
# 2009 Air Quality Updating and Screening Assessment

# Winchester City Council

## Document Control

| | | | |
|---|---|---|---|
| **Client** | Winchester City Council | **Principal Contact** | Phil Tidridge |

| | |
|---|---|
| **Job Number** | J967 |

| | |
|---|---|
| **Report Prepared By:** | Mella O'Driscoll |

Document Status and Review Schedule

| Issue No. | Report No. | Date | Status | Reviewed by |
|---|---|---|---|---|
| **1** | 967/1/F1 | 14th January 2010 | Draft Report | Prof. Duncan Laxen |
| **2** | | | | |
| **3** | | | | |

# Executive Summary

This Updating and Screening Assessment (USA) has been carried out in order for Winchester City Council to fulfil the requirements of the Local Air Quality Management 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 USA evaluates new and changed sources to identify those that may give rise to a risk of an exceedence of an air quality objective. Results from monitoring within the district are also presented and evaluated in relation to the objectives. Where a risk of an exceedence is identified at a relevant location the Council will proceed to a Detailed Assessment.

Previous air quality assessments have concluded that concentrations of carbon monoxide, benzene, 1,3-butadiene, lead and sulphur dioxide ($SO_2$) are compliant with UK objectives. However concentrations of nitrogen dioxide ($NO_2$) have been found to exceed the annual mean objective at various locations within the district, in particular in Winchester City Centre. Previous air quality assessments have also identified exceedences of the 24-hour annual mean concentrations of $PM_{10}$ in the city centre. Following a detailed dispersion modelling report carried out in 2004, an Air Quality Management Area (AQMA) for the annual mean nitrogen dioxide objective and 24-hour mean $PM_{10}$ objective was declared in Winchester City Centre.

The Council operates two automatic monitoring sites measuring nitrogen dioxide, and four automatic monitoring sites measuring $PM_{10}$. The nitrogen dioxide automatic sites are supplemented by a much larger network of diffusion tubes measuring nitrogen dioxide at a wide range of roadside and background locations. Results for 2008 show that $PM_{10}$ and CO concentrations in the District meet the relevant objectives. Nitrogen dioxide concentrations were below the objective at most locations across the district, however exceedences were observed at a number of city centre locations within the boundary of the existing AQMA. The AQMA also exists for 24-hour mean $PM_{10}$ concentrations, however in 2008 and in recent years this objective has been met. It is therefore recommended that the AQMA for exceedences of the 24-hour mean $PM_{10}$ objective be revoked. This will require a Detailed Assessment which will utilise the $PM_{10}$ monitoring together with modelling to fully assess $PM_{10}$ concentrations within the district. On the other hand, the AQMA for nitrogen dioxide will be retained.

The USA has not identified any new or significantly altered road traffic, industrial, commercial or domestic sources that need to be subjected to a Detailed Assessment.

# Table of contents

## Appendices

# 1 Introduction

## 1.1 Description of Local Authority Area

The district of Winchester lies in the county of Hampshire, in South East England. Winchester City lies in the north of the district. There are a number of small villages and towns in the district, the biggest of which are Bishop's Waltham in the south and New Alresford in the north east. The region is serviced by a number of roads including the M3 motorway connecting Winchester to both London and Southampton; the A31 which travels to the east from Winchester City and the A34 which travels to the north from Winchester City. Road traffic is the main source of air pollution in Winchester.

## 1.2 Purpose of Report

This report fulfils the requirements of the Local Air Quality Management 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.

## 1.3 Air Quality Objectives

The air quality objectives applicable to LAQM in England are set out in the Air Quality (England) Regulations 2000 and the Air Quality (Amendment) (England) Regulations 2002, and are shown in Table 1.1. This table shows the objectives in units of microgrammes per cubic metre $\mu g/m^3$ (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 Local Air Quality Management in England.**

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

## 1.4 Summary of Previous Review and Assessments

Winchester City Council has carried out review and assessment reports assessing air quality in the district. These are summarised below:

- **Winchester City Council Stage 1 Review (December 1998)** concluded that a further assessment was required for carbon monoxide, nitrogen dioxide and $PM_{10}$.
- The resulting **Winchester City Council Stage 2/3 Review (August 2000)** concluded that carbon monoxide, nitrogen dioxide and $PM_{10}$ concentrations would comply with the relevant objectives across the whole district, however, further assessment of nitrogen dioxide concentrations at properties close to main roads in the town centre was requested by Defra. The report included a dispersion modelling study (AAQuIRE model) of South Hampshire performed by consultants CES.
- **Winchester City Council Air Quality Review and Assessment (Additional Assessment of Nitrogen dioxide levels within Winchester Town Centre) (October 2001)** was carried out in response to Defra's comments. It concluded that a small number of properties close to busy city centre roads may have nitrogen dioxide concentrations higher than the background site and dispersion modelling should be carried out to assess these locations further. In response to this, Defra advised that an AQMA should be declared, followed by dispersion modelling.
- **Casella Stanger & Winchester City Council – Air Quality Review and Assessment - Detailed Dispersion Modelling (July 2003)** outlined detailed dispersion modelling of Winchester town centre carried out using the BREEZE dispersion model. Nitrogen dioxide concentrations were predicted to exceed the objectives. The report also assessed particulates, and concluded that the model performed poorly therefore further modelling was recommended, with a model which would take better consideration of topographical effects.
- **Winchester City Council Air Quality Review, Updating and Screening Assessment (2003)** took account of the Technical Guidance LAQM TG(03), issued by Defra in early 2003. This report concluded that additional monitoring was required for sulphur dioxide at the Alresford Station of the Watercress Steam Railway Line and that the conclusions from previous review and assessment reports remained valid. An AQMA in Winchester City Centre for annual mean nitrogen dioxide and 24-hour mean $PM_{10}$ was declared in November 2003.
- **Casella Stanger – Winchester City Council – Air Quality Review and Assessment – ADMS Roads update (August 2004).** Modelling carried out in the July 2003 report was updated using ADMS roads which took better consideration of topographical effects. It was concluded that the level of exceedences for particles was less than that for nitrogen dioxide and that any action plan aimed at achieving the nitrogen dioxide standard should ensure compliance with the 24-hour particle standard. It was recommended that additional monitoring sites measuring particulates should be considered to ensure objectives are being met.
- **Winchester City Council – Detailed Assessment of sulphur dioxide levels from the Hampshire Watercress Line (February 2005)** monitored the levels of sulphur dioxide at the Alresford railway station platform from the steam engines running on the heritage railway between Alresford and Alton. It concluded that pollution levels were in compliance with all the sulphur dioxide air quality objectives and therefore an AQMA was not required.
- **Winchester City Council – Air Quality Progress Report (2005)** concluded that air quality objectives were likely to be met across the district for all pollutants with the exception of nitrogen dioxide adjacent to the M3 in the Shawford to Otterbourne area. This issue was scheduled to be considered further in the 2006 USA.
- **Winchester City Council – Air Quality Action Plan (2006)** provided a detailed assessment of nitrogen dioxide levels within Winchester City Centre Air Quality Management Area. It identified 21 actions to reduce nitrogen dioxide concentrations as far as practicable.

- **Winchester City Council Updating and Screening Assessment 2006** concluded that exceedences of nitrogen dioxide objectives within the AQMA still existed and the boundaries did not need to be changed. Monitoring of nitrogen dioxide at Otterbourne suggested the objective was being exceeded. Concentrations of $PM_{10}$ met the annual and 24-hour objective at all monitoring stations, therefore the action plan would now focus solely on nitrogen dioxide, however $PM_{10}$ would continue to be monitored at all locations. Defra suggested consideration be given to revoking the $PM_{10}$ 24-hour mean AQMA if objectives were being met.
- **Winchester City Progress Report 2007** outlined the most recent monitoring results. Results in 2006 were similar to those in preceding years with concentrations on nitrogen dioxide meeting the objectives except at locations within the AQMA. Concentrations of $PM_{10}$ met the 24-hour and annual mean objectives at all monitoring locations. Three additional $PM_{10}$ monitors were implemented in Winchester city centre to better assess $PM_{10}$ concentrations. One of these was co-located with the existing background $PM_{10}$ monitor, and the remaining two were implemented at roadside locations within the AQMA boundary. Additional nitrogen dioxide monitoring was carried out in the Compton to Otterbourne area adjacent to the M3. No new relevant industrial processes or local developments were identified.
- **Winchester City Progress Report 2008** confirmed that 2007 results were similar to those in previous years, although slightly lower than those in 2006. The Compton to Otterbourne diffusion tube study was continued in 2007. Results were below the objectives at all locations except diffusion tube monitoring site 4, where there was no relevant exposure. The air quality was therefore deemed acceptable in the Otterbourne area and the monitoring study was discontinued. Monitoring however continued at diffusion tube monitoring site 4 to assess trends in the area.

# 2 New Monitoring Data

## 2.1 Summary of Monitoring Undertaken

### 2.1.1 Automatic Monitoring Sites

Winchester City Council operate two permanent automatic monitoring stations including a roadside site located at Echo Offices, St Georges Street and an urban background site located at Godson House, Friarsgate. An additional three Osiris $PM_{10}$ monitoring stations have been installed in Winchester City Centre since December 2005. One of these is co-located at the background site and the remaining two are located at roadside locations at City Road and North Walls. There have been no sites commissioned or decommissioned since the 2008 progress report. Details of the monitoring sites are provided in Table 2.1. Figures showing the locations of all monitoring sites are presented in Appendix 1.

