



2010 Air Quality Progress Report for East Hampshire

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

April 2010

Local Authority Officer	Gemma Richards Environmental Health Officer
--------------------------------	--

Department	Environmental Services
Address	East Hampshire District Council, Penns Place, Petersfield, GU31 4EX
Telephone	01730 234322
e-mail	ehealth@easthants.gov.uk

Report Reference number	EHDC 2010 PR
Date	28 April 2010

Executive Summary

This report is East Hampshire District Council's 2010 Progress Report and forms part of the fourth review and assessment of air quality in East Hampshire. The assessment has been carried out in accordance with the Government's published Technical Guidance LAQM.TG (09).

The information that is provided in this report supplements and updates that given in the 2009 Air Quality Update which reviewed all nitrogen dioxide data held for Bordon and reported on the initial results of a new monitoring survey at height.

All relevant air quality monitoring data, transport information and emissions from industrial processes in the District have been considered in the production of this report. The Progress Report shows that the air quality objectives included in the Air Quality Regulations are likely to be achieved for all pollutants with the exception of nitrogen dioxide.

For nitrogen dioxide, the results from diffusion tube monitoring in Bordon show that the annual mean objective for nitrogen dioxide is exceeded at one location:

- Tube BR7 Corals (2) Chalet Hill, Bordon (first floor tube).

This supports the conclusions of the 2009 Air Quality Update and provides East Hampshire District Council with sufficient data to determine that declaring an Air Quality Management Area (AQMA) in Bordon is justified.

East Hampshire District Council needs to declare an AQMA in Bordon which includes the residential properties above Corals, High Street, Bordon. Current evidence suggests that an exceedence of the annual mean objective for NO₂ is only likely at this location in Bordon; therefore the boundary of the AQMA will cover the residential properties above Corals, 1-5 High Street, Bordon only. The aim will be to obtain approval for the declaration of an AQMA during Summer 2010.

The results for tube BR8 High Street (2), Bordon suggest there is not a strong case for declaring an AQMA which includes the first floor flat at this location. East Hampshire District Council will continue to monitor concentrations of NO₂ at this location and will review this decision on an annual basis.

The results for the remainder of monitoring positions fall below the air quality objectives, therefore a Detailed Assessment for these locations is not currently required.

Table of contents

1	Introduction	6
1.1	Description of Local Authority Area	6
1.2	Purpose of Progress Report	6
1.3	Air Quality Objectives	6
1.4	Summary of Previous Review and Assessments	8
2	New Monitoring Data	12
2.1	Summary of Monitoring Undertaken	12
2.2	Comparison of Monitoring Results with Air Quality Objectives	16
3	New Local Developments	25
3.1	Road Traffic Sources	25
3.2	Other Transport Sources	25
3.3	Industrial Sources	25
3.4	Commercial and Domestic Sources	25
3.5	New Developments with Fugitive or Uncontrolled Sources	25
4	Planning Applications	26
5	Conclusions and Proposed Actions	27
5.1	Conclusions from New Monitoring Data	27
5.2	Conclusions relating to New Local Developments	27
5.3	Other Conclusions	27
5.4	Proposed Actions	27
6	References	29

Appendices

Appendix 1: Map of East Hampshire

Appendix 2: QA/QC Data (including bias adjustment factors and short-term to long-term data adjustment).

Appendix 3: Maps Showing the Location of Nitrogen Dioxide Diffusion Tubes in East Hampshire

Appendix 4: Full Raw Dataset for Diffusion Tubes 2009 (monthly)

Appendix 5: Precision and Accuracy of Triplicate Tubes

Appendix 6: 2009 Diffusion Tube Data with Local and National Bias Adjustment Factors Applied

List of Tables

Table 1.1 Air Quality Objectives

Table 2.1 Details of Automatic Monitoring Sites

Table 2.2 Details of Non-Automatic Monitoring Sites

Table 2.3a Results of Automatic Monitoring of Nitrogen Dioxide (annual mean)

Table 2.3b Results of Automatic Monitoring of Nitrogen Dioxide (24 hour mean)

Table 2.4a Results of Nitrogen Dioxide Diffusion Tubes

Table 2.4b Summary of Results of 2009 Diffusion Survey at Height

Table 2.5a Results of PM10 Automatic Monitoring (annual mean)

Table 2.5b Results of PM10 Automatic Monitoring (90th percentile)

