



2014 Air Quality Progress Report for Chesterfield Borough Council

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

August 2014

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Executive Summary

Chesterfield BC carried out monitoring for Nitrogen Dioxide, Particulates (PM₁₀ and PM_{2.5}), Benzene under the auspices of the air quality management regime, and Aldehydes, as part of a RicardoAEA research project.

The monitoring indicates an ongoing marginal breach of the Air Quality Objective for Nitrogen Dioxide at the row of terraced housing on Church Street, Brimington. The results indicate an ongoing marginal breach of the Air Quality Objective for Nitrogen Dioxide at the row of terraced housing on Church Street, Brimington. However, as the breach has been indicated by the use of passive diffusion tubes alternative monitoring has been arranged. This has entailed the use of an automatic NOx monitor throughout 2014, located directly opposite the houses in the grounds of a church hall. This is being operated under contract by TRL with the fully validated results being forwarded each quarter. The results of this monitoring will be reported in the 2015 Update, Screening and Assessment Report.

The monitoring also indicates that there is a new breach of the Air Quality Objective for Nitrogen Dioxide at part of a row of terraced housing on Sheffield Road, Whittington Moor. However, other diffusion tube monitoring on the same façade does not support this finding. Monitoring will continue at this location, as at present, and at such time as sufficient monitoring data has been obtained at Church Street Brimington to either support or obviate the need to declare an AQMA at that location, the automatic monitoring equipment currently being used there will be relocated to this vicinity if a suitable location can be found. Preliminary agreement for a potentially suitable location has been achieved, but further work is required in this regard, and this is ongoing.

Monitoring indicates that there is no breach of the Air Quality Objective for PM₁₀ and the trend demonstrates a reduction in levels at both AURN sites. Current monitoring will continue.

Monitoring indicates that there is no breach of the Air Quality Objective for Benzene, the trend shows a very gradual increase in levels, but shows no realistic likelihood of breaching the Objective. Current monitoring will continue.

Monitoring of aldehydes (in the form of acetaldehyde and formaldehyde) was undertaken in order to assess whether NOx could be used as a proxy for possible increases in pollution due to the increased use of bio-diesels. Whilst interesting results were obtained (particularly with regard to grass mowing releasing large levels of aldehydes) no link between NOx and aldehyde levels could be found, and funding was withdrawn and the monitoring ceased.

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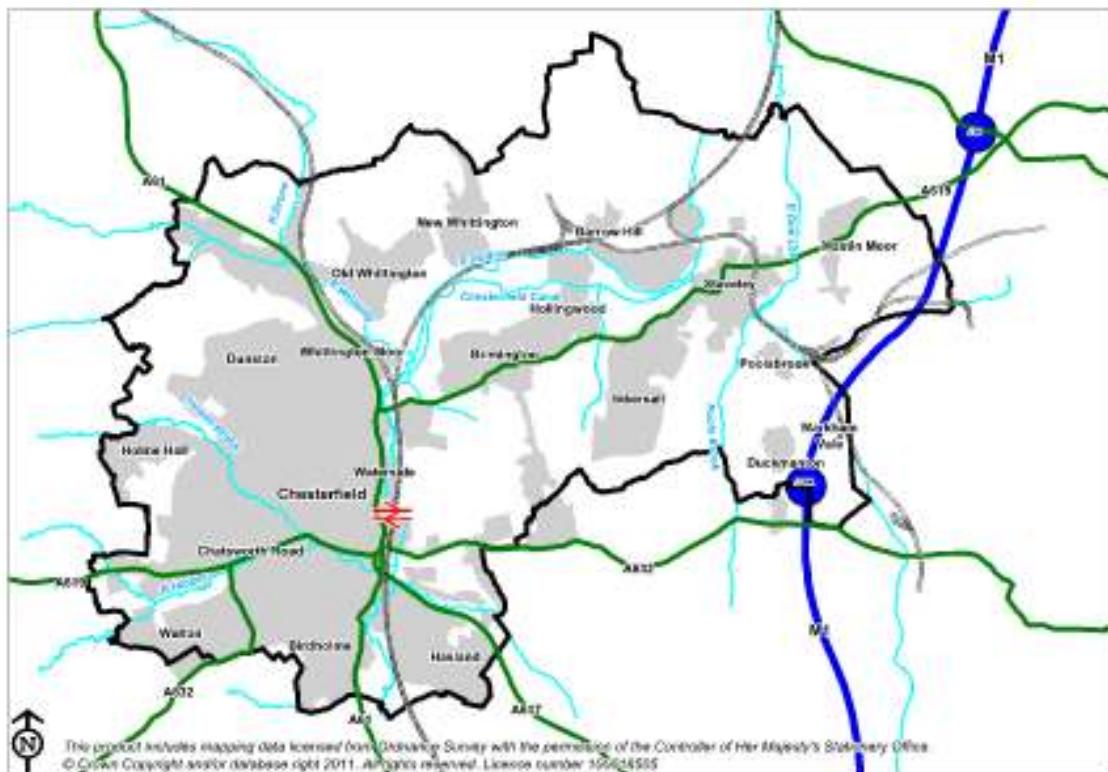
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1 Introduction

1.1 Description of Local Authority Area

Chesterfield is a market town situated in North Derbyshire. The population is approximately 100,000. The borough is surrounded by the boroughs of North East Derbyshire to the north, south and west, and Bolsover District to the east. The Borough of Chesterfield consists mainly of the town centre, which has a mix of small retail and service sector activities, and immediate suburbs of Chesterfield, to the south, west, and north-west of the town centre. To the east is the small town of Staveley, with ribbon and estate housing developments connecting the two centres. Chesterfield town is surrounded by rural areas, those to the north, west, and south are outside the borough area. Part of the area between Chesterfield town and Staveley is rural farmland, but there are vacant former industrial sites in this area, a legacy of the closure of much of the heavy industry which had driven the growth of the borough. Smaller self-contained former mining villages are located in the east of the borough area. The M1 Motorway skirts the eastern fringes of the borough, and the town centre is bypassed by the A61 trunk road, built on the line of one of the former railways which converged on the town. The main source of pollution in the borough comes from road transport, but there is also some remaining traditional heavy industry still located in the borough, predominantly following the railway line north of the town centre, and in an industrial estate in the north western corner of the borough.

