2011 Air Quality Progress Report for Chesterfield Borough Council

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

September 2011

Local Authority Officer	Steve Payne

Department	Environment
Address	Town Hall Rose Hill Chesterfield Derbyshire S40 1LP
Telephone	01246 345741
e-mail	steven.payne@chesterfield.gov.uk

Report Reference number	2011 PR - 2
Date	5th September 2011

Executive Summary

In accordance with the requirements of the Environment Act 1995, local authorities are required to conduct periodic Reviews and Assessments of air quality within the Borough on a regular basis. These reviews and assessments involve an examination of the levels of those pollutants for which air quality objectives have been set. In conducting such local air quality reviews and assessments the current levels of these pollutants as well as their expected future levels has to be estimated to ensure that the objectives are not being exceeded at present and that they are unlikely to be exceeded in future.

This report is Chesterfield Borough Council's 2011 Progress report and summarises the findings of the most recent review and assessment of air quality within the Borough. It has been undertaken in accordance with the Technical Guidance LAQM.TG (09) and associated tools (as updated in 2010) and includes the most recent monitoring data (up to the end of 2010) as well as the impact of any developments or changes that may have an impact on air quality.

Based on the available data it is concluded that with three exceptions, the air quality objectives are currently being met for all pollutants at all locations within the Borough. The exceptions are at four locations where the annual objectives for Nitrogen Dioxide, derived from diffusion tube measurements, were exceeded. Two of these locations are known to suffer from queuing traffic because of particular local road and traffic conditions and not because of the volume of traffic. Three exceedences are marginal and increased monitoring will take place at these locations, as part of a detailed assessment. In addition, studies are currently underway to devise appropriate measures to alleviate traffic congestion in these areas.

The fourth location is a new location, introduced in 2010 to examine the impact of a new development. It is believed that the data obtained from this location includes the effect of construction traffic and may therefore not be representative of normal operational conditions, a programme of increased monitoring at this location will seek to ascertain if whether this is the case.

The Council will be proceeding to a detailed assessment, at the four sites outlined above, and will continue to monitor conditions around the Borough as part of the continued scheme of air quality monitoring within the Borough.

Table of contents

Appendices

Appendix A: QA:QC Data

List of Tables

List of Figures

1 Introduction

1.1 Description of Local Authority Area

Chesterfield is a small market town situated in North Derbyshire. It is surrounded by the semi-rural boroughs of North East Derbyshire to the north, south and west, and Bolsover District to the east. Chesterfield is a compact, urban authority with a population of approximately 90,000 inhabitants spread over 19 wards. The Borough includes a semi-pedestrianised town centre which lies within the south-western region of the borough and includes a mix of residential and commercial developments. Most inhabitants live in the surrounding suburbs,

As Figure 1.1 shows, the M1 Motorway skirts the eastern fringes of the borough, and busy motorway junctions (including junctions 30, 29 and 29a) lie immediately to the east of the densely populated areas of Staveley, Duckmanton and Poolsbrook. The town centre is bypassed by the A61 ring road which diverts traffic to the south and away from the town. The main source of pollution in the borough arises from road transport, but some traditional heavy industry still remain including brick manufacturers, steel works and open cast sites.

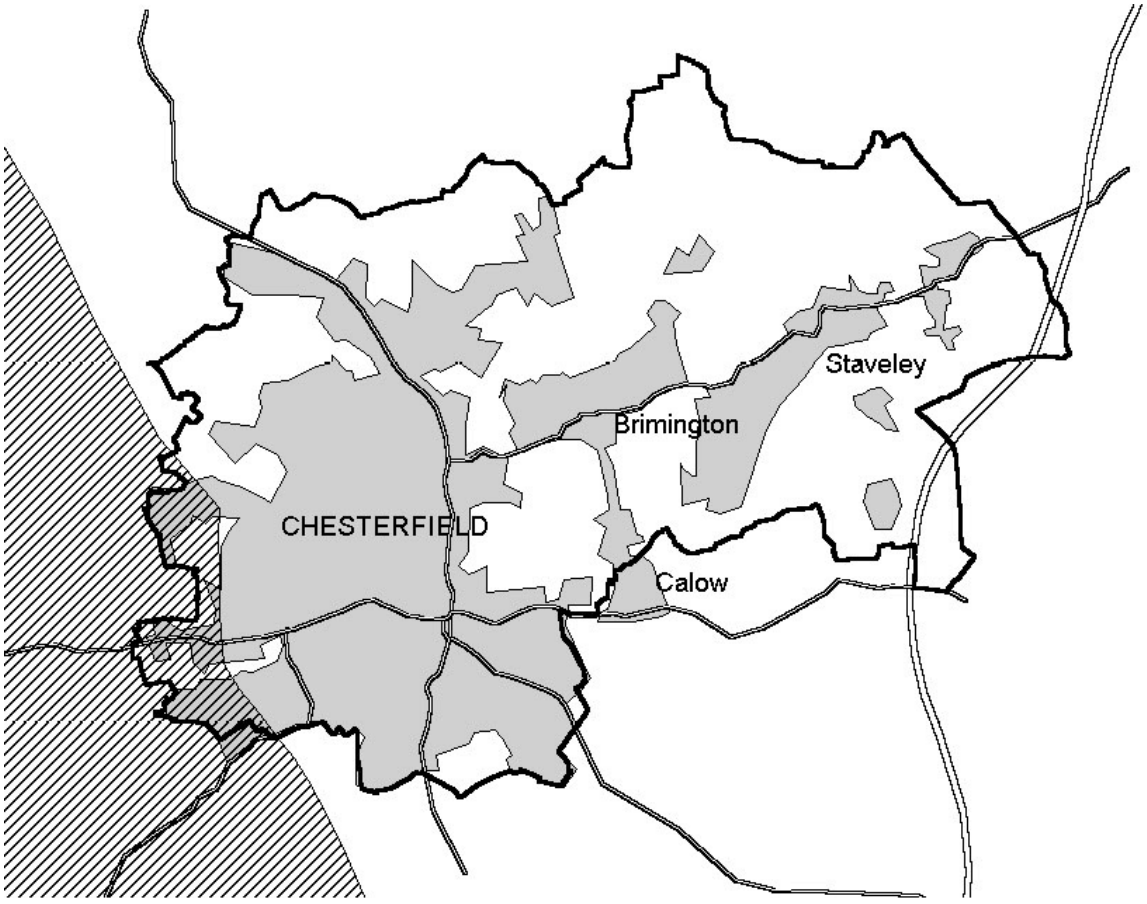


Figure 1.1 The Borough of Chesterfield

1.2 Purpose of Progress Report

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

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

1.3 Air Quality Objectives

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

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

Pollutant	Concentration	Measured as	Date to be achieved by
Benzene	16.25 $\mu g/m^3$	Running annual mean	31.12.2003
	5.00 $\mu g/m^3$	Annual mean	31.12.2010
1,3-Butadiene	2.25 $\mu g/m^3$	Running annual mean	31.12.2003
Carbon monoxide	10.0 mg/m^3	Running 8-hour mean	31.12.2003
Lead	0.5 $\mu g/m^3$	Annual mean	31.12.2004
	0.25 $\mu g/m^3$	Annual mean	31.12.2008
Nitrogen dioxide	200 $\mu g/m^3$ not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 $\mu g/m^3$	Annual mean	31.12.2005
Particles (PM_{10}) (gravimetric)	50 $\mu g/m^3$, not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	40 $\mu g/m^3$	Annual mean	31.12.2004
Sulphur dioxide	350 $\mu g/m^3$, not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 $\mu g/m^3$, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 $\mu g/m^3$, not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

1.4 Summary of Previous Review and Assessments

In common with Local Authorities throughout the country, Chesterfield Borough Council completed their first, second and third round of air quality reviews and assessments in 2003. These reviews concluded that nitrogen dioxide (NO_2) and fine particulate matter (PM_{10}) were at risk of exceeding their air quality objectives at the time. As a result, a detailed assessment was recommended. Such an assessment was conducted in 2004 and concluded that the two pollutants in question should be kept under close review and that monitoring be continued, but no further immediate action should be taken. The subsequent Progress Report in 2005 reported new monitoring data and pointed to additional possible hotspots in the Borough.

The 2006 Updating and Screening assessment included a full review of all pollutants and all data available at that time, and concluded that NO_2 concentrations exceeded their objectives at three locations within the Borough. These were:

- along parts of the A61 Derby Road
- along parts of the A619 Chesterfield Road, Staveley
- along parts of the A619 Chatsworth – Markham Road

It was believed that the elevated levels of NO_2 at these locations were due to high levels of traffic coupled with congestion, particularly during rush hour. This is not surprising as both the A619 and A61 are major arterial routes into Chesterfield.

