



**Mansfield  
District Council**

*Creating a District where  
People can Succeed*

**MANSFIELD DISTRICT COUNCIL  
ENVIRONMENTAL HEALTH**

**PLEASLEY DETAILED ASSESSMENT REPORT 2016**



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Cover photograph shows Pleasley Mills, a series of Listed Buildings 1km from the monitoring area

## **1. Introduction**

The Mansfield District is situated in the north-west of Nottinghamshire, bordering on Derbyshire. It occupies some of the highest land in the county, averaging 135m above sea level. The district has three Environmental Permitting Regulations 2012 Part A processes, no A2 processes and 37 Part B processes (which includes 15 petrol stations).

The District has had a long history of coal-mining, but no mines are in operation now. Although a few areas still use solid fuel for domestic heating, such usage has declined dramatically since the coal mines closed. Smoke Control Orders are operative for the whole of the district. These orders are policed by the Council's Environmental Health Service.

The district covers 7,692 hectares with a population of some 98,000, which makes it one of the smallest districts in the county in population terms. There are three main population centres: Mansfield itself, Mansfield Woodhouse and Market Warsop. Some 40% of land is used for housing and industry, with a further 40% for farming; the remainder is divided between woodland, grassland and heath. 6,500 properties are Council-owned, and 5-10% of the land. A number of public parks and amenities have been constructed on former landfills, but none of these is currently actively-gassing.

The road network includes an inner and an outer ring road around Mansfield itself. Only one of the annual average daily traffic flows currently exceeds 25,000 vehicles, although the very busy A38 ends in the town, and the A60 passes through from Nottingham to Worksop. The traffic control in Mansfield is the best in the county outside the City and is controlled by the county's traffic control system (SCOOT). This system allows for the automatic change of signal controls to reduce congestion at traffic lights at peak flow times.

The original Air Quality Report identified possible concerns with nitrogen dioxide (NO<sub>2</sub>) and particulates (PM<sub>10</sub>). Modelling carried out in 2005 by consultants did not suggest continuing problems with these, but diffusion tube monitoring on

Chesterfield Road North, Pleasley, near the District boundary has regularly exceeded the  $40\mu\text{g}/\text{m}^3$  nitrogen dioxide annual objective by up to  $7\mu\text{g}/\text{m}^3$ .

### **1.1 Review and assessment of air quality in Mansfield**

Historically, the District relied heavily on coal for heating, and the pollutants of concern were therefore black smoke and sulphur dioxide. These were monitored using machines that drew air through a filter to trap soot particles, and then passed the air through a 'bubbler' that trapped  $\text{SO}_2$  in a liquid in a bottle. Over a number of years, Smoke Control Orders were introduced to cover the whole district, which produced a major improvement in air quality, both for smoke and  $\text{SO}_2$ .

Following the closure of the coal mines, the emphasis has shifted to vehicle exhaust emissions ( $\text{NO}_2$ ), and, to a much smaller degree, airborne dust ( $\text{PM}_{10}$ ). The Council monitors extensively for  $\text{NO}_2$ , with 17 passive monitoring tubes on lamp-posts throughout the District, plus a real-time analyser.  $\text{PM}_{10}$  is currently monitored real-time in one location only.

The trends for these two pollutants over the last five years suggest a decline in levels of both, that for  $\text{PM}_{10}$  being a greater decline than that for  $\text{NO}_2$ .

### **1.2 Requirement for a Detailed Assessment Report**

One diffusion tube on the A617 (Chesterfield Road North) in Pleasley has regularly been showing an annual average result of over  $40\mu\text{g}/\text{m}^3$  for several years. Since diffusion tubes are only an indicative method, the real-time  $\text{NO}_x$  analyser (located in a secure unit with the real-time dust analyser) was moved into the area in late 2011, and a further diffusion tube was put up at the edge of the built-up area, on the Chesterfield Road North/Poplar Drive junction, in early 2015.

Since many of the Pleasley properties are terraced, with no front gardens and doors opening straight off the pavement into the front room, it is considered that residents would be more likely to suffer effects from  $\text{NO}_2$ .