Figure 1.1: An indicative map of Chesterfield showing the major trunk roads and areas of the borough



1.2 Purpose of Progress Report

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

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

Table 1.1 Air Quality Objectives included in Regulations for the purpose of LAQM in England

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene	16.25 µg/m ³	Running annual mean	31.12.2003
	5.00 µg/m ³	Annual mean	31.12.2010
1,3-Butadiene	2.25 µg/m ³	Running annual mean	31.12.2003
Carbon monoxide	10 mg/m ³	Running 8-hour mean	31.12.2003
Lead	0.50 µg/m ³	Annual mean	31.12.2004
	0.25 µg/m ³	Annual mean	31.12.2008
Nitrogen dioxide	200 µg/m ³ not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 µg/m ³	Annual mean	31.12.2005
Particulate Matter (PM ₁₀) (gravimetric)	50 µg/m ³ , not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	40 µg/m ³	Annual mean	31.12.2004
Sulphur dioxide	350 µg/m ³ , not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 µg/m ³ , not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 µg/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

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 exceedence 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 exceedence 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 exceedence 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 µg/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 Authority's 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 exceedence 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 exceedences 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.
2011	Progress Report (revised)	Monitoring data highlighted four areas showing elevated levels of Nitrogen Dioxide and possible exceedence of the annual Nitrogen Dioxide Air Quality Objective. These areas were Whittington Hill; Sheffield Road; Duke Street, Staveley; and Church Street, Brimington. Recommendation to produce Detailed Assessments for these areas.
2012	Update & Screening Assessment	Monitoring Data indicates that NO ₂ levels have decreased across the borough as a whole, and as a result the four areas highlighted above area revised to a single site. However, the ongoing Detailed Assessments are continuing.
2013	Detailed Assessment	Monitoring data demonstrated that the four areas identified as being at risk of breaching the AQO are all below the objective and as such there is no requirement to declare AQMAs. However, DEFRA rejected this finding and request that, if the data in the following report indicates an exceedance at the façade of a row of houses within one of the areas (for the 2012 full calendar year), an AQMA be declared in that area.
2013	Progress Report	Monitoring data confirmed the breach of the NO ₂ AQO at a single row of terraced houses at the roadside in Brimington.
2014	Progress Report	This Report

2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Sites

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

Table 2.1a Details of Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref		Pollutants Monitored	Monitoring Technique
Chatsworth Road	Urban Traffic	436349 E	370657 N	NOx	Chemi-luminescent
				PM ₁₀	FDMS
				PM _{2.5}	FDMS
				Benzene	Pumped Tubes
				Aldehyde	Pumped Filters
Queens Park Annex	Urban Background	437909 E	370545 N	NOx	Chemi-luminescent
				PM ₁₀	FDMS
				PM _{2.5}	FDMS
				Aldehyde	Pumped Filters

Table 2.1b 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
Queens Park Annex	N	N (75m)	85m	No

The maps, below, show the locations of the two automatic monitoring stations operated by Chesterfield Borough Council.

Figure 2.1 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 Bureau Veritas and DEFRA

This site, formerly classified as a Roadside site, has been reclassified as an Urban Traffic site. This site is indicative of public exposure for dwellings in urban locations.

Figure 2.2: Location of Queens Park Annex Automatic Monitoring Site



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

This site is classified as an Urban Background site, and was indicative of the diffusion tubes in locations set away from main roads. However, with the re-organisation of the diffusion tubes across the Borough to concentrate on roadside monitoring this site now operates, solely to provide data to DEFRA for input to the Automatic Urban/Rural Network (AURN)

The construction works (which were mentioned in the previous report) are due to commence this year, and as such the automatic monitoring at this site will cease. However, the monitoring continued for the full calendar year, allowing fully validated annual monitoring data to be gathered, for the purposes of this report. A new location for the unit has been agreed with Bureau Veritas, on behalf of DEFRA. This will allow continued urban background data to be gathered and supplied to the AURN. Details of the new site and the monitoring results for the part year in the new location will be reported in the 2015 Update, Screening and Assessment Report.

In addition to the above sites which are affiliated to AURN, we have installed a temporary site, following on from the 2013 Detailed Assessment report (which indicated an ongoing, though marginal breach of the Air Quality Objective for nitrogen dioxide at a row of terraced houses on Church Street, Brimington). The details of this site are given below. This site started operation in mid December 2013 and will operate throughout 2014. The results of this will be reported in the 2015 Update, Screening and Assessment report.

Table 2.2: Details of Temporary Automatic Monitoring Site

Site Name	Site Type	OS Grid Ref		Pollutants Monitored	Monitoring Technique
Brimington Church Street	Urban Traffic	440428 E	373503 N	NOx	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?
Brimington Church Street	N	Y (1m)	2m	Yes

Figure 2.3: Location of Temporary Automatic Monitoring Site



Figure 2.4: Location of Sampling Head in Relation of the Affected row of Terraced Housing on the Opposite side of Church St



The sample head (arrowed) is placed between the road sign and the window of the building façade, and projects above the adjacent wall. One of the diffusion tubes on the terrace façade is directly opposite, but is obscured by the van near the centre of the picture. Note how, due to the row of parked vehicles, the useable carriageway is displaced away from the terrace façade. The practical result of this is that the sample head is located an equivalent distance from the traffic as the diffusion tubes on the housing façade.

The co-location tubes which had been used on the Chesterfield Site (at Queens Park Annex, and due to be relocated due to impending redevelopment) are currently being used at this site.

2.1.2 Non-Automatic Monitoring Sites

The locations of the NO₂ diffusion tubes across the Borough as a whole was changed in September 2011, to facilitate the undertaking of 4 Detailed Assessments.

Following completion of the Detailed Assessments in four areas in the borough in 2013, it was clear that two of the areas were sufficiently below the AQO level for nitrogen dioxide for monitoring to revert to a single diffusion tube (these areas are Whittington Hill, and Duke Street, Staveley). This means that a number of tubes became available for relocating to more appropriate sites.

The monitoring location at Hollis Lane has been reinstated, reflecting the increased traffic flow in this area. In addition 5 new diffusion tubes locations were brought into use in and around Mansfield Road, Hasland. Anecdotally, the traffic congestion on this road has increased greatly, due to recent changes made to a junction on this road. This involved the removal of a pre-existing roundabout (shown in Figure 2.5, below).

Figure 2.5: Original Road Layout



(Courtesy of Google Maps)

This has been replaced by a traffic light controlled junction (shown in Figure 2.6, overleaf).

Figure 2.6: Revised Road Layout



(Courtesy of Google Maps)

The green space at the top of both pictures is Eastwood Park. This has been the subject of investment to bring it back into general use. Concern had been raised that the previously uncontrolled junction may have given rise to an increased risk of accidents to crossing pedestrians, prompting the alterations which were carried out by the County Council (in their role as the local highways authority). The new monitoring locations are spaced along the main road and on the junction road which makes up the leg of the “T” junction, with an additional tube on a further adjacent road junction, due to the proximity of houses at that location, and the locations are shown in Figure 2.7, overleaf.

Figure 2.7: New Diffusion Tube Locations in Hasland



In addition to this the operation of an automatic monitor, analysing NO₂ in support of the monitoring which highlighted a marginal breach of the AQO, is also being supported by the use of co-location tubes which have been moved from the background AURN site. This relocated diffusion tube monitoring will be reported upon in the next report in 2015.

The locations of diffusion tube monitoring across the Borough during the period covered by this report is shown in Appendix B and in Table 2.3 overleaf. As can be seen from the map in Appendix B, the monitoring locations now reflect the major roads and possible congestion points on those roads.