None of the other pollutants were found to be at risk of exceeding their objectives, but at Whittington Moor elevated levels of PM_{10} were also measured. These PM_{10} levels did, in fact, exceed the provisional objectives applicable at that time. It was therefore recommended that a detailed assessment should be conducted.

Such a detailed assessment was conducted in 2007 and focussed on the three areas identified during the 2006 Updating and Screening Assessment. This (2007) assessment predicted that NO_2 concentrations would be exceeded at several locations in the Borough, mainly, along the most heavily trafficked routes as modelled. As a result, the 2007 detailed study recommended that an Air Quality Management Area (AQMA) be declared in certain parts of the Borough. A ribbon AQMA covering Derby Road (A61), Chatsworth Road (A619) and Chesterfield Road, Staveley (A619) was therefore proposed. It was also recommended that monitoring of NO_2 be continued and that a further assessment be conducted at a later stage to confirm the findings.

Proposals for the AQMA were taken to public consultation in October 2008, and while these proposals were being finalised, additional data became available. These data, reported in the 2009 Updating and Screening highlighted two further areas where NO_2 levels, obtained from diffusion tubes,

were being exceeded. These areas were Whittington Hill and Compton Street, both of which were outside the originally proposed AQMA.

Compton Street is relatively close to the town centre, lying approximately 800 metres north of the main pedestrianised areas of the town. It carries commuter traffic from the suburbs into the town centre and is a known 'dodge' route for vehicles heading out of town on Chatsworth Road, Derby Road and Sheffield Road. Nonetheless, the total traffic flows are not notably especially high compared with some of the other roads.

Whittington Hill lies approximately 6 kilometres from the town centre and carries commuter traffic to and from the suburbs and townships to the east and north of the town. The road is on a hill (as the name suggests) and has terraced houses close to the kerb side. It is also a bus route and carries heavy goods vehicles serving the various industrial estates in that region.

The Council therefore decided to investigate the exceedances at these two additional locations to determine whether the AQMA boundary should be extended to include these new areas, and as recommended in the 2007 study, a further detailed assessment was commissioned. The aim of this further detailed assessment was to focus on the new areas (Whittington Hill and Compton Street) as well as to refine the modelling of the areas included in the originally proposed AQMA. The new assessment therefore included detailed dispersion modelling together with a detailed review of all recent monitoring data within the Borough. In addition to the assessment of air quality, this new study also included a source apportionment assessment to determine the key sources of pollution and to inform the action plan or any subsequent measures to improve air quality in the area.

The new study, found that data from the two air quality stations operated by the Council (which form part of the national Automatic Urban and Rural Network and which are therefore subject to rigorous Quality Control) were largely consistent with data from other neighbouring stations. This was true both for NO_2 and fine particulate matter (PM_{10}'s and $PM_{2.5}$'s). It would therefore appear that a large proportion of the pollution within the Borough is regional rather than local. More importantly, none of the data (for NO_2 or particulate matter) obtained from the continuous analysers exceeded any of the air quality objectives. Data from the NO_2 diffusion tubes deployed within the Borough were also examined and checked against data from the continuous analysers. As is the accepted practice, diffusion tubes co-located with each analyser were used to calculate bias factors for the diffusion tube data. For the roadside analyser using the data for 2009, a bias factor of 0.7 was derived and this was used in analysing data from the roadside diffusion tubes. The corrected diffusion tube data indicated that there were no exceedances of the air quality objectives for NO_2 in 2009, but there were a few locations where elevated levels of NO_2 concentrations were obtained.

Dispersion modelling was then conducted, with the model being verified using both the continuous monitoring data and the diffusion tube data. Good agreement was obtained between the modelled and measured data, leading to a high degree of confidence in the results from the modelling. The model

included all of the major roads and heavily trafficked areas and was more detailed than any of the previous modelling studies conducted in Chesterfield, but used traffic data that were consistent with those used in previous studies.

NO_2 concentrations predicted by the model did not exceed the air quality objectives at any location where the objectives apply. Elevated levels of NO_2 concentrations were found at roundabouts, busy intersections and at areas of traffic congestion, but the highest concentrations were on the roads themselves where the objectives do not apply, that is, where people are not usually present for prolonged periods.

This finding differs from the earlier modelling studies, despite similar traffic and input data being used. This is due, at least in part, to the previous studies using background levels of NO_X and NO_2 concentrations which were higher than those believed to be valid for 2009. In this new study the most recent data for background concentrations were used and these were found to be consistent with the background data obtained from the background analyser. The findings of this latest study, based both on monitoring data, and dispersion modelling, was that the air quality objectives were not being exceeded in 2009 Further, given current projections in traffic growth and vehicle emissions, it is unlikely that air quality objectives will be exceeded in future.

The study also showed that within Chesterfield as a whole, road transport accounted for some 35% of all NO_X emissions. Other significant sources of NO_X emissions within the Borough were Industrial Combustion (25%), Other Transport (22%) and Commercial, Institutional and Residential Combustion (17%). It was also found that within Chesterfield, not surprisingly, the areas where road transport produced the highest concentrations were within the City Centre and along the major roads and heavily trafficked routes. Not surprisingly, these were also the areas where the highest NO_2 concentrations were obtained.

The contribution of HGV's to NO_X emissions at hot spots within the City Centre was still relatively high, but several other factors contributed to the elevated concentrations; these included the volume of traffic and congestion. The most practical method of improving air quality at these locations therefore appears to be to reduce congestion and allow traffic to flow as freely as possible

No other pollutants, including fine particulate matter, were found to be in danger of exceeding their air quality objectives.

Table 1.2 below summarises all previous review and assessment reports in a quick reference table.

Table 1.2 Summary of Previous Review and Assessments

Date	Report Title	Conclusions and recommendations
2003	Update & Screening Assessment	Nitrogen Dioxide and PM_{10} were at risk of exceeding the health-based objectives. This led to a Detailed Assessment of these pollutants being conducted in 2004
2004	Detailed Assessment	No immediate action necessary, but Nitrogen Dioxide and PM_{10} should remain under close review. Improvements in air quality monitoring across the borough was also recommended
2005	Progress Report	Monitoring data highlighted a risk of exceedance of the Air Quality Nitrogen Dioxide Objectives on Derby Road. However, the data capture was not of sufficient accuracy for immediate action to be taken. Recommendations were made to improve the air quality monitoring strategy.
2006	Update & Screening Assessment	Monitoring data highlighted three locations showing exceedance of the annual Nitrogen Dioxide Air Quality Objective. These were Chatsworth Road (A619) and Derby Road (A61 South) and Chesterfield Road, Staveley (A619). Recommendation was made to complete a Detailed Assessment for these areas
2007	Detailed Assessment	Modelled data confirmed that Chatsworth Road (A619) and Derby Road (A61 South) and Chesterfield Road, Staveley (A619). showed exceedance of the annual Nitrogen Dioxide Air Quality Objective. Proposal was made to declare a ribbon AQMA, the proposed boundary of which would be based on a contour produced by the ADMS model, and incorporated areas of the borough predicted as having average annual NO_2 levels in excess of 36 $\mu g/m^3$.
2008	Progress Report	Recommendation to improve data capture, relocation of background monitoring site and relocation of some diffusion tubes to increase accuracy of results. Better working with planning department on major developments and improving the councils air quality web pages.
2009	Update & Screening Assessment	Monitoring data highlighted two further areas (both lying outside of the boundary for the proposed AQMA) showing elevated levels of Nitrogen Dioxide and possible exceedance of the annual Nitrogen Dioxide Air Quality Objective. These areas were Whittington Hill and Compton Street. Recommendation to produce detailed assessments for both areas.
2010	Progress Report	None of the air quality objectives were exceeded in 2009 and it was decided to withdraw the proposals for the declaration of an AQMA. It was recommended to continue to monitor air quality at all of the hot spots previously identified. In addition, the Council is reviewing the monitoring locations to ensure that a comprehensive monitoring data set is obtained and can be used to assess air quality within the Borough with confidence.
2010	Detailed Assessment and Source apportionment	Detailed assessment based on dispersion modelling of the most heavily trafficked areas within the Borough including Whittington Hill and Compton Street. Both monitoring and modelling indicated no exceedances of any of the objectives in 2009. Elevated levels were however found at a few locations and recommendations were made to continue to monitor trends throughout the Borough and especially at these locations.