**Table 2.1 Details of 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 ? |
|---|---|---|---|---|---|---|---|
| Echo Offices | Roadside | 448215, 129510 | $PM_{10}$, $NO_2$, CO | Y | N | 2.75 | Y |
| Godson House | Urban background | 448509, 129539 | $PM_{10}$, $NO_2$, CO | Y | N | N/A | N |
| City Road | Roadside | 447976 129872 | $PM_{10}$ | Y | N | 4.1 | Y |
| North Walls | Roadside | 448458 129735 | $PM_{10}$ | Y | N | 1.9 | Y |

### 2.1.2 Non-Automatic Monitoring

Winchester City Council operates 28 nitrogen dioxide diffusion tube monitoring sites within Winchester City Centre and nine additional diffusion tube monitoring sites across the district. Details are provided in Table 2.2a, and Table 2.2b. During 2006 and 2007, the Council carried out a nitrogen dioxide monitoring study of the Otterbourne to Compton area near to the M3. Although monitoring at these locations has now ceased, details are presented in Table 2.2c.

There is no non-automatic monitoring of any other pollutants carried out by Winchester City Council.

**Table 2.2a Details of Non- Automatic Monitoring Sites (City Centre)**

| Site Name | Site Type | OS Grid Ref | 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? |
|---|---|---|---|---|---|---|
| Site 1, 10 Eastgate St | Urban Centre | 448563, 129391 | Y | Y (0.1m) | 5.55 | Y |
| Sites 2, 3, 4 Greyfriars | Urban Centre | 448566, 129560 | Y | Y (0.1m) | 9.70 | Y |
| Site 5, Friarsgate | Urban Centre | 448426, 129523 | Y | Y (4.6m - at same distance from road | 4.25 | Y |
| Site 6, Upper Brook St | Urban Centre | 448227, 129504 | Y | Y (9.2m - at same distance from road) | 8.00 | Y |
| Sites 7, 8, 9 Roadside Monitor | Roadside | 448213, 129504 | Y | N | 3.10 | N/A |
| Site 10, St Georges St TC | Urban Centre | 448106, 129541 | Y | Y (0.1m) | 4.05 | Y |
| Site 11, St Georges | Urban Centre | 448163, 129512 | Y | N | 3.60 | N/A |
| Site 12, Jewry St CH | Urban Centre | 448046, 129692 | Y | Y (0.1m) | 4.05 | Y |
| Site 13, Jewry St FK | Urban Centre | 448029, 129666 | Y | N | 2.75 | N/A |
| Site 14, Southgate St DV | Urban Centre | 447918, 129413 | Y | Y (0.1m) | 3.65 | Y |
| Site 15, Southgate St CH | Urban Centre | 447929, 129409 | Y | Y (0.1m) | 2.10 | Y |
| Site 16, Sussex St | Urban Centre | 447804, 129741 | Y | Y (2.4m further away from road) | 3.60 | Y |
| Site 17, City Road | Urban Centre | 447963, 129875 | Y | Y (0.1m) | 6.55 | N |
| Site 18, 74 Northwalls | Urban Centre | 448234, 129794 | Y | Y (10.2m - at same distance from road) | 1.20 | Y |
| Site 19, 15 Northwalls | Urban Centre | 448297, 129789 | Y | Y (0.3m further away from road) | 3.70 | Y |
| Site 20, Wales St | Urban Centre | 448842, 129820 | Y | Y (0.1m) | 1.70 | Y |
| Site 21, Alresford Rd | Other (M3) | 449557, 129437 | N | N | NA | NA |
| Site 22, Chesil St | Urban Centre | 448679, 129068 | Y | Y (0.1m) | 1.30 | Y |
| Site 23, Romsey Rd HL | Urban Background | 447003, 129425 | N | N | 15.40 | N/A |
| Site 24, Stockbridge Rd | Urban Centre | 447534, 130006 | Y | Y (10m - at same distance from road) | 5.40 | Y |
| Site 25, Andover Rd | Urban | 447745, | Y | Y (0.5m further | 6.50 | Y |

| Site Name | Site Type | OS Grid Ref | 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? |
|---|---|---|---|---|---|---|
| | Centre | 130456 | | from road) | | |
| Sites 26, 27, 28, Worthy Rd 1 | Urban Centre | 448092, 130411 | Y | Y (3.7m further from road) | 2.20 | Y |
| Site 29, St Cross Rd | Urban Centre | 447842, 129050 | Y | Y (6m further from road) | 2.40 | Y |
| Site 30, Romsey Road | Urban Centre | 447495, 129511 | Y | Y (0.8m further from road) | 1.10 | Y |
| Site 31, Andover Rd | Urban Centre | 447898, 130065 | Y | Y(0.6 m further from road) | 4.20 | Y |
| Site 32, Bus Station | Other (Bus station) | 448427, 129401 | Y | N | NA | N/A |
| Site 33, Parchment St | Urban Background | 448173, 129568 | Y | Y | 1.15 | N |

**Table 2.2b Details of Non- Automatic Monitoring Sites (District wide)**

| Site Name | Site Type | OS Grid Ref | 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? |
|---|---|---|---|---|---|---|
| Site 1 High Street, Twyford | Roadside | 448062,124372 | $NO_2$ | N | NA | 0.9m |
| Site 2 Southdown Road, Otterbourne | Other (M3) | 446690, 124645 | $NO_2$ | N | NA | NA |
| Site 3 Pellican Court, Hursley | Roadside | 442835, 125162 | $NO_2$ | N | NA | 6.2 |
| Site 4 Church Green Close, Kings Worthy | Other (A34) | 449161, 132291 | $NO_2$ | N | NA | NA |
| Site 5 West St., New Alresford | Roadside | 458828, 132707 | $NO_2$ | N | NA | Centre of Road |
| Site 6Hambledon Rd., Denmean | Roadside | 465915, 112047 | $NO_2$ | N | NA | 1.2 |
| Site 7 Winchester Rd, Wickham | Roadside | 457305, 111730 | $NO_2$ | N | NA | 0.8 |
| Site 8 Winchester Rd, Bishops Waltham | Roadside | 455331, 117399 | $NO_2$ | N | NA | 1.0 |
| Site 9 Whiteley Ln, Whiteley | Other (M27) | 453638, 182580 | $NO_2$ | N | NA | NA |

**Table 2.2c Details of Non- Automatic Monitoring Sites (M3 Study in 2006 - 2007)**

| Site Name | Site Type | OS Grid Ref | In AQMA? | Relevant Exposure? | Distance to M3 | Worst-case Location? |
|---|---|---|---|---|---|---|
| Site 1 Gordon Road, Winchester | Other (M3) | 449443, 128927 | N | Y | 130m | Y |
| Site 2 Shephards Down School, Compton (Moved) | Other (M3) | 446537,124704 | N | Y | 42m | Y |
| Site 3 Pearson Lane, Shawford | Other (M3) | 447037, 125204 | N | Y | 86m | Y |
| Site 4 Southdown Road, Otterbourne (near road) | Roadside | 446659, 124655 | N | N | NA | NA |
| Site 5 Highways Road, Otterbourne | Other (M3) | 446414, 124279 | N | Y | 15m | Y |
| Site 6 Bourne Close, Otterbourne | Other (M3) | 446030, 123672 | N | Y | 90m | N |
| Site 7 Cranbourne Drive, Otterbourne | Other (M3) | 445920, 123331 | N | Y | 191m | Y |
| Site 8 Chapel Lane, Otterbourne | Other (M3) | 445505, 122345 | N | Y | 230m | Y |
| Site 9 Southdown Road, Compton (property) | Other (M3) | 446694, 124642 | N | Y | 57m | Y |

The Council uses tubes provided and analysed by Gradko International Ltd using 50% TEA (Triethanolamine) in water, which are typically exposed for four to six week periods. The diffusion tubes were exposed for 11 4-5 week periods during 2008. QA/QC data is included in Appendix C.

The 2008 results have been corrected for bias using a locally derived bias adjustment factor of **1.02**. Further information is described in Appendix 2.

## 2.2 Comparison of Monitoring Results with AQ Objectives

### 2.2.1 Nitrogen Dioxide

Winchester City Council has an extensive nitrogen dioxide monitoring network across the district, including two automatic sites located within Winchester city Centre, 28 diffusion tube monitoring sites located with in Winchester City Centre (three of which are triplicate co-location sites) and nine diffusion tube monitoring sites located in smaller towns in the area.

### Automatic Monitoring Data

Annual mean nitrogen dioxide concentrations and the number of exceedences of the hourly objective in 2006, 2007 and 2008 are presented in Tables 2.3a and 2.3b below.

Measured concentrations at the background site at Godson House are below the annual mean objective in 2008, with concentrations similar to those recorded in 2006 and 2007. Annual mean concentrations measured at the roadside site at Echo Offices, exceed the objective, however concentrations in 2008 are slightly lower than those recorded in previous years. Both monitoring sites are located within the AQMA and results suggest that this status remains appropriate.

There were no measured exceedences of the 1-hour mean objective.

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

| Site Name | Within AQMA? | Proportion of year with valid data 2008 % | Annual mean concentrations (µg/m$^3$) | | |
|---|---|---|---|---|---|
| | | | 2006 | 2007 | 2008 |
| Echo Offices | Y | 99 | **51.3** | **51.3** | **47.8** |
| Godson House | Y | 99 | 28.1 | 26.8 | 27.4 |

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

| Site Name | Within AQMA? | Data Capture 2008 % | Number of Exceedences of hourly mean (200 µg/m$^3$) | | |
|---|---|---|---|---|---|
| | | | 2006 | 2007 | 2008 |
| Echo Offices | Y | 99 | 0 | 0 | 0 |
| Godson House | Y | 99 | 0 | 0 | 0 |

## Non- Automatic Monitoring Data

Diffusion tube monitoring results in 2008 showed nitrogen dioxide concentrations to exceed the objective at a number of locations in the City Centre. Nitrogen dioxide concentrations across the district were all below the objective. Local bias adjustment factors have been applied to all data. This is discussed in Appendix C.