Table 2.3 Details of Diffusion Tube Monitoring Sites

Tube Number	Site Name	Site Type	O/S Grid Reference	In AQMA?	Relevant Exposure?	Distance to Kerb of Nearest Road	Worst Case Location?
1	Bradbury Club, 150 Chatsworth Rd	Façade	437222 370956	No	Yes	1m	Yes
2	Bridge Inn, Hollis Lane	Façade	438710 370950	No	Yes	2m	Yes
3	376 Sheffield Road	Façade	438291 373006	No	Yes	1m	Yes
4	390 Sheffield Road	Façade	438284 373057	No	Yes	1m	Yes
5	17, South Place	Façade	438293 370863	No	Yes	1m	Yes
6	6 Church Street, Brimington	Façade	440440 373514	No	Yes	1m	Yes
7	DCC Offices, West Street	Roadside	437670 371490	No	Yes	1m	Yes
8	St Augustines, 212 Derby Road	Façade	438395 369776	No	Yes	3m	Yes
9	Lincoln Street, 287 Derby Road	Façade	438385 369574	No	Yes	2m	Yes
10	7 High Street, Brimington	Façade	440531 373484	No	Yes	1m	Yes
11	42, Whittington Hill (B6052)	Façade	438307 374560	No	Yes	2m	Yes
12	460, Sheffield Road	Façade	438279 373336	No	Yes	2m	Yes
13	10 Calow Lane, Hasland	Façade	439780 369440	No	Yes	1m	Yes
14	348 Derby Road, Storforth Lane	Façade	438357 369410	No	Yes	2m	Yes
15	Chatsworth Road AQ. Site	Co-location	436349 370658	No	Yes	4m	Yes
16	Chatsworth Road AQ. Site	Co-location	436349 370658	No	Yes	4m	Yes
17	Chatsworth Road AQ. Site	Co-location	436349 370658	No	Yes	4m	Yes
18	Queens Park Annexe	Co-location	437909 370544	No	No	85m	No
19	Queens Park Annexe	Co-location	437909 370544	No	No	85m	No
20	Queens Park Annexe	Co-location	437909 370544	No	No	85m	No
21	14 Chesterfield Road, Brimington	Roadside	440175 373396	No	Yes	1m	Yes
22	25/27 Ringwood Road, Brimington	Façade	440669 373711	No	Yes	1m	Yes
23	29 Mansfield Road, Hasland	Façade	439830 369320	No	Yes	2m	Yes
24	10, Compton Street, Saltergate	Façade	437686 371433	No	Yes	1m	Yes

Tube Number	Site Name	Site Type	O/S Grid Reference	In AQMA?	Relevant Exposure?	Distance to Kerb of Nearest Road	Worst Case Location?
25	J+S Trophies, The Green, Hasland	Façade	439490 369608	No	Yes	3m	Yes
26	Harold Lillekar's Funerals, Mansfield Rd	Façade	439490 369590	No	Yes	6m	Yes
27	Lowgates, Staveley	Façade	443897 374912	No	Yes	3m	Yes
28	Patrick Hinds House, Church St, Brimington	Façade	440323 373482	No	Yes	1m	Yes
29	Hollywell Cross R/T, Old Post Restaurant	Façade	438417 371357	No	Yes	1m	Yes
30	348, Chatsworth Rd, Brampton Mile	Façade	436702 370761	No	Yes	1m	Yes
31	386 Sheffield Road	Façade	438289 373028	No	Yes	2m	Yes
32	Warner Street, Hasland	Roadside	438976 370356	No	Yes	1m	Yes
33	55 Duke Street, Staveley	Façade	443452 374762	No	Yes	4m	Yes
34	Travel Blank	-	-	-	-	-	-
35	632, Chatsworth Road, Storrs Road	Façade	435654 370537	No	Yes	3m	Yes
36	Lite Bites, Mansfield Road, Hasland	Façade	439710 369420	No	Yes	2m	Yes
37	50 Church Street, Brimington	Façade	440361 373513	No	Yes	1m	Yes
38	14 Church Street, Brimington	Façade	440421 373515	No	Yes	1m	Yes
39	43 Sheffield Road	Façade	438343 371908	No	Yes	1m	Yes
40	380 Sheffield Road	Façade	438290 373014	No	Yes	1m	Yes
41	James Street / Lockoford Lane	Roadside	438407 372798	No	Yes	1m	Yes

The locations of the diffusion tubes across the borough is shown in Appendix B

2.1.3 Benzene

Benzene is sampled at the Chesterfield Roadside site, by the use of sampling tubes containing a proprietary absorbent (Carbopack X). The tubes are exposed for 14 days, before being returned to RicardoAEA for analysis.

2.1.4 Other Pollutants Monitored

Aldehydes

The two AURN sites in Chesterfield were used in a pilot study into the levels of aldehydes (Acetaldehyde and Formaldehyde), in order to assess whether NOx monitoring could be used as a proxy for aldehydes caused by the increased use of bio-diesels. Two distinct regions were used: the two Chesterfield AURN sites, and three AURN sites in Devon: Exeter Roadside, Yarner Wood (approximately 13 miles to the north-east of Torquay), and Honiton. Some light-hearted comparison was made between Chesterfield and the area of Devon often marketed as “The English Riviera”, but the more prosaic fact behind the choice of locations is the similar ratio of older vehicles in the fleet in the study areas.

The project began in August 2012 and was planned to be carried out over two years. The sampling was undertaken by the exposure of two Dinitrophenylhydrazine absorption tubes each week (for the full 24 hours on Tuesday and Thursday respectively), the analysis being carried out centrally by RicardoAEA.

2.2 Comparison of Monitoring Results with Air Quality Objectives

2.2.1 Nitrogen Dioxide (NO₂)

Automatic Monitoring Data

Nitrogen Dioxide is monitored by the use of two AURN affiliated sites, allowing the co-location of diffusion tubes to validate monthly exposed diffusion tubes which are located at appropriate sites around the borough.

Table 2.4a: Results of Automatic Monitoring for Nitrogen Dioxide: Comparison with Annual Mean Objective

Site ID	Site Type	Within AQMA?	Data Capture 2013 %	Annual mean concentrations (µg/m ³)			
				2010	2011	2012	2013
Chesterfield	Urban Background	N	94.2	19.5	14.8	14.6	18.2
Chesterfield Roadside	Traffic	N	92.6	22.9	23.2	18.2	21.7

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

Site ID	Location	Within AQMA?	Data Capture 2013 %	Number of Exceedences of hourly mean (200 µg/m ³)			
				2010	2011	2012	2013
Chesterfield	Urban Background	N	94.2	0	0	0	0
Chesterfield Roadside	Traffic	N	92.6	0	0 (94)	0	0

Where the period of valid data is less than 90% of a full year, include the 99.8th percentile of hourly means in brackets.