Unfortunately the data capture from the real-time analyser has been poor in most years, generally due to the age of the equipment, and consequently it has taken the Council a number of years to be able to come to a conclusion about the NO<sub>2</sub> levels in the area, following advice from Bureau Veritas and instructions from Defra to carry out more monitoring.

## **2 Detailed assessment for nitrogen dioxide**

### **2.1 National perspective**

All Member States of the European Union must comply with Directive 2008/50/EC on Ambient Air Quality and Cleaner Air for Europe, and the Fourth Air Quality Daughter Directive (2004/107/EC). These Directives require all Member States, including the UK, to undertake air quality assessments, and to report the findings to the European Commission on an annual basis.

A report titled 'Air Pollution in the UK 2014: Compliance Assessment Summary', published in September 2015, noted that not all the 43 zones and agglomerations into which the UK was divided were compliant with the limit values for nitrogen dioxide by 2014, although the East Midlands zone was, apart from the Nottingham Urban Area.

The Guardian newspaper's website carried an article on 20 February 2014 titled 'Air pollution: European commission launches legal action against the UK'. It announced that the UK faced fines and court appearances for failing to reduce what were called 'excessive' levels of nitrogen dioxide emissions from road traffic. Other countries have also failed to meet the objectives.

Meeting the limit values alongside busy roads is a considerable challenge. Most British cities have plans to meet the objectives by 2020, although London has said it could not meet them until 2025.

### **2.2 Local perspective**

Long-term diffusion tube monitoring shows that the Mansfield district in general does not experience high levels of nitrogen dioxide. This is attributed to the facts that there are no roads in the district with daily traffic flows of more than 24,000 vehicles, and few buildings with more than three storeys.

There are two areas where NO<sub>2</sub> diffusion tube monitoring results are regularly close to, or even above, the annual objective: Debdale Lane and Chesterfield Road North. Both these sites are on the A617 north of the town and are considered to be experiencing these NO<sub>2</sub> levels due to the volume of traffic – Debdale Lane is part of a busy junction with quite long waiting times at the traffic lights, and Chesterfield Road North, while not exactly a ‘narrow congested street’, has issues due to its topography and the amount of traffic using it at busy periods.

The annual average (raw data) from the diffusion tube on Debdale Lane is usually just above the objective limit - it was 43µg/m<sup>3</sup> in 2008 but has been dropping very slightly since, to 42µg/m<sup>3</sup> in 2014 and 40µg/m<sup>3</sup> in 2015.

Exceedances are still being logged by the diffusion tube at Chesterfield Road North, Pleasley - the last two years’ raw data annual average being 49µg/m<sup>3</sup> (2014), and 46µg/m<sup>3</sup> (2015), both above the objective limit. A further diffusion tube was put in place in the area at the beginning of 2015, at the junction of Chesterfield Road North and Poplar Drive, to define the possible exceedance area more closely. This logged an annual average of 36µg/m<sup>3</sup> (raw data) in 2015.

### **2.3 Monitoring equipment**

The monitoring of NO<sub>x</sub> in the district is carried out using a Signal 447 Chemiluminescence Analyser (the Ambirak version, with an on-site computer as the data logger). The instrument is downloaded and calibrated weekly by trained Mansfield District Council staff using a certified standard gas to give zero and span checks. All equipment used for calibration is test-compliant; the span gas is purchased from Air Liquide, and all gas mixtures are accredited. All procedures carried out comply with the national network guidance.

All monitoring and measuring equipment is on a yearly service contract with the original suppliers.

### 3 New monitoring results

#### 3.1 Real-time monitoring

The real-time monitoring unit is in the southern corner of the Pleasley Landmark Centre's car park, which is 40m north of the high-reading diffusion tube location. Due to the size of the enclosure, it is not possible to locate it any closer to the tube location. The monitoring unit contains the equipment noted in section 2.3 above. A map of monitoring locations in Pleasley is given as Figure 2.