**Table 2.4a Results of Nitrogen Dioxide Diffusion Tubes (City Centre)**

| Location | Within AQMA? | Data Capture 2008 % | Annual mean concentrations 2008 (µg/m$^3$) Adjusted for bias [a,b] |
|---|---|---|---|
| Site 110 Eastgate St | Y | 100 | 37.8 |
| Site 2, 3, 4, Greyfriars | Y | 100 | 38.0 |
| Site 5,Friarsgate | Y | 100 | 31.6 |
| Site 6, Upper Brook St | Y | 100 | **47.4** |
| Site 7, 8 , 9,Roadside Monitor | Y | 100 | **45.8** |
| Site 10, St Georges St TC | Y | 100 | **57.8** |
| Site 11,St Georges St Lad | Y | 73 | **60.7** |
| Site 12,Jewry St CH | Y | 91 | **45.0** |
| Site 13,Jewry St FK | Y | 100 | **55.2** |
| Site 14,Southgate St DV | Y | 100 | **42.1** |
| Site 15,Southgate St CH | Y | 100 | **48.6** |
| Site 16,Sussex St | Y | 100 | **43.9** |
| Site 17,City Road | Y | 100 | 38.8 |
| Site 18,74 Northwalls | Y | 100 | **44.9** |
| Site 19,15 Northwalls | Y | 91 | 35.2 |
| Site 20,Wales St | Y | 100 | 33.1 |
| Site 21,Alresford Rd | N | 91 | 38.3 |
| Site 22,Chesil St | Y | 91 | **41.4** |
| Site 23,Romsey Rd HL | N | 100 | 24.1 |
| Site 24,Stockbridge Rd | Y | 100 | 25.7 |
| Site 25,Andover Rd | Y | 100 | 33.8 |
| Site 26, 27, 28,Worthy Rd 1 | Y | 100 | 32.5 |
| Site29,St Cross Rd | Y | 82 | 39.4 |
| Site 30,Romsey Road | Y | 91 | **53.1** |
| Site 31,Andover Rd | Y | 91 | 38.2 |
| Site 32,Bus Station | Y | 73 | **41.8** |
| Site 33,Parchment St | Y | 82 | 30.8 |
| Site 34,Middle Brook St | Y | 82 | 25.3 |

*a* *Bias adjustment factor of 1.02*
*b* *Concentrations exceeding the objective indicted in bold*

Data capture was below 75% at site 11, however the measured exceedence was 60.7 µg/m$^3$, and it can be safely concluded that the objective would still be exceeded even if a higher data capture had been obtained. The data capture at site 32 was also below 75%, although in this case the concentration was 41.8 µg/m$^3$, which is just above the objective. Because of the lower margin of the exceedence at this location, a higher data capture may potentially change whether the measured concentration at this site was above or below the objective. The result, whether above or below the objective, would not affect the overall status of the AQMA. Also there is no relevant exposure at this location in relation to the annual mean objective. The results for these sites have therefore not been annualised.

Because the measured concentration at site 11 exceeded 60 µg/m$^3$, it is possible that the 1-hour objective is being exceeded at this location. However, there is no relevant exposure at this location, and the high concentration is therefore not considered further.

**Table 2.4b Results of Nitrogen Dioxide Diffusion Tubes (District-wide)**

| Location | Within AQMA? | Data Capture 2008 % | Annual mean concentrations 2008 (µg/m$^3$) Adjusted for bias [a,b] |
|---|---|---|---|
| Site 1, High Street, Twyford | N | 91 | 33.4 |
| Site 2, Southdown Road, Otterbourne | N | 100 | 36.1 |
| Site 3, Pellican Court, Hursley | N | 100 | 17.2 |
| Site 4, Church Green Close, Kings Worthy | N | 100 | 34.2 |
| Site 5, West St., New Alresford | N | 100 | 34.9 |
| Site 6, Hambledon Rd., Denmean | N | 100 | 22.8 |
| Site 7, Winchester Rd, Wickham | N | 100 | 34.0 |
| Site 8, Winchester Rd, Bishops Waltham | N | 100 | 35.8 |
| Site 9, Whiteley Ln, Whiteley | N | 100 | 31.8 |

*a* *Bias adjustment factor of 1.02*
*b* *Concentrations exceeding the objective indicted in bold*

**Table 2.5a Results of Nitrogen Dioxide Diffusion Tubes (City Centre)**

| Site ID | Location | Within AQMA? | Annual mean concentrations[a] (µg/m$^3$) Adjusted for bias[b] | | |
|---|---|---|---|---|---|
| | | | 2006 | 2007 | 2008 |
| Site 1 | 10 Eastgate St | Y | **44.8** | 38.5 | 37.8 |
| Site 2,3,4 | Greyfriars | Y | **44.6** | **40.9** | 38.0 |
| Site 5 | Friarsgate | Y | 36.7 | 33.9 | 31.6 |
| Site 6 | Upper Brook St | Y | **49.7** | **46.8** | **47.4** |
| Site 7, 8, 9 | Roadside Monitor | Y | **50.8** | **50.8** | **45.8** |
| Site 10 | St Georges St TC | Y | **67.1** | **65.6** | **57.8** |
| Site 11 | St Georges St Lad | Y | **72.5** | **62.4** | **60.7** |
| Site 12 | Jewry St CH | Y | **53.3** | **49.7** | **45.0** |
| Site 13 | Jewry St FK | Y | **61.0** | **59.1** | **55.2** |
| Site 14 | Southgate St DV | Y | **45.4** | **45.0** | **42.1** |
| Site 15 | Southgate St CH | Y | **55.7** | **55.1** | **48.6** |
| Site 16 | Sussex St | Y | **47.4** | **44.1** | **43.9** |
| Site 17 | City Road | Y | **48.9** | **42.2** | 38.8 |
| Site 18 | 74 Northwalls | Y | **54.8** | **46.5** | **44.9** |
| Site 19 | 15 Northwalls | Y | **41.5** | 36.7 | 35.2 |
| Site 20 | Wales St | Y | 39.3 | 38.9 | 33.1 |
| Site 21 | Alresford Rd | N | **44.9** | **41.2** | 38.3 |
| Site 22 | Chesil St | Y | **47.7** | **43.6** | **41.4** |
| Site 23 | Romsey Rd HL | N | 31.5 | 24.6 | 24.1 |
| Site 24 | Stockbridge Rd | Y | 30.2 | 30.1 | 25.7 |
| Site 25 | Andover Rd | Y | 36.4 | 36.9 | 33.8 |
| Site 26, 27, 28 | Worthy Rd | Y | 38.4 | 36.6 | 32.5 |
| Site29 | St Cross Rd | Y | **41.5** | **43.4** | 39.4 |
| Site 30 | Romsey Road | Y | **64.9** | **66.1** | **53.1** |
| Site 31 | Andover Rd | Y | **45.2** | **40.5** | 38.2 |
| Site 32 | Bus Station | Y | **55.6** | **49.7** | **41.8** |
| Site 33 | Parchment St | Y | 39.0 | 32.4 | 30.8 |
| Site 34 | Middle Brook St | Y | 31.0 | 28.9 | 25.3 |

*a Concentrations exceeding the objective indicted in bold*
*b Bias adjustment factors of 1.26 in 2006, 1.08 in 2007and 1.02 in 2008*

**Table 2.5b Results of Nitrogen Dioxide Diffusion Tubes (District wide)**

| Location | Within AQMA? | Annual mean concentrations (µg/m$^3$) Adjusted for bias[a] | | |
|---|---|---|---|---|
| | | 2006 | 2007 | 2008 |
| Site 1, High Street, Twyford | N | None | None | 33.4 |
| Site 2, Southdown Road, Otterbourne | N | None | None | 36.1 |
| Site 3, Pellican Court, Hursley | N | None | None | 17.2 |
| Site 4, church Green Close, Kings Worthy | N | None | None | 34.2 |
| Site 5, West St., New Alresford | N | None | None | 34.9 |
| Site 6, Hambledon Rd., Denmean | N | None | None | 22.8 |
| Site 7, Winchester Rd, Wickham | N | None | None | 34.0 |
| Site 8, Winchester Rd, Bishops Waltham | N | None | None | 35.8 |
| Site 9, Whiteley Ln, Whiteley | N | None | None | 31.8 |

*a Bias adjustment factors of 1.26 in 2006, 1.08 in 2007and 1.02 in 2008*

Results from the Otterbourne to Compton M3 diffusion tube study are presented in Table 2.5c. In both 2006 and 2007 nitrogen dioxide concentrations were below the objective level at all locations except site 4. There is no relevant exposure at this location, therefore nitrogen dioxide levels meet the objectives at all relevant exposure sites. Site 4 has been maintained as part of the Winchester District-wide nitrogen dioxide diffusion tube monitoring network in order to assess trends in nitrogen dioxide concentration close to the M3 in future years. This is now site 2 in the District-wide study and was seen to be below the objective in 2008 (Table 2.5b).

**Table 2.5c Results of Nitrogen Dioxide Diffusion Tubes (M3 study)**

| Site ID Location | Within AQMA? | Data Capture 2006[a] % | Annual mean concentration 2006 (µg/m$^3$)[a,b] | Data Capture 2007[a] % | Annual mean concentration 2007 (µg/m$^3$)[a,b] |
|---|---|---|---|---|---|
| Site 1, Gordon Road, Winchester | N | 90 | 31.0 | 80 | 30.3 |
| Site 2, Shephards Down School, Compton (Moved) | N | 100 | 39.7 | 100 | 29.2 |
| Site 3, Pearson Lane, Shawford | N | 100 | 36.3 | 100 | 37.3 |
| Site 4, Southdown Road, Otterbourne (near road) | N | 100 | **42.6** | 100 | **45.4** |
| Site 5, Highways Road, Otterbourne | N | 60 | 32.9 | 60 | 34.8 |
| Site 6, Bourne Close, Otterbourne | N | 100 | 29.4 | 40 | 33.9 |
| Site 7, Cranbourne Drive, Otterbourne | N | 100 | 27.2 | 100 | 26.6 |
| Site 8, Chapel Lane, Otterbourne | N | 80 | 34.1 | 100 | 30.5 |
| Site 9, Southdown Road, Compton (property) | N | 50 | 37.7[c] | 90 | 39.6 |

*a Bias adjustment factors of 1.26 in 2006 and 1.08 in 2007*
*b Concentrations exceeding the objective indicted in bold*
*c Data for only 5 months due to change in location*

### $PM_{10}$

Annual mean concentrations of $PM_{10}$ and the number of days exceeding the daily mean concentrations in 2006, 2007 and 2008 are presented in Table 2.5a and 2.5b below. Results from the North Wall Site in 2008 were not reported due to significant data gaps and poor performance of this monitor resulting in unreliable results.