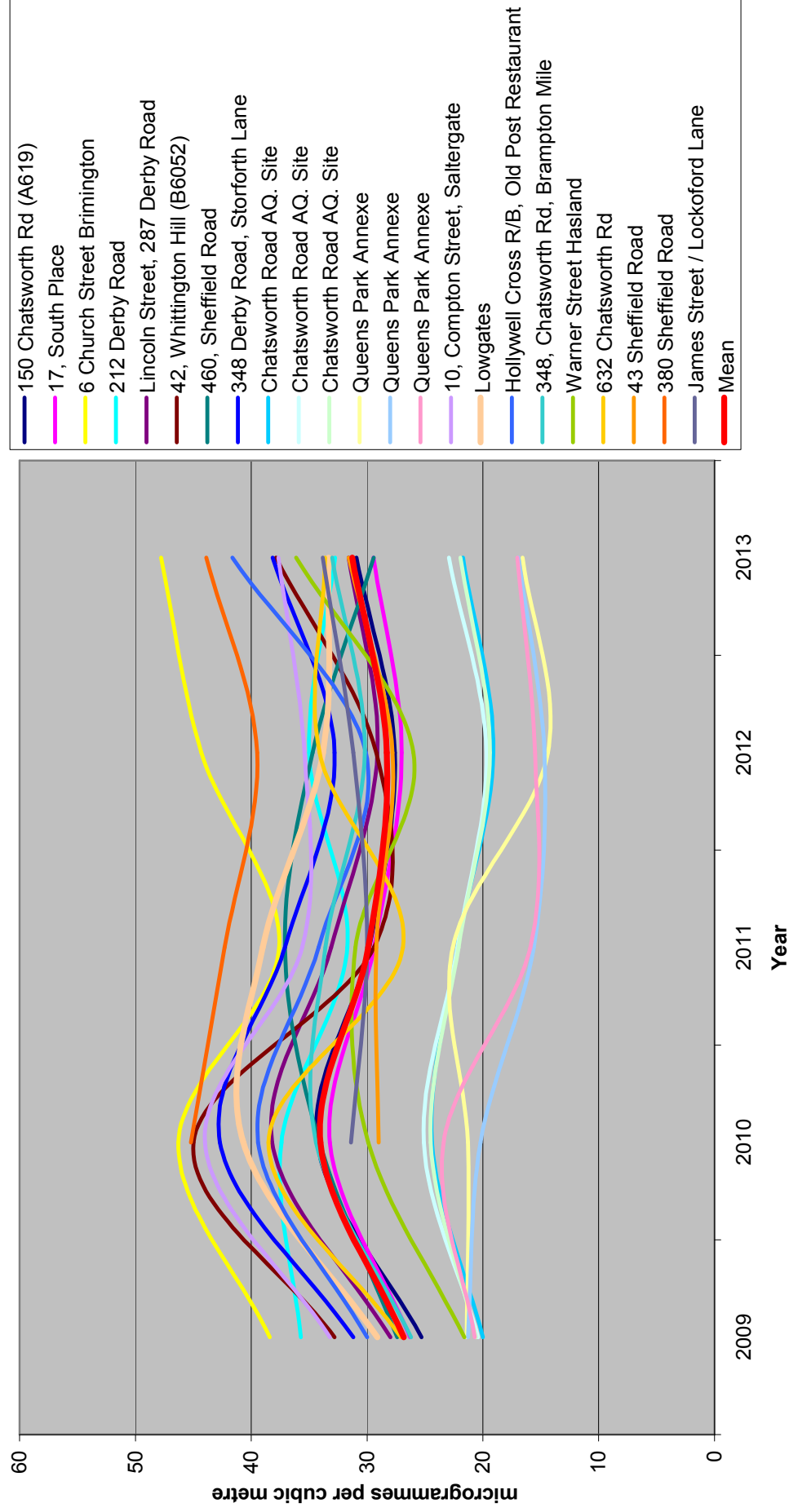
Diffusion Tube Monitoring Data

Table 2.5: Bias Adjusted Diffusion Tubes Results:

Tube Number	Site Name	Site Type	Data Capture (%)	Annual Average ($\mu\text{g}/\text{m}^3$)
1	Bradbury Club, 150 Chatsworth Rd	Façade	100	30.9
2	Bridge Inn, Hollis Lane	Facade	84	37.7
3	376 Sheffield Road	Façade	75	36.9
4	390 Sheffield Road	Façade	100	30.9
5	17, South Place	Façade	92	29.5
6	6 Church Street, Brimington	Façade	92	47.8
7	DCC Offices, West Street	Roadside	75	23.3
8	St Augustines, 212 Derby Road	Façade	92	32.8
9	Lincoln Street, 287 Derby Road	Façade	75	31.6
10	7 High Street, Brimington	Façade	100	38.8
11	42, Whittington Hill (B6052)	Façade	100	37.9
12	460, Sheffield Road	Façade	100	29.4
13	10 Calow Lane, Hasland	Façade	75	24.3
14	348 Derby Road, Storforth Lane	Façade	100	38.1
15	Chatsworth Road AQ. Site	Co-location	100	21.7
16	Chatsworth Road AQ. Site	Co-location	100	21.7
17	Chatsworth Road AQ. Site	Co-location	100	21.9
18	Queens Park Annexe	Co-location	92	16.6
19	Queens Park Annexe	Co-location	92	16.9
20	Queens Park Annexe	Co-location	84	17.0
21	14 Chesterfield Road, Brimington	Roadside	84	35.9
22	25/27 Ringwood Road, Brimington	Façade	100	36.8
23	29 Mansfield Road, Hasland	Façade	92	27.7
24	10, Compton Street, Saltergate	Façade	84	37.7
25	J+S Trophies, The Green, Hasland	Façade	100	36.1
26	Harold Lillekar's Funerals, Mansfield Rd	Façade	100	21.6
27	Lowgates, Staveley	Façade	100	33.3
28	Patrick Hinds House, Church St, Brimington	Façade	100	35.6
29	Holywell Cross R/T, Old Post Restaurant	Façade	42	41.6
30	348, Chatsworth Rd, Brampton Mile	Façade	100	33.0
31	386 Sheffield Road	Façade	84	43.8
32	Warner Street, Hasland	Roadside	100	35.4
33	55 Duke Street, Staveley	Façade	100	39.9
34	Travel Blank	-	-	-
35	632, Chatsworth Road, Storrs Road	Façade	100	33.6
36	Lite Bites, Mansfield Road, Hasland	Façade	84	31.1
37	50 Church Street, Brimington	Façade	100	41.6
38	14 Church Street, Brimington	Façade	100	50.0
39	43 Sheffield Road	Façade	84	31.6
40	380 Sheffield Road	Façade	100	43.9
41	James Street / Lockoford Lane	Roadside	100	33.8

Note: The result for tube 29 (Holywell Cross R/T, Old Post Restaurant) has been annualised due to the low data capture rate.

