2010 and 2011 Air Quality Progress Report for Basingstoke and Deane Borough Council

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

May 2011

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Executive Summary

Under the Environment Act 1995, Local Authorities are required to undertake regular review and assessments of air quality. Local Authorities have recently begun the fourth round of the review and assessment process. Each round is comprised of two steps. The first step is an Updating and Screening Assessment. Where a significant risk of exceedence of one or more of the UK objectives was identified it was necessary for the Local Authority to proceed to a Detailed Assessment. Where a Local Authority did not need to undertake a Detailed Assessment, a shorter Progress Report is required instead.

This report is Basingstoke and Deane Borough Council's Progress Report for the calendar years of 2009 and 2010. The Council did not submit a report that addressed 2009 and by agreement with DEFRA this report covers both 2009 and 2010.

Basingstoke and Deane Borough Council last conducted an Updating and Screening Assessment (USA) in 2009, which looked at measurements of NO_2 taken from diffusion tube sites throughout the borough. This report noted exceedences of the AQS objectives around the Winton Square area of Basingstoke and on the A339 near Headley. However, Detailed Assessments of Air Quality in these areas have concluded that concentrations of NO_2 at locations of relevant exposure do not exceed the AQS objective limit.

Concentrations of NO_2 measured throughout the borough have been relatively stable for a number of years, although measurements from many sites show a slight decreasing trend. Exceedences in the aforementioned areas of Winton Square and the A339 have again been noted from data collected during 2009 and 2010. This data suggests that new exceedences of the AQS objective for NO_2 have occurred at two sites, 6 and 21. However, the conclusions of the 2008 report are believed by Basingstoke and Deane Borough Council to still apply.

Site 6 is a roadside monitoring site, the closest relevant exposure to which is estimated to be over 11 metres from the kerb. At this distance NO_2 concentrations are calculated to be well below the AQS objective limit. Similarly site 21 is a kerbside site, however there is no associated relevant exposure and the AQS objectives therefore do not apply to concentrations measured at the site. Furthermore, existing measurements indicate that the AQS objectives are not exceeded at locations of new relevant exposure in the locality of Winton Square. However, additional monitoring at these locations of new exposure would be useful in confirming the accuracy of this conclusion.

Data from 2009 and 2010 indicates that Basingstoke and Deane Borough Council do not therefore need to conduct any further Detailed Assessments of Air Quality in the borough at this juncture. An Updating and Screening Assessment should therefore be completed in 2012, utilising data recorded in 2011, as per the recommendations of LAQM guidance.

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1 Introduction

1.1 Description of Local Authority Area

The borough of Basingstoke and Deane covers over 630 km^2 of Hampshire, in South-East England, around 90% of which is rural. The borough has a residential population of over 160,000, around half of whom live in the town of Basingstoke. Over the last 70 years Basingstoke has grown from a small market town with a population of around 14,000, to be the borough's principle settlement, with a population of nearly 83,000.

The strategic location of Basingstoke on national road and rail transport networks has contributed a great deal to its success as a centre of employment in the area. In addition to which, the relative proximity of major transport hubs in London, Southampton and Portsmouth has aided the town's commercial success. Strategic transport routes in the borough include the M3, and nearby rail line, linking Basingstoke to London and Southampton, and the A303, A339 and A33 linking Basingstoke to Andover, Newbury and Reading respectively.

Other notable conurbations in the borough include Bramley, Tadley, Kingsclere, Overton, Oakley, and Whitchurch. However, the borough is otherwise characterised by its numerous small hamlets and villages, such as the hamlet of Deane. These lie mostly to the west of Basingstoke, particularly on the periphery of the North Wessex Downs Area of Outstanding Natural Beauty, a large part of which lies in the western part of the borough.

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 micrograms 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	Maximum daily 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

1.4.1 First Round of Review and Assessment

Basingstoke and Deane Borough Council completed all stages of the first round of Review and Assessment by 2000, concluding that the Air Quality Strategy objectives were likely to be met for all pollutants by the required dates.

1.4.2 Second Round of Review and Assessment

Air Quality Updating and Screening Assessment (USA), 2003
The assessment carried out by Basingstoke and Deane Borough Council in 2003 concluded that, since no exceedences of the Air Quality Strategy objectives were predicted at locations of relevant exposure in the borough, a Detailed Assessment was not required.

Progress Report, 2004
By considering diffusion tube monitoring data from sites in the borough, a potential exceedence of the annual mean objective for nitrogen dioxide was identified at the Winchester Street junction with Winton Square. A Detailed Assessment was therefore deemed to be required, considering concentrations of NO_2 at locations of relevant exposure in the vicinity of the junction. As a precursor to this assessment, additional diffusion tube monitoring was undertaken at four locations from May 2004.

Detailed Assessment, 2005
The assessment of concentrations of NO_2 around the Winchester Street junction with Winton Square concluded that, since the use of a flat above a restaurant in the area did not constitute relevant public exposure, an AQMA was not required. It was however recommended that additional monitoring of nitrogen dioxide be implemented in the area. Monitoring by use of diffusion tubes was subsequently implemented at seven additional sites close to Winton Square.

1.4.3 Third Round of Review and Assessment

Air Quality Updating and Screening Assessment (USA), 2006
The third round Updating and Screening Assessment, completed in June 2006, identified likely exceedences of the Air Quality Strategy annual mean objective for NO_2 from the additional monitoring implemented in December 2005. It was concluded that there was potential exposure to this exceedence at the location noted the 2004 Progress Report, and considered in the 2005 Detailed Assessment, but it was not concluded that exposure at the site (used as a staff rest room) constituted relevant public exposure. No significant changes likely to affect emissions of carbon monoxide, benzene, 1,3-butadiene, lead, sulphur dioxide or PM_{10} were noted, and it was therefore concluded that exceedences of the Air Quality Strategy objectives for these pollutants was not likely and there was no requirement to proceed to a Detailed Assessment.

Progress Report, 2007

In July 2007 Basingstoke and Deane Borough Council produced a Progress Report considering NO_2 monitoring data from 22 sites, concluding that there were no likely exceedences at locations of relevant exposure in the borough.

Progress report, 2008
The final Stage 3 Progress Report, published in April 2008, concluded from NO_2 monitoring at 20 sites that there were no likely exceedences of the Air Quality Strategy objective at locations with relevant exposure. It was noted that several new housing developments were underway in the borough, but Basingstoke and Deane Borough Council were not required to conduct a Detail Assessment for any of the pollutants covered by the Air Quality Strategy.

1.4.4 Fourth round of Review and Assessment

Air Quality Updating and Screening Assessment (USA), 2008
Monitoring data from eight diffusion tube sites in the district recorded annual mean NO_2 concentrations exceeding the Air Quality Strategy objective. Seven of these sites are located in the vicinity of Winton Square, and had therefore been considered in the 2005 Detailed Assessment, however data from site 15 indicated possible exceedences at locations of relevant exposure at The Old Plough on Newbury Road near Headley. Concentrations of NO_2 at the roadside façade of the building were estimated to be 45 $\mu g \cdot m^{-3}$. Since The Old Plough is a residential property, it was therefore recommended that Basingstoke and Deane Borough Council proceed to a Detailed Assessment of NO_2 in the vicinity of site 15. It was also recommended that Basingstoke and Deane Borough Council increase the number of diffusion tube monitoring sites along Newbury Road (A339), Headley, Thatcham and deploy them at several sites in the vicinity of site 15, the Old Plough.

