



**CHESTERFIELD**  
BOROUGH COUNCIL

# 2016 Air Quality Annual Status Report (ASR)

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

June 2016

**Chesterfield Borough Council**

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Report Reference number	CBC AQ 2016
Date	21st June 2016

## Executive Summary: Air Quality in Our Area

Pollution monitoring, focussed on the main traffic commuting routes, has confirmed that pollution levels are a cause for concern at discrete “hot-spot” locations within the borough. These are at some sites where housing is located at the roadside and the road carries a high traffic loading, and is subject to stop/start flow restrictions (ie traffic light controlled junctions).

### Air Quality in Chesterfield

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 pollutant of concern in Chesterfield is Nitrogen Dioxide (NO<sub>2</sub>) and the predominant source is traffic. The overall trend in levels of the pollutant shows a gradual decline in levels, but year-on-year data show fluctuating levels and at pollutant hotspots this variation demonstrates intermittent breaches of the Air Quality Objective.

One location (Church Street, Brimington) has required the declaration of an Air Quality Management Area and a second location (Sheffield Road, Stonegravels) is being considered due to the changes in levels of Nitrogen Dioxide.

Fine particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>) is also a concern. The levels measured do not indicate a breach of the Air Quality Objectives, but as a general systemic irritant, measures are required to address the general increase in traffic congestion, as this is the pre-dominant source of pollution across the Borough.

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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

## **Actions to Improve Air Quality**

Much work has been carried out, both nationally and locally, to monitor pollution levels. This has allowed the pollutants included in the national Air Quality Strategy to be narrowed to the pollutants of national concern. Work is now being concentrated on the pollutants of concern, and on drawing up effective interventions to control the pollution.

## **Local Priorities and Challenges**

Whilst there is still some heavy industry in Chesterfield (in a ribbon alongside the Chesterfield by-pass and at Sheepbridge industrial estate) by far the greatest source of air pollution is traffic. This is concentrated on the main commuting routes (A-619 linking the south side of Manchester to the northbound M-1, and the B-6057), and monitoring is concentrated on these roads. The responsibility for traffic and transport planning fell to Derbyshire County Council but much of the eastbound traffic (particularly HGVs) originates in Greater Manchester, Cheshire and Staffordshire which fall outside their control. More recently, Chesterfield BC has applied to formally join the Sheffield City Region Devolved Assembly. The future of traffic management across the region is currently being negotiated between the new and existing partner agencies.

## **How to Get Involved**

Information on how members of the public can take steps to improve air quality can be found on the Council's website: <http://www.chesterfield.gov.uk/environmental-issues/air-quality/the-publics-role-in-air-quality.aspx>

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## 1 Local Air Quality Management

This report provides an overview of air quality in Chesterfield during 2015. 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 Chesterfield 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

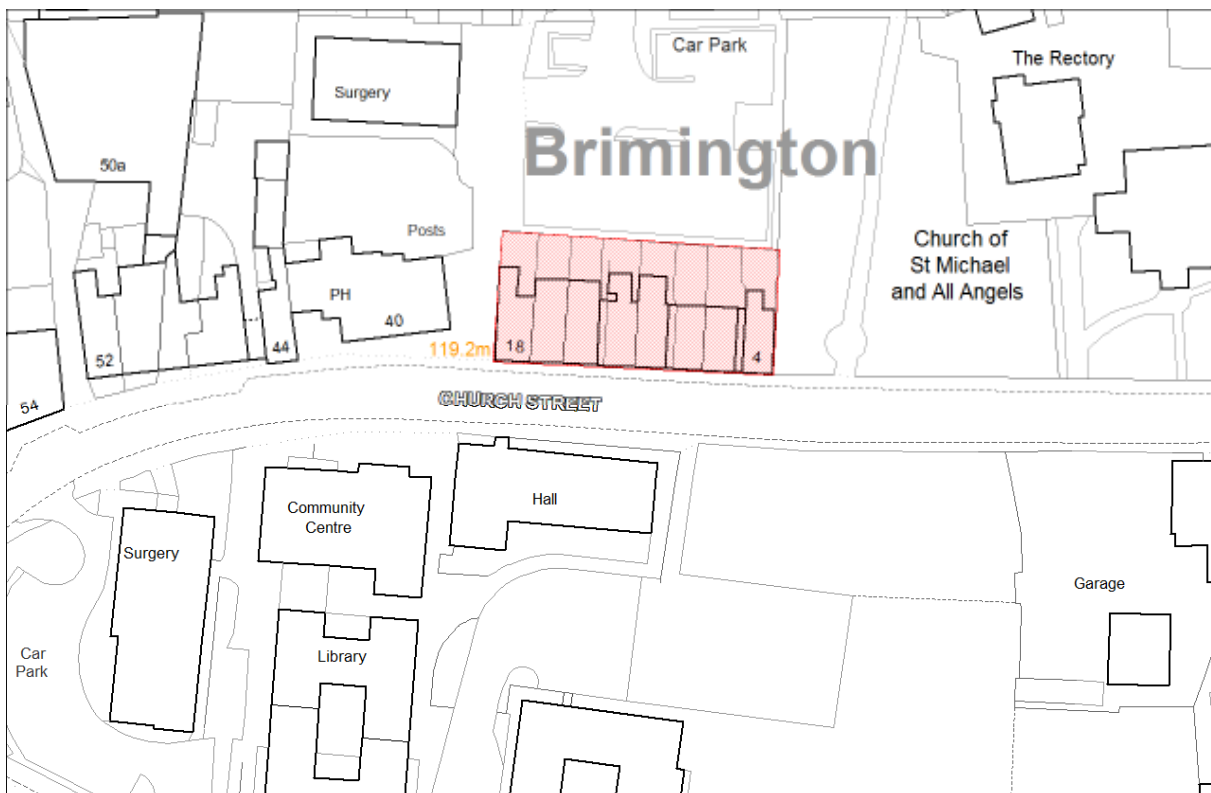
Air Quality Management Areas (AQMAs) are declared when there is an exceedance or likely exceedance of an air quality objective. After declaration, the authority must prepare an Air Quality Action Plan (AQAP) within 12-18 months setting out measures it intends to put in place in pursuit of the objectives.