All sites are located within the AQMA declared for exceedences of the 24-hour mean objective for $PM_{10}$, concentrations of $PM_{10}$ and the number of days exceeding the 24-hour objective. Measured concentrations, however, are below the objectives in 2006, 2007 and 2008.

**Table 2.6a Results of $PM_{10}$ Automatic Monitoring: Comparison with Annual Mean Objective**

| Location | Within AQMA? | Data Capture 2008 % | Annual mean concentrations (µg/m$^3$) | | |
|---|---|---|---|---|---|
| | | | 2006 | 2007 | 2008[a] |
| Echo Offices | Y | 96 | 26.9 | 24.8 | 22.2 |
| Godson House | Y | 99 | 20.3 | 19.4 | 18.1 |
| Background Osiris | Y | 86 | - | 16.4 | 18.6 |
| City Road | Y | 86 | - | 21.1 | 21.1 |
| North Walls | Y | - | - | 16.7 | - |

**Table 2.6b Results of $PM_{10}$ Automatic Monitoring: Comparison with 24-hour Mean Objective**

| Location | Within AQMA? | Data Capture 2008 % | Number of Exceedences of 24-hour mean (50 µg/m$^3$) | | |
|---|---|---|---|---|---|
| | | | 2006 | 2007 | 2008 |
| Echo Offices | Y | 96 | 15 | 15 | 9 |
| Godson House | Y | 99 | 8 | 10 | 5 |
| Background Osiris* | Y | 86 | 6 | 1 | 2 |
| City Road* | Y | 86 | 8 | 18 | 4 |
| North Walls* | Y | - | 6 | 10 | - |

**Based on 90 percentile due to data collection <90perecent*

## 2.2.2 Sulphur Dioxide

No sulphur dioxide monitoring was carried out by Winchester City Council in 2008. Monitoring has been discontinued since 2005 due to the very low levels recorded.

Previous assessment of sources of sulphur dioxide concluded that an area associated with the heritage railway line may be at risk of elevated sulphur dioxide concentrations. Subsequent monitoring at the Alresford railway station indicated concentrations of sulphur dioxide below the objective.

### 2.2.3 Carbon Monoxide

Carbon monoxide concentrations were measured at the Echo Offices roadside site in 2008. Annual mean concentrations of carbon monoxide and the number of 8-hour running mean exceeding the daily mean concentrations in 2006, 2007 and 2008 are presented in Tables 2.7a and 2.7b below.

Due to carbon monoxide concentrations being continually below the objectives in recent years, carbon monoxide monitoring will cease from 2009.

**Table 2.7a Results of carbon monoxide Automatic Monitoring: Annual Mean**

| Location | Within AQMA? | Data Capture 2008 % | Annual mean concentrations (mg/m$^3$) | | |
|---|---|---|---|---|---|
| | | | 2006 | 2007 | 2008 |
| Echo Offices | Y | 96 | 0.5 | 0.5 | 0.4 |

**Table 2.7b Results of Carbon Monoxide Automatic Monitoring: Comparison with 8-hour running Mean Objective**

| Location | Within AQMA? | Data Capture 2008 % | Number of Exceedences of 8-hour running mean (10 µg/m$^3$) | | |
|---|---|---|---|---|---|
| | | | 2006 | 2007 | 2008 |
| Echo Offices | Y | 96 | 0 | 0 | 0 |

### 2.2.4 Other pollutants monitored

No other pollutants were monitored by Winchester City Council in 2008.

The results from monitoring in the District show that concentrations of nitrogen dioxide exceed the objective at a number of locations within the existing AQMA in Winchester City Centre. Concentrations at all other relevant locations are below the objectives.

Concentrations of $PM_{10}$ are below the annual mean and 24-hour objective levels at all monitoring locations, and have been so for three years. It is recommended that consideration should be given to revoking the $PM_{10}$ AQMA.

In order to revoke the $PM_{10}$ AQMA a Detailed Assessment is required.

# 3 Road Traffic Sources

Significant changes to traffic flows and new locations meeting the revised criteria have been identified through discussions between Winchester City Council and Hampshire County Council.

## 3.1 Narrow Congested Streets with Residential Properties Close to the Kerb

The criteria for assessing narrow congested streets are set out in Box 5.3, section A1 of TG(09). The traffic flow required to trigger a Detailed Assessment has reduced since the last Updating and Screening Assessment from 10,000 vpd to 5,000 vpd. Other than streets already included within the AQMA, Winchester City Council did not identify any streets meeting these criteria.

Winchester City Council confirms that there are no new/newly identified congested streets with a flow above 5,000 vehicles per day and residential properties close to the kerb, that have not been adequately considered in previous rounds of Review and Assessment.

## 3.2 Busy Streets Where People May Spend 1-hour or More Close to Traffic

The criteria for assessing busy streets relevant for the hourly nitrogen dioxide objective are set out in Box 5.3, section A2 of TG(09) and are unchanged from previous rounds of Review and Assessment. Busy streets where people may spend 1-hour or more close to traffic were considered in previous Updating and Screening Assessments and no such locations identified.

Winchester City Council confirms that there are no new/newly identified busy streets where people may spend 1 hour or more close to traffic.

## 3.3 Roads with a High Flow of Buses and/or HGVs.

The criteria for assessing roads with high flows of buses and/or HGVs are set out in Box 5.3, section A3 of TG(09) and are unchanged from previous rounds of Review and Assessment. Roads with a high flow of buses and/or HGVs were considered in previous Updating and Screening Assessments and no such locations identified.

Winchester City Council confirms that there are no new/newly identified roads with high flows of buses/HDVs.

## 3.4 Junctions

The criteria for assessing junctions are set out in Box 5.3, section A4 of TG(09) and are unchanged from previous rounds of Review and Assessment. Junctions were considered in previous Updating and Screening Assessments and no such locations identified.

Winchester City Council confirms that there are no new/newly identified busy junctions/busy roads.

## 3.5 New Roads Constructed or Proposed Since the Last Round of Review and Assessment

The criteria for assessing new roads are set out in Box 5.3, section A5 of TG(09) and are unchanged from previous rounds of Review and Assessment. New roads proposed or constructed were considered in previous Updating and Screening Assessments and no such locations identified.

Winchester City Council confirms that there are no new/proposed roads.

## 3.6 Roads with Significantly Changed Traffic Flows

The criteria for assessing roads with significantly changed traffic flows are set out in Box 5.3, section A6 of TG(09) and are unchanged from previous rounds of Review and Assessment. Roads with a greater than 25% change in flow were considered in previous Updating and Screening Assessments. No additional locations have been identified since the previous round of review and assessment.

Winchester City Council confirms that there are no new/newly identified roads with significantly changed traffic flows.

## 3.7 Bus and Coach Stations

The criteria for assessing roads with significantly changed traffic flows are set out in Box 5.3, section A7 of TG(09) and are unchanged from previous rounds of Review and Assessment. Bus and coach stations were considered in previous Updating and Screening Assessments. Technical Guidance LAQM.TG (09) considers bus stations with less than 2,500 bus movements per day as not being significant. Winchester Bus Station has less than 2,500 movements per day, and is therefore not considered further.

Winchester City Council confirms that there are no relevant bus stations in the Local Authority area.

# 4 Other Transport Sources

## 4.1 Airports

The criteria for assessing airports are set out in Box 5.4, section B1 of TG(09) and are less stringent than previous rounds of Review and Assessment. Airports were considered in previous Updating and Screening Assessments and no such locations identified.

Winchester City Council confirms that there are no airports in the Local Authority area.

## 4.2 Railways (Diesel and Steam Trains)

### 4.2.1 Stationary Trains

The criteria for assessing stationary locomotives are set out in Box 5.4, section B2 of TG(09) (Approach 1) and are unchanged from previous rounds of Review and Assessment. Locations where diesel locomotives may regularly remain stationary for 15 minutes or more were considered in previous Updating and Screening Assessments. One such location was previously identified and subject to a Detailed Assessment, which showed no objective exceedences.

Winchester City Council confirms that there are no new locations where diesel or steam trains are regularly stationary for periods of 15 minutes or more, with potential for relevant exposure within 15m.

### 4.2.2 Moving Trains

The criteria for assessing moving locomotives are set out in Box 5.4, section B2 of TG(09) (Approach 2). These are new for the 2009 Updating and Screening Assessment. None of the rail lines listed in Table 5.1 of the Technical Guidance LAQM.TG(09) pass through the Winchester District. Therefore there are no locations with a 'large number' of movements of diesel locomotives.

Winchester City Council confirms that there are no locations with a large number of movements of diesel locomotives, and potential long-term relevant exposure within 30m.

## 4.3 Ports (Shipping)

The criteria for assessing ports are set out in Box 5.4, section B3 of TG(09) and are unchanged from previous rounds of Review and Assessment. Winchester Council has no coastline and therefore no significant shipping to consider.

Winchester City Council confirms that there are no ports or shipping that meet the specified criteria within the Local Authority area.