As a result of these recommendations, Basingstoke and Deane Borough Council undertook a Detailed Assessment of Air Quality in the locale of The Old Plough, located alongside the A339 near the junction with Ashford Hill Road, in accordance with the requirements of the Environment Act 1995.

Detailed Assessment of Air Quality, 2010
Monitoring data from diffusion tube sites for 2008 to 2010 were considered in this assessment. Data from new monitoring locations at Beech House and The Old Plough indicated concentrations of NO_2 significantly below the AQS annual mean objective limit at locations of relevant exposure. Although kerbside monitoring at The Old Plough indicated NO_2 concentrations above the objective limit, the sites were found to have no relevant exposure and it was therefore concluded that there was no need to declare an AQMA for NO_2 in the area. It was however recommended that Basingstoke and Deane Borough Council should continue, and possibly expand, monitoring of NO_2 at locations of relevant exposure in the area.

2 New Monitoring Data

This Progress Report utilises data collected from non-automatic monitoring sites in 2009 and 2010, supplied by Basingstoke and Deane Borough Council, and automatic monitoring data from the UK Automatic Urban and Rural Network (AURN).

2.1 New monitoring data

2.1.1 Automatic monitoring data

Basingstoke and Deane Borough Council do not operate automatic monitoring of any kind within the borough. The closest AURN site to the borough, with reasonably continuous NO_2 data for 2009 and 2010, is located at the Harwell business park, and this has therefore been used where annualisation of data is necessary.

2.1.2 Non-automatic monitoring data

Basingstoke and Deane Borough Council operate non-automatic monitoring of NO_2 at 28 sites; the most recently installed have produced data since January 2010. Data recorded from all sites in January 2010 represented the two preceding months as no data was collected at the end of December 2009, this data has therefore been used to represent both December 2009 and January 2010 monthly mean NO_2 concentrations. In cases where the LAQM.TG(09) 'Nitrogen Dioxide Fall off with Distance' methodology has been used, it should be noted that the calculations do not account for environmental factors, and are may therefore be notably less accurate that monitoring at relevant receptors would be.

Table 2.1 Details of Non- Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref	Pollutants Monitored	In AQMA?	Relevant Exposure? *(Y/N with distance (m) to relevant exposure)*	Distance to kerb of nearest road *(N/A if not applicable)*	Worst-case Location?
1. Winton Square, Basingstoke	Roadside	463600 151800	NO_2	N	N	1.7	Y
2. Winchester Rd., Basingstoke	Roadside	462300 150700	NO_2	N	N	2.3	Y
3. Lambs Row, Lychpit	Urban Background	465600 153300	NO_2	N	N	1.5	N
4. Stocker Close, Basingstoke	Urban Background	463500 150700	NO_2	N	N	1.6	N
5. Four Lanes School, Hanmore Road	Urban Background	465811 155467	NO_2	N	Y	5.0	N
6. Adjacent to Forge Farm, Newbury Rd	Roadside	451228 162862	NO_2	N	N	1.4	N
7. Outside The Guru (restaurant)	Urban Background	451721 162462	NO_2	N	Y	1.2	N
8. Front façade, Star Inn, Newbury Rd	Roadside	451712 159779	NO_2	N	Y	3.6	N
9. Traffic Lights at Winton Square	Roadside	463640 151857	NO_2	N	N	1.4	Y
10. Corner of New St./Winton Square jct	Roadside	463659 151864	NO_2	N	N	1.1	Y
11. Corner of Winton Square/Sarum Hill jct.	Roadside	463586 151862	NO_2	N	N	1.6	Y
12. Outside 4 Winton Square	Kerbside	463607 151840	NO_2	N	N	0.9	Y
13. Adjacent to 52 New Rd, Basingstoke	Roadside	463982 152014	NO_2	N	Y	4.8	Y
14. Adjacent Summersby, Newtown Common	Roadside	447294 163593	NO_2	N	N	5.0	Y
15. Outside the Old Plough, Newbury Rd	Roadside	451377 162725	NO_2	N	N	1.8	Y
16. Jct. Winton Sq / Winchester Rd	Roadside	463587 151845	NO_2	N	N	1.1	Y
17. Outside 37 Winchester St	Kerbside	463662 151852	NO_2	N	N	0.4	Y
18. Adjacent to 37 Winchester St	Roadside	463664 151836	NO_2	N	N	1.7	Y
19. Adj. Copenhagen House. New St.	Kerbside	463658 151912	NO_2	N	N	0.5	Y
20. Outside 45 Winchester St.	Kerbside	463625 151846	NO_2	N	N	0.5	Y
21. Jct. Winton Sq / Winchester Rd	Kerbside	463586 151830	NO_2	N	N	0.6	Y

Site Name	Site Type	OS Grid Ref	Pollutants Monitored	In AQMA?	Relevant Exposure? *(Y/N with distance (m) to relevant exposure)*	Distance to kerb of nearest road *(N/A if not applicable)*	Worst-case Location?
22. Façade of Agra Balti, 34 Winchester Rd	Roadside	463636 151856	NO_2	N	N	1.3	Y
23. Front façade, Beech House, Newbury Road	Roadside	451349 162760	NO_2	N	Y	14.7	N
24. Front façade, The Old Plough (1)	Roadside	451367 162731	NO_2	N	Y	5.5	Y
25. Front façade, The Old Plough (2)	Roadside	451367 162731	NO_2	N	Y	5.5	Y
26. Front façade, The Old Plough (3)	Roadside	451367 162731	NO_2	N	Y	5.5	Y
27. Bus stop o/s The Old Plough	Roadside	451361 162732	NO_2	N	N	2.0	Y
28. O/s Beech House, Newbury Road	Roadside	451343 162749	NO_2	N	N	2.0	Y

2.2 Comparison of Monitoring Results with Air Quality Objectives

2.2.1 Nitrogen Dioxide

Basingstoke and Deane Borough Council carry out extensive monitoring of NO_2 via use of 28 diffusion tubes located at sites throughout the borough in both rural and urban settings. The rationale for this focus on NO_2 stems from the high road transport emissions in the borough, due to traffic in Basingstoke town and on the borough's numerous trunk roads such as the M3 and A34.

At the time of the last Updating and Screening assessment, it was found that in 2008 there were exceedences of the AQS objective limit for NO_2 at eight diffusion tube sites, of which seven were situated in the area around Winton Square, and one was located near the Old Plough on Newbury Road. Detailed Assessments undertaken of NO_2 at both of these locations have however concluded that there is no relevant exposure at locations where the AQS annual mean objective limit is exceeded. Currently, therefore, there are no AQMAs declared in the borough of Basingstoke and Deane.

2.2.2 Automatic Monitoring Data

Basingstoke and Deane Borough Council do not operate automatic monitoring of any kind within the borough. The closest AURN site, with continuous NO_2 data from 2009 and 2010, is located at the Harwell business park in Oxfordshire. Data from this site has therefore been used where annualisation of data from non-automatic monitoring sites is necessary.

2.2.3 Diffusion Tube Monitoring Data

Basingstoke and Deane Borough Council operate non-automatic monitoring of NO_2 at 28 sites, six of which were first set-up in December 2009. Data recorded from sites in January 2010 represented the two preceding months as no data was collected at the end of December 2009, this data has therefore been used to represent both December 2009 and January 2010 monthly mean NO_2 concentrations.