2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Sites

Chesterfield Borough Council (CBC) operates two automatic monitoring stations which form part of the Automatic Urban and Rural Network (AURN). As a result, the stations are maintained and operated in strict accordance with the required data collection and quality assurance procedures that apply to all national monitoring stations.

One of these stations is a "Roadside" station located adjacent to number 461 Chatsworth Road (part of the A619) at OS coordinates, 436349E, 370657N. It is positioned some 4m from the kerb. This station, shown in Figure 2.1, was commissioned in March 2008. As figure 2.1 shows, there are residential properties along both sides of Chatsworth Road; this site therefore provides invaluable data regarding the levels of pollutants experienced by nearby residents. It should be noted that since winter 2009, the station has been reclassified as an Urban Background station.

The other station is an Urban Background station; this is located adjacent to the Pavilion at Queens Park Annex sport ground (OS coordinates 437909E, 370545N). It is clear from Figure 2.2 that the site is well away from any road or industrial sources and as a result, it provides data which is indicative of the general background in the area. This station was commissioned in March 2008.

Both stations monitor NO, NOx and NO_2 as well as PM_{10} and $PM_{2.5}$ but at Chatsworth Road, Benzene is also monitored using NPL Benzene tubes NO_2 is monitored using Monitor Labs chemiluminescence analysers and PM_{10} and $PM_{2.5}$ are monitored using R&P TEOM analysers fitted with AURN FDMS systems. Continuous monitoring of most of these pollutants has been conducted in Chesterfield for a number of years and continued in 2010.

. The chemiluminescence analysers at both stations are serviced and maintained by Supporting U whereas the TEOM's and FDMS's are serviced and maintained on behalf of DEFRA (AURN) by Air Monitors. In keeping with the AURN affiliate status, both stations are audited on a six monthly basis by AEA Energy and Environment (AEA).

The stations are visited every two weeks by a Local Site Operator, who performs calibrations and equipment checks in accordance with the Site Operators Manual AEAT/ENV/R1595. The results are submitted to AEA and Bureau Veritas (BV) for verification after each calibration. Data from these stations are regularly downloaded by AEA and BV, who applies the calibrations and upload the data to the air quality website where it is accessible to the public. AEA are also responsible for the subsequent ratification of the data.

Figure 2.1 Map of Chatsworth Road Automatic Monitoring Site (Roadside)

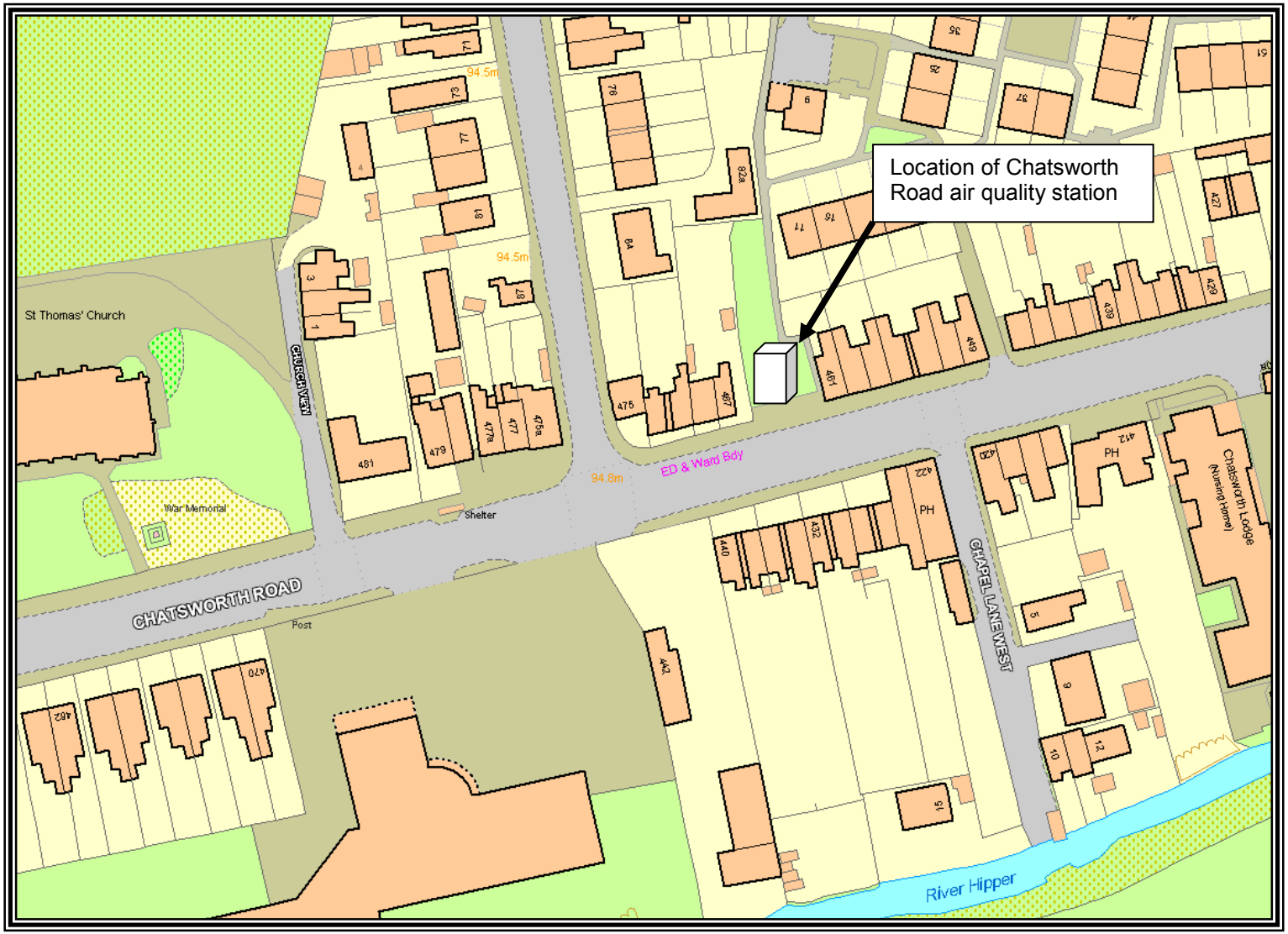


Figure 2.2 Map of Queens Park Annex Automatic Monitoring Site (Background)