Figure 2.8: Trends in Annual Mean Nitrogen Dioxide Concentrations Measured at Diffusion Tube Monitoring Sites

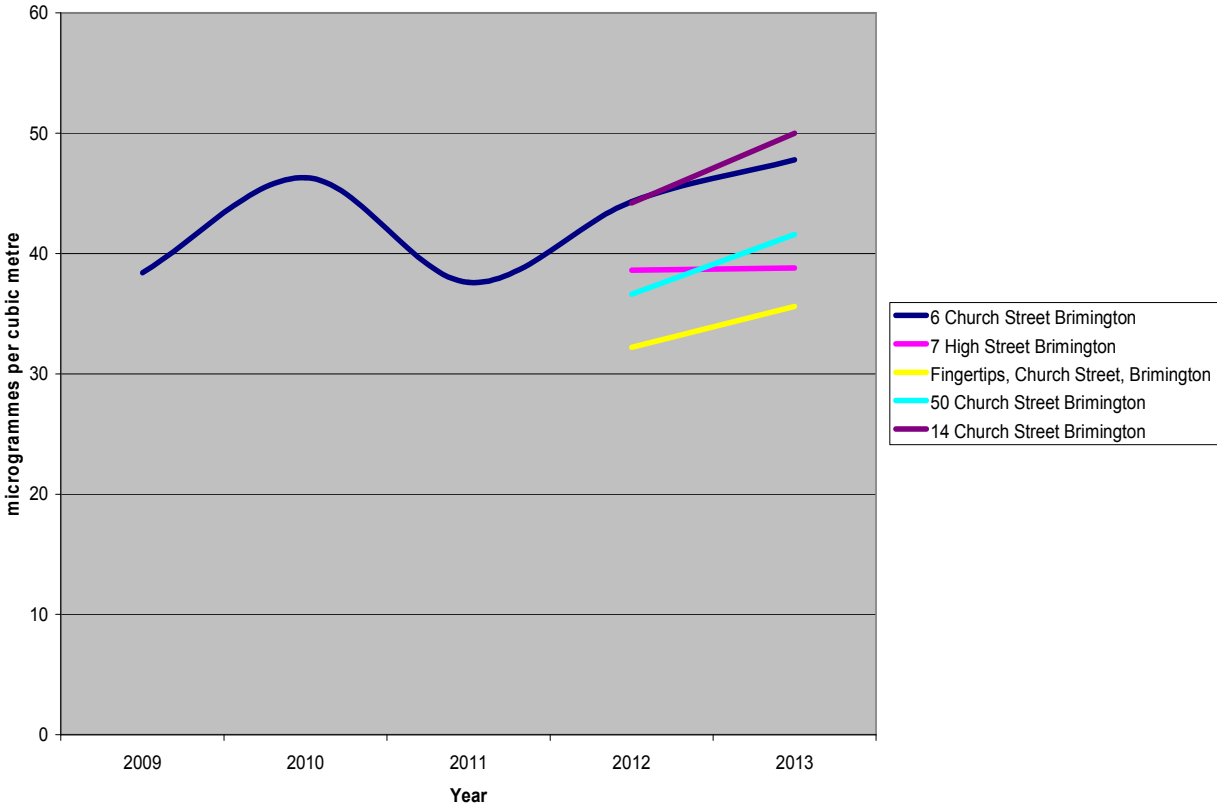


As can be clearly seen, the general trend of improving air quality from a peak in 2010 has reversed.

Of the long term diffusion tube locations (which are solely those plotted in the graph) three sites now breach the annual AQO. These are:
 6 Church Street, Brimington,
 380 Sheffield Road, Whittington Moor,
 and Holywell Cross Roundabout, in the town centre.

Of these sites, Church Street and Sheffield Road were included in the sites subject to a Detailed Assessment in 2011/12. The result of that assessment showed that there was an ongoing, minor, breach of the AQO at Church Street and this was confirmed by the 2013 Progress Report. The Detailed Assessment in this area was carried out by the use of multiple diffusion tubes, both on the affected terrace of housing and in the general area. When this data is analysed, the following trend data is demonstrated:

Figure 2.9: NO₂ Trends in the Brimington Assessment Area



The increasing NO₂ levels are all on the route leading through Brimington towards the northbound M1. The traffic flows around the one-way system in the heart of Brimington is shown overleaf:

Figure 2.10: Traffic Flow at Brimington



Note: The arrows show the traffic direction, the red dots show the locations of the diffusion tubes, and the green star denotes the location of the automatic NOx monitor

Figure 2.11, below, shows an oblique view of the area, showing the same area as the plan, above, and clearly shows the contrast in the area surrounding the carriageways, with the open spaces to the south contrasting sharply with the enclosed nature of the original road to the north.

Figure 2.11: Oblique view of Church St, Brimington, and the immediate vicinity



(Courtesy of Google Maps)

The route to the M1 is at the top right in both images.

The area of Church Street, Brimington is currently subject to intensive monitoring, augmenting the existing multiple diffusion tubes, by the use of an automatic monitor operated on our behalf by TTRL Ltd. The results of this monitoring will be reported in the 2015 Update Screening and Assessment Report, but verified results for the first quarter of monitoring indicate that the levels are within the AQO. However, it must be stressed that these are very preliminary findings, and no conclusions can be reached at this early stage in the monitoring.

The second site, at 380 Sheffield Road, is on a row of terraced houses which are adjacent to a main road, and a revised junction serving the football ground and adjacent major supermarket. The Detailed Assessment in this area was carried out by the use of 4 diffusion tubes on the façade of the terraced houses and as the levels found were close to, but below, the AQO this monitoring has continued.

Figures 2.12 and 2.13 (below), which follow shows the affected face to the left (with the locations of diffusion tubes shown in red, below), with the road providing access to the supermarket in the centre. The crossroad junction adjacent to the façade is traffic light controlled.