As no automatic monitoring was undertaken in the Basingstoke and Deane Borough during 2009 or 2010, the bias adjustment factors used within this Progress Report were derived from the national database of collocation studies as shown in appendix Figures A1 and A2. Results from this spreadsheet provided national bias adjustment factors of 0.82 for 2009 and 0.84 for 2010, which have been used to adjust data throughout this report.

Table 2.4 Results of Nitrogen Dioxide Diffusion Tubes

Location	Within AQMA?	Relevant public exposure? Y/N	Data Capture for monitoring period 2008-10[a] %	Data Capture for full calendar year 2010[b] %	Annual mean concentrations (µg/m^3) [d]		
					2008 [c]	2009 [c]	2010 [c]
1. Winton Square, Basingstoke	N	N	97%	100%	30.4	31.8	29.9
2. Winchester Rd, Basingstoke	N	N	64%	50%	37.3	37.3	37.4
3. Lambs Row, Lychpit	N	N	92%	92%	20.1	22.1	21.9
4. Stocker Close, Basingstoke	N	N	97%	100%	20.4	19.8	20.1
5. Four Lanes School, Hanmore Road	N	Y	92%	100%	16.2	17.3	18.7
6. Adjacent to Forge Farm, Newbury Rd	N	N	67%	100%	*38.7*	**62.4**	**55.1**
7. Outside The Guru (restaurant)	N	Y	58%	100%	*15.5*	24.7	37.0
8. Front façade, Star Inn, Newbury Rd	N	Y	64%	92%	*21.9*	24.7	29.5
9. Traffic Lights at Winton Square	N	N	97%	100%	**41.8**	**43.2**	**41.7**
10. Corner of New St/Winton Square jct	N	N	100%	100%	**42.8**	**44.4**	**41.6**
11. Corner of Winton Square/Sarum Hill jct.	N	N	83%	92%	31.5	30.6	30.2
12. Outside 4 Winton Square	N	N	97%	100%	**42.9**	**42.9**	**40.6**
13. Adjacent to 52 New Rd, Basingstoke	N	Y	100%	100%	34.7	38.4	36.4
14. Adjacent Summersby, Newtown Common	N	N	86%	100%	20.8	22.4	20.8
15. Outside the Old Plough, Newbury Rd	N	N	86%	100%	**61.8**	**57.8**	**51.7**
16. Jct. Winton Sq / Winchester Rd	N	N	97%	100%	38.3	38.7	36.2
17. Outside 37 Winchester St	N	N	94%	100%	**47.6**	**43.0**	39.0
18. Adjacent to 37 Winchester St	N	N	100%	100%	**43.2**	**43.3**	**42.1**
19. Adj. Copenhagen House. New St.	N	N	100%	100%	39.5	38.2	36.2

Location	Within AQMA?	Relevant public exposure? Y/N	Data Capture for monitoring period 2008-10[a] %	Data Capture for full calendar year 2010[b] %	Annual mean concentrations (µg/m^3) [d]		
					2008 [c]	2009 [c]	2010 [c]
20. Outside 45 Winchester St.	N	N	94%	92%	**52.1**	**50.8**	**46.5**
21. Jct. Winton Sq / Winchester Rd	N	N	97%	100%	37.8	39.7	**40.1**
22. Façade of Agra Balti, 34 Winchester Rd	N	N	100%	100%	**42.3**	**45.0**	**42.6**
23. Front façade, Beech House, Newbury Road	N	Y	54%	100%	-	*17.0*	22.2
24. Front façade, The Old Plough (1)	N	Y	54%	100%	-	*22.1*	34.2
25. Front façade, The Old Plough (2)	N	Y	54%	100%	-	*24.1*	34.1
26. Front façade, The Old Plough (3)	N	Y	54%	100%	-	*22.1*	34.6
27. Bus stop o/s The Old Plough	N	N	54%	100%	-	*35.1*	**56.7**
28. O/s Beech House, Newbury Road	N	N	54%	100%	-	*35.1*	**55.0**

[a] Data capture for the monitoring period, ie. 2008 to 2010 (e.g. if monitoring was carried out for only 2009 and 2010 the maximum data capture would be 67%.)
[b] Data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%.)
[c] Data is "annualised", as described in Box 3.2 of TG(09), if monitoring was not carried out for the full year.
[d] Concentrations in **bold** are noted exceedences of the AQS objectives, whilst those in *italics* are from years with data capture less than 25%.

Exceedences of the AQS objectives have been recorded at sites 9, 10, 12, 17, 18, 20 and 22, in the area around Winton Square, in all years from 2008 to 2010. However, NO_2 concentrations at these sites have been noted and investigated in previous assessments, and it has been concluded that there is not relevant exposure at locations of exceedence.

The annual average concentration of NO_2 at site 21 measured in 2010 is above the AQS objective, however there is no relevant exposure near the site and this does not therefore require further detailed assessment. Historical data from this site, and the nearby site 16, indicate a clear trend of rising NO_2 levels and may be indicative of worsening air quality in the area.

Concentrations of NO_2 recorded at site 15 remain well above the AQS objective, as do those measured at the nearby sites 27 and 28. However it was concluded in the 2010 Detailed Assessment that these concentrations do not represent locations of relevant exposure, and do not imply exceedences of the AQS objective for NO_2 at locations of relevant exposure.

Site 6 is a roadside monitoring site, also on the A339 near Headley, the closest relevant exposure to which is estimated to be over 11 metres from the road. At this distance NO_2 concentrations are calculated to be well below the AQS objective limit, as shown below in Table 2.5.

Table 2.5 Estimation of NO_2 concentration at a relevant receptor near site 6

Site ID	Raw mean 2010	Bias adjusted (BA factor = 0.84)	Kerbside adjusted
6. Adjacent to Forge Farm, Newbury Rd	**65.6**	**55.1**	34.9

New relevant exposure has been noted at two locations in the Winton Square/Winchester Road area, both of which are flats above commercial premises. Neither location is close to an existing monitoring site, and it would therefore be advisable to install diffusion tubes near the properties in order to allow a more accurate assessment of NO_2 at the façades.

The flat at 8 Winton Square has relevant exposure on the first floor approximately 2.5 metres horizontally from the kerb. The closest NO_2 monitoring to the property is undertaken at sites 11 and 16, located 1.6 and 1.1 metres respectively from the kerb. Neither of these sites recorded levels of NO_2 above the AQS annual mean objective limit in 2009 or 2010, and kerbside adjustment of these data to estimate concentrations at a distance of 2.5 metres from the kerb indicate that levels of NO_2 at the façade are between 29 and 33 $\mu g \cdot m^{-3}$ (as shown in Table 2.6 below). It is therefore unlikely that the AQS objective is exceeded at the relevant exposure at 8 Winton Square.