A summary of AQMAs declared by Chesterfield can be found in Table 2.1 and Figure 2.1 (below).

**Table 2.1 – Declared Air Quality Management Areas**

AQMA Name	Pollutants and Air Quality Objectives	One Line Description	Action Plan
No 1 Air Quality Management Area	NO <sub>2</sub> annual mean	Numbers 4, 6, 8, 10, 12, 14, 16, and 18 Church Street, Brimington, Chesterfield, S43 1JG	In Preparation

**Figure 2.1 – Declared Air Quality Management Areas**





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

The Action Plan relating to the AQMA detailed above is currently in preparation.

## 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.

Chesterfield is taking the following measures to address PM<sub>2.5</sub>:

We are a member of the East Midlands Air Quality Network and we will continue to work with partner agencies to ensure effective traffic management, in order to minimise the impact of traffic pollution across the borough.

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

### 3.1 Summary of Monitoring Undertaken

#### 3.1.1 Automatic Monitoring Sites

This section sets out what monitoring has taken place and how it compares with objectives.

Chesterfield undertook automatic (continuous) monitoring at 3 sites during 2015. Two of the sites are affiliated to AURN and this has allowed the gathering of full 12 months data. The other site (at Sheffield Road) is being used to validate diffusion tube monitoring data at a specific “hot-spot” location. This unit is operating for 12 months (June 2015 to June 2016), and the data will be discussed more fully once the full 12 month dataset has been collated and assessed, this will be included in the next annual report. Table A.1 in Appendix A shows the details of the sites. NB. Local authorities do not have to report annually on the following pollutants: 1,3 butadiene, benzene, carbon monoxide and lead, unless local circumstances indicate there is a problem. National monitoring results are available at [https://uk-air.defra.gov.uk/data/data\\_selector?](https://uk-air.defra.gov.uk/data/data_selector?)

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

#### 3.1.2 Non-Automatic Monitoring Sites

Chesterfield undertook non- automatic (passive) monitoring of NO<sub>2</sub> at 40 sites during 2015. Table A.2 in Appendix A shows the details of the sites.

Maps showing the location of the monitoring sites are provided in Appendix D. Further details on Quality Assurance/Quality Control (QA/QC) and bias adjustment for the diffusion tubes are included in Appendix C.

## 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>)

The two AURN affiliated sites do not demonstrate any breaches of the Air Quality Objective for Nitrogen Dioxide or PM<sub>10</sub>. The preliminary data from the site at Sheffield Road indicates that there will be no breach of the Air Quality Objective for Nitrogen Dioxide.

Four diffusion tube monitoring locations within the borough show a breach of the annual air quality objective for nitrogen dioxide. Two of these locations are within the existing AQMA, at Church Street, Brimington. A third location is just outside the boundary of the AQMA, at a location which has not previously demonstrated an exceedance. The fourth location is on Sheffield Road, Stonegravel. This location is subject to intensive monitoring as a location of concern, and this will be commented upon more fully once 12 months of data has been gathered. Currently, each of these locations is demonstrating a marginal exceedance, and we can be confident that there are no locations which breach the 1 hour mean objective. Given that the new exceedances are marginal we do not intend to amend the existing AQMA or to declare a new AQMA at this stage as it has appeared historically that the local levels are greatly affected by regional trends. As such we cannot be sure, at this stage, of an ongoing breach which would justify such action. Intensive monitoring in the vicinity of these diffusion tubes will continue.

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>.

For diffusion tubes, the full 2015 dataset of monthly mean values is provided in Appendix B.

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. As can clearly be seen there have been no instances where the hourly objective has been breached. Similarly, the diffusion tube monitoring has not demonstrated any levels approaching an annual

mean greater than  $60\mu\text{g}/\text{m}^3$ , this indicates that an exceedance of the 1-hour mean objective is highly unlikely at any monitoring location.

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

Both AURN sites monitor for PM<sub>10</sub>. The levels monitored do not breach either the annual mean or the 24 hour mean objectives.

Table A.5 in Appendix A compares the ratified and adjusted monitored PM<sub>10</sub> annual mean concentrations for the past 5 years with the air quality objective of  $40\mu\text{g}/\text{m}^3$ .

Table A.6 in Appendix A compares the ratified continuous monitored PM<sub>10</sub> daily mean concentrations for the past 5 years with the air quality objective of  $50\mu\text{g}/\text{m}^3$ , not to be exceeded more than 35 times per year.

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

Both AURN sites monitor for PM<sub>2.5</sub>. The data show that the levels of PM<sub>2.5</sub> within the borough area comply with the annual average EU limit value ( $25\mu\text{g}/\text{m}^3$  by 2020). The levels at Chatsworth Road have been fairly consistent for the last few years, and have shown a gradual minor decrease in levels. No trend data is yet available at the Loundsley Green site, as it has only operated at this site for the current year. The levels at this background site are lower, as would be expected. Monitoring is continuing.

Table A.7 in Appendix A presents the ratified and adjusted monitored PM<sub>2.5</sub> annual mean concentrations for the past 5 years.

### **3.2.4 Sulphur Dioxide (SO<sub>2</sub>)**

Sulphur Dioxide is not a pollutant of concern, and is no longer monitored in Chesterfield.

### **3.2.5 Benzene**

The Chesterfield Roadside site is part of the National Hydrocarbons Network. The results demonstrate no likelihood of breaching the Air Quality Objective.