Figure 2.12: Affected Façade and the adjacent road layout



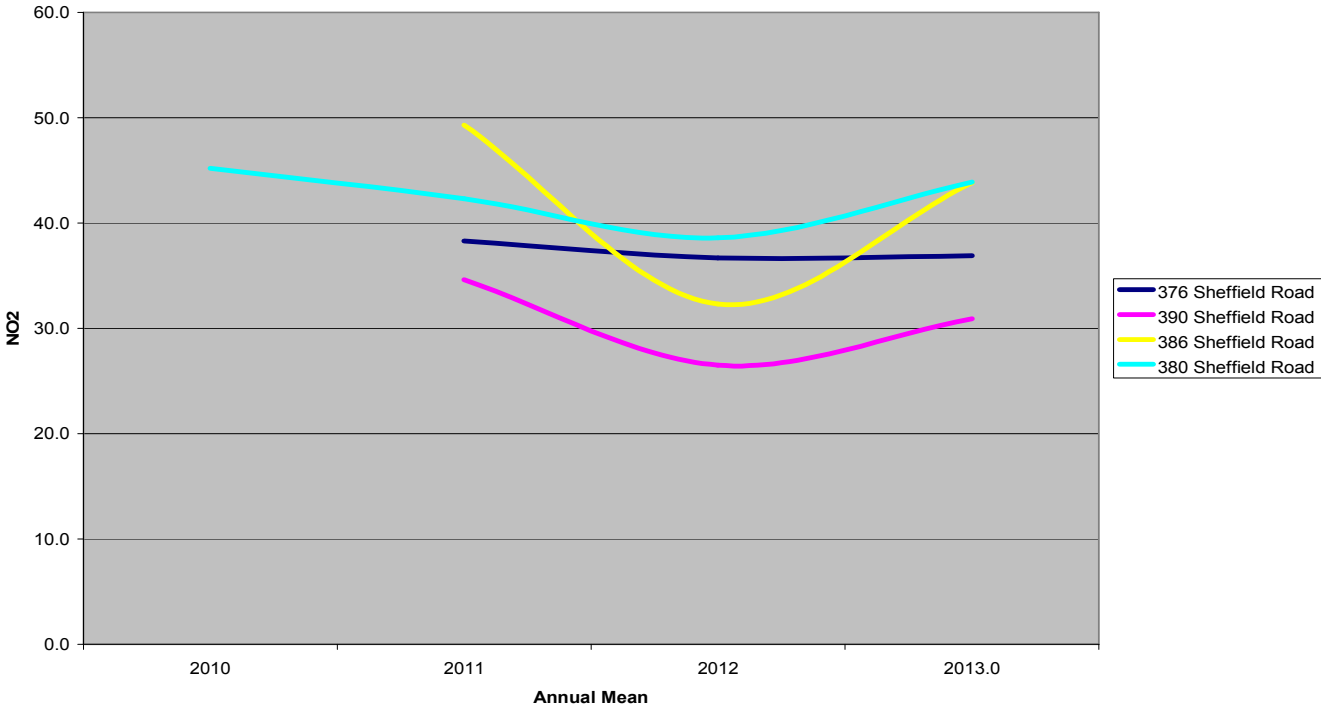
Figure 2.13: Oblique View of Affected Façade and adjacent road layout



(courtesy of Google Maps)

The two central diffusion tubes (as shown in figure 2.12) have demonstrated a breach of the AQO, whereas both the northernmost and southernmost diffusion tubes are within the AQO.

Figure 2.14: NO₂ Trends in the Sheffield Rd Area



The results which have been obtained are of concern in that a breach of the AQO has been demonstrated. However, of further concern is the disparity between the results obtained over such a short section of housing façade. Given that the traffic flow along this very short section of road should be very similar along its length, and acceleration across the junction should mostly affect the southernmost located diffusion tube, the reason for the disparity is currently unexplained. Figure 2.15 shows the affected façade (in the centre of the picture) with the traffic light controlled junction directly to the left.

Figure 2.15: Oblique View of Affected Façade



(Courtesy of Google Maps)

It is proposed that, upon completion of the in-depth monitoring which is currently taking place at Church St, Brimington, the monitoring equipment will be relocated to this area, and a similar exercise will be undertaken at this location.

The third site, at Holywell Cross Roundabout is included in the monitoring exercise as it is a location where all of the main commuting routes converge to the north side of the town centre. There are no dwellings in this area, only short term exposure can be expected in this vicinity. Given that the annual mean is $41.6\mu\text{g}/\text{m}^3$, and therefore well below the trigger level requiring an assessment as to whether there is the potential for an exceedence of the NO_2 hourly mean AQS objective (ie greater than $60\mu\text{g}/\text{m}^3$), we are confident that there is no need for further action at this stage. Monitoring will continue at this location.

Figure 2.16: Holywell Cross Roundabout and car park



(Courtesy of Google Maps)

The diffusion tube is located on the façade to the centre left of the picture, directly adjacent to the queuing traffic.

2.2.2 Particulate Matter (PM₁₀)

Fine particulates (in the form of PM₁₀ and PM_{2.5}) is monitored at the two AURN affiliated sites (as detailed in section 2.1.1) Reliability of the TEOM units continues to be an issue and this reflects the general situation across the network. The results are given below:

Table 2.6a: Results of PM₁₀ Automatic Monitoring: Comparison with Annual Mean Objective

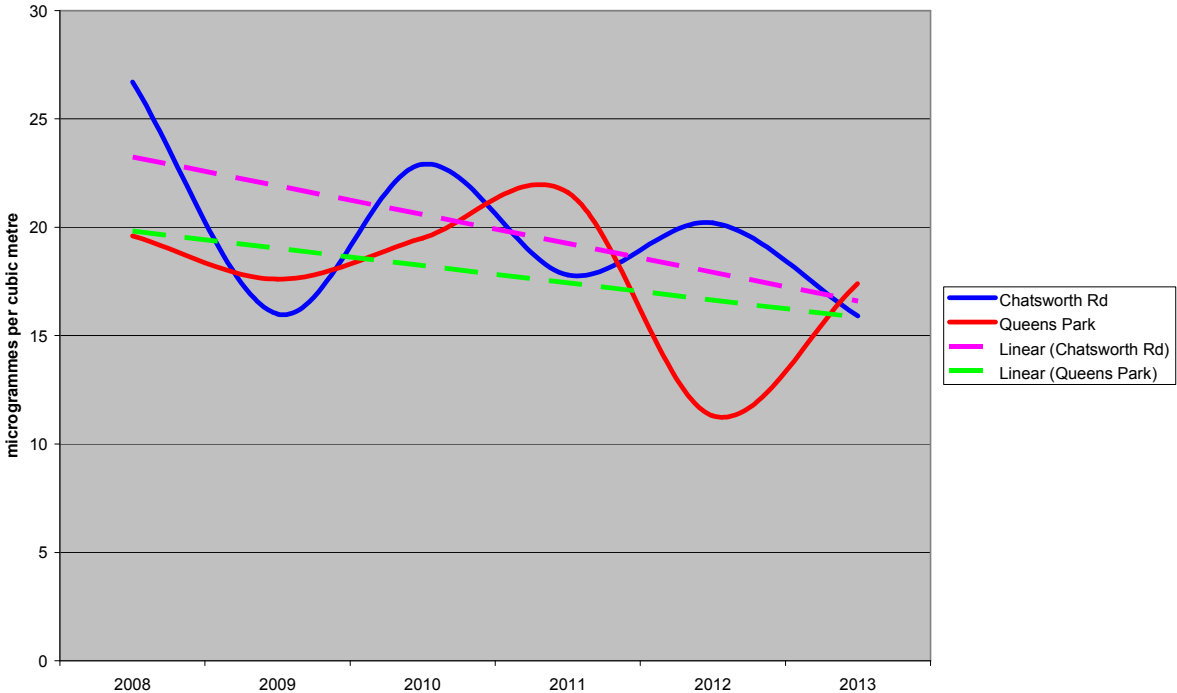
Site ID	Site Type	Within AQMA?	Data Capture 2013 %	Annual mean concentrations (µg/m ³)			
				2010	2011	2012	2013
Chesterfield	Urban Background	N	93.2	19.5	21.6	11.3	17.4
Chesterfield Roadside	Traffic	N	89.8	22.9	17.8	20.2	15.9

Table 2.6b: Results of PM₁₀ Automatic Monitoring: Comparison with 24-hour Mean Objective

Site ID	Location	Within AQMA?	Data Capture 2013 %	Number of Exceedences of daily mean objective (50 µg/m ³) Where data capture < 90%, include the 90 th percentile of daily means in brackets.			
				2010	2011	2012	2013
Chesterfield	Urban Background	N	93.2	0	0 (38.4)	0 (18.6)	4
Chesterfield Roadside	Traffic	N	89.8	0	0 (27.6)	14 (35.7)	6 (26)

Monitoring indicates that there has been no breach of the Air Quality Objective.