# 5 Industrial Sources

## 5.1 Industrial Installations

### 5.1.1 New or Proposed Installations for which an Air Quality Assessment has been Carried Out

The criteria for assessing industrial installations are set out in Box 5.5, section C1 of TG(09) and are unchanged from previous rounds of Review and Assessment. There are no new or proposed industrial installations within Winchester Councils area.

Winchester City Council confirms that there are no new or proposed industrial installations for which planning approval has been granted within its area or nearby in a neighbouring authority.
.

### 5.1.2 Existing Installations where Emissions have Increased Substantially or New Relevant Exposure has been Introduced

None of the industrial installations identified in previous Updating and Screening Assessments have substantially increased emissions and no new exposure has been introduced nearby.

Winchester City Council confirms that there are no industrial installations with substantially increased emissions or new relevant exposure in their vicinity within its area or nearby in a neighbouring authority.
.

## 5.2 Major Fuel (Petrol) Storage Depots

The criteria for assessing major fuel (petrol) storage depots are set out in Box 5.5, section C2 of TG(09) and are unchanged from previous rounds of Review and Assessment. Major petrol storage depots were considered in the previous Updating and Screening Assessments and no such locations identified.

Winchester City Council has confirms that there are no major fuel or petrol storage depots meeting the specified criteria. .

## 5.3 Petrol Stations

The criteria for assessing petrol stations are set out in Box 5.5, section C3 of TG(09) and are unchanged from previous rounds of Review and Assessment. All petrol filling stations were considered in the previous Updating and Screening Assessments and were found not to be relevant.

Winchester City Council confirms that there are no petrol stations meeting the specified criteria.

## 5.4 Poultry Farms

The criteria for assessing poultry farms are set out in Box 5.5, section C4 of TG(09). They form a new section for the 2009 Updating and Screening Assessment. Mechanically ventilated units exceeding 400,000 birds and naturally ventilated units exceeding 200,000 birds require further investigation. There are three part A permits for poultry units in Winchester Councils area. These include a naturally ventilated poultry unit at Whites Hill Farm with 79,000 birds and two mechanically ventilated units at North Winchester Farm and Wolfhanger Farm with 238,000 birds and 182,000 birds respectively. None of these meet the relevant criteria.

Winchester City Council confirms that there are no poultry farms meeting the specified criteria.

# 6 Commercial and Domestic Sources

## 6.1 Biomass Combustion – Individual Installations

The criteria for assessing biomass combustion (individual installations) are set out in Box 5.8, section D1a of TG(09). They form a new section of the 2009 Updating and Screening Assessment. There are currently no biomass boiler between 50kW and 20MW in the Winchester District. Planning permission has been granted to Pucknall Energy Generation Ltd for a 900kW biomass boiler located at Upper Slackstead Farm, Braishfield, Romsey (Planning Application number 08/00034/HCS), however construction has not yet commenced and it was reported to the council recently that the development may not go ahead.

The biomass boiler was assessed using the Review and Assessment tool for biomass combustion stacks. Emission rates and stack dimensions provided in report on the calculation of discharge stack height, carried out by Millennium Science and Engineering Ltd (MSE, 2007). The predicted emission rate for $PM_{10}$ exceeds the target emission rate calculated.

**Table 6.1 Summary of Biomass Screening Tool Calculations**

| Parameter | Value | |
|---|---|---|
| Building Height (m) | 9.3 | |
| Stack Diameter (m) | 0.615 | |
| Stack Height (m) | 12 | |
| Effective Stack Height (m) | 4.5 | |
| | **$NO_2$** | **$PM_{10}$** |
| Background Concentration (µg/m$^3$) | 11.16 | 15.87 |
| Calculated Target Emission Rate (g/s) | 0.2368 | 0.0443 |
| Predicted Emission Rate (g/s) | 0.016 | 0.078 |

Winchester City Council confirms that there are currently no biomass combustion plant in the Local Authority area. Planning permission has been granted for a 900kW boiler at Pucknell Farm, although construction of this development is not currently proceeding. The screening tool for biomass combustion stacks has predicted that emission rates of $PM_{10}$ exceed the target emission rates.

**This source will be reconsidered in the 2010 Progress Report. Should construction of the plant have commenced at that time, it will be necessary to proceed to a Detailed Assessment for $PM_{10}$.**

## 6.2 Biomass Combustion – Combined Impacts

The criteria for assessing biomass combustion (combined impacts) are set out in Box 5.8, section D1b of TG(09). They form a new section of the 2009 Updating and Screening Assessment. There have been no planning applications for biomass boilers in Winchester District apart from that discussed in section 6.1 above.

Winchester City Council confirms that there are no existing biomass combustion plant in the Local Authority area.

## 6.3 Domestic Solid-Fuel Burning

The criteria for assessing domestic solid-fuel burning are set out in Box 5.8, section D1b of TG(09) and are unchanged from previous rounds of Review and Assessment. Areas with significant domestic solid fuel burning were considered in previous rounds of review and assessment and were found not to be relevant.

Winchester City Council confirms that there are no areas of significant domestic fuel use in the Local Authority area.

# 7 Fugitive or Uncontrolled Sources

The criteria for assessing fugitive or uncontrolled sources are set out in Box 5.10, section E1 of TG(09) and are unchanged from previous Review and Assessments. Fugitive or uncontrolled sources of $PM_{10}$ such as quarries, landfill sites and opencast coal sites were considered in previous Updating and Screening Assessments. No significant sources were identified.

Winchester City Council confirms that there are no potential sources of fugitive particulate matter emissions in the Local Authority area.

# 8 Conclusions and Proposed Actions

## 8.1 Conclusions from New Monitoring Data

Nitrogen dioxide monitoring data are below the objective at all monitoring locations except those with in the AQMA boundary. Although there are monitoring locations within the AQMA boundary where measured nitrogen dioxide concentrations were below the objective in 2008, concentrations exceed or are close to the objective at the majority of the locations over the past three years. The status of AQMA therefore remains valid.

New $PM_{10}$ monitoring suggests that concentrations continue to remain below the annual mean and 24-hour objectives. It is therefore recommended that a Detailed Assessment be carried out in order to assess $PM_{10}$ concentrations more accurately and determine whether the $PM_{10}$ AQMA should be revoked.

## 8.2 Conclusions from Assessment of Sources

### Road Traffic Sources

The Updating and Screening Assessment did not identify the need for a Detailed Assessment in respect to road traffic sources.

### Other Transport Sources

No issues were identified in relation to other transport sources.

### Industrial Sources

No issues were identified in relation to industrial sources.

### Commercial and Domestic Sources

A proposed large biomass boiler was identified as a potential source of air quality pollution with predicted emissions of $PM_{10}$ exceeding the calculated target emission rate.

No other issues were identified in relation to commercial and domestic sources.

### Fugitive and Uncontrolled Sources

No issues were identified in relation to fugitive and uncontrolled sources.

## 8.3 Proposed Actions

This Updating and Screening Assessment has shown that measured concentrations of $PM_{10}$ within the existing AQMA have been well below the objective for three years. Monitoring carried out at two additional locations also showed concentrations below the objectives. It is therefore recommended that a Detailed Assessment of $PM_{10}$ is undertaken within the existing AQMA area to fully assess concentrations of $PM_{10}$ by modelling and monitoring, with a view to revoking the AQMA.

$PM_{10}$ emissions from a proposed biomass boiler have been identified as being potentially unacceptable, although construction of this development is not currently proceeding. This source will be reconsidered in the 2010 Progress Report. Should construction of the plant have commenced at that time, it will be necessary to proceed to a Detailed Assessment for $PM_{10}$.

Nitrogen dioxide concentrations continue to meet the objectives at all locations outside of the AQMA. There are measured exceedences of the nitrogen dioxide objective within the AQMA. It is therefore recommended that the AQMA should be retained in its current form.

There is no requirement to proceed to a Detailed Assessment for any other pollutant.

The results from this work will contribute to the next Progress Report, to be submitted in 2010, and to subsequent Updating and Screening Assessments.

# 9 References

Defra, 2009. Local Air Quality Management, Technical Guidance LAQM.TG(09), February 2009.

Defra, 2010a. R&A website, spreadsheet version 09/09
http://www.uwe.ac.uk/aqm/review/R&Asupport/diffusiontube290909.xls

Defra 2010b. *Diffusion Tubes for Ambient $NO_2$ Monitoring: Practical Guidance for Laboratories and Users*. Report to Defra and the Devolved Administrations. ED48673043. February 2008.