## Appendix A: Monitoring Results

Table A.1 – Details of Automatic Monitoring Sites

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)
Chesterfield Roadside	Roadside	332395	433175	NO <sub>2</sub> ;	N	Chemiluminescent	3	2	3
				PM <sub>10</sub>		FDMS			
				PM <sub>2.5</sub>		FDMS			
Chesterfield Loundsley Green	Urban background	332200	433540	Benzene	N	Pumped Tubes	N/A	17	3
				NO <sub>2</sub>		Chemiluminescent			
				PM <sub>10</sub>		FDMS			
Sheffield Road	Roadside	373019	438307	PM <sub>2.5</sub>	N	FDMS	18	2	1.5
				Heavy Metals		Pumped Filters			
				NO <sub>2</sub>		Chemiluminescent			

(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	Pollutants Monitored	In AQMA ?	Distance to Relevant Exposure (m) <sup>(1)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Tube collocated with a Continuous Analyser?	Height (m)
1	Bradbury Club, 150 Chatsworth Rd	Façade	370956	437222	NO2	No	0	1m	N	2
2	Bridge Inn, Hollis Lane	Facade	370950	438710	NO2	No	0	2m	N	2
3	376 Sheffield Road	Façade	373006	438291	NO2	No	0	1m	N	2
4	390 Sheffield Road	Façade	373057	438284	NO2	No	0	1m	N	2
5	17, South Place	Façade	370863	438293	NO2	No	0	1m	N	2
6	6 Church Street, Brimington	Façade	373514	440440	NO2	Yes	0	1m	N	2
7	DCC Offices, West Street	Roadside	371490	437670	NO2	No	3	1m	N	2
8	St Augustines, 212 Derby Road	Façade	369776	438395	NO2	No	0	3m	N	2
9	Lincoln Street, 287 Derby Road	Façade	369574	438385	NO2	No	0	2m	N	2
10	7 High Street, Brimington	Façade	373484	440531	NO2	No	0	1m	N	2

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Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA ?	Distance to Relevant Exposure (m) <sup>(1)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Tube collocated with a Continuous Analyser?	Height (m)
11	42, Whittington Hill (B6052)	Façade	374560	438307	NO2	No	0	2m	N	2
12	460, Sheffield Road	Façade	373336	438279	NO2	No	0	2m	N	2
13	10 Calow Lane, Hasland	Façade	369440	439780	NO2	No	0	1m	N	2
14	348 Derby Road, Storrorth Lane	Façade	369410	438357	NO2	No	0	2m	N	2
15	Chatsworth Road AQ. Site	Co-location	370658	436349	NO2	No	4m	4m	Y	2
16	Chatsworth Road AQ. Site	Co-location	370658	436349	NO2	No	4m	4m	Y	2
17	Chatsworth Road AQ. Site	Co-location	370658	436349	NO2	No	4m	4m	Y	2
18	Sheffield Road AQ Site	Co-location	373014	438308	NO2	No	2m	2m	Y	2
19	Sheffield Road AQ Site	Co-location	373014	438308	NO2	No	2m	2m	Y	2
20	Sheffield Road AQ Site	Co-location	373014	438308	NO2	No	2m	2m	Y	2

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Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA ?	Distance to Relevant Exposure (m) <sup>(1)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Tube collocated with a Continuous Analyser?	Height (m)
21	14 Chesterfield Road, Brimington	Roadside			NO2	No			N	2
22	25/27 Ringwood Road, Brimington	Façade	373396	440175	NO2	No	1m	1m	N	2
23	29 Mansfield Road, Hasland	Façade	373711	440669	NO2	No	0	2m	N	2
24	10, Compton Street, Saltergate	Façade	369320	439830	NO2	No	0	1m	N	2
25	J+S Trophies, The Green, Hasland	Façade	371433	437686	NO2	No	0	3m	N	2
26	Harold Lillekar's Funerals, Mansfield Rd	Façade	369608	439490	NO2	No	0	6m	N	2
27	Lowgates, Staveley	Façade	374912	443897	NO2	No	0	3m	N	2
28	Patrick Hinds House, Church St, Brimington	Façade	373482	440323	NO2	No	0	1m	N	2



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Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA ?	Distance to Relevant Exposure (m) <sup>(1)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Tube collocated with a Continuous Analyser?	Height (m)
29	Hollywell Cross R/T, Old Post Restaurant	Façade	371357	438417	NO2	No	0	1m	N	2
30	348, Chatsworth Rd, Brampton Mile	Façade	370761	436702	NO2	No	0	1m	N	2
31	386 Sheffield Road	Façade	373028	438289	NO2	No	0	2m	N	2
32	Warner Street, Hasland	Roadside	370356	438976	NO2	No	2m	1m	N	2
33	55 Duke Street, Staveley	Façade	374762	443452	NO2	No	0	4m	N	2
34	Travel Blank	-	-	-	NO2	-	-	-	-	-
35	632, Chatsworth Road, Storrs Road	Façade	370537	435654	NO2	No	0	3m	N	2
36	Life Bites, Mansfield Road, Hasland	Façade	369420	439710	NO2	No	0	2m	N	2
37	50 Church Street, Brimington	Façade	373513	440361	NO2	No	0	1m	N	2

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Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA ?	Distance to Relevant Exposure (m) <sup>(1)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Tube collocated with a Continuous Analyser?	Height (m)
38	14 Church Street, Brimington	Façade	373515	440421	NO2	Yes	0	1m	N	2
39	43 Sheffield Road	Façade	371908	438343	NO2	No	0	1m	N	2
40	380 Sheffield Road	Façade	373014	438290	NO2	No	0	1m	N	2
41	James Street / Lockoford Lane	Roadside	372798	438407	NO2	No	2	1m	N	2