**Figure 1.** Real-time monitoring unit at Pleasley Landmark Centre (directly to the left of blue-and-white signboard in centre of photo)

#### 3.2 Diffusion tube monitoring

All the Local Authorities in Nottinghamshire are contracted with Gradko International for the supply and analysis of NO<sub>2</sub> diffusion tubes, so that there is consistency throughout the county. Gradko has a very strict QA procedure which involves analysing, once a month, a certified solution supplied by AEA Technology. Gradko also takes part in the NO<sub>2</sub> Network Field Intercomparison Exercises carried out by AEA Technology, in which it is rated as 'good'. Gradko has confirmed that the laboratory complies with the procedures detailed in the Defra Harmonisation Practical Guidance.



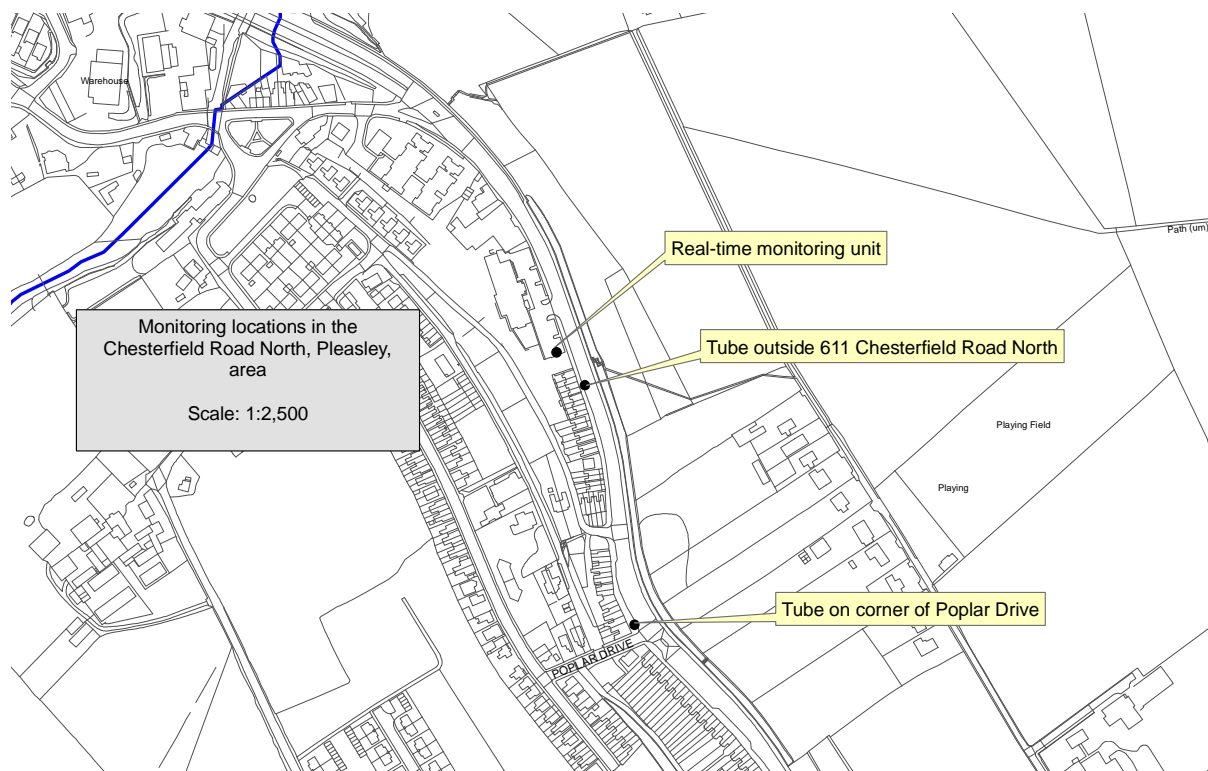
Mansfield's diffusion tubes are stored under refrigeration prior to use, and are used within the specified expiry dates. Upon changing the tubes, the date, site and exposure times are recorded and they are put into a sealed bag. The tubes are mounted following AEA guidance wherever practicable. They are forwarded to Gradko for analysis along with a sealed 'travel blank' tube.

### **3.2.1 Locations of monitoring tubes**

Three monitoring tubes (for comparison purposes) are mounted on the roadside elevation of the air pollution monitoring unit enclosure. The unit is in the south-east corner of the car park at the Landmark Centre, Chesterfield Road North, Pleasley, which is on the A617 in the north-west of the District, only some 300m from the District boundary. These tubes are approximately six metres from the north-bound carriageway of the road.