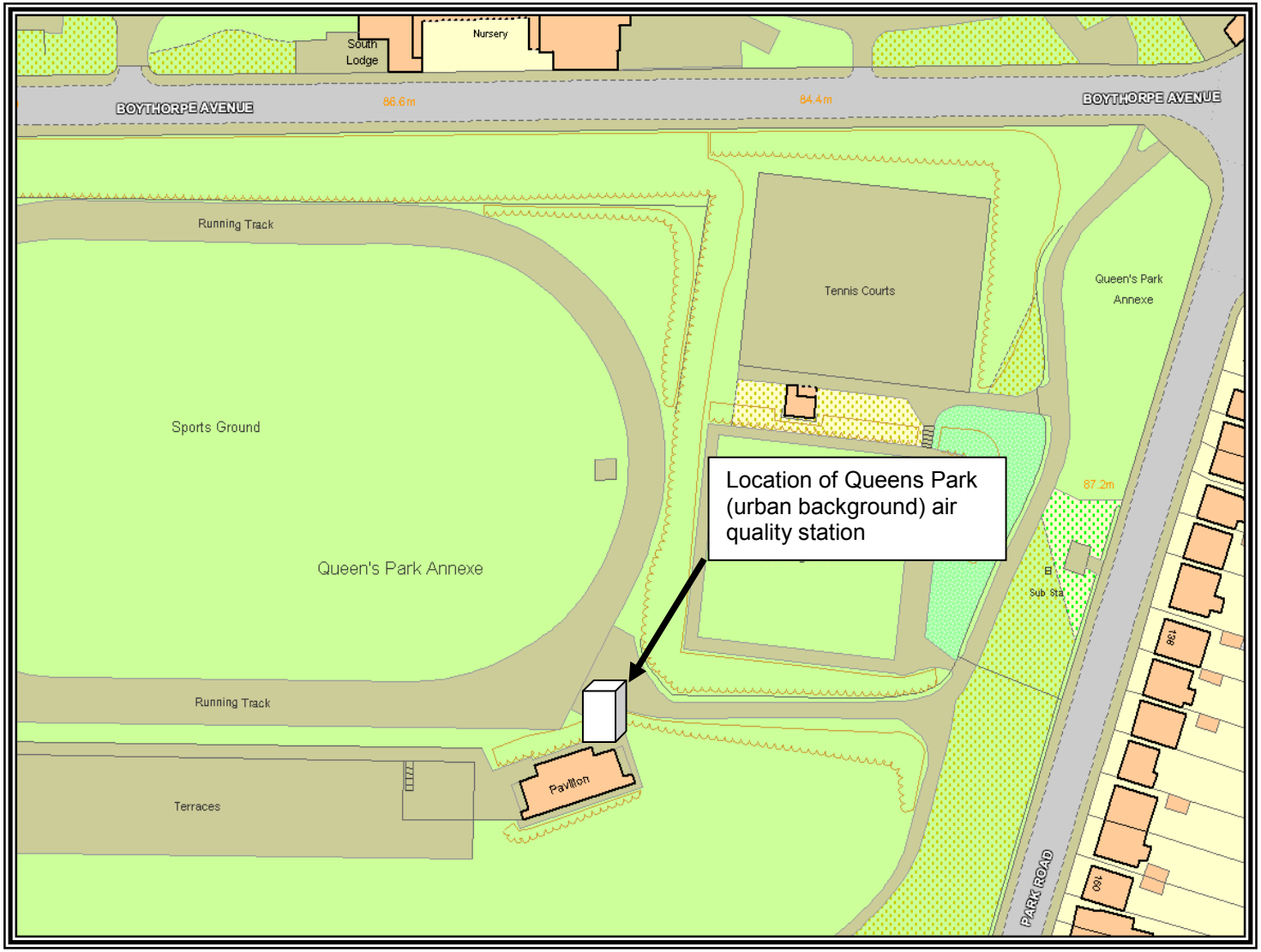


Table 2.1 Details of Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref		Pollutants Monitored	Monitoring Technique	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	Roadside (but reclassified as an Urban background)	436349 E	370657 N	NOx PM_{10} $PM_{2.5}$ Benzene	Chemi-luminescent FDMS FDMS Pumped Tubes	N	Y (1m)	4.5m	Y
Queens Park Annex	Urban background	437909 E	370545 N	NOx PM_{10} $PM_{2.5}$	Chemi-luminescent FDMS FDMS	N	N / A	N / A	N

2.1.2 Non-Automatic Monitoring

The only non-automatic monitoring conducted in Chesterfield is diffusion tube monitoring of nitrogen dioxide. During 2010, a total of 41 diffusion tubes were used to measure NO_2 concentrations throughout the Borough. This is three more than were deployed in 2009. Note that this includes two sets of triple, co-located, tubes at each of the two automatic monitoring stations mentioned above. Details of all sites are summarised in Table 2.2 below. In essence the bulk of these were roadside sites, selected both for practicality and to obtain worst case conditions at relevant receptors. It should be noted however that there are no relevant receptors at site 2 and site 7 is believed to be affected by a gas fire vent.

The tubes, supplied and analysed by South Yorkshire Air Quality Samplers (SYAQS) were 50% acetone and 50% triethanolamine (TEA) and were exposed for a four or five week period as recommended by the diffusion tube monitoring calendar. The deployment and general handling of the tubes was consistent with the recommendations of TG09.

Full details of the QA procedures and the derivation of bias factors are provided in Appendix A, suffice to say that bias factor of 0.74 and 0.87 were obtained form the roadside and background analysers respectively.

It should be noted that the national bias factors database currently has five entries for bias factors from South Yorkshire Labs (presumed to be South Yorkshire Air Quality Samplers since SYL ceased to operate at the end of 2009). However, two have poor precisions, and the remaining three have bias factors which range from 0.78 to 0.92. The values obtained herein (0.74 from the roadside site and 0.87 from the background site) are therefore not inconsistent with those contained in the database, albeit that the roadside site produced data towards the low end of the distribution. The locally derived bias factor of 0.74 was therefore used to adjust the roadside diffusion tube data.

Table 2.2 Details of Non- Automatic Monitoring Sites (Diffusion tubes)

Site No. / Name	Site type	OS Grid Ref	Distance to kerb of nearest road (m)	Height above local ground (m)	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Worst Case location
1. Bradbury Club, 150 Chatsworth Road, (A619)	Roadside	437 224 370 958	4.9	2.1	Y (Building Façade)	Yes
2. Markham Road, (A619)	Roadside	438 427 370 832	1.8	2.5	N (No receptors in immediate vicinity)	Yes
3, St Augustine's Road	Roadside	438 306 369 739	6.7	2.2	Y (Building Façade)	Yes
4. Derby Road Development (A61)	Roadside	438 517 370 229	13.9	2.5	Y (Building Façade)	Yes
5. 17 South Place	Roadside	438 293 370 870	3.5	2.5	Y (Building Façade)	Yes
6. Chest Rd Rndbt Brimington	Roadside	440 445 373 514	1.8	2.3	Y (Building Façade)	Yes
7. Dukes Street, Staveley	Roadside	443 456 374 807	4.2	2.2	Y (Building Façade) – affected by gas vent	Yes
8. St Augustine's Church, 212 Derby Road	Roadside	438 395 369 776	5.7	2.5	Y (Building Façade)	Yes
9. Lincoln Street, 287 Derby Road,	Roadside	438 385 369 578	5.1	2.5	Y (Building Façade)	Yes
10. No. 18 Chesterfield Road, Brimington	Roadside	440 148 373 384	2.1	2.8	Y (Building Façade)	Yes
11. No. 42, Whittington Hill (B6052)	Roadside	438 306 374 563	4.5	2.4	Y (Building Façade)	Yes
12. No. 460 Sheffield Road	Roadside	438 297 373 337	2.0	2.0	Y (Building Façade)	Yes
13. No. 99 Chesterfield Road, Staveley	Roadside	442 759 374 270	4.2	2.9	Y (Building Façade)	Yes
14. No. 348 Derby Road, Storforth Lane	Roadside	438 759 369 409	5.2	2.5	Y (Building Façade)	Yes

15,16, 17. 461 Chatsworth Road	Roadside	436 349 370 657	4.5	2.9	Co-located tubes – with Roadside analyser	Yes
18, 19, 20. Queens Park Annex (AQ station)	Urban Background	437 909 370 545	N/A	3.1	N/A Co-located tubes – with Background analyser	No
21. Staveley Stables	Urban Background	443 417 374 911	N/A	2.3	N/A	No
22. No. 35 Ringwood Road, Brimington	Roadside	440 689 373 569	2.1	2.5	Y (Building Façade)	Yes
23. No. 1 Beetwell Street	Roadside	438 112 370 980	9.9	2.0	Y (Building Façade)	Yes
24. No. 10 Compton Street, near Saltergate	Roadside	437 686 371 433	1.9	2.3	Y (Building Façade)	Yes
25. No. 501 Chatsworth Road, near Vincent Crescent	Roadside	435 988 370 602	9.1	2.2	Y (Building Façade)	Yes
26. No. 114 Saltergate	Roadside	437 793 371 368	6	2.4	Y (Building Façade)	Yes
27. Lowgates	Roadside	443 885 374 907	3.3	2.4	Y (Building Façade)	Yes
28. No. 45 Hollis Lane	Roadside	438 740 370 946	5.1	2.4	Y (Building Façade)	Yes
29. Hollywell Cross Roundabout, Old Post Restaurant	Roadside	438 416 371 358	1.5	2.4	Y (Building Façade)	Yes
30. No. 348 Chatsworth Road, Brampton Mile	Roadside	436 705 370 763	3.7	2.5	Y (Building Façade)	Yes
31. No. 24 Derby Road, Jawbones Hill	Roadside	438 359 369 978	4.7	2.8	Y (Building Façade)	Yes
32. Hasland By-Pass (A617)	Roadside	439244 370153	7.2	1.5	N	Yes
33. Oak Farm	Urban Background	444 702 372 482	N/A	2.1	N/A	No

34. No. 451 Chatsworth Road, opp Chapel Lane West	Roadside	436 377 370 663	2.7	2.5	Y (Building Façade)	Yes
35. No. 632 Chatsworth Road, near Storrs Road	Roadside	435 654 370 538	5.2	2.5	Y (Building Façade)	Yes
36. Queens Park	Urban Background	437 935 370 866	N/A	2.4	N/A	No
37. No. 15 Muirfield Road	Roadside	438 920 372 925	11.7	2.4	Y (Building Façade)	Yes
38. No. 93 Eastside Road	Roadside	438 517 373 514	10.8	2.0	Y (Building Façade)	Yes
39. No. 43 Sheffield Road	Roadside	438 345 377 909	4.1	2.4	Y (Building Façade)	Yes
40. No. 380 Sheffield Road	Roadside	438 290 373 015	1.4	2.4	Y (Building Façade)	Yes
41. James St. / Lockford Lane	Roadside	438 407 372 798	2.2	2.4	Y (Building Façade)	Yes

.