Table 2.6 Estimation of NO_2 concentration at a relevant receptor near sites 11 and 16

Site ID	Raw mean 2010	Annualised and bias adjusted	Kerbside adjusted
11. Corner of Winton Square / Sarum Hill jct.	35.9	30.2	29.0
16. Jct. Winton Sq / Winchester Rd	**43.0**	36.2	33.2

The relevant exposure noted at 17a Winchester Road is again a first floor flat, located over 1.5 metres from the kerb. There are no nearby diffusion tube sites located near the property, the closest being sites 16 and 21 which are both around 90 metres away, however an indicative assessment may be achieved by assuming a constant concentration of NO_2 along the stretch of Winchester Road approaching Winton Square. In this case, kerbside adjustment of the results from these two sites indicates that levels of NO_2 at the façade of the property do not exceed 35-37 $\mu g \cdot m^{-3}$, as shown below in Table 2.7.

Table 2.7 Estimation of NO_2 concentration at a relevant receptor near sites 16 and 21

Site ID	Raw mean 2010	Annualised and bias adjusted	Kerbside adjusted
16. Jct. Winton Sq / Winchester Rd	**43.0**	36.2	35.0
21. Jct. Winton Sq / Winchester Rd	**47.7**	**40.1**	36.5

Overall trends of NO_2 concentrations in the borough since 2004 do not show a clear increase or decrease over time. As shown in figure 2.4a below, measurements at those sites which have recorded exceedences generally show some drop in levels of NO_2 from 2009 to 2010, however at most sites concentrations remain close to those recorded in 2008.

Figure 2.4b shows measured concentrations of NO_2 at sites in the vicinity of Winton Square, where numerous exceedences have been noted in previous reports, and declaration of an AQMA has been considered and rejected. There has been little overall change in levels of NO_2 at most sites in this area since 2004, however the mean concentration has fallen slightly.

Figure 2.4a Trends in Annual Mean Nitrogen Dioxide Concentration Measured at Diffusion Tube Monitoring Sites Recording Exceedences in 2010

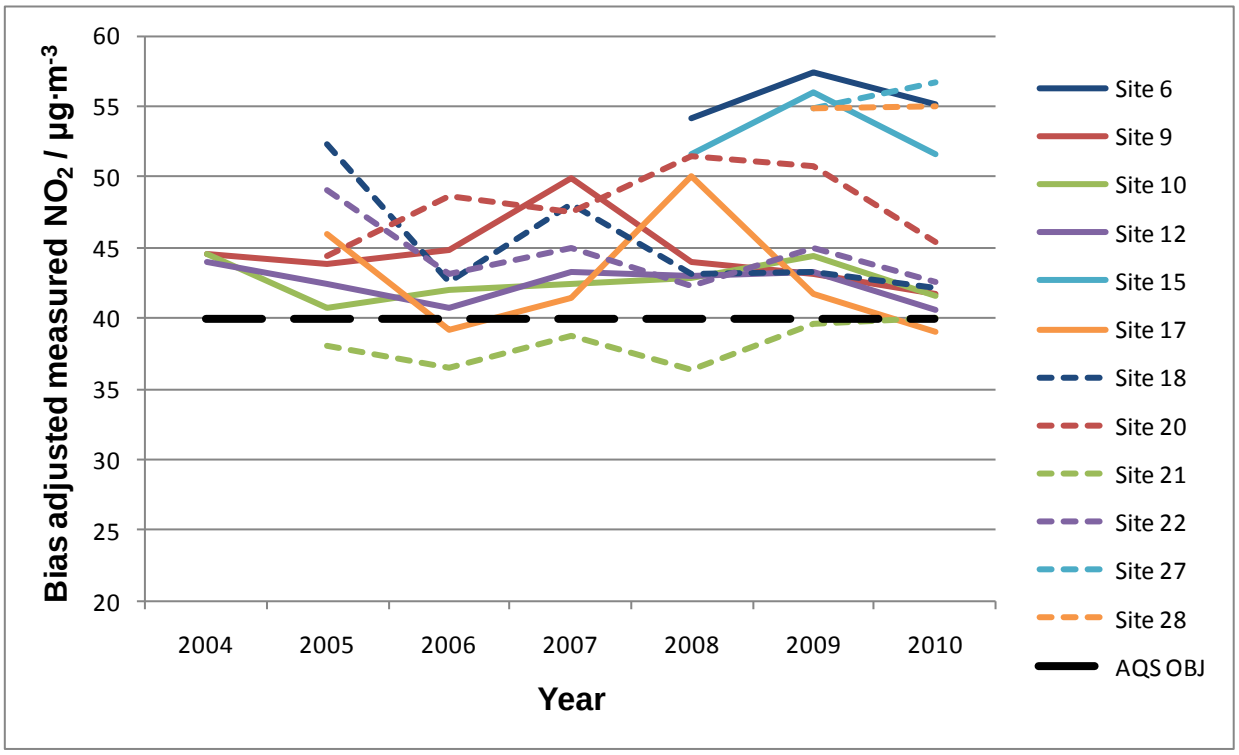
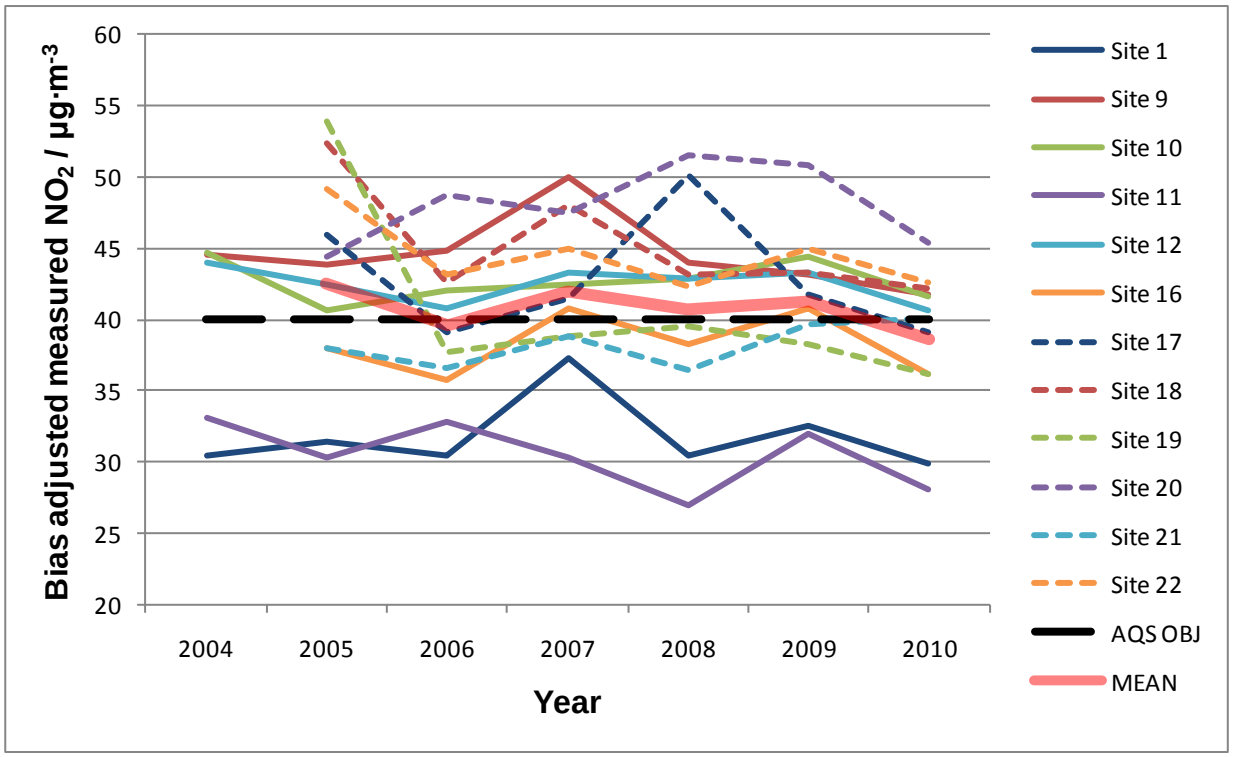


Figure 2.4b Trends in Annual Mean Nitrogen Dioxide Concentration Measured at Diffusion Tube Monitoring Sites Near the Junction of Winchester Road and Winton Square



2.2.4 PM_{10}

Basingstoke and Deane Borough Council have not conducted monitoring of PM_{10} in 2009 or 2010.