One tube is mounted on a lamp-post outside 611 Chesterfield Road North, Pleasley, in the centre of a row of eight terraced houses where the front doors open directly off the pavement into the living rooms. The location is some 40 metres further south of the Landmark Centre, and the tube is approximately two metres from the north-bound carriageway of the road.

The final tube is mounted on a lamp-post next to the bus stop near the northern corner of Chesterfield Road North and Poplar Drive, Pleasley. This is another 160 metres south of the previously-described location. The three nearest properties are shops with flats above, and all have doors opening directly off the pavement into the building. The tube is some three metres from the north-bound carriageway of the road.



**Figure 2.** Monitoring locations in the Chesterfield Road North, Pleasley, area

### 3.2.2 Results and trends

The results for real-time and diffusion tube monitoring for the past five years are presented below:

Real-time data ( $\mu\text{g}/\text{m}^3$ )

Site	2011	2012	2013	2014	2015
Groundhog	16	19	45	17	16

The results are consistently low for the real-time monitoring, with little evidence of any increase or decrease of  $\text{NO}_2$  levels.

The 2013 result is an anomaly. The  $\text{NO}_2$  data logging was being carried out through a link to a Casella APM950 dust analyser, but the analyser broke down irreparably on 2 February of that year. The Council could not replace the APM950 until the start of the new financial year, but the MAM (now called a Dust Guardian) bought in its place could not take the output from the Signal 447  $\text{NO}_2$  analyser. Consequently only 27 days of  $\text{NO}_2$  data were logged for the whole year. The data was annualised, but very little reliance can be put on a result obtained from such a small amount of raw data. There were no hourly mean exceedances, and the 99.8<sup>th</sup> percentile was 34.

The general trend of annual results from this monitoring location would suggest that a full year's data for 2013 is likely to have averaged under 20 $\mu\text{g}/\text{m}^3$ .

Diffusion tubes ( $\mu\text{g}/\text{m}^3$ )

	Raw data	With factor	With fall-off with distance
<b>2011</b>		<b>Factor 0.95</b>	
GH (average of 3 tubes)	30.87	29.33	23.90
CRN	48.41	45.99	39.60
<b>2012</b>		<b>Factor 0.89</b>	
GH (average of 3 tubes)	33.23	29.57	24.10
CRN	49.78	44.30	38.30
<b>2013</b>		<b>Factor 0.9</b>	
GH (average of 3 tubes)	36.44	32.80	25.90
CRN	50.29	45.26	39.00
<b>2014</b>		<b>Factor 0.95</b>	
GH (average of 3 tubes)	35.06	33.31	26.20
CRN	49.39	46.92	40.30
<b>2015</b>		<b>Factor 0.91</b>	
GH (average of 3 tubes)	32.78	29.83	24.20
CRN	45.85	41.72	36.20
PD	36.44	33.16	30.90

'Fall-off with distance' calculations - which take into account the distance of the tube from the kerb and the distance of the frontage of the nearest house from the kerb – brought the annual average for the CRN tube for 2015 down to about 36 $\mu\text{g}/\text{m}^3$ . Although the 2014 exceeded the objective by a small amount, the general trend of results suggests that levels are not exceeding at the nearest property. Nevertheless, results are consistently close to the objective, and monitoring will continue to take place to check on levels.

The nearest receptor in the case of the air pollution monitoring unit is 24m, as the size of the enclosure means it cannot be located any closer to a receptor.

### 3.2.3 Bias correction factor

#### Factor from local co-location studies (if available)

Mansfield District Council has had three co-located diffusion tubes mounted on its mobile air pollution monitoring unit since April 2001. Using the spreadsheet from the AEA website, the local factor for 2015 is 0.59 (see Appendix A).

### Diffusion tube bias adjustment factors

The Gradko diffusion tube bias adjustment factor, from studies carried out in 2015, is 0.91. This is the factor for tubes prepared using 20% TEA in water. 29 studies were used, 24 of which were of 'good' precision (83%). The spreadsheet version 03/15 was consulted.