2.2 Comparison of Monitoring Results with Air Quality Objectives

2.2.1 Nitrogen Dioxide

Automatic Monitoring Data

Table 2.3a shows that the annual NO_2 objective of 40 μg.m^3 was not exceeded at either of the two automatic monitoring sites within the Borough. These stations form part of the AURN network, and the data summarised below have been fully ratified as well as being subject to strict quality control. There are also no discernible trends in these data, as evidenced from Figure 2.3 and the results appear to be more or less constant during the past few years.

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

Site Location	Within AQMA ?	Relevant public exposure? Y/N	Data Capture for full calendar year 2010 %	Annual mean concentrations (μg/m^3)		
				2008 [1]	2009	2010
Roadside station : Chatsworth Road	N	Y	96.1	23.2	20.6	22.9
Urban Background station : Queens Park	N	N	91.1	18.8	19.0	19.5

[1] Data capture in 2008 was 73% so means were “annualised” as suggested in Box 3.2 of TG(09) –see Appendix A. Data from four surrounding AURN stations were used and an average annual mean to period mean ratio of 1.06 was obtained.

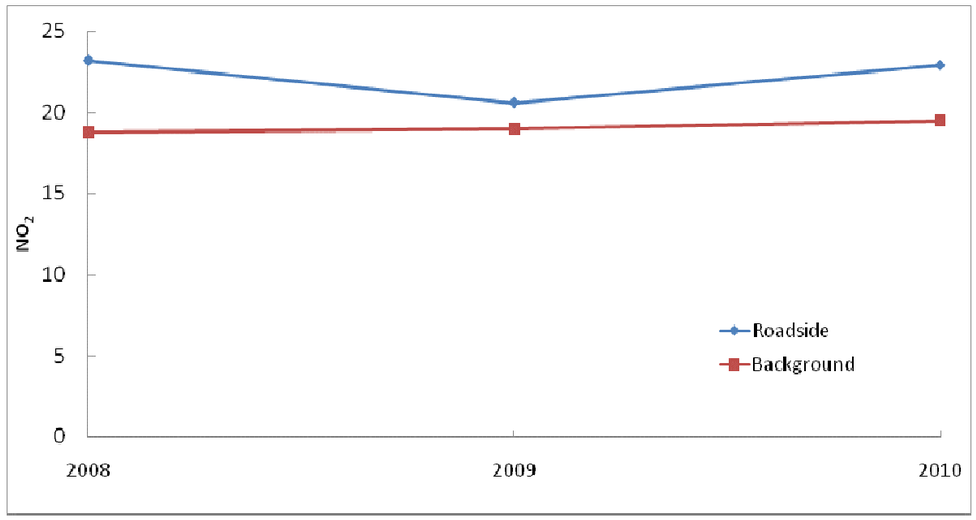


Figure 2.3 Trends in Annual Mean Nitrogen Dioxide Concentration Measured at Automatic Monitoring Sites.

Turning to the 1 hour mean objective of 200 μgm^3, Table 2.3b shows that there were also no exceedances. Both the annual mean and 1 hour mean objectives for NO_2 were therefore met at both continuous monitoring locations.

Table 2.3b Results of Automatic Monitoring of Nitrogen Dioxide: Comparison with the 1-hour Mean Objective

Site Location	Within AQMA ?	Relevant public exposure? Y/N	Data Capture for full calendar year 2010 %	Number of Exceedances of hourly mean (200 μg/m^3)		
				2008 [2]	2009	2010
Roadside station : Chatsworth Road	N	Y	96.1	0	0	0
Urban Background station : Queens Park	N	N	91.1	0	0	0

[2] Data capture in 2008 was 73%. 99.79th percentile values of Roadside and background NO_2 were 88 and 69 μg/m^3 respectively.

Diffusion Tube Monitoring Data

Table 2.4 shows the bias adjusted and annualised diffusion tube data for the last three years. It is worth noting that data from the last two months of the year were lost in the post, so the maximum data capture was 10 months or 83.3%. In addition, during 2010, a number of other tubes were lost due to a variety of reasons; as a result, data capture was relatively poor in some cases with some 16 locations with data capture rates of 75% or less; these locations are shaded orange in the Table 2.4. This therefore adds to the uncertainty in these data. The 2010 data shown in Table 2.4 includes the average for the available data as well as the annualised means which were derived using the procedure outlined in Box 3.2 of TG09, but with data taken from the continuous roadside analyser. For those tubes with 10 months of data only, the factor used to scale (annualise) these data was 1.11. Details of the scaling factors used for each tube are provided in Appendix A.

Based on the annualised diffusion tube data, the annual objective for NO_2 was exceeded at five locations (shaded yellow in Table 2.4). However, as mentioned above, one of these locations (site 2 at Markham Road) is not a valid location as there are no receptors in the vicinity of this location. In addition, site 7 (Dukes Street) was affected by emissions from an adjacent gas fire vent. This has now been relocated in the near vicinity.

Of the remaining three locations, where the annual objective was exceeded, site 6 (Chest Road) and site 11 (Whittington Hill) have a history of elevated concentrations. This is due to localised effects of queuing traffic at both locations. Possible measures to reduce traffic congestion at these locations are being investigated.

The other location (site 40 at 380 Sheffield Road) is a new location along Sheffield Road close to the recently opened B2net Football Stadium. Unfortunately data capture was low, so there is a high degree of uncertainty in this data. Nonetheless, a close watch is being kept on data from this site.

In addition to the ongoing monitoring at the above locations, the existing programme of monitoring will be revised to more closely monitor the sites which have been identified as being close to, or exceeding the Air Quality Standard. This will involve halting the monitoring at Site 2 (there is no longer any relevant exposure at this location which is due for demolition), and relocating the tubes which have been at sites consistently well below the Air Quality Standard, allowing increased data collection from monitoring in the vicinity of the four sites identified.

Table 2.4 Results of Nitrogen Dioxide Diffusion Tubes

Site Location	Within AQMA ?	Relevant public exposure? Y/N	Data Capture for full calendar year 2010 %	Annual mean concentrations (µg/m^3)			
				2008	2009	2010[1]	2010 Annualised
1. Bradbury Club, 150 Chatsworth Road, (A619)	N	Y	83.3	32.3	25.3	28.9	32.0
2. Markham Road, (A619)	N	N	83.3	**48.8**	35.9	**44.5**	**49.4**
3, St Augustine's Road	N	Y	83.3	23.1	19.3	20.2	22.4
4. Derby Road Development (A61)	N	Y	83.3	23.7	19.6	21.1	23.4
5. 17 South Place	N	Y	83.3	33.0	26.3	27.9	31.0
6. Chest Rd Rndbt	N	Y	83.3	45.1	38.4	38.9	**43.2**
7. Dukes Street, Staveley	N	Y	83.3	39.1	35.7	37.4	**41.5**
8. St Augustine's Church, 212 Derby Road	N	Y	75.0	35.9	30.2	31.4	37.1
9. Lincoln Street, 287 Derby Road,	N	Y	83.3	36.2	28.0	32.1	35.6
10. No. 18 Chesterfield Road, Brimington	N	Y	66.7	32.1	23.6	20.5	26.1
11. No. 42, Whittington Hill (B6052)	N	Y	83.3	39.6	32.8	37.8	**42.0**
12. No. 460 Sheffield Road	N	Y	75.0	31.2	27.4	28.7	33.9
13. No. 99 Chesterfield Road, Staveley	N	Y	83.3	32.8	27.5	27.8	30.9
14. No. 348 Derby Road, Storforth Lane	N	Y	83.3	37.3	31.2	35.9	39.8
15,16, 17. 461 Chatsworth Road	N	Y	83.3	24.5	20.3	20.7	23.0
18, 19, 20. Queens Park Annex (AQ station)	N	N	83.3	18.5	18.1	17.9	19.9
21. Staveley Stables	N	N	58.3	25.3	22.5	23.0	23.2
22. No. 35 Ringwood Road, Brimington	N	Y	75.0	34.5	26.9	30.4	33.2
23. No. 1 Beetwell Street	N	Y	58.3	25.2	22.8	25.8	24.8
24. No. 10 Compton Street, near Saltergate	N	Y	50.0	40.7	33.2	37.0	34.4
25. No. 501 Chatsworth Road, near Vincent Crescent	N	Y	83.3	20.2	17.4	19.	21.2
26. No. 114 Saltergate	N	Y	50.0	31.5	25.0	20.8	20.4