2.2.5 Sulphur Dioxide

Basingstoke and Deane Borough Council have not conducted monitoring of SO_2 in 2009 or 2010.

2.2.6 Benzene

Basingstoke and Deane Borough Council have not conducted monitoring of C_6H_6 in 2009 or 2010.

2.2.7 Other pollutants monitored

Basingstoke and Deane Borough Council have not conducted monitoring of any pollutants other than NO_2.

2.2.8 Summary of Compliance with AQS Objectives

Basingstoke and Deane Borough Council has examined the results from monitoring in the borough. Concentrations at locations of relevant exposure are all below the objectives, therefore there is no need to proceed to a Detailed Assessment.

3 New Local Developments

At present, there are no planned local developments likely to affect air quality in the Basingstoke and Deane Borough.

3.1 Road Traffic Sources

There have been no significant changes or developments relating to road transport in the borough in 2009 or 2010.

3.2 Other Transport Sources

No changes to other transport sources have occurred in 2009 or 2010 which are considered to have a potentially significant effect on air quality in the borough.

3.3 Industrial Sources

There have not been any significant new industrial developments, or changes to existing industrial developments in 2009 and 2010, and no new relevant exposure has been noted at sites near industrial sources of emissions.

3.4 Commercial and Domestic Sources

Emissions from commercial and domestic sources are not thought to have changed notably in 2009 and 2010.

3.5 New Developments with Fugitive or Uncontrolled Sources

No new sources of fugitive emissions in Basingstoke and Deane Borough have been noted in 2009 or 2010.

4 Planning Applications

A new housing development has received planning application approval to be constructed on Winchester Road near the junction with Winton Square. These dwellings will represent new relevant exposure in the vicinity of locations where exceedences of the AQS objectives for NO_2 have been measured in the past, and concerns have therefore been raised that this will lead to the declaration of an AQMA in the area.

The new development consists of four dwellings, and an associated allocation of four car parking spaces and eight cycle parking spaces. The impact of new occupancy in the area upon local traffic flows and other domestic emissions is therefore considered likely to be negligible, and thus unlikely to affect a change in local air quality which would lead to exceedences of the AQS objectives at relevant receptors.

At present monitoring results from sites 16 and 21 indicate that, whilst NO_2 concentrations at the kerbside on Winchester Road are slightly higher than the AQS objectives, those at relevant receptors set back from the roadside are not. At 4.5 metres, the distance which the façade of the development is planned to be set back from the kerb, NO_2 concentrations are estimated to be approximately 31-32 $\mu g \cdot m^{-3}$ and therefore significantly lower than the AQS objective limit for NO_2 (see table 5.1).

Furthermore, since there are already a number of dwellings in the vicinity which have façades closer to the road than the new development, it is unlikely that exceedences of AQS objectives would occur at the new development and not at other nearby residential properties. It is therefore reasonable to conclude that the construction of this development is unlikely to impact upon any assessment of air quality at locations of relevant exposure in the area of Winchester Road near the junction with Winton Square.

Table 5.1 Estimations of NO_2 concentrations at a distance of 4.5 metres from the kerb of Winchester Road, near the junction with Winton Square

Site ID	Raw mean 2010	Bias adjusted (BA factor = 0.84)	Estimated concentration at 4.5 m from kerb
16. Jct. Winton Sq / Winchester Rd	**43.0**	36.2	31.1
21. Jct. Winton Sq / Winchester Rd	**47.7**	**40.1**	32.2

5 Air Quality Planning Policies

The UK Air Quality Strategy identifies planning policy as a key mechanism for Local Air Quality Management. As such, Basingstoke and Deane Borough Council have identified a number of Local Air Quality Priority Areas (LAQPA), where levels of NO_2 are close to or above the AQS annual mean objective limit of 40 $\mu g \cdot m^{-3}$. Development proposals in these areas are encouraged to undertake an air quality impact assessment, considering the impact that existing air quality might have on the development as well as the impact that the development will have on air quality. As part of this, supplementary monitoring of pollutants is encouraged to ensure accuracy of the assessment.

Basingstoke and Deane Borough Council requires that air quality assessments of planned developments in the borough assess the existing air quality in the area, and predict future air quality with and without the developments' impact. Consideration must then be given to the impact of air quality on existing residents, and on residents to be introduced to the area as part of a residential development. The criteria under which an air quality impact assessment is required as part of a planning application are published by Basingstoke and Deane Borough Council on their website, and broadly include proposals which:

- generate increased congestion, affect traffic volumes, speed, or composition on local roads, or include significant new parking capacity;
- introduce new exposure to existing sources of pollution;
- include biomass or CHP plants or introduce new industrial activity; or
- could give rise to increased HGV flows and fugitive dust emissions in sensitive areas as a result of the construction process.

In cases where developments are deemed to interfere with Air Quality Strategy, and insufficient mitigation or offsetting of air quality impacts can be provided, refusal of planning permission is considered, in line with guidance published on the Basingstoke and Deane Borough Council website.

Basingstoke and Deane Borough Council Environmental Protection Team, through pro-active consultation in planning, work to ensure that the AQS objectives for NO_2 are not exceeded at locations of relevant exposure in the borough. In recent years particular attention has been paid to the area of Winton Square, in which high levels of NO_2 have been found as a result of traffic pollution. Air Quality Planning Policy in this area has helped to ensure that residents not exposed to the effects of air pollution, and prevented the need for declaration of an AQMA.

6 Local Transport Plans and Strategies

In 1999 Hampshire County Council and Basingstoke and Deane Borough Council, in partnership with key stakeholders in the local community, jointly prepared the Basingstoke Environmental Strategy for Transport (BEST). The document provides a framework to address the future transport needs of Basingstoke and the surrounding area in a sustainable way, taking a long-term view up to 25 years ahead. With effect from April 2008 the methodology for calculating Transport (BEST) contributions has been updated to reflect the Hampshire County Council Transport Contributions Policy, which was adopted in September 2007. A copy of the Transport Contributions Policy can be accessed on the Basingstoke and Deane Borough Council website.

The guiding principles of BEST will co-ordinate the future development and transport policy key decisions of both Councils and guide the investment plans of our two authorities, local businesses, property developers and public transport operators.

BEST will bring forward and influence proposals for:

- Public Transport
- Walking
- Cycling
- Road Safety
- Roads and Traffic
- Car Parking
- Freight movement
- Planning and the Environment
- Public involvement and Travel Awareness

7 Climate Change Strategies

Basingstoke and Deane Borough Council's Climate Change Strategy, last published in February 2008, commits the council to contribute locally to the UK's Kyoto protocol target for a CO_2 emission reduction of 12.5% by 2012. Locally, its key stated objectives are to:

- reduce carbon emissions in the council's own buildings,
- help the borough to prepare and plan for the inevitable impacts of climate change,
- ensure that climate change issues are considered in all the council's services and operations,
- reduce carbon emissions across the borough through partnerships and community involvement.