Figure 2.17: Trends in Annual Mean PM₁₀ Concentrations



The above figure shows the annual levels and overall trends for PM₁₀ results for the current monitoring locations. As can clearly be seen, the overall trend for PM₁₀ monitoring results at both sites is a steady reduction. During the preparation of this report, the World Health Organisation issued data regarding PM₁₀ pollution (http://www.who.int/phe/health_topics/outdoorair/databases/cities/en/), and Chesterfield was included on a list of regions in the UK which exceed their threshold (20µg/m³), which has not been adopted across the EU. This was based on 2011 data. As can be seen from the chart, above, the background levels were above the WHO threshold in that year but the levels, while fluctuating, are displaying a general downward trend.

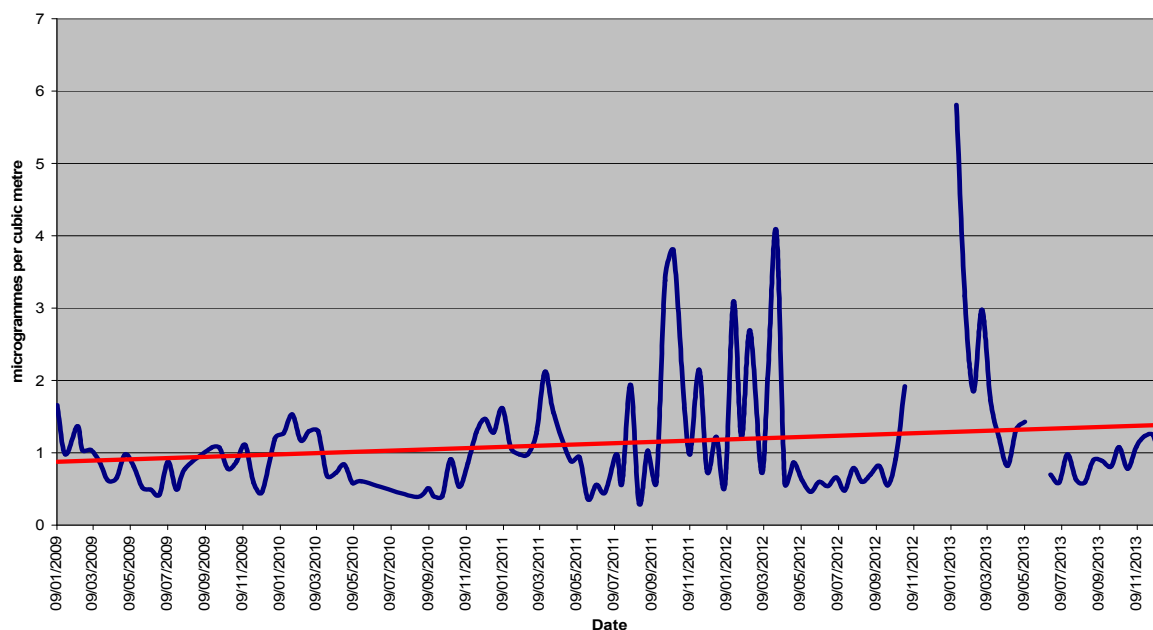
2.2.3 Benzene

Benzene is sampled at the Chesterfield Roadside site, by the use of sampling tubes containing a proprietary absorbent (Carbopack X). The tubes are exposed for 14 days. The monitoring results (shown below) are well below the AQO, and have consistently been so over the years of monitoring at this site.

Table 2.7: Benzene Monitoring Results

Start Date	End Date	Measurement
03/01/2013	17/01/2013	5.81
17/01/2013	31/01/2013	3.17
31/01/2013	14/02/2013	1.85
14/02/2013	28/02/2013	2.98
28/02/2013	14/03/2013	1.73
14/03/2013	28/03/2013	1.21
28/03/2013	11/04/2013	0.82
11/04/2013	25/04/2013	1.32
25/04/2013	09/05/2013	1.43
06/06/2013	20/06/2013	0.7
20/06/2013	04/07/2013	0.59
04/07/2013	18/07/2013	0.98
18/07/2013	01/08/2013	0.63
01/08/2013	15/08/2013	0.59
15/08/2013	29/08/2013	0.9
29/08/2013	12/09/2013	0.89
12/09/2013	27/09/2013	0.81
27/09/2013	10/10/2013	1.08
10/10/2013	24/10/2013	0.78
24/10/2013	07/11/2013	1.08
07/11/2013	21/11/2013	1.23
21/11/2013	05/12/2013	1.24
05/12/2013	19/12/2013	0.75
19/12/2013	02/01/2014	0.51
Mean		1.38

Figure 2.18: Trends in Benzene Levels, from 2009 to 2013



2.2.4 Other Pollutants Monitored

Aldehydes

No reliable correlation between the pollutants could be ascertained and the funding for the study was withdrawn in December 2013. An interesting finding of the study was that the highest levels of aldehydes were found at the Chesterfield (Queens Park Annex) site. This was found to occur in the form of data spikes, particularly during the summer. It was concluded that the sudden increases, and rapid reversion to levels nearer to the mean, were due to the coincidence of sampling days with site maintenance and, in particular, mowing the sports area.

2.2.5 Summary of Compliance with AQS Objectives

Chesterfield Borough Council has measured concentrations of Nitrogen Dioxide above the annual mean objective at relevant locations and **will need to proceed to a Detailed Assessment**, for Sheffield Road. This will be carried out following completion of the ongoing study at Church Street, Brimington

3 New Local Developments

3.1 Road Traffic Sources

A new link road has been constructed serving the Markham Vale commercial development at Junction 29a on the M1 (summary details of which we given in the 2012 Update, Screening and Assessment Report). The road is sufficiently remote from local housing to have little appreciable impact and can therefore be discounted

3.2 Other Transport Sources

No additional transport sources have been identified

3.3 Industrial Sources

No newly identified industrial sources have been identified since the last report.

3.4 Commercial and Domestic Sources

No newly identified commercial and domestic sources have been identified since the last report.

3.5 New Developments with Fugitive or Uncontrolled Sources

No newly identified fugitive or uncontrolled sources have been identified since the last report.

Chesterfield Borough Council confirms that there are no new or newly identified local developments.

Chesterfield Borough Council confirms that all the following have been considered:

- **Road traffic sources**
- **Other transport sources**
- **Industrial sources**
- **Commercial and domestic sources**
- **New developments with fugitive or uncontrolled sources.**

4 Conclusions and Proposed Actions

4.1 Conclusions from New Monitoring Data

The monitoring indicates an ongoing marginal breach of the Air Quality Objective for Nitrogen Dioxide at the row of terraced housing on Church Street, Brimington.