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

(2) 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 2015 (%) <sup>(2)</sup>	NO <sub>2</sub> Annual Mean Concentration (µg/m <sup>3</sup> ) <sup>(3)</sup>				
					2011	2012	2013	2014	2015
Chesterfield Roadside	Roadside	Automatic	95.6	95.6	23.2	19.3	21.7	20.6	19.9
Chesterfield Loundsley Green	Urban Background	Automatic	81.6	81.6	Monitoring at previous background location				14.4
Sheffield Road	Roadside	Automatic	99.6	49.8	Not yet in use				26.9
1	Façade	Diffusion Tube	92	92	32.1	27.6	30.9	26.9	28.7
2	Facade	Diffusion Tube	92	92	Not yet in use				34.0
3	Façade	Diffusion Tube	76	76	Not yet in use	35.7	36.9	35.4	36.6
4	Façade	Diffusion Tube	84	84	Not yet in use	27.1	30.9	36.5	39.5
5	Façade	Diffusion Tube	100	100	31.6	27.0	29.5	26.9	28.8
6	Façade	Diffusion Tube	84	84	Not yet in use	<b>44.3</b>	<b>47.8</b>	<b>43.8</b>	<b>40.5</b>
7	Roadside	Diffusion Tube	100	100	Not yet in use	35.0	23.3	24.1	22.6
8	Façade	Diffusion Tube	68	68	35.6	29.1	32.8	30.7	30.3

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Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2015 (%) <sup>(2)</sup>	NO <sub>2</sub> Annual Mean Concentration (µg/m <sup>3</sup> ) <sup>(3)</sup>				
					2011	2012	2013	2014	2015
9	Façade	Diffusion Tube	100	100	31.7	29.2	31.6	30.2	27.5
10	Façade	Diffusion Tube	84	84	Not yet in use	38.6	38.8	38.0	43.1
11	Façade	Diffusion Tube	92	92	40.8	34.7	37.9	35.2	24.6
12	Façade	Diffusion Tube	100	100	30.8	28.7	29.4	27.6	28.7
13	Façade	Diffusion Tube	100	100	Not yet in use	26.0	24.3	24.6	23.5
14	Façade	Diffusion Tube	100	100	39.9	32.8	38.1	34.7	35.3
15	Co-location	Diffusion Tube	100	100	23.5	19.1	21.7	18.2	19.4
16	Co-location	Diffusion Tube	100	100	23.7	19.7	23.0	19.8	19.4
17	Co-location	Diffusion Tube	100	100	24.3	19.5	21.9	19.1	20.0
18	Co-location	Diffusion Tube	50	50	Monitoring equipment at previous location				
19	Co-location	Diffusion Tube	50	50					
20	Co-location	Diffusion Tube	50	50					
21	Roadside	Diffusion Tube	58	58	Not yet in use	35.9	32.1	32.1	24.5

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Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2015 (%) <sup>(2)</sup>	NO <sub>2</sub> Annual Mean Concentration (µg/m <sup>3</sup> ) <sup>(3)</sup>				
					2011	2012	2013	2014	2015
22	Façade	Diffusion Tube	100	100	38.3	35.4	36.8	32.3	32.8
23	Façade	Diffusion Tube	84	84	Not yet in use				24.3
24	Façade	Diffusion Tube	76	76	<b>41.9</b>	33.8	37.7	35.8	36.6
25	Façade	Diffusion Tube	100	100	Not yet in use				33.0
26	Façade	Diffusion Tube	100	100	Not yet in use				18.3
27	Façade	Diffusion Tube	100	100	36.8	30.1	33.3	31.3	30.6
28	Façade	Diffusion Tube	100	100	Not yet in use				34.0
29	Façade	Diffusion Tube	76	76	36.1	30.2	<b>41.6</b>	35.6	36.3
30	Façade	Diffusion Tube	100	100	33.4	26.0	33.0	30.2	28.5
31	Façade	Diffusion Tube	92	92	Not yet in use				<b>43.1</b>
32	Roadside	Diffusion Tube	100	100	34.3	34.1	36.1	29.9	31.4
33	Façade	Diffusion Tube	100	100	Not yet in use				38.4
35	Façade	Diffusion Tube	100	100	36.3	30.3	33.6	29.7	29.4

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2015 (%) <sup>(2)</sup>	NO <sub>2</sub> Annual Mean Concentration (µg/m <sup>3</sup> ) <sup>(3)</sup>			
					2011	2012	2013	2014
36	Façade	Diffusion Tube	92	92	Not yet in use	31.1	27.1	27.8
37	Façade	Diffusion Tube	92	92	Not yet in use	36.6	36.1	39.6
38	Façade	Diffusion Tube	100	100	Not yet in use	<b>43.4</b>	<b>42.2</b>	<b>44.4</b>
39	Façade	Diffusion Tube	100	100	31.5	27.8	31.6	27.5
40	Façade	Diffusion Tube	100	100	<b>45.6</b>	39.5	<b>43.9</b>	33.0
41	Roadside	Diffusion Tube	84	84	32.3	31.2	33.8	31.2