In May 2007, the council signed up to The Nottingham Declaration on Climate Change, committing to take climate change into account in all its work and areas of influence. In order to facilitate this, the council's action plan includes:

- supporting the South East Climate Change Partnership
- working with TV Energy on renewable energy/energy efficiency projects throughout the borough
- monitoring and improving water and energy consumption in the council's Civic Offices.
- providing energy efficiency advice to home owners
- taking climate change issues into consideration by the council's Forward Planning Team and in the Local Development Framework, which will guide planning in the future
- protecting key wildlife habitats and landscapes
- keeping residents up-to-date with education and information campaigns to raise awareness of the issues
- improving recycling in the borough.

The updated action plan for carbon management has been published on the Basingstoke and Deane Borough Council website.

8 Conclusions and Proposed Actions

8.1 Conclusions from New Monitoring Data

Monitoring data from 2009 and 2010 indicate that concentrations of NO_2 have exceeded the AQS objective limit at numerous sites around the Winton Square area in Basingstoke and the A339 north of Headley. Further assessment of these locations has however indicated that no exceedences of the objectives have occurred at relevant receptors near the monitoring sites. Basingstoke and Deane Borough Council are not therefore required to take any additional actions based on these data.

8.2 Conclusions relating to New Local Developments

There are no new industrial, commercial or domestic developments in Basingstoke and Deane Borough which are likely to adversely affect air quality. The only noted new residential development is a block of new properties which are to be built on Winchester Road near the junction with Winton Square, however since these are set back from the road they are not likely to result in new exceedences of the AQS objectives at locations of relevant exposure.

8.3 Proposed Actions

No exceedences of the AQS objectives have been found for monitored pollutants in the borough of Basingstoke and Deane, and there are no new developments which are considered likely to affect considerations of air quality management in the area. There is therefore no requirement for Basingstoke and Deane Borough Council to undertake any additional assessments of air quality prior to the submission of the next Progress Report as per UK air quality regulations. It may however be recommended that Basingstoke and Deane Borough Council should consider undertaking monitoring of NO_2 by diffusion tube close to the two new sites of noted relevant exposure, at 8 Winton Square, and 17a Winchester Road.

9 References

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Basingstoke and Deane Borough Council Carbon Management Action Plan
http://www.basingstoke.gov.uk/NR/rdonlyres/DEDFA37C-7B9B-46EA-B69C31E381989F30/0/CarbonManagementActionPlan.pdf

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http://www.basingstoke.gov.uk/NR/rdonlyres/BEE80286-51AD-4015-8C0E-6E6F8E485F87/0/sh_AirQualityandPlanningAugust20102.pdf

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DEFRA (2009) Part IV of the Environment Act 1995. Local Air Quality Management Technical Guidance LAQM.TG(09). February 2009

DifTPrecisionAccuracyBias Spreadsheet (Version 4) accessed on the UK Air Quality Achieve website
http://laqm.defra.gov.uk/documents/AEA_DifTPAB_v04.xls

National Diffusion Tube Bias Adjustment Factor Spreadsheet (v.04/11) accessed on the Review & Assessment Helpdesk website
http://laqm.defra.gov.uk/documents/Diffusion_Tube_Bias_Factors_v04_11_v6.xls

The Air Quality (England) Regulations 2000 (SI 928), The Air Quality (England) (Amendment) Regulations 2002 (SI 3043), The Stationery Office (1995) The Environment Act 1995: Part IV

UK National Air Quality Information Archive, UK background concentrations of NO_2. Downloaded CSV Format Background Maps for 2008 to 2020
http://laqm.defra.gov.uk/maps/maps2008.html

Appendices

Appendix A: QA/QC Data

Appendix A: QA:QC Data

Diffusion Tube Bias Adjustment Factors

Diffusion tubes may systematically under or over-read NO_2 concentrations when compared to the reference chemiluminescence analyser. This is described as bias and can be corrected for to improve the accuracy of the diffusion tube results, using a suitable bias adjustment factor.

Basingstoke and Deane Borough Council's diffusion tubes are prepared and analysed by Environmental Scientifics Group (ESG) using the 20% TEA in water method. This laboratory takes part in the QA/QC Field Intercomparison, operated on behalf of DEFRA as part of their Support to Local Authorities for LAQM contract.

As no automatic monitoring was undertaken in the Basingstoke and Deane Borough during 2009 or 2010, the bias adjustment factors used within this Progress Report were derived from the national database of collocation studies (http://laqm.defra.gov.uk/documents/Diffusion_Tube_Bias_Factors_v04_11_v6.xls) as shown in Figures A1 and A2. Results from this spreadsheet provided national bias adjustment factors of 0.82 for 2009 and 0.84 for 2010, which have been used to adjust data throughout this report.

Figure A1 – Diffusion Tube Bias Adjustment Calculations for 2009

National Diffusion Tube Bias Adjustment Factor Spreadsheet — Spreadsheet Version Number: 04/11

Follow the steps below in the correct order to show the results of relevant co-location studies
Data only apply to tubes exposed monthly and are not suitable for correcting individual short-term monitoring periods
Whenever presenting adjusted data, you should state the adjustment factor used and the version of the spreadsheet
This spreadhseet will be updated every few months: the factors may therefore be subject to change. This should not discourage their immediate use.

This spreadsheet will be updated in late June 2011 on the LAQM Helpdesk Website

The LAQM Helpdesk is operated on behalf of Defra and the Devolved Administrations by Bureau Veritas, in conjunction with contract partners AECOM and the National Physical Laboratory.

Spreadsheet maintained by the National Physical Laboratory. Original compiled by Air Quality Consultants Ltd.

Step 1:	Step 2:	Step 3:	Step 4:
Select the Laboratory that Analyses Your Tubes from the Drop-Down List	Select a Preparation Method from the Drop-Down List	Select a Year from the Drop-Down List	Where there is only one study for a chosen combination, you should use the adjustment factor shown with caution. Where there is more than one study, use the overall factor[3] shown in blue at the foot of the final column.
If a laboratory is not shown, we have no data for this laboratory.	If a preparation method is not shown, we have no data for this method at this laboratory.	If a year is not shown, we have no data[2]	If you have your own co-location study then see footnote[4]. If uncertain what to do then contact the Local Air Quality Management Helpdesk at LAQMHelpdesk@uk.bureauveritas.com or 0800 0327953