Table 4.1 Potential Future Developments with a Possible Impact on Air Quality

List of Figures

Figure 2.1.1 Location of Bordon Air Quality Monitoring Station

Figure 2.3 Trends in Annual Mean Nitrogen Dioxide Concentration Measured at Bordon Air Quality Station

Figure 2.2.1a Photographs of BR4 Corals (1) (lower tube) and BR7 Corals (2) (higher tube)

Figure 2.2.1b Photograph of BR5 High Street (1) (lower tube) and BR8 High Street (2) (higher tube)

1 Introduction

1.1 Description of Local Authority Area

East Hampshire is a rural District which borders West Sussex and Surrey and lies to the north of the urban areas of Portsmouth and Havant. The District covers an area of approximately 200 square miles and has a population of approximately 110,000 people. It is renowned for its attractive countryside, much of which is of an exceptionally high quality. Approximately 40% of the District lies within the East Hampshire Area of Outstanding Natural Beauty.

The District is based around the two market towns of Petersfield and Alton with other major centres at Whitehill, Bordon and Horndean. The rest of the District is characterised by many attractive villages, the largest of which are Liphook and Liss. The towns and villages contain many buildings and areas of architectural, archaeological and historic interest, which contribute greatly to the attractive appearance and character of the District's built environment.

The District is bisected by the A3 (Motorway and Trunk Road), which is a major transport link between London and Portsmouth. Other roads of local importance include the A31 (Farnham to Winchester), the A32 (Alton to Fareham), the A272 (Winchester to Petersfield), the A325 (A3 to Farnham via Bordon) and the A339 (Alton to Basingstoke). Rail services to London and the South coast stop at Liphook, Liss, Petersfield and Rowlands Castle. There are also stations at Alton and Bentley. The Mid Hants Watercress Line operates steam trains between Alton and Ropley.

East Hampshire has a buoyant local economy. There is a range of manufacturing and service industries, mainly in small to medium sized firms, and a significant public sector presence. The Ministry of Defence is also a major employer. In the countryside, agriculture remains an important sector of the local economy.

A map of East Hampshire is shown in Appendix 1.

1.2 Purpose of Progress Report

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

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

1.3 Air Quality Objectives

The air quality objectives applicable to Local Air Quality Management (LAQM) **in England** are set out in the Air Quality (England) Regulations 2000 (SI 928), and the Air Quality (England) (Amendment) Regulations 2002 (SI 3043). They are shown in Table 1.1. This table shows the objectives in units of microgrammes per cubic metre $\mu\text{g}/\text{m}^3$ (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 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2003
	5.00 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2010
1,3-Butadiene	2.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2003
Carbon monoxide	10.0 mg/m^3	Running 8-hour mean	31.12.2003
Lead	0.5 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2004
	0.25 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2008
Nitrogen dioxide	200 $\mu\text{g}/\text{m}^3$ not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2005
Particles (PM₁₀) (gravimetric)	50 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	40 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2004
Sulphur dioxide	350 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

1.4 Summary of Previous Review and Assessments

The First Review and Assessment of Air Quality

East Hampshire District Council completed the first review and assessment of air quality in December 2000¹. This assessment concluded that the air quality objectives contained in the Air Quality Regulations 1997 would be achieved throughout the District.

The Second Review and Assessment of Air Quality

East Hampshire District Council completed the second review and assessment of air quality in July 2005. This comprised of the following elements:

- Updating and Screening Assessment – August 2003²
- Progress Report – September 2004³
- Detailed Assessment – July 2005⁴

The Council carried out the Updating and Screening Assessment of air quality in August 2003. The results of this assessment showed that no pollutants were expected to exceed the air quality objectives and therefore there was no requirement to proceed to a Detailed Assessment. However the assessment highlighted several areas which the Council needed to investigate further. These included:

- Monitoring of nitrogen dioxide levels adjacent to the A3 Bramshott Chase
- Monitoring PM₁₀ at the Bordon Sandpit in Sleaford
- Discussion with the Mid Hants Watercress Line regarding public exposure to sulphur dioxide.

In 2004 the Council produced a Progress Report which investigated the issues raised in the 2003 Updating and Screening Assessment. The report also provided the latest nitrogen dioxide and PM₁₀ monitoring results from the air quality monitoring station at Horndean and from the nitrogen dioxide diffusion tube monitoring carried out across the District.