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

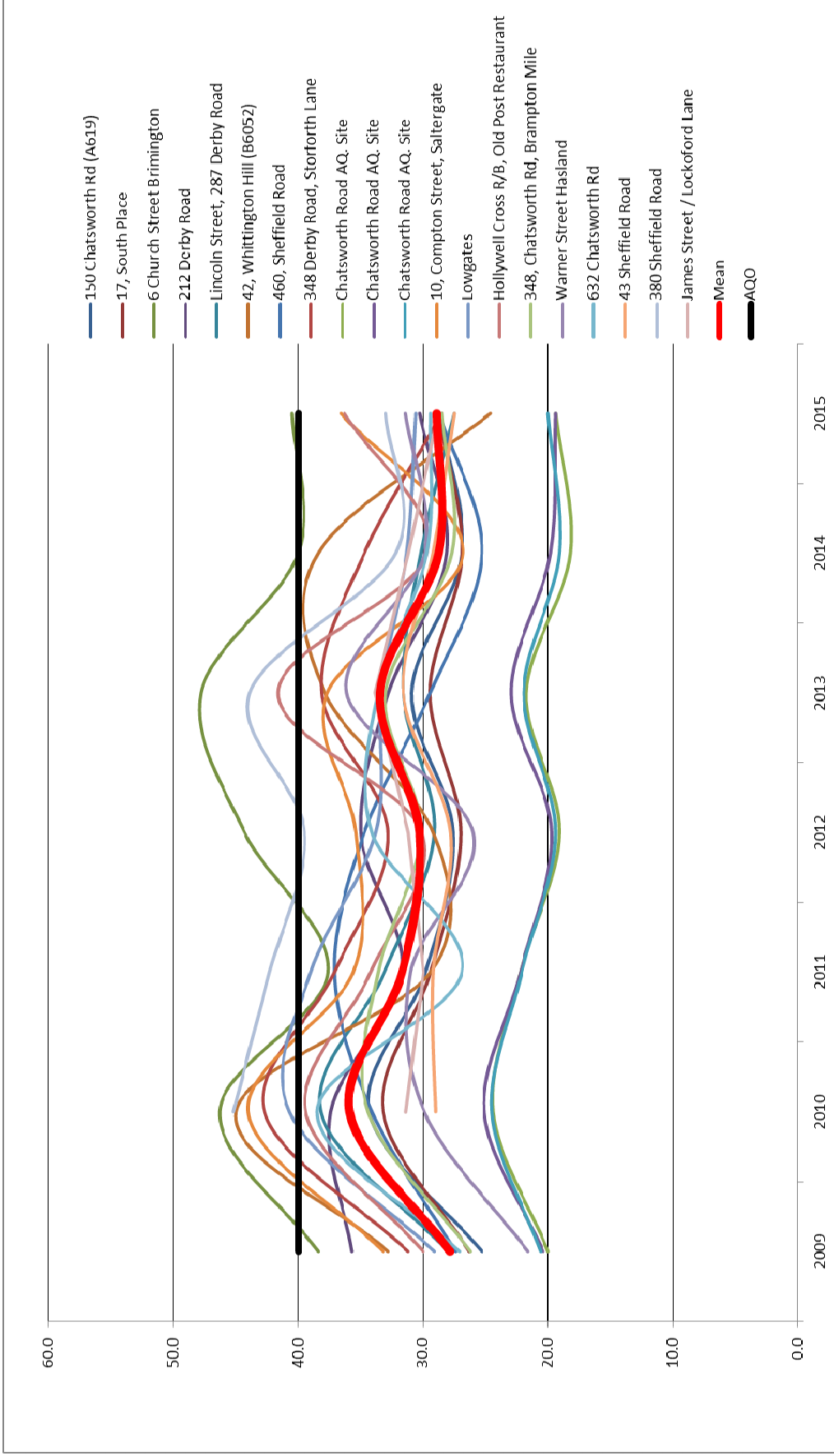
NO<sub>2</sub> annual means exceeding 60µg/m<sup>3</sup>, indicating a potential exceedance of the NO<sub>2</sub> 1-hour mean objective are shown in **bold and underlined**.

(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.

Figure A.1 – Annual Mean NO<sub>2</sub> Trend Data



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

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 2015 (%) <sup>(2)</sup>	NO <sub>2</sub> 1-Hour Means > 200µg/m <sup>3</sup> <sup>(3)</sup>				
					2011	2012	2013	2014	2015
Chesterfield Roadside	Roadside	Automatic	94.8	94.8	0 (94)	0	0	0	0
Chesterfield Loundsley Green	Urban Background	Automatic	65.4	65.4	N/A	N/A	N/A	N/A	0 (53.5)
Sheffield Road	Roadside	Automatic	99.5	49.8	N/A	N/A	N/A	N/A	0 (97.9)

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 90%, the 99.8<sup>th</sup> percentile of 1-hour means is provided in brackets.



**Table A.5 – Annual Mean PM<sub>10</sub> Monitoring Results**

Site ID	Site Type	Valid Data Capture 2015 (%) <sup>(2)</sup>	PM <sub>10</sub> Annual Mean Concentration (µg/m <sup>3</sup> ) <sup>(3)</sup>				
			2011	2012	2013	2014	2015
Chesterfield Roadside	Roadside	97.6%	17.8	20.2	15.9	19.0	19.8
Chesterfield Loundsley Green	Urban Background	76.9%	N/A	N/A	N/A	N/A	14.4

Notes: Exceedances of the PM<sub>10</sub> annual mean objective of 40µg/m<sup>3</sup> are shown in **bold**.

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

**Table A.6 – 24-Hour Mean PM<sub>10</sub> Monitoring Results**

Site ID	Site Type	Valid Data Capture 2015 (%) <sup>(2)</sup>	PM <sub>10</sub> 24-Hour Means > 50µg/m <sup>3</sup> <sup>(3)</sup>				
			2011	2012	2013	2014	2015
Chesterfield Roadside	Roadside	97.6%	0 (27.6)	14 (35.7)	6 (26.0)	11	2
Chesterfield Loundsley Green	Urban Background	76.7%	N/A	N/A	N/A	N/A	1 (23)

Notes: Exceedances of the PM<sub>10</sub> 24-hour mean objective (50µg/m<sup>3</sup> not to be exceeded more than 35 times/year) are shown in **bold**.

(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 90%, the 90.4<sup>th</sup> percentile of 24-hour means is provided in brackets.

**Table A.7 – PM<sub>2.5</sub> Monitoring Results**

Site ID	Site Type	Valid Data Capture 2015 (%) <sup>(2)</sup>	PM <sub>2.5</sub> Annual Mean Concentration (µg/m <sup>3</sup> ) <sup>(3)</sup>				
			2011	2012	2013	2014	2015
Chesterfield Roadside	Roadside	97.4	13.9	14.8	10.2	11.5	10.4
Chesterfield Loundsley Green	Urban Background	57.7	N/A	N/A	N/A	N/A	7.8