Analysed By[1]	Method (To undo your selection, choose (All) from the pop-up list)	Year[2] (To undo your selection, choose (All))	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m³)	Automatic Monitor Mean Conc. (Cm) (µg/m³)	Bias (B)	Tube Precision[5]	Bias Adjustment Factor (A) (Cm/Dm)
Environmental Scientific Groups	20% TEA in Water	2009	S	Chichester DC	11	44	34	30.2%	G	**0.77**
Environmental Scientific Groups	20% TEA in Water	2009	R	Castlereagh BC	12	49	39	23.7%	G	**0.81**
Environmental Scientific Groups	20% TEA in Water	2009	R	Castlereagh BC	12	31	25	27.4%	G	**0.79**
Environmental Scientific Groups	20% TEA in Water	2009	R	Lisburn CC	12	32	26	21.2%	P	**0.83**
Environmental Scientific Groups	20% TEA in Water	2009	R	North Down BC	12	49	36	36.3%	G	**0.73**
Environmental Scientific Groups	20% TEA in Water	2009	R	Wrexham CBC	11	26	23	13.4%	G	**0.88**
Environmental Scientific Groups	20% TEA in Water	2009	R	Horsham DC	10	36	32	13.4%	G	**0.88**
Environmental Scientific Groups	20% TEA in Water	2009	K	AEA Tech Intercomparison	12	132	107	22.9%	G	**0.81**
Environmental Scientific Groups	20% TEA in Water	2009	R	Dumfries and Galloway Council	10	41	35	17.3%	G	**0.85**
Environmental Scientific Groups	20% TEA in Water	2009		**Overall Factor[3] (9 studies)**				**Use**		**0.82**

Figure A2 – Diffusion Tube Bias Adjustment Calculations for 2010

National Diffusion Tube Bias Adjustment Factor Spreadsheet — Spreadsheet Version Number: 04/11

Follow the steps below **in the correct order** to show the results of **relevant** co-location studies
Data only apply to tubes exposed monthly and are not suitable for correcting individual short-term monitoring periods
Whenever presenting adjusted data, you should state the adjustment factor used and the version of the spreadsheet
This spreadsheet will be updated every few months: the factors may therefore be subject to change. This should not discourage their immediate use.

This spreadsheet will be updated in late June 2011 on the LAQM Helpdesk Website

The LAQM Helpdesk is operated on behalf of Defra and the Devolved Administrations by Bureau Veritas, in conjunction with contract partners AECOM and the National Physical Laboratory.

Spreadsheet maintained by the National Physical Laboratory. Original compiled by Air Quality Consultants Ltd.

Step 1:	Step 2:	Step 3:	Step 4:
Select the Laboratory that Analyses Your Tubes from the Drop-Down List	Select a Preparation Method from the Drop-Down List	Select a Year from the Drop-Down List	**Where there is only one study for a chosen combination, you should use the adjustment factor shown with caution. Where there is more than one study, use the overall factor[3] shown in blue at the foot of the final column.**
If a laboratory is not shown, we have no data for this laboratory.	If a preparation method is not shown, we have no data for this method at this laboratory.	If a year is not shown, we have no data[2]	If you have your own co-location study then see footnote[4]. If uncertain what to do then contact the Local Air Quality Management Helpdesk at LAQMHelpdesk@uk.bureauveritas.com or 0800 0327953

Analysed By[1]	Method (To undo your selection, choose (All) from the pop-up list)	Year[2] (To undo your selection, choose (All))	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m³)	Automatic Monitor Mean Conc. (Cm) (µg/m³)	Bias (B)	Tube Precision[5]	Bias Adjustment Factor (A) (Cm/Dm)
Environmental Scientific Groups	20% TEA in Water	2010	U	Chichester DC	12	42	28	51.8%	P	**0.66**
Environmental Scientific Groups	20% TEA in Water	2010	R	Wrexham CBC	11	25	24	7.1%	P	**0.93**
Environmental Scientific Groups	20% TEA in Water	2010	UB	Warrington BC	12	28	32	-12.3%	G	**1.14**
Environmental Scientific Groups	20% TEA in Water	2010	R	Dumfries and Galloway Council	12	43	40	8.8%	G	**0.92**
Environmental Scientific Groups	20% TEA in Water	2010	R	North East Lincolnshire Council	11	41	35	17.7%	G	**0.85**
Environmental Scientific Groups	20% TEA in Water	2010	R	North East Lincolnshire Council	10	48	26	83.9%	P	**0.54**
Environmental Scientific Groups	20% TEA in Water	2010	UB	North East Lincolnshire Council	10	28	31	-11.5%	P	**1.13**
Environmental Scientific Groups	20% TEA in Water	2010	R	Horsham DC	12	36	30	19.2%	P	**0.84**
Environmental Scientific Groups	20% TEA in Water	2010	K	Marylebone Road Intercomparison	11	117	94	24.2%	G	**0.81**
Environmental Scientific Groups	20% TEA in Water	2010	R	North Down BC	11	46	34	34.8%	G	**0.74**
Environmental Scientific Groups	20% TEA in Water	2010		**Overall Factor[3] (10 studies)**				**Use**		**0.84**

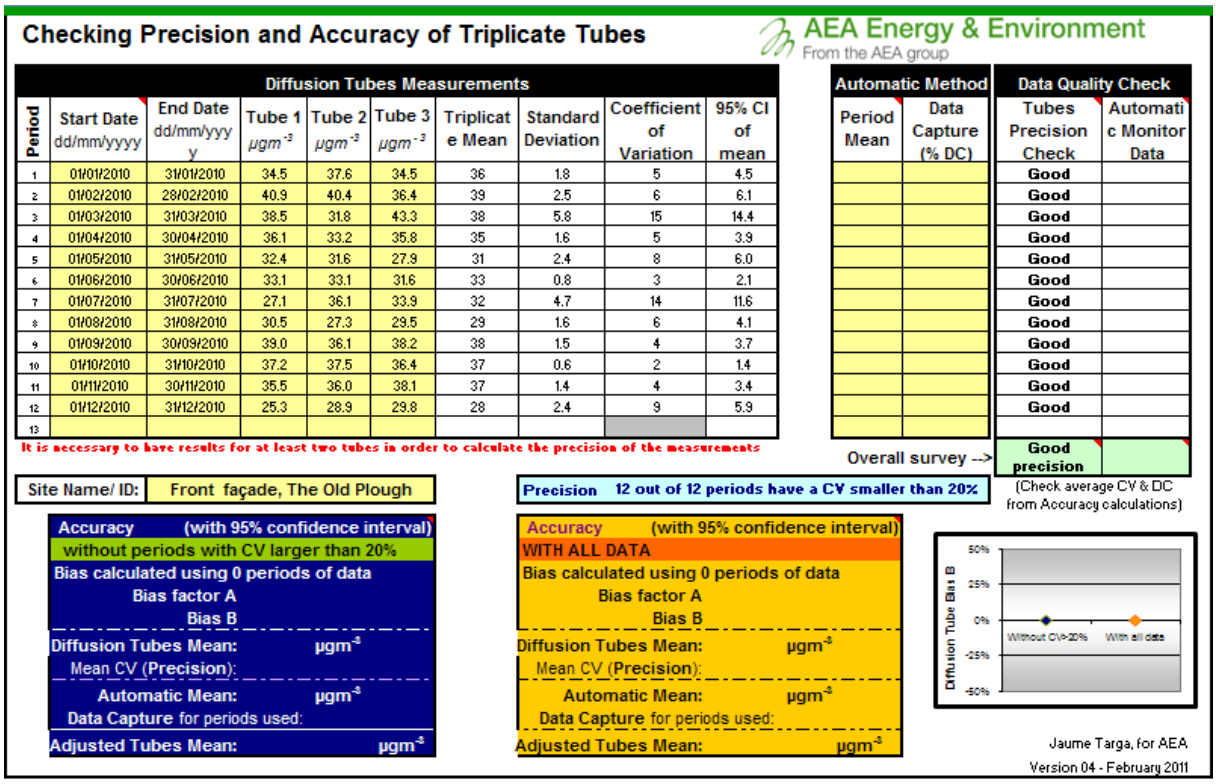
QA/QC of diffusion tube monitoring

The Workplace Analysis Scheme for Proficiency (WASP) is an independent analytical performance-testing scheme, operated by the Health and Safety Laboratory (HSL). WASP formed a key part of the former UK NO_2 Network's QA/QC, and remains an important QA/QC exercise for laboratories supplying diffusion tubes to Local Authorities for use in the context of Local Air Quality Management (LAQM). The laboratory participants analyse four spiked tubes, and report the results to HSL. HSL assign a performance score to each laboratory's result, based on their deviation from the known mass of nitrite in the analyte.

