheltenham Borough Council.

The whole of the Borough was declared as an AQMA in 2011, as it was felt undesirable to have a multitude of smaller and probably linear (single road) AQMAs, which would require their own AQAPs, consultations, and other processes.

### Assessment of Sources:

Following the screening criteria in LAQM.TG (16), there are no transport sources of concern; therefore, a Screening Assessment will not be required.

Following the screening criteria in LAQM.TG (16), there are no other transport sources of concern; therefore, a Screening Assessment will not be required.

Following the screening criteria in LAQM.TG (16), there are no industrial sources of concern; therefore, a Screening Assessment will not be required.

Following the screening criteria in LAQM.TG (16), there are no commercial/domestic sources of concern; therefore, a Screening Assessment will not be required.

Following the screening criteria in LAQM.TG (16), there are no fugitive sources of concern; therefore, a Screening Assessment will not be required.

### **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 Gradko International Limited. The tubes at all locations throughout the area have a monthly exposure period.

The bias adjustment factors utilised were:

- 2012 bias adjustment factor: 0.99
- 2013 bias adjustment factor: 1.04
- 2014 bias adjustment factor: 0.97
- 2015 bias adjustment factor: 1.06
- 2016 bias adjustment factor: 1.01

From 2012 local Bias Adjustment Factors were used from a triplicate co-location study that commenced at the Council's roadside Air Quality Monitoring Station in April 2012. Triplicate co-location measurements continue to be used.

#### **Factor from Local Co-location Studies**

The Bias Adjustment Factor used for 2016 was from a local co-location study located at the roadside Automatic NO<sub>2</sub> analyser instrument at the junction of St George's Street and Swindon Road. The Bias Adjustment Calculation resulted in a Bias Adjustment Factor of 1.01 for 2016. This was calculated using the AEA\_DifTPAB\_v04.xls spreadsheet. A copy of the spreadsheet is included in below.

#### **Discussion of Choice of Factor to Use**

The Local Bias Adjustment Factor was used since the triplicate study demonstrated good precision and we obtained high quality chemiluminescence analyser results.

#### **QA/QC of automatic monitoring**

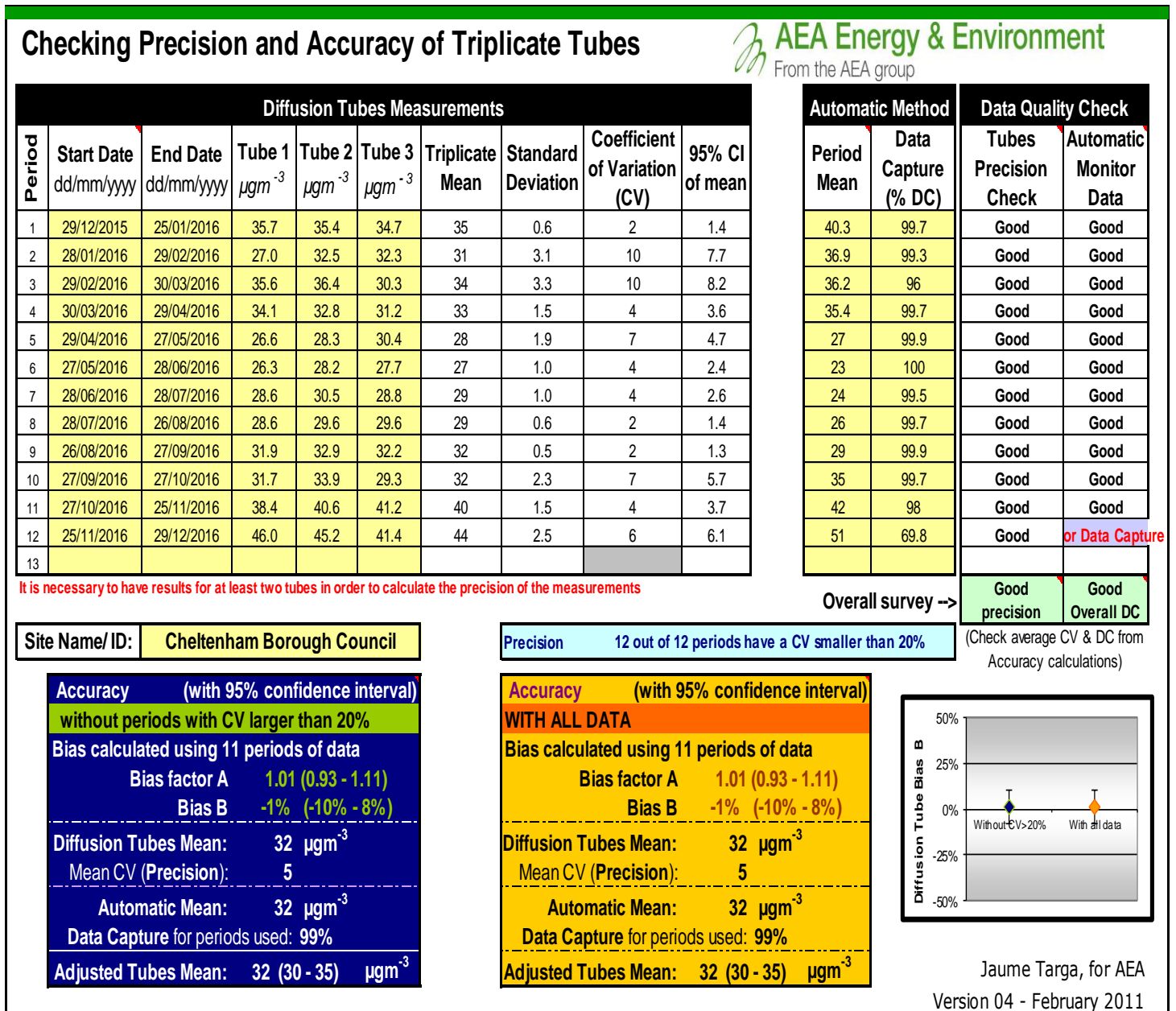
Cheltenham Borough Council's nitrogen dioxide Air Quality Monitoring Station (AQMS) on St Georges Street/Swindon Road junction is operated and managed by Enviro Technology Services plc. The unit was installed in August 2011 and Enviro Technology Services undertake routine monthly calibration visits and 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 below).