MSE, 2007. Talbots Biomass Heating Ltd - Calculation of Discharge Stack Height for a Proposed BG100 Energy Recovery Faclility at Braishfield, Hampshire, October 2007. http://www3.hants.gov.uk/planning/mineralsandwaste/planning-applications/applications/application-details.htm?id=13277

Winchester City Council, 1998. Winchester City Council Stage 1 Review, December 1998

Winchester City Council, 2000. Winchester City Council Stage 2/3 Review, august 2000

Winchester City Council, 2001. Winchester City Council Air Quality Review and Assessment – Additional Assessment of Nitrogen Dioxide levels within Winchester Town Centre, October 2001

Winchester City Council, 2003a. Winchester City Council Air Quality Review and Assessment – Detailed Dispersion Modelling, July 2003

Winchester City Council, 2003b. Winchester City Council Updating and Screening Assessment, 2003

Winchester City Council and Casella Stanger, 2004. Winchester City Council Air Quality Review and Assessment – ASMS Roads update August 2004

Winchester City Council, 2005a. Winchester City Council Detailed Assessment of sulphur dioxide levels from the Hampshire Watercress Line, February 2005

Winchester city Council, 2005b. Winchester City Council Air Quality Progress Report 2005

Winchester City Council, 2006a. Winchester City Council – Air Quality Action Plan 2006

Winchester city Council, 2006b. Winchester City Council Updating and Screening Assessment 2006