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

## Appendix B: Full Monthly Diffusion Tube Results for 2015

Table B.1 – NO<sub>2</sub> Monthly Diffusion Tube Results - 2015

Site ID	NO <sub>2</sub> Mean Concentrations (µg/m <sup>3</sup> )												Annual Mean		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Raw Data	Bias Adjusted <sup>(1)</sup>	
1	Bradbury Club, 150 Chatsworth Rd	33	41	40	36	29	28	30	-	38	45	41	38	36.3	28.7
2	Bridge Inn, Hollis Lane	47	55	48	35	36	-	35	39	41	42	37	43	41.6	32.9
3	376 Sheffield Road	-	50	53	53	43	37	-	-	46	51	40	44	46.3	36.6
4	390 Sheffield Road	57	51	58	47	53	43	47	46	46	52	-	-	50.0	39.5
5	17, South Place	-	27	36	33	30	30	50	31	49	47	32	-	36.5	28.8
6	6 Church Street, Brimington	47	58	55	58	53	45	36	55	62	68	41	37	51.3	40.5
7	DCC Offices, West Street	-	36	31	28	19	-	21	24	28	42	26	31	28.6	22.6
8	St Augustines, 212 Derby Road	39	43	41	39	34	30	34	41	38	44	35	43	38.4	30.3
9	Lincoln Street, 287 Derby Road	-	43	41	-	29	30	31	32	34	-	-	38	34.8	27.5

Chesterfield Borough Council

Site ID	NO <sub>2</sub> Mean Concentrations (µg/m <sup>3</sup> )												Annual Mean	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Raw Data	Bias Adjusted <sup>(1)</sup>
	10	54	62	59	56	50	45	53	55	60	55	53	53	54.6
11	48	-	-	36	24	25	26	28	33	39	24	28	31.1	24.6
12	35	46	39	33	-	28	31	33	39	46	36	34	36.4	28.7
13	31	37	36	34	21	21	23	18	33	43	29	31	29.8	23.5
14	35	44	45	43	38	37	48	49	52	60	39	44	44.5	35.2
15	30	27	27	25	19	16	19	21	26	34	26	25	24.6	19.4
16	25	33	29	28	20	15	18	19	24	30	24	29	24.5	19.4
17	26	31	26	21	19	19	18	20	25	47	25	27	25.3	20.0
18	Site not yet in use												30.8	24.4



Chesterfield Borough Council

Site ID		NO <sub>2</sub> Mean Concentrations (µg/m <sup>3</sup> )												Annual Mean	
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Raw Data	Bias Adjusted <sup>(1)</sup>
<b>27</b>	Lowgates, Staveley	44	47	43	37	29	30	36	33	45	51	40	30	38.8	30.6
<b>28</b>	Patrick Hinds House, Church St, Brimington	46	53	46	41	37	36	41	38	48	51	36	43	43.0	34.0
<b>29</b>	Hollywell Cross R/T, Old Post Restaurant	35	47	51	47	36	40	-	-	55	63	39	-	45.9	36.3
<b>30</b>	348, Chatsworth Rd, Brampton Mile	31	46	41	37	30	28	29	35	39	45	34	38	36.1	28.5
<b>31</b>	386 Sheffield Road	53	64	55	56	50	-	54	52	55	59	52	50	54.5	<b>43.1</b>
<b>32</b>	Warner Street, Hasland	40	40	50	42	33	34	33	35	50	55	35	30	39.8	31.4
<b>33</b>	55 Duke Street, Staveley	56	58	52	46	39	44	47	45	54	57	42	43	48.6	38.4
<b>34</b>	Travel Blank	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Site ID	NO <sub>2</sub> Mean Concentrations (µg/m <sup>3</sup> )												Annual Mean		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Raw Data	Bias Adjusted <sup>(1)</sup>	
	<b>35</b>	632, Chatsworth Road, Storrs Road	37	42	39	38	35	32	36	33	40	42	35	37	37.2
<b>36</b>	Lite Bites, Mansfield Road, Hasland	37	41	41	36	26	26	-	29	38	51	30	32	35.2	27.8
<b>37</b>	50 Church Street, Brimington	-	60	56	49	44	41	49	44	51	57	50	50	50.1	39.6
<b>38</b>	14 Church Street, Brimington	56	63	62	63	51	46	55	52	62	69	48	48	56.3	44.4
<b>39</b>	43 Sheffield Road	30	40	39	38	26	30	29	30	38	50	34	33	34.8	27.5
<b>40</b>	380 Sheffield Road	45	49	44	42	36	36	37	33	40	51	43	45	41.8	33.0
<b>41</b>	James Street / Lockoford Lane	-	50	42	43	25	27	25	31	-	53	33	35	36.4	28.8

(1) See Appendix C for details on bias adjustment

(2)





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

NO<sub>2</sub> diffusion tubes are supplied by South Yorkshire Air Quality Samplers, the preparation method being 50% TEA in acetone. The laboratory follows the procedures set out in the Harmonisation Practical Guidance. The national bias factor for the tubes supplied by this source is 0.84. Data from the two sites operated by Chesterfield BC is supplied to DEFRA for input into the calculation of this factor.


### Factor from Local Co-location Studies (if available)

The local bias factor for the traffic site operated by Chesterfield BC is as follows:

Chesterfield Roadside (Chatsworth Road): 0.79

The calculation for deriving this factor is shown below:

#### Checking Precision and Accuracy of Triplicate Tubes



From the AEA group

Diffusion Tubes Measurements										Automatic Method		Data Quality Check	
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 $\mu\text{g m}^{-3}$	Tube 2 $\mu\text{g m}^{-3}$	Tube 3 $\mu\text{g m}^{-3}$	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean	Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
1	07/01/2015	04/02/2015	30.0	25.0	26.0	27	2.6	10	6.6	21.92	97	Good	Good
2	04/02/2015	04/03/2015	27.0	33.0	31.0	30	3.1	10	7.6	23.89	96	Good	Good
3	04/03/2015	01/04/2015	27.0	29.0	26.0	27	1.5	6	3.8	23.04	100	Good	Good
4	01/04/2015	29/04/2015	25.0	28.0	21.0	25	3.5	14	8.7	17.23	100	Good	Good
5	29/04/2015	27/05/2015	19.0	20.0	19.0	19	0.6	3	1.4	15	96	Good	Good
6	27/05/2015	01/07/2015	16.0	15.0	19.0	17	2.1	12	5.2	15	100	Good	Good
7	01/07/2015	29/07/2015	19.0	18.0	18.0	18	0.6	3	1.4	15	89	Good	Good
8	29/07/2015	26/08/2015	21.0	19.0	20.0	20	1.0	5	2.5	15	94	Good	Good
9	26/08/2015	30/09/2015	26.0	24.0	25.0	25	1.0	4	2.5	22	89	Good	Good
10	30/09/2015	28/10/2015	34.0	30.0	47.0	37	8.9	24	22.1	27	94	Poor Precision	Good
11	28/10/2015	02/12/2015	26.0	24.0	25.0	25	1.0	4	2.5	21.26	97	Good	Good
12	02/12/2015	06/01/2016	25.0	29.0	27.0	27	2.0	7	5.0	18.1	97	Good	Good
13													