### Discussion of choice of factor to use

The 2015 bias adjustment factor for Gradko tubes is 0.91. The local factor calculated on the AEA spreadsheet is 0.59, but this is based on results from only four periods of data, as the database has poor overall data capture. Consequently, the Gradko figure has been used for the 2015 monitoring data.

### Short-term to long-term data adjustment

It proved difficult to find long-term sites within 80 kilometres that monitored the pollutants in question and had a good rate of data capture. The following sites were used: Barnsley Gawber (52km), Nottingham Centre (21km), and Sheffield Devonshire Green (33km). The ratios calculated from these sites meant that only minimal adjustments needed to be made to Mansfield's data to annualise it.

Nitrogen dioxide

Site	Site type	Annual mean	Period mean (Jan, Feb, June-Oct, Dec 2015)	Ratio
Barnsley Gawber	Urban background	18.64	18.98	0.98
Nottingham Centre		31.04	31.56	0.98
Sheffield Devonshire Green		25.38	25.84	0.98
			<b>Average</b>	<b>0.98</b>

### 3.3 Potential breach area

The area under consideration is the last 500 metres of the north-west section of the A617 (Chesterfield Road North, Pleasley) before the District boundary. This road leads to Chesterfield, but before reaching this town, it crosses the M1 at Junction 29. Consequently the road is well-travelled, particularly where drivers in the area are looking for a route between the A1 on the east of Mansfield and the M1 on the west.

The traffic count shows that nearly 22,000 vehicles a day - 3.4% of which are HGVs and 1% PSVs - use this section of road, making it the third most-busy road in the District.

The Mansfield and Ashfield Regeneration Route (MARR) bypasses Mansfield to the south and west. The end of the western section joins the A617 a kilometre south of the District boundary, so all the traffic travelling north has to pass through the section of Pleasley under review.

MARR joins the A617 at a high point topographically, and the road then goes steadily down to the crossing of the River Meden on the District boundary. All the houses on the west side of the Chesterfield Road frontage have been demolished from the MARR junction to the Poplar Drive junction (a distance of some 500m). These properties were terraced, with five blocks with some twenty houses in each.

The east side of Chesterfield Road North in this area has no houses; instead there is a stone wall. This wall is generally some two metres high; it begins at the cemetery, and continues down the whole length of the road. Behind the wall is a bank with trees growing on it; the bank is at least another two metres high and in some places is about four metres. Beyond the bank, the land is fairly level and open, and mostly used for agriculture.

This combination of landscape, housing and traffic has meant that the Council feels the road could be classed as a 'narrow congested street with properties close to the kerb'. Although all houses between the MARR junction and the Poplar Drive junction have been demolished, the properties further north are not scheduled for demolition.

The monitoring results for 2015 indicate that the Poplar Drive area is not experiencing high levels of NO<sub>2</sub>, nor is the area around the Landmark Centre where the real-time unit is located. The high-reading tube is 40m south of the real-time unit. This would indicate that the possible problem is restricted to that section of Chesterfield Road North between the Poplar Drive junction and the Landmark Centre, a length of approximately 300m containing 34 properties.



**Figure 3** showing height of wall on Chesterfield Road North near the MARR junction

**Figure 4** taken from top of banking opposite CRN diffusion tube location, showing height of banking



**Figure 5** showing height of wall plus banking behind (note relative size of bus shelter)

### **3.4 Estimation of population exposure**

Thirty-four properties could be affected by the levels of NO<sub>2</sub> on this section of Chesterfield Road North, from the Poplar Drive junction to the Landmark Centre car park. These are numbers 557 to 621 Chesterfield Road North (see Figure 6).

Many of these houses are terraces. Numbers 557 to 571 are one block, including four shops with flats above, then there is a narrow passage, followed by numbers 573 to 583 in another block. Numbers 585/587 and 589/591 are two pairs of semi-detached houses, followed by a detached house, 593. There are then three pairs of semi-detached houses – 595/597, 599/601 (this pair is shops with flats above), and 603/605. The final properties are a block of eight terraced houses, 607 to 621.

There are no houses on the opposite side of the road.

The area left by demolition of the terraces on Chesterfield Road North between the Poplar Drive and MARR junctions is currently being redeveloped with housing. The properties are being built on small streets running off Chesterfield Road North at right-angles, so that the houses do not face onto the main road, and the gable ends have few windows. This layout was a requirement of the planning permission, to minimise possible NO<sub>2</sub> levels inside the properties nearest the main road.