The M200E NO<sub>x</sub> 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**

Nitrogen dioxide diffusion tubes used by Cheltenham Borough Council in 2016 were 20% TEA in water supplied and analysed by Gradko International Limited. It can be confirmed that the laboratory follows the procedures set out in the Harmonisation Practical Guidance Procedures under the DEFRA practical guidance. It also participates in the Ambient, Indoor, Workplace Air and Stack Emissions Proficiency Testing (AIR PT) scheme. This is an independent analytical proficiency-testing (PT) scheme, operated by the Health and Safety Laboratory (HSL) and accredited by LGC Limited. The results from the AIR PT scheme for this laboratory during 2016 indicate that 99% of the results submitted were deemed to be satisfactory.

Fig D.1 Copy of Diffusion Tube Co-location study calculation of Precision and Bias Adjustment 2016



If you have any enquiries about this spreadsheet please contact the LAQM Helpdesk at:

[LAQMHelpdesk@uk.bureauveritas.com](mailto:LAQMHelpdesk@uk.bureauveritas.com)

## Ratified data from NO<sub>2</sub> analyser on St Georges Road - Swindon Road junction

Produced by AQDM on behalf of Cheltenham B.C.

### CHELTENHAM SWINDON ROAD 1 January to 31 December 2016

This data has been fully ratified by AQDM to LAQM TG(09) standards

#### Site Description

ROADSIDE: Junction of Swindon Road and St George St

#### Statistical Summary Report

This 2016 report contains all the statistics required for the LAQM reporting.

### Fig D.2 Air Quality Statistics 2016

Pollutant	NO	NO <sub>2</sub>	NO <sub>x</sub>
Number Very High #	-	0	-
Number High #	-	0	-
Number Moderate #	-	0	-
Number Low #	-	8491	-
Maximum 15-minute mean	576 µg m <sup>-3</sup>	358 µg m <sup>-3</sup>	1021 µg m <sup>-3</sup>
Maximum hourly mean	470 µg m <sup>-3</sup>	147 µg m <sup>-3</sup>	836 µg m <sup>-3</sup>
Maximum running 8-hour mean	264 µg m <sup>-3</sup>	97 µg m <sup>-3</sup>	501 µg m <sup>-3</sup>
Maximum running 24-hour mean	198 µg m <sup>-3</sup>	76 µg m <sup>-3</sup>	379 µg m <sup>-3</sup>
Maximum daily mean	184 µg m <sup>-3</sup>	74 µg m <sup>-3</sup>	357 µg m <sup>-3</sup>
Average	26 µg m <sup>-3</sup>	34 µg m <sup>-3</sup>	73 µg m <sup>-3</sup>
Data capture	96.7 %	96.7 %	96.7 %