The monitoring also indicates that there is a new breach of the Air Quality Objective for Nitrogen Dioxide at part of a row of terraced housing on Sheffield Road, Whittington Moor.

Monitoring indicates that there is no breach of the Air Quality Objective for PM₁₀ and the trend demonstrates a reduction in levels at both AURN sites.

Monitoring indicates that there is no breach of the Air Quality Objective for Benzene, the trend shows a very gradual increase in levels, but shows no realistic likelihood of breaching the Objective.

4.2 Proposed Actions

The results indicate an ongoing marginal breach of the Air Quality Objective for Nitrogen Dioxide at the row of terraced housing on Church Street, Brimington. As such we have a duty to declare an Air Quality Management Area in this area, and this process has begun. However, as the breach has been indicated by the use of passive diffusion tubes alternative monitoring has been arranged. This has entailed the use of an automatic NO_x monitor throughout 2014, located directly opposite the houses in the grounds of a church hall. This is being operated under contract by TRL with the fully validated results being forwarded each quarter. The results of this monitoring will be reported in the 2015 Update, Screening and Assessment Report.

The monitoring also indicates that there is a new breach of the Air Quality Objective for Nitrogen Dioxide at part of a row of terraced housing on Sheffield Road, Whittington Moor. However, other diffusion tube monitoring on the same façade does not support this finding. Monitoring will continue at this location, as at present, and at such time as sufficient monitoring data has been obtained at Church Street Brimington to either support or obviate the need to declare an AQMA at that location, the automatic monitoring equipment currently being used there will be relocated to this vicinity if a suitable location can be found. Preliminary agreement for a potentially suitable location has been achieved, but further work is required in this regard, and this is ongoing.

5 References

Local Air Quality Management Technical Guidance – LAQM TG(09)

Diffusion Tubes for Ambient NO₂ Monitoring: Practical Guidance for Laboratories and Users, AEA/ENV/R/2504 – AEA, Feb 2008

http://laqm.defra.gov.uk/documents/Database_Diffusion_Tube_Bias_Factors-v07_13-Final.xls

http://laqm.defra.gov.uk/documents/Tube_Precision_2014_version_03_14-Final.pdf

NO₂ Diffusion Tubes for LAQM: Guidance Notes for Local Authorities, AEA, 2006
QA/QC Procedures for the UK Automatic Urban and Rural Air Quality Monitoring Network, AEAT/ENV/R/2837 – AEA, 2009

The Relationship Between Diffusion Bias and Distance from the Road - Air Quality Consultants Ltd, 2006

A Review of Air Quality Station Type Classifications for the UK Compliance Monitoring - Ricardo AEA, 2013

UK Hydrocarbon Network, Annual Report for 2012 – AEA, 2013

Aldehyde Summary Report - Ricardo AEA, 2013

Aldehyde, Ketone and Methane Emissions from Motor Vehicle Exhausts - American Science Journal, 2011

The Car and the Commute - RAC Foundation, 2013

Systematic Biases in Measurement of Urban Nitrogen Dioxide using Passive Diffusion Samplers - Edinburgh Research Archive, 2000

NO₂ Concentrations and Distance from Roads - Air Quality Consultants, 2008

The Contribution of Transport to Air Quality - European Environment Agency, 2012

Appendices

Appendix A: Quality Assurance / Quality Control (QA/QC) Data

Appendix B: Locations of diffusion tube samplers across the Borough

Appendix A: QA:QC Data

Diffusion Tube Bias Adjustment Factors

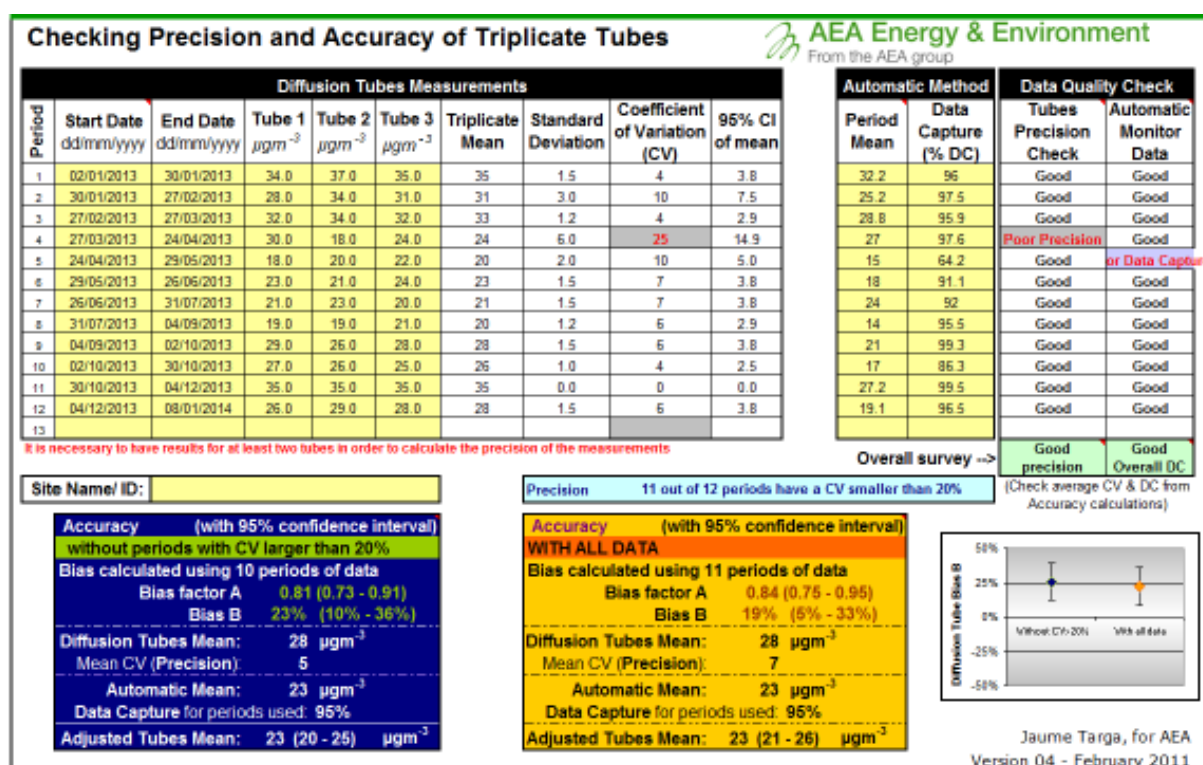
NO₂ diffusion tubes are supplied by South Yorkshire Air Quality Samplers, the preparation method being 50% TEA in acetone. The laboratory follows the procedures set out in the Harmonisation Practical Guidance. The national bias factor for the tubes supplied by this source is 0.84. Data from the two sites 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): 0.81

The calculation for deriving this factor is shown below:



Further details on the sites are given in section 2.1.1 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 (0.81) 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.

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.

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 NO₂ Monitoring: Practical Guidance for Laboratories and Users". The WASP results show the overall performance of the analysis laboratory as good.

Appendix B: Location of Diffusion Tube Monitoring Across the Borough Area