NO<sub>2</sub> exposure is likely to be greater in the 23 terraced properties between Poplar Drive and the Landmark Centre, which have no front gardens, and their front doors lead straight off the pavement into the front room.





## 4 Conclusions and recommendations

The real-time annual mean for NO<sub>2</sub>, annualised and corrected by falloff with distance, for 2015 was 16µg/m<sup>3</sup>. The annual means for 2011, 2012, and 2014 have not exceeded 19µg/m<sup>3</sup>. (The 2013 result of 45ug/m<sup>3</sup> has been discounted as it was based on extremely poor data capture of only 27 days for the whole year). Although the results show no decrease over the five years, they are very low. The objective for NO<sub>2</sub> is not being exceeded at the location of the air pollution monitoring unit.

The diffusion tube at Poplar Drive has only been in place since the beginning of 2015. It is approximately 160m south of the high-reading tube, at the edge of the remaining housing area. It has shown two monthly exceedances (raw data), but its annual average result, even without correction factors, did not exceed the objective limit in 2015.

The diffusion tube sited on the lamp-post outside 611 Chesterfield Road North, 40m south of the real-time air pollution monitoring unit, continues to exceed the annual mean objective (raw data). The reason for the difference between the results for real-time and passive monitoring is assumed to be due to a combination of the lie of the land and the terraced houses, which causes in effect a 'canyon'. When the correction factors are applied, the CRN tube results are close to the objective limit but not exceeding. The general trend of results is consistent, with no evidence for increase or decrease of levels.

From the evidence gathered in the area since real-time monitoring began in late 2011, the Council does not believe it needs to declare an Air Quality Management Area for nitrogen dioxide in Pleasley, between the Poplar Drive junction and the Landmark Centre car park. However, the Council does intend to continue indicative monitoring at the current diffusion tube sites at 611 Chesterfield Road North and the Poplar Drive junction. Since the high results are almost certainly being caused by the amount of traffic travelling through what is in effect a 'canyon', the Council will need to liaise with the Highways authority to look at possible solutions to the problem.

## **The future**

Monitoring with diffusion tubes will continue in the Pleasley area at the Poplar Drive and Chesterfield Road North sites.

Unfortunately it has become necessary to move the real-time analysers from the Landmark car park as anti-social behaviour is taking place behind the enclosure, which hides such activities from view. The Council is looking at the possibility of purchasing a smaller-size enclosure or a different type of monitoring unit, which could be deployed again in the Pleasley area if required.

The results of all monitoring will continue to be given in future Air Quality Reviews.

# Appendix A

## Checking precision and accuracy of triplicate tubes



Diffusion tubes measurements										Automatic method		Data quality check	
Period	Start date	End date	Tube 1 $\mu\text{gm}^{-3}$	Tube 2 $\mu\text{gm}^{-3}$	Tube 3 $\mu\text{gm}^{-3}$	Triplicate mean	SD	CV	95% CI of mean	Period mean	Data capture (%)	Tubes precision check	Automatic monitor data capture check
1	09/01/2015	05/02/2015	37.5	43.6	41.7	41	3.1	8	7.8	39.55	100	Good	Good
2	05/02/2015	04/03/2015	39.4	36.1	40.3	39	2.2	6	5.5	17.54	18	Good	Poor data capture
3	04/03/2015	01/04/2015	35.8	36.7	37.3	37	0.8	2	2.0		0	Good	
4	01/04/2015	01/05/2015	28.8	23.9	30.8	28	3.6	13	8.8		0	Good	
5	01/05/2015	28/05/2015	28.0	28.0	29.4	28	0.8	3	1.9		0	Good	
6	28/05/2015	02/07/2015	31.0	30.9	32.9	32	1.1	4	2.8	13.4	30	Good	
7	02/07/2015	30/07/2015	26.4	27.9	28.6	28	1.1	4	2.8	12.84	100	Good	Good
8	30/07/2015	03/09/2015	28.8	29.3	29.2	29	0.3	1	0.6	11.67	100	Good	Good
9	03/09/2015	01/10/2015	29.0							12.02	100		Good
10	01/10/2015	28/10/2015	29.4							13.77	94		Good
11	28/10/2015	02/12/2015	30.1								0		
12	02/12/2015	06/01/2015	39.5	36.9		38	1.8	5	16.5	16.37	97	Good	Good