# Daily Air Quality Index (DAQI) as defined by COMEAP January 2012 and revised April 2013

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

NO<sub>x</sub> mass units are NO<sub>x</sub> as NO<sub>2</sub> µg m<sup>-3</sup>

### Fig D.3 Air Quality Exceedences 2016

Pollutant	Air Quality (England) Regulations 2000 & (Amendment) Regulations 2002	Max Conc	Number	Days	Allowed	Exceeded
Nitrogen Dioxide	Annual mean > 40 µg m <sup>-3</sup>	34 µg m <sup>-3</sup>	0	-	-	No
Nitrogen Dioxide	Hourly mean > 200 µg m <sup>-3</sup>	147 µg m <sup>-3</sup>	0	0	18 hours	No

The annual mean for Nitrogen Dioxide was 34 µg m<sup>-3</sup> which did not exceed the 40 µg m<sup>-3</sup> Objective.

The maximum hourly mean was 147 µg m<sup>-3</sup> so there were no exceedences on the NO<sub>2</sub> hourly limit of 200 µg m<sup>-3</sup>. There is an annual allowance of 18 hours so this Objective was not exceeded.

## Appendix E: Map(s) of Monitoring Locations

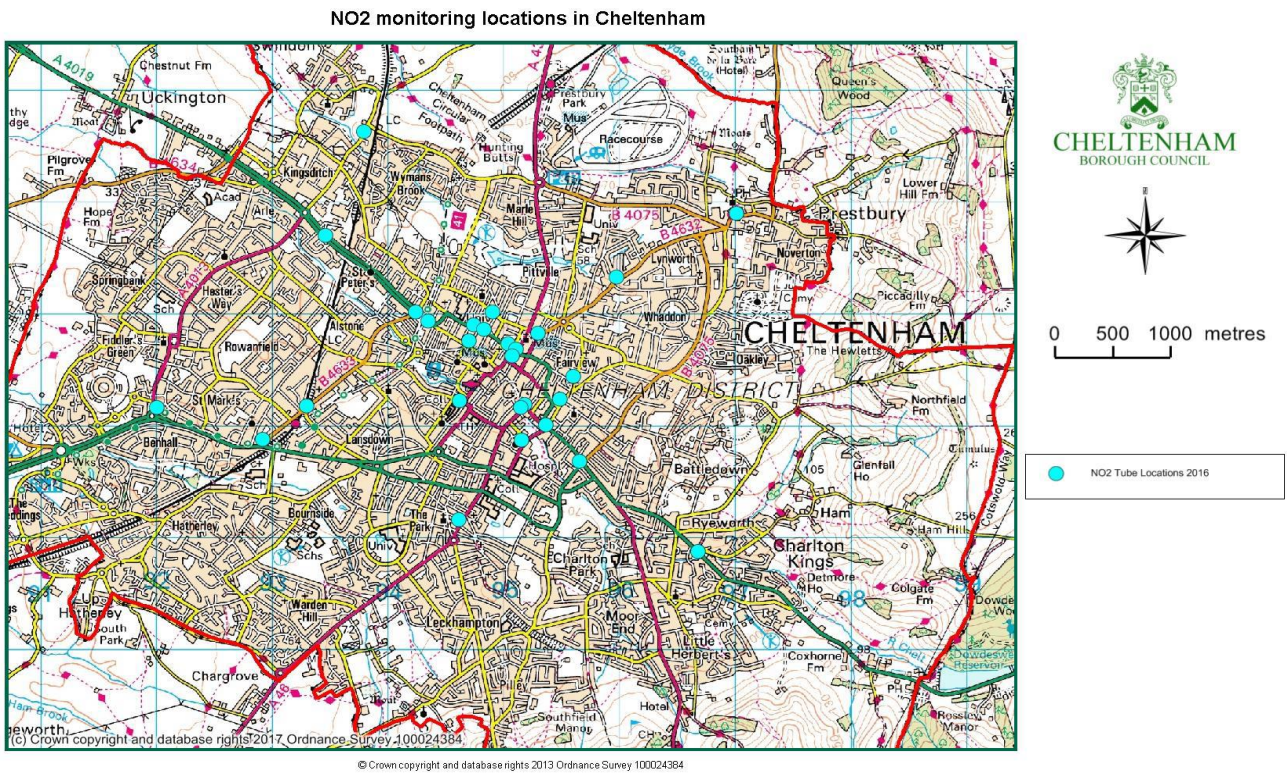
Fig E.1 Location of NO2 roadside monitoring station