27. Lowgates	N	Y	83.3	34.7	29.1	34.2	37.9
28. No. 45 Hollis Lane	N	Y	50.0	30.6	27.3	29.5	26.8
29. Hollywell Cross Roundabout, Old Post Restaurant	N	Y	83.3	35.2	30.0	33.2	36.8
30. No. 348 Chatsworth Road, Brampton Mile	N	Y	83.3	34.1	26.2	28.9	32.1
31. No. 24 Derby Road, Jawbones Hill	N	Y	83.3	25.9	23.8	24.1	26.7
32. Hasland By-Pass (A617)	N	N	66.7	24.3	21.6	25.2	26.4
33. Oak Farm	N	N	41.7	27.6	29.6	28.5	28.8
34. No. 451 Chatsworth Road, opp Chapel Lane West	N	Y	83.3	27.4	23.8	24.7	27.4
35. No. 632 Chatsworth Road, near Storrs Road	N	Y	66.7	34.6	27.1	32.4	32.5
36. Queens Park	N	N	66.7	22.4	19.6	20.6	21.4
37. No. 15 Muirfield Road	N	Y	83.3	22.3	18.5	20.3	22.5
38. No. 93 Eastside Road	N	Y	83.3	28.2	25.2	25.3	28.1
39. No. 43 Sheffield Road	N	Y	41.7	Tubes deployed from 2010		24.4	32.6
40. No. 380 Sheffield Road	N	Y	66.7			38.0	**49.8**
41. James St. / Lockford Lane	N	Y	50.0			26.4	36.7

2.2.2 PM_{10}

Tables 2.5a and 2.5b summarise the PM_{10} data obtained during the past three years from the two AURN monitoring stations in Chesterfield. These were obtained from TEOMS fitted with Filter Dynamics Measurement Systems (FDMS); no correction was therefore necessary. It should however be noted that all of the 2010 data and a major portion of the 2009 data were deemed to be invalid due to a problem with the analyser. The background analyser was fully operational in both 2009 and 2010, with data capture rates of 91.8% and 90.3% respectively. These results, together with the limited data from the roadside analyser in 2009 (24.5% obtained for January to March 2009) are therefore presented below in Tables 2.7a and 2.7b to show the annual mean PM_{10} concentrations and the number of exceedances of the daily mean objective of 50 $\mu g/m^3$.

Based on these results, none of the objectives were exceeded at the background site. Given that data at the roadside site are generally, only slightly higher than those at the background site, as evidenced from the 2008 data, it is reasonable to conclude that the PM10 objectives at the roadside site were also met.

Table 2.5a Results of PM_{10} Automatic Monitoring: Comparison with Annual Mean Objective

Location	Within AQMA?	Data Capture for full calendar year 2010 %	Annual mean concentrations ($\mu g/m^3$)		
			2008 [3]	2009 [3]	2010
Roadside station : Chatsworth Road	N	0.0	28.5	23.1	No Data [4]
Urban Background station : Queens Park	N	90.3	20.9	17.6	19.9

[3] Data for 2008 "annualised" as in Box 3.2 of TG(09), but 2009 data not annualised as neighbouring AURN sites also had data capture rates which were less than 75%.

[4] The roadside data for 2010, were deleted after the last set of inter-comparison studies. This is believed to be a problem with the analyser.

Table 2.5b Results of PM_{10} Automatic Monitoring: Comparison with 24-hour Mean Objective

Location	Within AQMA?	Data Capture 2010 %	Number of Exceedences of daily mean objective (50 μg/m^3)		
			2008	2009	2010
Roadside station : Chatsworth Road	N	0.0	3	0 Limited Data	No Data
Urban Background station : Queens Park	N	90.3	0	6	8

2.2.3 Sulphur Dioxide

SO_2 has not been monitored within Chesterfield since 2004 and the data then obtained confirmed that the objectives were in no danger of being exceeded. Since then there have been no activities or developments that are likely to change the situation.

2.2.4 Summary of Compliance with AQS Objectives

Chesterfield Borough Council has continued to monitor NO_2 and PM_{10} throughout 2010. The data has demonstrated compliance with the PM_{10} objectives at the two locations monitored. With regards to NO_2 the objectives were met at all but five locations monitored using diffusion tubes, but only four of these locations are regarded as being relevant to the determination of ambient air quality. Three of these locations are known traffic hot spots and attempts are currently underway to devise schemes to improve traffic flow at these locations. The fourth location is a new location near to the recently opened football stadium but data capture was poor so there is a high degree of uncertainty in this data. Nonetheless, the results are being monitored closely, and increased monitoring is being planned at these locations.

Chesterfield Borough Council has examined the results from monitoring in the Borough. Concentrations were below the objectives at all but three locations where the objectives apply. At these locations, the annual objective for NO_2 were exceeded. Two of these locations have previously shown elevated levels of NO_2 due to the geometry of the road and local queuing traffic and investigations are underway to improve traffic flow at these locations. The other location is a new location but data capture for 2010 was poor at this location. The situation is therefore being monitored closely. A detailed assessment was conducted last year and these locations were identified as potential hot spots but no exceedances of the objectives were obtained. **Nevertheless, current monitoring has identified exceedences and the Council will therefore be proceeding to a Detailed Assessment, and will continue to monitor traffic conditions at these locations.**

3 New Local Developments

3.1 Road Traffic Sources

A new football ground was opened in 2010; this is the B2net Stadium on Sheffield Road and forms part of a larger redevelopment of the site previously occupied by Dema Glass. Although the football stadium is the major development on the site, several other smaller businesses are to be located on the site. Smaller access roads have been constructed, but Sheffield road and Lockoford Lane will take most of the increased traffic. A program of diffusion tube monitoring has already began (in March 2010) to examine NO_2 in this area.

A new hotel development was opened in November 2010. This 100 bed hotel and conferencing centre is situated on Lockoford Lane, on a prominent site alongside the A61 and is expected to result in a modest increase in traffic along these routes.

A new motor dealership was also recently opened just off the A61, just north of the new football stadium. This will also result in modest increases in traffic along the A61.

The impact of the additional traffic along these routes will be assessed in the next round.

3.2 Other Transport Sources

No other new transport sources have been identified.

3.3 Industrial Sources

No new industrial sources including large petrol stations have been identified.

3.4 Commercial and Domestic Sources

No new commercial or large domestic sources have been identified, but biomass plants are being considered for future developments..

3.5 New Developments with Fugitive or Uncontrolled Sources

There are no other new developments (other than those previously mentioned) which have the potential for fugitive or uncontrolled emissions. There have however been construction and roadworks which have produced localised fugitive emissions but these were managed in accordance with the usual construction practices.

.

Chesterfield Borough Council has identified the following new or previously unidentified local developments which may impact on air quality in the Local Authority area.

- The new B2net football stadium and associated developments along Sheffield Road and the A61
- The Casa Hotel, next to the A-61
- The new Motor dealership, next to the A-61

These developments are close to the site on Sheffield Road where there has been an exceedence, and so will be included in the detailed assessment with further consideration in the next Updating and Screening Assessment, scheduled for 2012.

4 Local / Regional Air Quality Strategy

Chesterfield Borough Council produced an air quality strategy in 2008. This is currently being updated to include recent guidance and the recent assessments. The key aims of the strategy are as follows:

- To continue to implement the LAQM process and to complete all appropriate assessments by the relevant deadlines
- To keep under review the air quality monitoring programme and to expand or modify the programme to ensure that all major developments or hot spots are monitored
- To continue to work with all relevant stakeholders and partners to ensure that air quality within the Borough is adequately managed.
- To continue to use the local Planning Process, the Local Plan, Local Transport Plan and Development Control as a means to ensure that local developments and transport measures consider, and where possible aim to mitigate, their impact on local air quality in Chesterfield.
- To continue work with Derbyshire County Council Transport Department to investigate various transport initiatives that aim to understand and mitigate the impact of road traffic on local air quality in Chesterfield.
- To continue to work with Derbyshire County Council, local freight and fleet operators and taxi firms to encourage the use of methods and technologies which will mitigate their impact on local air quality in Chesterfield.
- To keep promoting and encouraging the use of public transport in Chesterfield.
- To continue to encourage the use of sustainable transport options in order to reduce car usage across the Borough.
- To continue to raise awareness of local air quality issues in Chesterfield by utilising all available opportunities to raise the profile of air quality amongst the residents and businesses of Chesterfield.
- To work with Derbyshire County Council, the Environment Agency, local industries and businesses to encourage the use of methods and technologies that aim to improve local air quality.
- To continue to work with Derbyshire County Council and the local community to encourage and aim to reduce emissions from domestic properties across the Borough.