Overall survey --> **Good precision** **Poor overall DC**

Site name/ ID: **Groundhog** Precision **9 out of 9 periods have a CV smaller than 20%**

Accuracy (with 95% confidence interval) without periods with CV larger than 20%		Accuracy (with 95% confidence interval) WITH ALL DATA		Without CV >20% 100% 104.9	With all data 100% 104.9%
Bias calculated using 4 periods of data		Bias calculated using 4 periods of data			
Bias factor A	0.59 (0.37 - 1.56)	Bias factor A	0.59 (0.37 - 1.56)		
Bias B	69% (-36% - 174%)	Bias B	69% (-36% - 174%)		
Diffusion tubes mean:	34 $\mu\text{gm}^{-3}$	Diffusion tubes mean:	34 $\mu\text{gm}^{-3}$		
Mean CV (precision):	4	Mean CV (precision):	4		
Automatic mean:	20 $\mu\text{gm}^{-3}$	Automatic mean:	20 $\mu\text{gm}^{-3}$		
	Data capture for periods used: 99%		Data capture for periods used: 99%		
Adjusted tubes mean:	20 (13 - 53) $\mu\text{gm}^{-3}$	Adjusted tubes mean:	20 (13 - 53) $\mu\text{gm}^{-3}$	Jaume Targa, for AEA	

**Table 1. Results of nitrogen dioxide diffusion tubes across the Mansfield District in 2015**

Site ID	Location	Site type	Within AQMA?	Triplicate collocated tube	Data capture 2015 (number of months/%)	Confirm if data has been distance corrected	Annual mean concentration (bias adjustment factor = 0.91)
							2015 ( $\mu\text{g}/\text{m}^3$ )
AR	Abbott Road	Roadside	N	N	12 (100%)	Y	20.9
CRN	Chesterfield Road North	Roadside	N	N	12 (100%)	Y	34.7
DL	Debdale Lane	Roadside	N	N	12 (110%)	Y	28.9
FT1	Clipstone Road West 1	Roadside	N	N	11 (92%)	Y	25.0
FT2	Clipstone Road West 2	Roadside	N	N	11 (92%)	Y	15.6
GH	Groundhog	Roadside	N	Y	(81%)*	Y	34.2*
LLN	Leeming Lane North	Roadside	N	N	12 (100%)	Y	22.5
NR	Nottingham Road	Roadside	N	N	8 (67%)	Y	30.0
PD	Poplar Drive	Roadside	N	N	9 (75%)	Y	24.8
RV	Rock Valley	Roadside	N	N	10 (83%)	Y	23.7
SS	Sherwood Street	Roadside	N	N	12 (100%)	Y	16.3
SRE	Southwell Road East	Roadside	N	N	11 (92%)	Y	17.5
SA	Stopford Associates	Roadside	N	N	12 (100%)	Y	24.6
TL	Toothill Lane	Roadside	N	N	12 (100%)	Y	19.5
WT	Warsop Town Hall	Roadside	N	N	12 (100%)	Y	22.2

\*Average of 3 co-located tubes.

**Table 2. Results of nitrogen dioxide diffusion tubes across the Mansfield District (2010 to 2015)**

Site ID	Site type	Within AQMA?	Annual mean concentration (adjusted for bias) $\mu\text{g}/\text{m}^3$					
			2010 (bias adjustment factor = 0.95)	2011 (0.89)	2012 (0.90)	2013 (0.95)	2014 (0.91)	2015 (0.91)
AR	Roadside	N	34	29	32	33	30	30
CRN	Roadside	N	<b>46</b>	<b>44</b>	<b>45</b>	<b>47</b>	<b>44</b>	<b>42</b>
DL	Roadside	N	<b>41*</b>	37	36	40	38	37
FT1	Roadside	N	28*	23*	24	25	26	25
FT2	Roadside	N	28*	18*	23	22	24	20
GH**	Roadside	N	30*	20*	32	33	31	30
LLN	Roadside	N	36	33	32	35	30	29
PD	Roadside	N	N/A	N/A	N/A	N/A	N/A	33
RV	Roadside	N	N/A	N/A	28	28	29	24
SS	Roadside	N	40*	28*	23*	25	20	20
SRE	Roadside	N	22*	18*	22	24	22	20
SA	Roadside	N	33*	28	26	27	26	24
TL	Roadside	N	33*	26	25	25	24	24
WT	Roadside	N	33*	28	26	26*	25	23