The outcomes of these QA/QC schemes are evaluated on a regular basis against a set of pre-defined performance criteria, in the independent Workplace Analysis Scheme for Proficiency. The WASP – Annual Performance Criteria, for NO_2 Diffusion Tubes used in Local Air Quality Management (LAQM), indicate that Environmental Scientific Groups demonstrated 'Good' precision in 8 of 9 studies (89%) in 2009 and 5 of 10 studies (50%) in 2010 using the 50% TEA in acetone method, with the remainder demonstrating 'Poor' precision. Only three precision results were reported from studies conducted using the 20% TEA in water method, all of which were from 2010 and demonstrated 'Good' precision

Diffusion tubes are located in triplicate on the façade of The Old Plough, Newbury Road, allowing for an assessment of the precision of results from this site. This has been calculated in accordance with LAQM.TG(09) guidance using the Precision and Accuracy Spreadsheet Tool (AEA_DifTAPB_v04) available from the LAQM Support Pages provided by DEFRA and the Devolved Administrations. These calculations indicate (as shown in Figure A3) that results from the triplicate co-location study show good precision for the period January to December 2010, however since no automatic monitoring data is available for the site an assessment of accuracy cannot be reliably made.

Figure A3 – Precision and Accuracy of Triplicate Tubes



Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements

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	95% CI of mean
1	01/01/2010	31/01/2010	34.5	37.6	34.5	36	1.8	5	4.5
2	01/02/2010	28/02/2010	40.9	40.4	36.4	39	2.5	6	6.1
3	01/03/2010	31/03/2010	38.5	31.8	43.3	38	5.8	15	14.4
4	01/04/2010	30/04/2010	36.1	33.2	35.8	35	1.6	5	3.9
5	01/05/2010	31/05/2010	32.4	31.6	27.9	31	2.4	8	6.0
6	01/06/2010	30/06/2010	33.1	33.1	31.6	33	0.8	3	2.1
7	01/07/2010	31/07/2010	27.1	36.1	33.9	32	4.7	14	11.6
8	01/08/2010	31/08/2010	30.5	27.3	29.5	29	1.6	6	4.1
9	01/09/2010	30/09/2010	39.0	36.1	38.2	38	1.5	4	3.7
10	01/10/2010	31/10/2010	37.2	37.5	36.4	37	0.6	2	1.4
11	01/11/2010	30/11/2010	35.5	36.0	38.1	37	1.4	4	3.4
12	01/12/2010	31/12/2010	25.3	28.9	29.8	28	2.4	9	5.9
13									

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

Automatic Method		Data Quality Check	
Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
		Good	
		Good	
		Good	
		Good	
		Good	
		Good	
		Good	
		Good	
		Good	
		Good	
		Good	
		Good	
Overall survey -->		Good precision	

(Check average CV & DC from Accuracy calculations)

Site Name/ ID: Front façade, The Old Plough

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

Accuracy (with 95% confidence interval)
without periods with CV larger than 20%
Bias calculated using 0 periods of data
Bias factor A
Bias B
Diffusion Tubes Mean: µgm⁻³
Mean CV (Precision):
Automatic Mean: µgm⁻³
Data Capture for periods used:
Adjusted Tubes Mean: µgm⁻³

Accuracy (with 95% confidence interval)
WITH ALL DATA
Bias calculated using 0 periods of data
Bias factor A
Bias B
Diffusion Tubes Mean: µgm⁻³
Mean CV (Precision):
Automatic Mean: µgm⁻³
Data Capture for periods used:
Adjusted Tubes Mean: µgm⁻³

Jaume Targa, for AEA
Version 04 - February 2011

If you have any enquiries about this spreadsheet please contact the LAQM Helpdesk at: LAQMHelpdesk@uk.bureauveritas.com

Short-term to Long-term Data adjustment

Although not required by the LAQM Technical Guidance, annualisation has been carried out on all data from diffusion tubes in Basingstoke and Deane Borough in order to improve the accuracy of the considered results. In few cases however has this adjustment resulted in an exceedence of the AQS objective for NO_2 being calculated where not recorded by unadjusted data, or vice-versa. The sites where this has had the greatest impact are those where data capture was lower than 90%, the adjustment ratios for which are given below in Table A1.

Table A1 – Annualisation ratios for sites with data capture rate lower than 90%

Year	Site(s)	Data capture rate	Calculated Annual Mean	Period Mean	Ratio
2009	2	42%	37.3	42.9	1.152
	5	83%	17.3	17.9	1.031
	7	67%	24.7	22.9	0.927
	8	83%	24.7	24.0	0.970
	11	75%	30.6	32.0	1.045
	14	83%	22.4	20.8	0.932
	15	83%	57.8	56.1	0.970
	23-28	8%	25.9 (mean)	40.5 (mean)	1.563
2010	2	50%	37.4	41.0	1.096

Where annualisation of data has been calculated, bias-adjusted results are divided by the ratio of the mean of AURN data from months for which diffusion tube data is available to the annual mean NO_2 from AURN data (see Table A2 below).

For example, annualisation of the data from site 2 is as follows:

Bias-adjusted mean NO_2 (data available for Feb – Apr, Aug – Sep & Dec '10) = 41.0 $\mu g \cdot m^{-3}$

Mean AURN (from Feb – Apr, Aug – Sep & Dec '10) = 15.6 $\mu g \cdot m^{-3}$
Mean AURN (from Jan – Dec '10) = 14.2 $\mu g \cdot m^{-3}$
Annualisation factor = 1.096
Annualised mean site 23 NO_2 = 41.0 ÷ 1.096 = 37.4 $\mu g \cdot m^{-3}$

Table A2 – Harwell AURN site NO_2 data

Year	Month	Harwell AURN NO_2 / $\mu g \cdot m^{-3}$	Days with continuous valid data	Notes
2009	1	25.1	28	Monthly averages calculated using only data from days without missing intervals.
2009	2	22.2	26	
2009	3	12.5	27	
2009	4	12.2	30	
2009	5	10.0	30	
2009	6	8.9	28	
2009	7	4.9	29	
2009	8	5.6	26	
2009	9	10.7	28	
2009	10	17.6	30	
2009	11	9.7	30	
2009	12	20.9	29	
2009	1	25.1	28	
2010	2	18.2	26	
2010	3	12.4	30	
2010	4	11.4	30	
2010	5	9.9	28	
2010	6	9.6	29	
2010	7	4.1	29	
2010	8	5.2	28	
2010	9	11.6	23	
2010	10	8.4	29	
2010	11	20.1	28	
2010	12	34.6	30	

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