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

**Site Name/ ID:** Chatsworth Road

**Accuracy** (with 95% confidence interval)  
without periods with CV larger than 20%

Bias calculated using 11 periods of data  
Bias factor A 0.79 (0.75 - 0.84)  
Bias B 26% (19% - 34%)

Diffusion Tubes Mean: 24  $\mu\text{g m}^{-3}$   
Mean CV (Precision): 7

Automatic Mean: 19  $\mu\text{g m}^{-3}$   
Data Capture for periods used: 96%

Adjusted Tubes Mean: 19 (18 - 20)  $\mu\text{g m}^{-3}$

**Precision** 11 out of 12 periods have a CV smaller than 20%

**Accuracy** (with 95% confidence interval)  
**WITH ALL DATA**

Bias calculated using 12 periods of data  
Bias factor A 0.79 (0.74 - 0.83)  
Bias B 27% (20% - 35%)

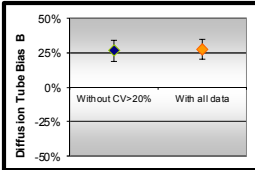
Diffusion Tubes Mean: 25  $\mu\text{g m}^{-3}$   
Mean CV (Precision): 9

Automatic Mean: 19  $\mu\text{g m}^{-3}$   
Data Capture for periods used: 96%

Adjusted Tubes Mean: 20 (18 - 21)  $\mu\text{g m}^{-3}$

Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
21.92	97	Good	Good
23.89	96	Good	Good
23.04	100	Good	Good
17.23	100	Good	Good
15	96	Good	Good
15	100	Good	Good
15	89	Good	Good
15	94	Good	Good
22	89	Good	Good
27	94	Poor Precision	Good
21.26	97	Good	Good
18.1	97	Good	Good

Overall survey --> Good precision Good Overall DC  
(Check average CV & DC from Accuracy calculations)



Jaume Targa, for AEA  
Version 04 - February 2011

Further details on the sites are given in Appendix D of this report

### Discussion of Choice of Factor to Use

The bias factor used in adjusting the data for this report is a local factor and, more specifically, is calculated using the traffic site, Chesterfield Roadside. This site is used as it is in a very similar location to those where the diffusion tubes are all now placed. The local factor (0.79) varies from the national factor (0.84) but as the data is specific to this region and, more pertinently, to the roadside monitoring which is now being uniformly undertaken, it is believed that the use of the local factor is fully

justified. It will also be noted that the results obtained by the diffusion tubes monitoring at Sheffield Road, Stonegravels compare favourably with the results obtained by the automatic monitor used in close proximity.

### **PM Monitoring Adjustment**

Monitoring is carried out using FDMS equipment, no data adjustment is required.

### **Short-term to Long-term Data adjustment**

No adjustment of the data is required.

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

Data validation is carried out by BureauVeritas on behalf of DEFRA. On site calibration is carried out by Chesterfield BC staff on a 14 day cycle, using standard calibration gases, and the calibration data is sent direct to BureauVeritas, and RicardoAEA, by email.

The temporary site is operated, on contract by TTRL Ltd. Their in-house team is responsible for the verification and full QA/QC of the data which they have supplied to us.

### **QA/QC of diffusion tube monitoring**

The diffusion tube monitoring is carried out in full compliance with the guidance contained in the document "Diffusion Tubes for Ambient NO<sub>2</sub> Monitoring: Practical Guidance for Laboratories and Users". The WASP results show the overall performance of the analysis laboratory as good.

## Appendix D: Details of Monitoring Locations

The details of the sites and the monitoring being undertaken at each location are given below in Tables 2.1a and 2.1b:

**Table D.1a: Details of Automatic Monitoring Sites**

Site Name	Site Type	OS Grid Ref		Pollutants Monitored	Monitoring Technique
Chatsworth Road	Urban Traffic	436349E	370657N	NOx	Chemi-luminescent
				PM <sub>10</sub>	FDMS
				PM <sub>2.5</sub>	FDMS
				Benzene	Pumped Tubes
Loundsley Green	Urban Background	436471E	372037N	Nox	Chemi-luminescent
				PM <sub>10</sub>	FDMS
				PM <sub>2.5</sub>	FDMS
				Heavy Metals	Pumped Filter

**Table D.1b: Details of Automatic Monitoring Sites**

Site Name	In AQMA?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Does this location represent worst-case exposure?
Chatsworth Road	N	Y (1m)	4.5m	Yes
Loundsley Green	N	N	17.5m	No

The maps, overleaf, show the locations of the two automatic monitoring stations operated by Chesterfield Borough Council, both of which are affiliated to the Automatic Urban/Rural Network (AURN) providing monitoring data to central government under the management and oversight of BureauVeritas.

**Figure D.1 Location of Chatsworth Road Automatic Monitoring Site**



Note: For data handling and data download purposes, this site is referred to as Chesterfield Roadside, by both BureauVeritas and DEFRA

**Figure D.2: Chatsworth Road site, showing immediately adjacent housing**



This site, classified as a Roadside site for LAQM purposes, is classified as an Urban Traffic site under the AQD. This site is indicative of public exposure for dwellings in urban locations adjacent to major traffic routes.

**Figure D.3: Location of Loundsley Green Automatic Monitoring Site**



Note: For data handling and data download purposes, this site is referred to as Chesterfield Loundsley Green, by both BureauVeritas and DEFRA.