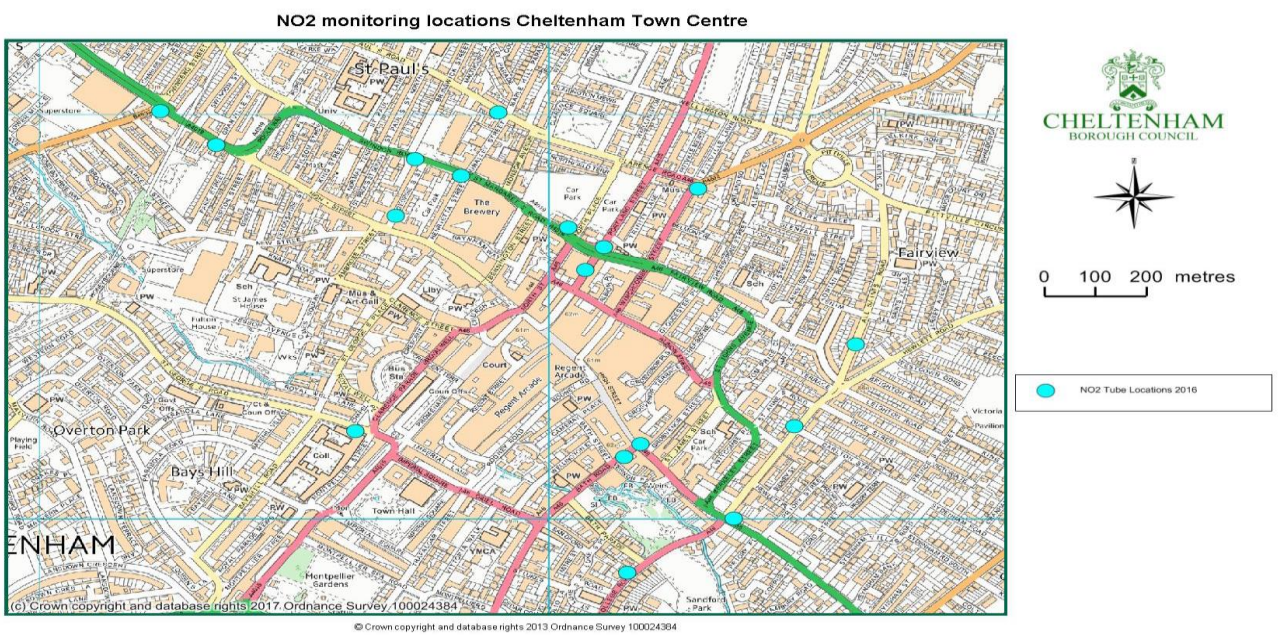
Fig E.2 Roadside monitoring station at St Georges Street/Swindon Road



**Fig E.3** Map of Non-Automatic Monitoring Sites 2016  
(precise locations can be seen via the Council's website)



**Fig E.4** Map of Town Centre non-automatic monitoring sites 2016  
(precise locations can be seen via the Council's website)



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

Table E.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective <sup>4</sup>	
	Concentration	Measured as
Nitrogen Dioxide (NO <sub>2</sub> )	200 µg/m <sup>3</sup> not to be exceeded more than 18 times a year	1-hour mean
	40 µg/m <sup>3</sup>	Annual mean
Particulate Matter (PM <sub>10</sub> )	50 µg/m <sup>3</sup> , not to be exceeded more than 35 times a year	24-hour mean
	40 µg/m <sup>3</sup>	Annual mean
Sulphur Dioxide (SO <sub>2</sub> )	350 µg/m <sup>3</sup> , not to be exceeded more than 24 times a year	1-hour mean
	125 µg/m <sup>3</sup> , not to be exceeded more than 3 times a year	24-hour mean
	266 µg/m <sup>3</sup> , not to be exceeded more than 35 times a year	15-minute mean

<sup>4</sup> The units are in microgrammes of pollutant per cubic metre of air (µg/m<sup>3</sup>).



## Glossary of Terms

Abbreviation	Description
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the local authority intends to achieve air quality limit values'
AQMA	Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives
ASR	Air quality Annual Status Report
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England
EU	European Union
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
NO <sub>2</sub>	Nitrogen Dioxide
NO <sub>x</sub>	Nitrogen Oxides
PM <sub>10</sub>	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less
PM <sub>2.5</sub>	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO <sub>2</sub>	Sulphur Dioxide
...	...

## References