Winchester City Council, 2007. Winchester City Council Progress Report 2007

Winchester City Council, 2008. Winchester City Council Progress Report 2008

# Appendices

Appendix A: Figures

Appendix B: Diffusion Tube Results

Appendix C: QA/QC Data

# Appendix A: Figures

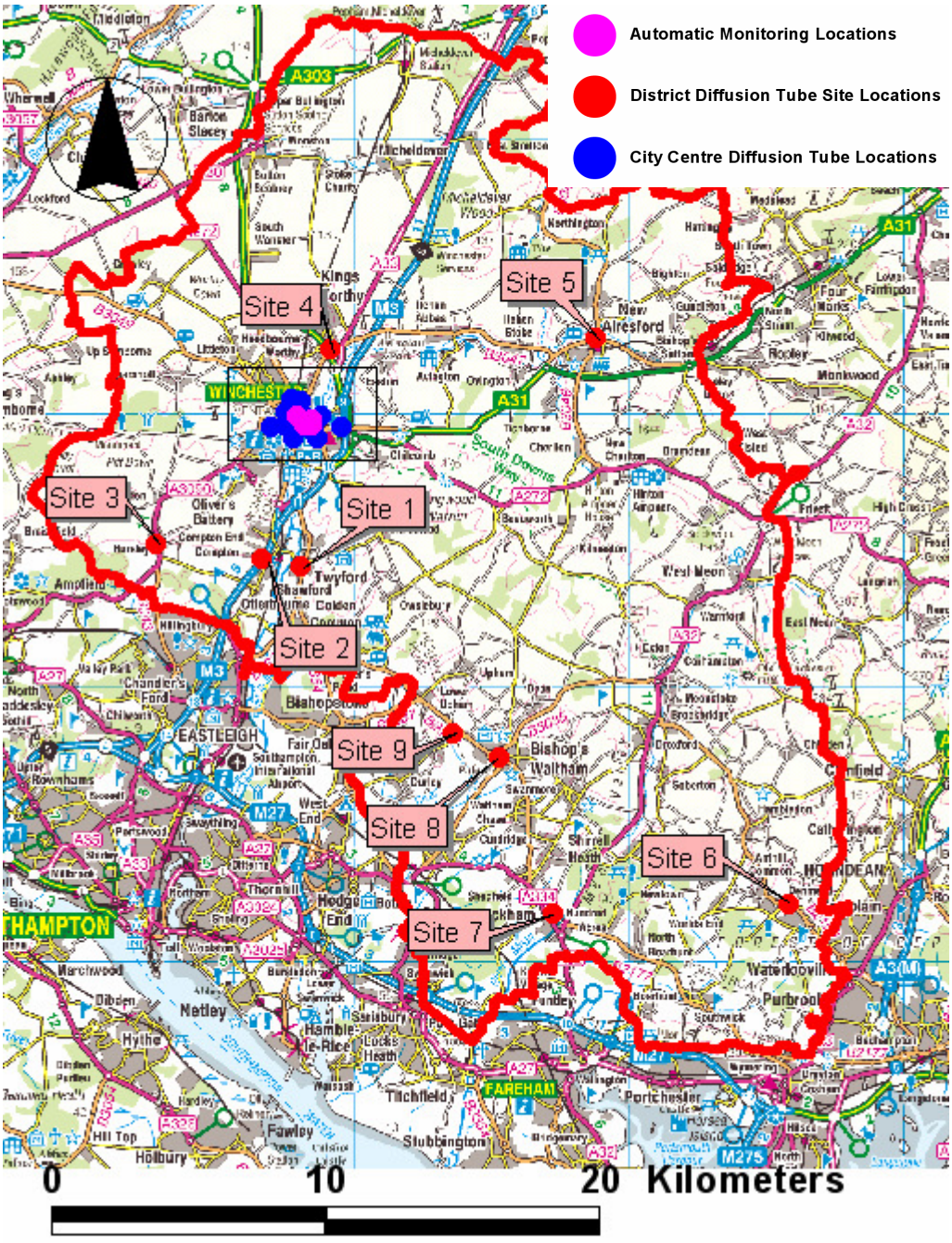



**Figure 1: Winchester District Showing Monitoring Site Locations**

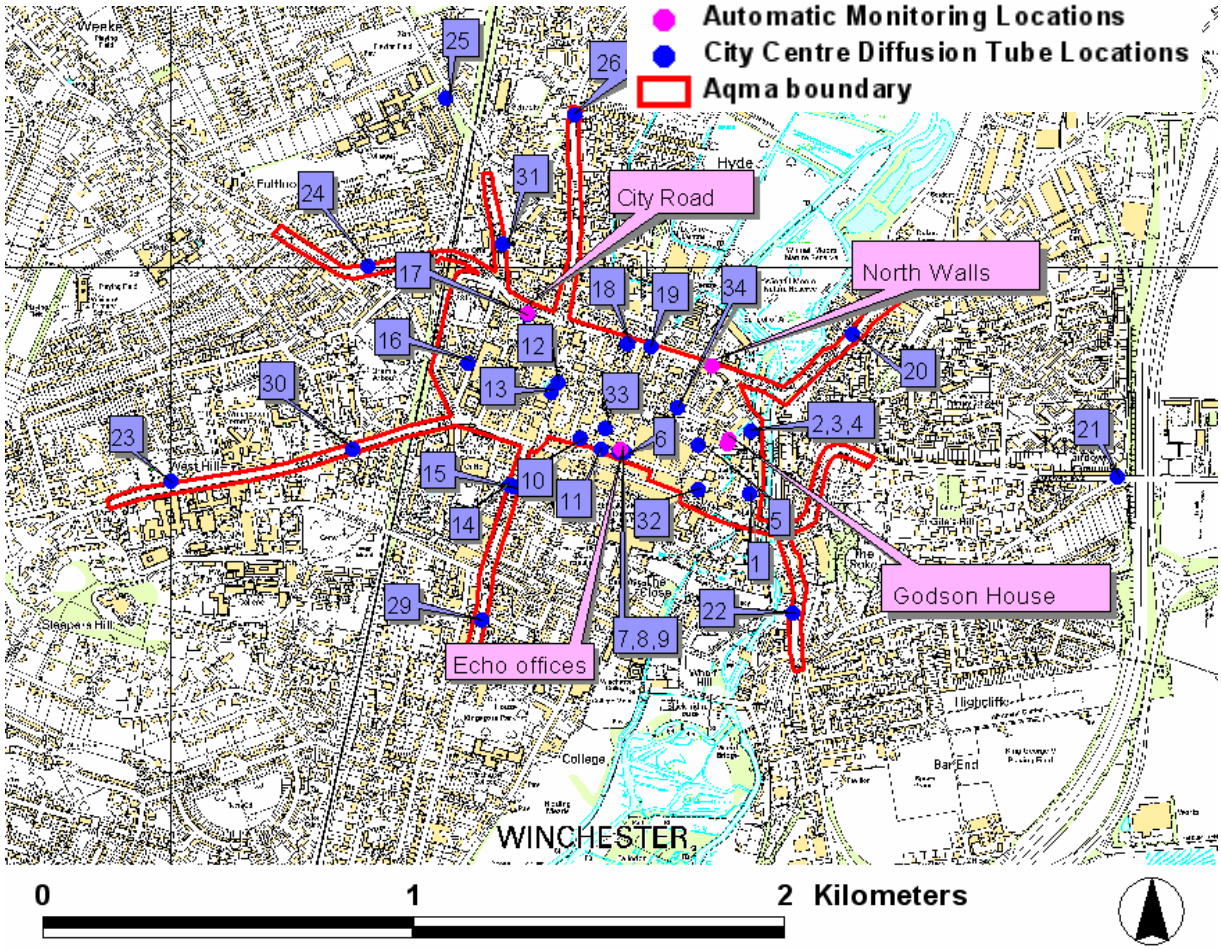



**Figure 2: Winchester District Showing Monitoring Site Locations**

# Appendix B: Monthly diffusion tube monitoring results

Table B1 Nitrogen Dioxide Diffusion Tube Monitoring Site Results- City Centre

| LOCATION | Concentration (µg/m$^3$) | | | | | | | | | | | Average (µg/m$^3$) | Date Capture |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 02/01/08 - 06/02/08 | 06/02/08 - 05/03/08 | 05/03/08- 04/04/08 | 04/04/08 - 20/05/08 | 20/05/08 - 18/06/08 | 18/06/08 - 23/07/08 | 23/07/08 - 20/08/08 | 20/08/08 - 17/09/08 | 17/09/08 - 17/10/08 | 17/10/08- 19/11/08 | 19/11/08 - 17/12/08 | | |
| Site 1, 10 Eastgate St | 38.0 | 44.1 | 40.3 | 38.4 | 39.6 | 31.7 | 31.9 | 31.7 | 36.3 | 36.1 | 47.4 | 37.8 | 100.0 |
| Site 2, Greyfriars 1 | 43.0 | 41.3 | 32.9 | 38.4 | 37.9 | 30.1 | 36.3 | 34.2 | 37.3 | 39.1 | 41.6 | 37.5 | 100.0 |
| Site 3, Greyfriars 2 | 38.7 | 49.6 | 35.0 | 35.5 | 38.9 | 34.9 | 36.3 | 33.4 | 37.3 | 39.7 | 47.1 | 38.8 | 100.0 |
| Site 4, Greyfriars 3 | 43.3 | 42.9 | 35.1 | 36.1 | 37.1 | 33.5 | 37.7 | 34.7 | 39.2 | 32.5 | 43.3 | 37.8 | 100.0 |
| Site 5, Friarsgate | 33.6 | 42.1 | 26.0 | 32.6 | 29.8 | 21.6 | 29.4 | 27.0 | 33.5 | 30.8 | 41.0 | 31.6 | 100.0 |
| Site 6, Upper Brook St | 78.5 | 58.1 | 39.0 | 47.3 | 46.8 | 33.3 | 36.5 | 41.8 | 47.4 | 40.2 | 52.8 | 47.4 | 100.0 |
| Site 7, Roadside Monitor | 40.0 | 58.4 | 43.5 | 48.7 | 54.4 | 34.8 | 33.8 | 39.4 | 46.7 | 40.6 | 57.2 | 45.2 | 100.0 |
| Site 8, Roadside Monitor | 40.2 | 59.9 | 44.5 | 52.8 | 56.8 | 32.9 | 39.5 | 37.0 | 49.6 | 41.3 | 51.7 | 46.0 | 100.0 |
| Site 9, Roadside Monitor | 40.6 | 57.0 | 45.0 | 52.8 | 55.4 | 37.3 | 36.7 | 38.9 | 48.0 | 40.9 | 55.1 | 46.2 | 100.0 |
| Site 10, St Georges St TC | 48.8 | 68.8 | 65.5 | 69.0 | 76.0 | 39.5 | 44.2 | 53.1 | 63.4 | 44.5 | 62.4 | 57.8 | 100.0 |
| Site 11, St Georges St Lad | | 65.1 | 56.1 | 59.9 | 60.8 | 50.4 | 65.7 | | 69.9 | | 57.5 | 60.7 | 72.7 |
| Site 12, Jewry St CH | 47.3 | 54.2 | 42.1 | | 46.0 | 34.0 | 51.6 | 45.6 | 46.0 | 38.6 | 44.8 | 45.0 | 90.9 |
| Site 13, Jewry St FK | 64.8 | 66.7 | 58.0 | 52.1 | 55.0 | 46.4 | 57.3 | 51.6 | 50.2 | 46.8 | 58.7 | 55.2 | 100.0 |
| Site 14, Southgate St DV | 45.5 | 53.8 | 39.1 | 40.3 | 45.1 | 32.1 | 33.9 | 36.5 | 44.3 | 40.0 | 52.5 | 42.1 | 100.0 |
| Site 15, Southgate St CH | 49.9 | 65.6 | 41.5 | 54.9 | 54.9 | 37.3 | 44.9 | 43.7 | 51.4 | 31.7 | 59.0 | 48.6 | 100.0 |
| Site 16, Sussex St | 36.3 | 54.7 | 32.8 | 45.1 | 46.8 | 30.5 | 40.3 | 40.8 | 54.6 | 47.6 | 52.9 | 43.9 | 100.0 |
| Site 17, City Road | 47.5 | 48.6 | 36.7 | 40.6 | 34.7 | 32.7 | 31.7 | 38.2 | 38.0 | 34.1 | 43.5 | 38.8 | 100.0 |
| Site 18, 74 Northwalls | 50.6 | 58.0 | 42.5 | 41.9 | 44.9 | 38.5 | 44.2 | 45.7 | 42.9 | 41.2 | 43.3 | 44.9 | 100.0 |
| Site 19, 15 Northwalls | 42.2 | 43.8 | 34.8 | 30.2 | 30.6 | | 31.6 | 31.1 | 34.3 | 35.7 | 37.8 | 35.2 | 90.9 |
| Site 20, Wales St | 37.4 | 37.3 | 30.9 | 33.2 | 34.2 | 23.2 | 29.4 | 28.5 | 33.6 | 35.2 | 41.3 | 33.1 | 100.0 |
| Site 21, Alresford Rd | 37.1 | 48.5 | 33.0 | 42.8 | 46.0 | | 26.0 | 38.6 | 40.5 | 32.3 | 37.7 | 38.3 | 90.9 |
| Site 22, Chesil St | 56.5 | 53.2 | 32.2 | 42.0 | 39.7 | 37.6 | | 29.2 | 42.2 | 38.3 | 43.1 | 41.4 | 90.9 |
| Site 23, Romsey Rd HL | 23.0 | 34.4 | 21.7 | 23.6 | 19.6 | 16.9 | 22.8 | 21.9 | 26.5 | 25.2 | 29.9 | 24.1 | 100.0 |
| Site 24, Stockbridge Rd | 27.9 | 41.5 | 22.5 | 26.6 | 24.4 | 13.1 | 18.4 | 20.0 | 31.4 | 25.3 | 31.3 | 25.7 | 100.0 |
| Site 25, Andover Rd | 31.5 | 48.1 | 30.7 | 37.2 | 40.3 | 20.4 | 23.7 | 26.4 | 36.9 | 33.1 | 43.3 | 33.8 | 100.0 |
| Site 26, Worthy Rd 1 | 36.6 | 35.6 | 30.2 | 29.6 | 31.3 | 25.6 | 27.9 | 29.8 | 35.9 | 28.8 | 37.8 | 31.7 | 100.0 |
| Site 27, Worthy Rd 2 | | 41.4 | 30.3 | 29.7 | 29.9 | 29.6 | 29.7 | 29.8 | 35.7 | 29.3 | 41.4 | 32.7 | 90.9 |
| Site 28, Worthy Rd 3 | 38.1 | 43.4 | 31.7 | 29.5 | 29.6 | 27.0 | 30.3 | 30.3 | 32.8 | 33.7 | 39.3 | 33.2 | 100.0 |
| Site29, St Cross Rd | 44.1 | 50.3 | 37.1 | 43.2 | 41.6 | 22.9 | 30.8 | 33.7 | | | 51.3 | 39.4 | 81.8 |
| Site 30, Romsey Road | 36.2 | 65.9 | 53.4 | | 68.1 | 36.3 | 52.3 | 58.6 | 58.2 | 36.7 | 65.8 | 53.1 | 90.9 |
| Site 31, Andover Rd | 40.4 | 50.5 | | 41.3 | 37.7 | 31.0 | 35.1 | 34.7 | 39.2 | 32.5 | 39.8 | 38.2 | 90.9 |
| Site 32, Bus Station | 41.2 | 52.7 | 40.8 | | 50.3 | 29.6 | | 27.9 | | 40.6 | 51.1 | 41.8 | 72.7 |
| Site 33, Parchment St | 34.4 | 43.6 | 27.0 | | 28.1 | 21.5 | | 26.0 | 31.9 | 29.1 | 35.5 | 30.8 | 81.8 |
| Site 34, Middle Brook St | 26.8 | 33.5 | 21.2 | | 23.3 | 16.0 | 19.5 | | 27.0 | 26.1 | 33.8 | 25.3 | 81.8 |

Table B2 Nitrogen Dioxide Diffusion Tube Monitoring Site Results- City Centre

| LOCATION | Concentration (µg/m$^3$) | | | | | | | | | | | Average (µg/m$^3$) | Date Capture |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 09/01/08 - 13/02/08 | 13/02/08 - 12/03/08 | 12/03/08 - 09/04/08 | 09/04/08 - 15/05/08 | 15/05/08 - 03/07/08 | 03/07/08 - 07/08/08 | 07/08/08 - 02/09/08 | 02/09/08 - 01/10/08 | 01/10/08 - 29/10/08 | 29/10/08 - 25/11/08 | 25/11/08 - 31/12/08 | | |
| Site 1 High St | 38.4 | | 31.7 | 37.0 | 29.6 | 27.2 | 26.4 | 35.9 | 30.8 | 37.3 | 39.9 | 33.4 | 90.9 |
| Site 2 Southdown Road | 38.2 | 39.6 | 37.6 | 32.6 | 33.9 | 29.3 | 22.5 | 37.2 | 37.0 | 41.4 | 47.5 | 36.1 | 100.0 |
| Site 3 Pelican Court | 21.4 | 20.4 | 16.4 | 19.3 | 13.5 | 10.9 | 11.0 | 15.5 | 15.5 | 19.5 | 25.3 | 17.2 | 100.0 |
| Site 4 Church Green Close | 53.0 | 54.0 | 47.0 | 26.2 | 24.2 | 24.5 | 25.1 | 25.3 | 29.8 | 30.9 | 36.3 | 34.2 | 100.0 |
| Site 5 West St/Broad St | 38.9 | 38.9 | 31.6 | 36.4 | 31.2 | 29.1 | 27.5 | 31.8 | 34.2 | 36.4 | 47.9 | 34.9 | 100.0 |
| Site 6 Hambledon Rd | 28.7 | 28.4 | 22.4 | 18.2 | 16.9 | 16.4 | 17.1 | 17.6 | 24.9 | 26.1 | 34.4 | 22.8 | 100.0 |
| Site 7 Winchester Rd | 42.6 | 37.1 | 34.1 | 32.5 | 31.2 | 27.3 | 26.5 | 31.0 | 31.7 | 39.0 | 41.4 | 34.0 | 100.0 |
| Site 8 Winchester Rd | 40.0 | 36.6 | 30.8 | 34.9 | 32.6 | 34.9 | 34.4 | 35.4 | 37.1 | 35.6 | 41.5 | 35.8 | 100.0 |
| Site 9 Whiteley Lane | 41.0 | 36.5 | 27.9 | 26.2 | 23.1 | 28.0 | 26.4 | 38.8 | 32.1 | 31.6 | 38.0 | 31.8 | 100.0 |

# Appendix C: QA:QC Data

## Diffusion Tube Bias Adjustment Factors

### Factor from Local Co-location Studies

Winchester City Council uses tubes provided and analysed by Gradko using 50% TEA (Triethanolamine) in water, which are typically exposed for four to six week periods.

The 2008 diffusion tube results have been corrected for bias using a locally derived bias adjustment factor of **1.02**. The factor was calculated following Defra guidance by comparing results from the triplicate co-location tubes located at the automatic monitoring stations. These results compare well with the national bias adjustment factor of 1.05 (Defra, 2010a).