The results from the air quality monitoring station showed that the nitrogen dioxide and PM₁₀ concentrations were likely to meet the air quality objectives in 2004/05. The diffusion tube monitoring showed possible exceedences of the annual mean concentration of nitrogen dioxide in 2005 at the A3 Bramshott Chase and A325 Chalet Hill, Bordon. This meant that a Detailed Assessment of nitrogen dioxide was required for these locations.

In 2005 the Council commissioned Casella Stanger to undertake a Detailed Assessment of air quality adjacent to the A3 Bramshott Chase and A325 Chalet Hill, Bordon. Using dispersion modelling, it was predicted that the annual mean nitrogen dioxide concentrations would be below the annual mean objective and the EU limit value in all years at Bordon and Bramshott Chase. However, monitoring along the A3 at Bramshott Chase suggested a potential exceedence of the annual mean objective for nitrogen dioxide. Casella Stanger recommended that the air quality monitoring was continued in order to provide an annual average estimate for 2005. No AQMA was required at this time.

This Detailed Assessment was based on a worst case scenario as it ignored the Highways Agency's future development of a tunnel at Hindhead in Surrey which will improve traffic flow along the A3.

The Third Review and Assessment of Air Quality

East Hampshire District Council completed the third review and assessment of air quality in September 2009. This comprised of the following elements:

- Updating and Screening Assessment – June 2006⁵
- 2008 Detailed Assessment with 2008 Progress Report – May 2009⁶
- Air Quality Update: Shortened Detailed Assessment of nitrogen dioxide in Bordon – September 2009⁷

The Council carried out the Updating and Screening Assessment of air quality in June 2006. For nitrogen dioxide, the results from diffusion tube monitoring highlighted that the 2005 and 2010 annual mean objective for nitrogen dioxide may be exceeded at several monitoring locations in the District including:

- A3 Bramshott/Grayshott
- A3 Horndean/ Portsmouth Rd
- A325 Bordon

This meant that a Detailed Assessment of nitrogen dioxide was required for these locations.

In 2007 the Council experienced a significant turnover of staff within the Environmental Protection team including the loss of the air quality officer. This resulted in some loss of continuity with the review and assessment process and a loss of expertise in air quality.

At the end of 2007 the Council commissioned Faber Maunsell to undertake a Detailed Assessment of air quality adjacent to the A325 Bordon and A3 Horndean/Portsmouth Rd, but not the A3 Bramshott/Grayshott.

The reasons for excluding the A3 Bramshott/Grayshott relate to the construction of the A3 Hindhead tunnel, a major project being carried out by the Highways Agency to deliver quicker and more reliable journeys on a safer road between London and Portsmouth.

The majority of the tunnel construction work is located outside of East Hampshire within Waverley Borough Council's area. An Environmental Assessment of this scheme carried out for the Highways Agency in 2004 predicted that the alterations to the A3 will result in improvements to air quality within East Hampshire District Council's area⁸. The development was predicted to result in a lower exposure of traffic pollutants at residential properties at Bramshott Chase due to the realignment of the A3. Predictions demonstrated that annual mean nitrogen dioxide concentrations at locations with relevant public exposure will remain below the annual mean objective when the road works have been completed⁸. With this in mind the Council concluded to continue monitoring nitrogen dioxide in this area, but to not proceed to a Detailed Assessment at this time.

Further reasons why a Detailed Assessment of the A3 Bramshott/Grayshott was not carried out include:

- a. Conditions in Bramshott Chase are currently temporary and so monitoring results will only present a transient set of circumstances during the construction phase for the new A3.
- b. The current phase of the construction project has relocated the A3 at greater distance from the receptors that were of concern in the 2006 USA.
- c. Not all monitoring locations reported in the 2006 USA are at representative locations (i.e. residential facades), but either on commercial sites or much closer to the roadway than the nearest relevant exposure.
- d. The road works within East Hampshire are expected to be completed in December

2010 with the tunnel due to open mid 2011.

- e. The new road will be located at greater distance from existing sensitive receptors.

Using the AAQURE regional air quality dispersion model and reviewing monitoring data, the 2008 Detailed Assessment concluded that no Air Quality Management Area was required at either the A325/Bordon or A3 Horndean/Portsmouth Rd. The report predicted that the annual mean nitrogen dioxide concentrations would be below the annual mean objective and the EU limit value in all years at all locations.