In bold, exceedence of the  $\text{NO}_2$  annual mean AQS objective of  $40\mu\text{g}/\text{m}^3$

\*Annualised figure. \*\*Average of 3 co-located tubes.

**Table 3. Uncorrected NO<sub>2</sub> diffusion tube dataset across the Mansfield District in 2015**

Site	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Yearly average for site
Abbott Road	33.71	41.66	32.26	27.93	26.05	26.72	25.37	32.49	35.22	41.69	33.41	33.10	<b>32.47</b>
CRN	50.86	51.50	50.60	40.72	39.99	44.43	45.63	44.68	47.36	47.16	38.34	48.91	<b>45.85</b>
Debdale Lane	46.59	43.72	44.51	34.66	34.10	36.39	36.79	39.36	39.44	47.17	38.84	42.34	<b>40.33</b>
Forest Town 1	27.26	31.84	28.41	25.04	22.84	(1)	24.27	25.16	26.18	30.28	29.09	31.46	<b>27.44</b>
FT 2	25.90	(1)	23.69	20.97	17.54	16.41	18.02	18.59	20.56	26.03	25.64	23.91	<b>21.57</b>
Groundhog 1	37.48	39.44	35.76	28.77	28.04	30.98	26.43	28.80	28.98	29.39	30.05	39.49	<b>31.97</b>
GH 2	43.61	36.08	36.72	23.91	28.04	30.86	27.93	29.27	(1)	(1)	(1)	36.89	<b>32.59</b>
GH 3	41.73	40.29	37.34	30.84	29.37	32.85	28.64	29.22	(1)	(1)	(1)	(2)	<b>33.79</b>
Leeming Lane North	39.47	34.98	34.95	26.99	25.20	29.42	25.81	29.86	32.28	39.27	29.16	33.51	<b>31.74</b>
Nottingham Road	(1)	(1)	42.70	34.75	32.04	37.57	39.71	37.35	36.69	50.55	(1)	(1)	<b>38.92</b>
Poplar Drive	41.59	35.06	38.25	11.49	23.96	(1)	(1)	(1)	38.96	48.06	30.29	35.37	<b>36.44</b>
Rock Valley	33.79	30.44	30.33	21.58	19.90	24.03	23.57	24.65	24.92	26.93	(1)	(1)	<b>26.01</b>
Sherwood Street	26.85	23.74	23.93	18.99	14.85	15.91	15.75	18.97	21.72	31.81	20.84	30.85	<b>22.02</b>
Southwell Road East	(1)	31.53	29.57	20.88	17.20	18.80	16.66	19.20	21.45	27.88	20.01	18.73	<b>21.99</b>
Stopford Associates	29.79	30.35	31.95	24.12	19.93	24.18	22.12	23.84	25.04	32.62	24.73	25.69	<b>26.20</b>
Toothill Lane	33.89	30.31	28.95	23.24	17.11	21.73	18.34	22.65	25.53	31.78	26.84	29.74	<b>25.84</b>
Warsop Town Hall	31.38	28.24	30.03	23.54	18.70	21.73	19.47	25.06	24.69	36.17	22.04	24.83	<b>25.49</b>
<b>Monthly average across district (all tubes)</b>	<b>36.26</b>	<b>35.28</b>	<b>34.11</b>	<b>25.79</b>	<b>24.40</b>	<b>27.47</b>	<b>23.43</b>	<b>25.74</b>	<b>27.49</b>	<b>33.08</b>	<b>21.72</b>	<b>32.49</b>	

All results are in µg/m<sup>3</sup>.

(1) Tube missing. (2) Tube result 'below detection limit'.