The decision to use the local bias adjustment factor was based on guidance outlined in Box 3.3 of TG(09) (Defra, 2009). The diffusion tubes were exposed for 11 4-5 week periods during 2008. As the national factors represent 12 monthly exposure periods, it is considered more appropriate to use the local factor.

### PM Monitoring Adjustment

As outlined in Defra guidance, results from BAM monitors have been divided by a correction factor of 1.21. All data from years previous to 2008 have also been adjusted by this factor.

Results from the Osiris monitors have been bias adjusted by the Council using a factor calculated based on comparisons between results from the Osiris and BAM monitors co-located at the Background automatic site. In 2008, this factor was calculated to be 1.13, compared with 1.19 for 2007.

### QA/QC of automatic monitoring

Nitrogen dioxide is monitored continuously by means of a chemiluminescent analyser. $PM_{10}$ concentrations at the Echo Offices and Godson House sites are monitoring by an unheated Met One BAM 1020 analyser, and concentrations at the other two site are measured by Osiris. Concentrations of CO are measures using API M300E CO Gas Filter Correlation analysers.

The data collected from theses sites are subject to verification and ratification process that follows procedures detailed in the AEA Handbook and Defra technical guidance (Defra, 2009). This includes:

- Nightly automatic internal zero and span checks (IZS) to the gas analysers;
- fortnightly calibration of gas analysers to traceable primary gas standards;
- NOx analysers being checked to both NO and $NO_2$ gas standards;
- Six monthly servicing by original equipment provider;
- Data correction for zero and span drifts using Enview/Enviman software;
- Data ratification provided by an independent third party (Air Quality Consultants);
- All gasses used for calibration have been independently certified.

The Osiris monitors use a light scattering methodology to provide 15 minute readings for particle concentrations. The instruments are checked remotely every fortnight by mobile phone connection and the pump filters are changed quarterly by site visit. These instruments are on a yearly service contract.

### QA/QC of diffusion tube monitoring

In 2008, all diffusion tubes were prepared an analysed by Gradko using 50 % TEA in water. In accordance with Defra recommendations, from 2009, all tubes will be prepared using 20% TEA in water.

Gradko is accredited to UKAS BS EN ISO 9001 and have implemented Harmonisation Practical Guidance. Results from the WASP scheme show good performance and the laboratory precision is also good.

Precision of the tubes was assessed at three monitoring locations where triplicate tubes were located. Data for 2008 shows all sites have good precision with coefficients of variation for all sampling periods and locations being less than 20 percent. The precision and Accuracy spreadsheets for each of the triplicate sites are presented below.

**Greyfriars Triplicate site**

**Checking Precision and Accuracy of Triplicate Tubes**

AEA Energy & Environment
From the AEA group

| Diffusion Tubes Measurements | | | | | | | | | | Automatic Method | | Data Quality Check | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Period | Start Date dd/mm/yyyy | End Date dd/mm/yyyy | Tube 1 µgm$^{-3}$ | Tube 2 µgm$^{-3}$ | Tube 3 µgm$^{-3}$ | Triplicate Mean | Standard Deviation | Coefficient of Variation (CV) | 95% CI of mean | Period Mean | Data Capture (% DC) | Tubes Precision Check | Automatic Monitor Data |
| 1 | 02/01/2008 | 06/02/2008 | 22.0 | 19.8 | 22.2 | 21 | 1.3 | 6 | 3.3 | | | Good | |
| 2 | 06/02/2008 | 05/03/2008 | 21.2 | 25.4 | 22.0 | 23 | 2.3 | 10 | 5.6 | | | Good | |
| 3 | 05/03/2008 | 04/04/2008 | 16.9 | 17.9 | 18.0 | 18 | 0.6 | 4 | 1.6 | | | Good | |
| 4 | 04/04/2008 | 20/05/2008 | 19.7 | 18.2 | 18.5 | 19 | 0.8 | 4 | 2.0 | | | Good | |
| 5 | 20/05/2008 | 18/06/2008 | 19.4 | 19.9 | 19.0 | 19 | 0.5 | 2 | 1.2 | | | Good | |
| 6 | 18/06/2008 | 23/07/2008 | 15.4 | 17.9 | 17.2 | 17 | 1.3 | 7 | 3.1 | | | Good | |
| 7 | 23/07/2008 | 20/08/2008 | 18.6 | 18.6 | 19.3 | 19 | 0.4 | 2 | 1.0 | | | Good | |
| 8 | 20/08/2008 | 17/09/2008 | 17.5 | 17.1 | 17.8 | 17 | 0.3 | 2 | 0.8 | | | Good | |
| 9 | 17/09/2008 | 17/10/2008 | 19.1 | 19.1 | 20.1 | 19 | 0.5 | 3 | 1.4 | | | Good | |
| 10 | 17/10/2008 | 19/11/2008 | 20.1 | 20.3 | 16.7 | 19 | 2.0 | 11 | 5.1 | | | Good | |
| 11 | 19/11/2008 | 17/12/2008 | 21.3 | 24.2 | 22.2 | 23 | 1.5 | 6 | 3.6 | | | Good | |
| 12 | | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | | |
| | | | | | | | | | | Overall survey --> | | Good precision | |

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

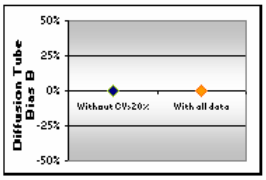
Site Name/ ID:

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

(Check average CV & DC from Accuracy calculations)

| 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
jaume.targa@aeat.co.uk
Version 03 - November 2006

## Automatic Roadside Monitor Triplicate site

### 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 (CV) | 95% CI of mean |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 02/01/2008 | 06/02/2008 | 20.5 | 20.6 | 20.8 | 21 | 0.2 | 1 | 0.4 |
| 2 | 06/02/2008 | 05/03/2008 | 30.0 | 30.7 | 29.2 | 30 | 0.7 | 2 | 1.8 |
| 3 | 05/03/2008 | 04/04/2008 | 22.3 | 22.8 | 23.1 | 23 | 0.4 | 2 | 1.0 |
| 4 | 04/04/2008 | 20/05/2008 | 25.0 | 27.0 | 27.1 | 26 | 1.2 | 5 | 3.0 |
| 5 | 20/05/2008 | 18/06/2008 | 27.9 | 29.1 | 28.4 | 28 | 0.6 | 2 | 1.5 |
| 6 | 18/06/2008 | 23/07/2008 | 17.8 | 16.9 | 19.1 | 18 | 1.1 | 6 | 2.8 |
| 7 | 23/07/2008 | 20/08/2008 | 17.3 | 20.3 | 18.8 | 19 | 1.5 | 8 | 3.7 |
| 8 | 20/08/2008 | 17/09/2008 | 20.2 | 19.0 | 19.9 | 20 | 0.7 | 3 | 1.6 |
| 9 | 17/09/2008 | 17/10/2008 | 23.9 | 25.4 | 24.6 | 25 | 0.7 | 3 | 1.8 |
| 10 | 17/10/2008 | 19/11/2008 | 20.8 | 21.2 | 21.0 | 21 | 0.2 | 1 | 0.4 |
| 11 | 19/11/2008 | 17/12/2008 | 29.3 | 26.5 | 28.2 | 28 | 1.4 | 5 | 3.6 |
| 12 | | | | | | | | | |
| 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 | |
| | | | |
| Overall survey --> | | Good precision | |

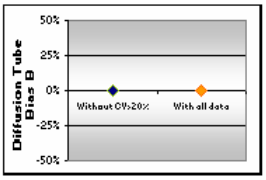
(Check average CV & DC from Accuracy calculations)

Site Name/ ID:

Precision: 11 out of 11 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
jaume.targa@aeat.co.uk
Version 03 - November 2006

## Worthy Road Triplicate site

### 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 (CV) | 95% CI of mean |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 02/01/2008 | 06/02/2008 | 18.8 | | 19.5 | 19 | 0.5 | 3 | 4.6 |
| 2 | 06/02/2008 | 05/03/2008 | 18.2 | 21.2 | 22.3 | 21 | 2.1 | 10 | 5.2 |
| 3 | 05/03/2008 | 04/04/2008 | 15.5 | 15.5 | 16.3 | 16 | 0.4 | 3 | 1.1 |
| 4 | 04/04/2008 | 20/05/2008 | 15.2 | 15.2 | 15.1 | 15 | 0.1 | 0 | 0.2 |
| 5 | 20/05/2008 | 18/06/2008 | 16.1 | 15.3 | 15.2 | 16 | 0.5 | 3 | 1.2 |
| 6 | 18/06/2008 | 23/07/2008 | 13.1 | 15.2 | 13.8 | 14 | 1.0 | 7 | 2.6 |
| 7 | 23/07/2008 | 20/08/2008 | 14.3 | 15.2 | 15.6 | 15 | 0.7 | 4 | 1.6 |
| 8 | 20/08/2008 | 17/09/2008 | 15.2 | 15.2 | 15.5 | 15 | 0.2 | 1 | 0.4 |
| 9 | 17/09/2008 | 17/10/2008 | 18.4 | 18.3 | 16.8 | 18 | 0.9 | 5 | 2.2 |
| 10 | 17/10/2008 | 19/11/2008 | 14.7 | 15.0 | 17.2 | 16 | 1.4 | 9 | 3.4 |
| 11 | 19/11/2008 | 17/12/2008 | 19.4 | 21.2 | 20.1 | 20 | 0.9 | 5 | 2.3 |
| 12 | | | | | | | | | |
| 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 | |
| | | | |
| Overall survey --> | | Good precision | |

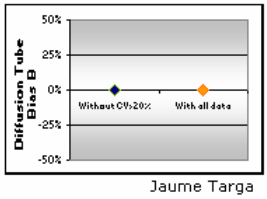
(Check average CV & DC from Accuracy calculations)

Site Name/ ID:

Precision: 11 out of 11 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
jaume.targa@aeat.co.uk
Version 03 - November 2006