5 Planning Applications

In addition to the developments mentioned above, Chesterfield Borough Council has recent planning applications for the following major developments:

- The Market Hall – refurbishment of a historic building. Works expected to start towards the end of 2011.
- Peak Resort – phased development of a major visitor and leisure attraction to the north west of Chesterfield. To include 212 bed accommodation and 250 woodland lodges and a 26 bed hotel. Also planned to include 120 hectare of park and woodland spaces.
- Waterside development – a major, mixed-use regeneration scheme proposed for a 16 hectare canal-side site next to the A61, close to Chesterfield Town Centre and Railway Station. Believed to be the 50th largest regeneration project in the country.
- Town Centre Northern Gateway – a major mixed use expansion of Chesterfield Town Centre, to provide new retail, leisure, employment and housing opportunities and expand the role of the town as a sub-regional destination.
- Land South of Chatsworth Road - the regeneration of a corridor of former industrial land to the south of Chatsworth Road. To include a mix of land-uses including new housing and employment opportunities, whilst protecting the environment of the River Hipper and historic buildings.
- The Markham Vale Development - a major business development centred on the former Markham Colliery. This will include a new junction on the M1, a new loop around Stavely, the restoration of derelict and contaminated land and the provision of a new freight terminal. This is expected to be complete in 2015.
- Re-development of Saltergate football stadium – the site of the old football stadium will be redeveloped to provide 68 residential properties.
- Former Newbold Community School – a 2 hectare site which is being considered for the development of housing.

Those developments which are likely to have an impact on air quality within the Borough will be considered in the next round of assessments. In fact, as mentioned above, the 2011 diffusion tube monitoring program has already been modified to take account of some of these developments.

6 Air Quality Planning Policies

There have been no changes or new planning policies relating to Air Quality within Chesterfield. However, the Council continues to fulfil its role in regulating emissions to air from a range of pollution sources and in enforcing the Clean Air Acts. In addition the Council also contributes to land use planning and supports Derbyshire County Council in developing the Local Transport Plan. Chesterfield Borough Council also has a key role implementing Local Air Quality Management.

7 Local Transport Plans and Strategies

Derbyshire County Council's Local Transport Plan 2011-2026, was published in May 2011. The document provides strategies for the whole of Derbyshire, and includes some which are directly aimed at transport improvement in the Borough of Chesterfield (an example of the is the Sustainable Chesterfield initiative), and acknowledges that whilst an AQMA has not been declared in the Borough, the possibility remains that if traffic flows alter this may have an adverse impact. Traffic schemes on the A-61 (Chesterfield Inner Relief Road), and the A-619 (Staveley-Brimington By-pass) are subject to review with regard to feasibility. Funding is being sought with regard to proposals regarding traffic congestion in Chesterfield.

8 Climate Change Strategies

Chesterfield Borough Council operates within a formal Integrated Management System based on the requirements of BS EN ISO 9001:2000 (Quality Standard) and EMAS (Eco-Management and Audit Scheme) and strives to continually improve the services provided. The Council is committed to preventing air, water and land pollution, and will comply with, and where appropriate, exceed the requirements of all-relevant legislation, regulations and codes of practice. To this end, the Council signed the Nottingham Declaration in 2007 strengthening our commitment to reduce CO_2 emissions. Chesterfield Borough Council will minimise the negative environmental impact of all our activities and services throughout their lifecycle. In particular we will set and review our objectives and targets in line with internal procedures, aiming to:

- Improve energy efficiency
- Reduce emissions to air
- Reduce water usage
- Increase environmentally preferable procurement
- Improve waste management
- Protect and enhance Biodiversity

9 Conclusions and Proposed Actions

9.1 Conclusions from New Monitoring Data

Chesterfield Borough Council expanded its NO_2 diffusion tube monitoring programme in 2010 to include 3 new sites. In addition, the Borough continuously monitors oxides of nitrogen and PM_{10} at two stations which from part of the AURN. Examination of this data has revealed that PM_{10} objectives are met within the Borough. However, while data from the continuous analyses indicates that the objectives for NO_2 are met at these locations, data from diffusion tubes shows possible exceedances of the annual objective for NO_2 at four locations.

Two of these locations have previously been identified as pollution "hot spots" due to queuing traffic and the local geometry of the road and the presence of a hill. However, it is not clear that the objectives are consistently exceeded at these locations and this year's assessment was based on just 10 months data capture requiring the data to be "annualised" and this adding to the uncertainty in the data. It is also worth noting that a detailed assessment was conducted last year and showed that the areas in question did not exceed the objectives. However, both locations are subject to particular local conditions and are along narrow roads. One of these locations is on a hill and the other is close to a roundabout with a bus stop close to the site monitored. This causes traffic to queue while the bus is picking up or off loading passengers. Investigations are therefore underway to improve traffic flow at these locations, and thus improve air quality.

The third location is close to one of the new developments and is likely to have been influenced by construction traffic. In addition, data capture was poor at this location. Data at this location is therefore being monitored closely.

The existing scheme of monitoring, using diffusion tubes, is in the process of being revised to reflect the results obtained. The aim of this is to obtain more robust data, in the form of a detailed assessment at the locations identified. In addition to this, a further NO_x continuous monitor is being sought, to be located in the vicinity of site 40, again as part of the work required to carry out the detailed assessment, as required upon finding a likely exceedence of the Air Quality Standard for Nitrogen Dioxide.

9.2 Conclusions relating to New Local Developments

A few new developments were opened in 2010 and the diffusion tube monitoring program has already been modified to ensure that data from sites affected by these developments will be obtained. The impact of these developments and others being planned will therefore be assessed in the next round of assessments.

Appendices

Appendix A: QA:QC Data

Diffusion Tube Bias Adjustment Factors

Diffusion tubes were supplied and analysed by South Yorkshire Air Quality Samplers (SYAQS) and contained 50% acetone and 50% triethanolamine (TEA). They were exposed for a four or five week period as recommended by the diffusion tube monitoring calendar. The deployment and general handling of the tubes was consistent with the recommendations of TG09.

Factor from Local Co-location Studies (if available)

Diffusion tubes were collocated in triplicate with both the roadside and background analysers. These collocated tubes were used to determine local bias factors appropriate to the tubes deployed throughout the Borough. Tables A1 and A2 show the bias factors, precision and accuracy obtained form the tubes collocated with the roadside and background analysers respectively. It should be noted that only 10 months of data were available for both sets of tubes as the tubes for the last two months of the year were lost in the post. As Table A1 shows, the tubes collocated with the roadside analyser produced a bias factor of 0.74 and the precision was good, both on a monthly basis and overall for the year. However, as Table A2 shows, the bias factor obtained form the tubes collocated with the background analyser was 0.87, but this was based on 9 months of data. In addition, for one of these months, the analyser was inoperative for a relatively long time giving a data capture of just 32%.

Table A1 Bias factor and precision from the diffusion tubes collocated with the roadside analyser

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
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 μgm^{-3}	Tube 2 μgm^{-3}	Tube 3 μgm^{-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	06/01/2010	03/02/2010	38	37	41	39	2.1	5	5.2	31.474	99.25	Good	Good
2	03/02/2010	03/03/2010	38	41	43	41	2.5	6	6.3	35.081	99.40	Good	Good
3	03/03/2010	31/03/2010	29	37	32	33	4.0	12	10.0	26.96	89.72	Good	Good
4	31/03/2010	28/04/2010	28	25	27	27	1.5	6	3.8	18.92	99.85	Good	Good
5	28/04/2010	02/06/2010	28	24	25	26	2.1	8	5.2	18.38	99.76	Good	Good
6	02/06/2010	30/06/2010	24	26	24	25	1.2	5	2.9	16.71	100.00	Good	Good
7	30/06/2010	04/08/2010	22	21	20	21	1.0	5	2.5	11.43	92.61	Good	Good
8	04/08/2010	01/09/2010	19	20	17	19	1.5	8	3.8	12.29	92.10	Good	Good
9	01/09/2010	28/09/2010	24	25	22	24	1.5	6	3.8	15.30	99.38	Good	Good
10	28/09/2010	03/11/2010	27	29	27	28	1.2	4	2.9	19.64	99.65	Good	Good
11													
12													
13													
										Overall survey ->		Good	Good

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

(Check average CV & DC from Accuracy calculations)

Site Name/ ID:	