**Figure D.4: Loundsley Green site, showing open surroundings**



This site is classified as an Urban Background site, and is indicative of urban locations set away from main roads. The immediate surroundings are playing fields, with residential development further afield. The adjacent road is used for access within the residential area, and does not carry through traffic

In addition to the above sites which are affiliated to AURN, we have used a temporary site to assess whether the passive monitoring data indicating a probable



exceedance of the NO<sub>2</sub> on a section of terraced housing on Sheffield Road was accurate, this site started operation in mid June 2015 and is currently gathering data. The full 12 months of monitoring data will be reported upon in the 2017 report.

**Table D.2: Details of Temporary Automatic Monitoring Site**

Site Name	Site Type	OS Grid Ref		Pollutants Monitored	Monitoring Technique
Sheffield Road	Urban Traffic	438307E	373019N	NO <sub>x</sub>	Chemi-luminescent

Site Name	In AQMA?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Does this location represent worst-case exposure?
Sheffield Road	N	Y (17m)	2m	Yes

This site is operated, on contract, by TRL Ltd, who are responsible for running the site and validating the data retrieved, which is then made available to this Authority.

**Figure D.5: Location of Temporary Automatic Monitoring Site**



**Figure D.6: Location of Sampling Head in Relation of the Affected Row of Terraced Housing on the Opposite Side of Sheffield Road**

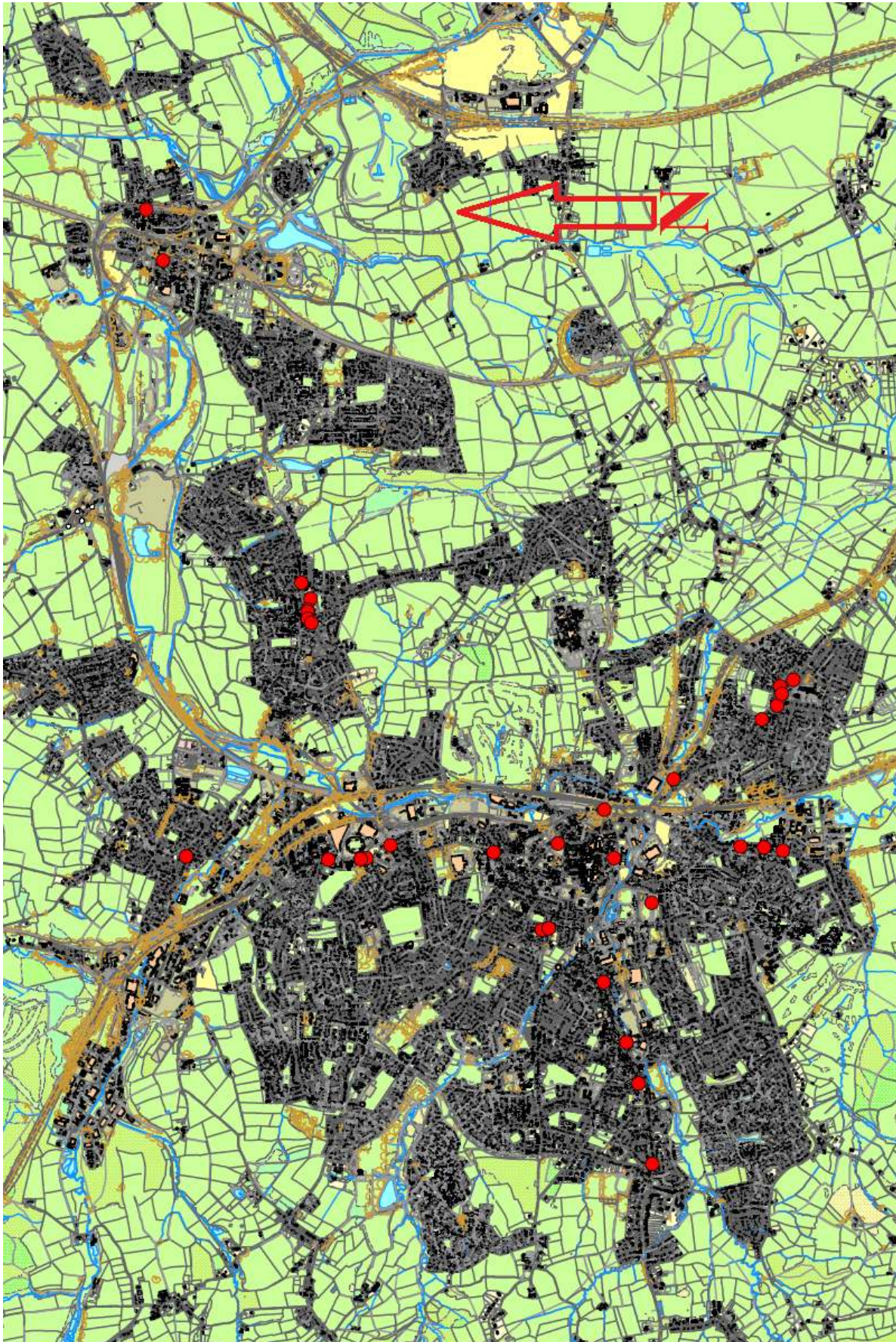


The co-location tubes which had been used on the Chesterfield Site (at Queens Park Annex, and now relocated and renamed as Chesterfield Loundsley Green) are currently being used at this site. We would like to acknowledge the assistance given by Chesterfield Football Club in providing support for this monitoring.

Figure D.7 (overleaf) shows where the diffusion tubes are located across the Borough



Figure D.7 Location of Diffusion Tubes





## Appendix E: 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

Please add a description of any abbreviation included in the ASR – An example is provided below.

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'
AQD	2008 EU Air Quality Directive
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

Environment, Food and Rural Affairs Committee, Air Quality – Fourth Report of Session 2015-16

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Fine Particulate Matter (PM<sub>2.5</sub>) in the United Kingdom, DEFRA 2012

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<http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html>