Precision: 10 out of 10 periods have a CV smaller than 20%

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

Bias calculated using 10 periods of data

Bias factor A: 0.74 (0.67 - 0.82)

Bias B: 36% (22% - 50%)

Diffusion Tubes Mean: 28 μgm^{-3}

Mean CV (Precision): 7

Automatic Mean: 21 μgm^{-3}

Data Capture for periods used: 97%

Adjusted Tubes Mean: 21 (19 - 23) μgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA

Bias calculated using 10 periods of data

Bias factor A: 0.74 (0.67 - 0.82)

Bias B: 36% (22% - 50%)

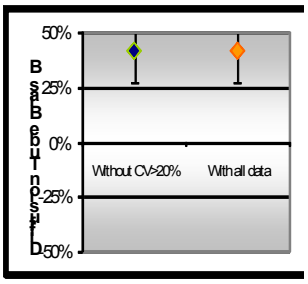
Diffusion Tubes Mean: 28 μgm^{-3}

Mean CV (Precision): 7

Automatic Mean: 21 μgm^{-3}

Data Capture for periods used: 97%

Adjusted Tubes Mean: 21 (19 - 23) μgm^{-3}



Jaume Targa, for AEA

Version 04 - February 2011

Table A2 Bias factor and precision from the diffusion tubes collocated with the background analyser

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
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 µgm^{-3}	Tube 2 µgm^{-3}	Tube 3 µgm^{-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	06/01/2010	03/02/2010	32	35	38	35	3.0	9	7.5	30.1919	99.40	Good	Good
2	03/02/2010	03/03/2010	38	37	36	37	1.0	3	2.5	31.54711	98.06	Good	Good
3	03/03/2010	31/03/2010	26							17.34478	99.85		Good
4	31/03/2010	28/04/2010	21	18	22	20	2.1	10	5.2	16.75	99.85	Good	Good
5	28/04/2010	02/06/2010	17	15	17	16	1.2	7	2.9	18.81	99.76	Good	Good
6	02/06/2010	30/06/2010	12	12	12	12	0.0	0	0.0	11.04	95.53	Good	Good
7	30/06/2010	04/08/2010	12	10		11	1.4	13	12.7	5.60	31.59	Good	or Data Captu
8	04/08/2010	01/09/2010	11	10	14	12	2.1	18	5.2	10.59	87.18	Good	Good
9	01/09/2010	28/09/2010	15	15	16	15	0.6	4	1.4	11.44	99.85	Good	Good
10	28/09/2010	03/11/2010	19	21	23	21	2.0	10	5.0	15.67	99.77	Good	Good
11													
12													
13													
										Overall survey -->		Good	Good

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

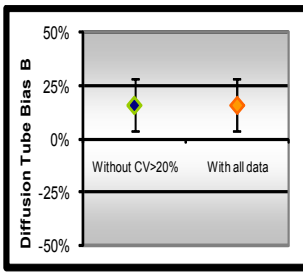
(Check average CV & DC from Accuracy calculations)

Site Name/ ID:	

Precision: 9 out of 9 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval) without periods with CV larger than 20%	
Bias calculated using 8 periods of data	
Bias factor A	0.87 (0.78 - 0.97)
Bias B	15% (3% - 28%)
Diffusion Tubes Mean:	21 µgm^{-3}
Mean CV (Precision):	7
Automatic Mean:	18 µgm^{-3}
Data Capture for periods used:	97%
Adjusted Tubes Mean:	18 (16 - 20) µgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA	
Bias calculated using 8 periods of data	
Bias factor A	0.87 (0.78 - 0.97)
Bias B	15% (3% - 28%)
Diffusion Tubes Mean:	21 µgm^{-3}
Mean CV (Precision):	7
Automatic Mean:	18 µgm^{-3}
Data Capture for periods used:	97%
Adjusted Tubes Mean:	18 (16 - 20) µgm^{-3}



Jaume Targa, for AEA
Version 04 - February 2011

Discussion of Choice of Factor to Use

The bias factor of 0.74 was used to adjust those tubes that were classified as "roadside" and the factor of 0.87 was used to adjust those classified as "urban background". .

It should be noted that the national bias factors database currently has five entries for bias factors from South Yorkshire Labs (presumed to be South Yorkshire Air Quality Samplers since SYL ceased to operate at the end of 2009). However, two have poor precisions, and the remaining three have bias factors which range from 0.78 to 0.92. The values obtained herein (0.74 from the roadside site and 0.87 from the background site) are therefore not inconsistent with those contained in the database, albeit that the roadside site produced data towards the low end of the distribution. The locally derived bias factors (0.74 for the "roadside" tubes and 0.87 for the "background" tubes) were therefore used bearing in mind that the recommendation in TG09 is to use local bias factors where reliable data of good precision and accuracy are available.

PM Monitoring Adjustment

No adjustments were made to the PM data obtained from the TEOM's as they were fitted with Filter Dynamics Systems.

Short-term to Long-term Data adjustment

The continuous monitoring data for 2008 was available from approximately min-March only; as a result data capture was 73%. The data were therefore annualised using the procedure outlined in Box 3.2 of TG09. Four sites within 40 km of Chesterfield were used. The annual mean and period means for these data are as shown below in Table A3. This gave an average factor of 1.06 which was used to derive the annual averaged NO2 concentrations in 2008.

Table A3. Factor used to derive the annual averaged data in 2008.

Site	Site Type	Annual Mean	Period Mean	Ratio
Sheffield Centre	Urban Centre	30.07	29.18	1.03
Ladybower	Rural	7.71	7.11	1.08
Barnsley Gawber	Urban Background	18.75	17.45	1.07
Nottingham Centre	Urban Centre	33	31.69	1.04
Average				**1.06**

A similar process was used to derive "annualised" PM10 data for 2008 but only two neighbouring stations had PM data. The factor derived was 1.07.

It was also necessary to "annualise" the data from the diffusion tubes. In this case, however, data from the roadside analyser was used resulting in a scaling factor of

1.11 for those tubes where the last two months of data were missing. For some of the other tubes higher scaling factors were necessary. Table A4 shows the factors used to annualise the diffusion tubes data.

Table A4. Factors used to derive the annual averaged data from the diffusion tubes.

Tube No.	Annualising Factor	Tube No.	Annualising Factor	Tube No.	Annualising Factor
1	1.11	14	1.11	31	1.11
2	1.11	15 to 17	1.11	32	1.05
3	1.11	18 to 20	1.11	33	1.01
4	1.11	21	1.008	34	1.11
5	1.11	22	1.09	35	1.004
6	1.11	23	0.96	36	1.04
7	1.11	24	0.93	37	1.11
8	1.18	25	1.11	38	1.11
9	1.11	26	0.98	39	1.333
10	1.27	27	1.11	40	1.31
11	1.11	28	0.91	41	1.39
12	1.18	29	1.11		
13	1.11	30	1.11		

QA/QC of automatic monitoring

The two continuous monitoring stations in Chesterfield form part of the AURN network, and as such all QA/QC procedures are conducted in accordance with the Site Operators Manual AEAT/ENV/R1595. The stations are visited every two weeks by a Local Site Operator, who performs calibrations and equipment checks. The results are then submitted to AEA and Bureau Veritas (BV) for verification after each calibration. Data form these stations are regularly downloaded by AEA and BV, who applies the calibrations and upload the data to the air quality website where it is accessible to the public. AEA area also responsible for the subsequent ratification of the data.

QA/QC of diffusion tube monitoring

South Yorkshire Air Quality Samplers (SYAQS) was formed in January 2010 by Mr, Andy Hawkins, formerly of South Yorkshire Laboratories (SYL) after SYL ceased to operate. It is understood that the equipment and all procedures employed by SYAQS are essential the same as those that were employed by SYL. Unlike SYL, SYAQS are not UKAS accredited for diffusion tube analysis, but they do participate in the Workplace Analysis Scheme for Proficiency (WASP). The scheme is an independent analytical performance testing scheme and is an important QA/QC exercise for laboratories supplying diffusion tubes to Local Authorities for use in the context of Local Air Quality Management (LAQM). At quarterly intervals HSL supplies the labs with 4 samplers doped with unknown amounts of nitrite. It then assesses and

calculates a performance index from the results. Discussions with a representative from the National Physics Laboratory (NPL) who manage these inter-comparison studies, indicate that they are treating data from SYAQS as a continuation of data from SYL. In fact, data from SYAQS, uploaded to the national diffusion tube bias adjustment factors database, lists data from SYAQS as being from South Yorkshire Labs (SYL). It should also be noted that data from SYL has previously been rated as "good" and this rating appears to be the same for the most recent SYAQS data.