The 2008 Detailed Assessment was first submitted to DEFRA in August 2008. Further information was submitted to DEFRA in October 2008 to address issues that had been identified during the appraisal process which included the proposal to submit a Progress Report as an appendix in the delayed Detailed Assessment.

In February 2009 after further communication with DEFRA regarding levels of nitrogen dioxide along the A325/Bordon the following course of action was agreed:

- To submit the next round 2009 USA by the end of April 2009 in accordance with the national timetable.
- To submit a shortened Detailed Assessment for the A325/Bordon at the end of August 2009 that focuses on monitoring results only and takes into account new monitoring sites located at high level.
- To make amendments to the 2008 Detailed Assessment detailed in the Council's letter to DEFRA dated 27/10/08 including a forward setting out that the report is the work of EHDC, that the latest bias adjustment data suggests that the results in the report may be optimistic and the agreed undertaking to review the position during 2009.

This course of action was completed in September 2009 with the submission of the 2009 Air Quality Update⁷. The purpose of this update was to determine whether or not the annual mean air quality objective for nitrogen dioxide was likely to be achieved in Bordon at the A325/ChaletHill junction. The report reviewed all monitoring data held for Bordon and included initial results of a new monitoring survey of nitrogen dioxide concentrations at first floor level.

The results of this assessment showed a likely exceedence of the annual mean objective for nitrogen dioxide at one location, tube BR7 located above Corals, High Street, Bordon. East Hampshire District Council concluded that an Air Quality Management Area (AQMA) would be required for this location and proposed to review this position early in 2010 when a complete dataset for 2009 would be available.

Results for 2009 are discussed in detail in section 2 of this report.

The Fourth Review and Assessment of Air Quality

East Hampshire District Council is currently completing the fourth review and assessment of air quality.

The Council carried out the Updating and Screening Assessment⁹ of air quality in April 2009. The results of this assessment showed that no pollutants were expected to exceed the air quality objectives, with the exception of nitrogen dioxide at the A325/ChaletHill junction in Bordon.

Previous report	Date produced	Brief outcome
LAQM Review & Assessment Report	December 2000	Air quality objectives achieved
Updating and Screening Assessment	August 2003	Air quality objectives achieved, but identified that several areas require further investigation.
Progress Report	September 2004	Addressed areas raised in 2003 USA. Identified that a Detailed Assessment was required for nitrogen dioxide at A3 Bramshott Chase and A325 Chalet Hill/ Bordon.
Detailed Assessment	July 2005	Air quality objectives achieved
Updating and Screening Assessment	June 2006	Identified that a Detailed Assessment was required for nitrogen dioxide at A3 Bramshott/Grayshott, A325 Chalet Hill/Bordon and A3 Horndean/Portsmouth Road
Detailed Assessment	August 2008	Predicted air quality objectives achieved at A3 Horndean/Portsmouth Road and A325 Chalet Hill/Bordon, but some concern that results in the report may be optimistic. Some minor alterations were made to the report as agreed with DEFRA.
2008 Detailed Assessment with 2008 Progress Report	May 2009	2008 Detailed Assessment submitted with agreed changes including 2008 Progress Report attached as an Appendix. Air quality objectives achieved with exception of nitrogen dioxide at the A325/ Chalet Hill, Bordon. EHDC undertook to review the position during 2009.
Updating and Screening Assessment	April 2009	Air quality objectives achieved, but highlighted Bordon being reviewed during 2009
Air Quality Update: Shortened Detailed Assessment of nitrogen dioxide in Bordon	September 2009	Likely exceedence of the annual mean objective for nitrogen dioxide at A325/Chalet Hill junction. EHDC to review position and determine the extent of AQMA early in 2010 when a complete dataset for 2009 available.

analysers remain suitable for use for the purpose of LAQM, TG(09) recommends that the data collected should be adjusted using the Kings College Volatile Correction Model (VCM).

The VCM has been used to correct the TEOM data collected for the period January to June 2009. Details of this are provided in Appendix 2.

In July 2009 the TEOM analyser was upgraded with a FDMS instrument using a grant from DEFRA. Advice was sought from the Local Authority Air Quality Helpdesk during this process due to concerns about changes to the drier in relation to meeting the EU reference method. The Helpdesk recommended that the order for the retrofit should not be cancelled, but suggested upgrading the drier to the CB model. This advice was followed. The FDMS drier is scheduled to be changed every 12 months because their efficiency drops away significantly after this period regardless of the type of drier installed.

Following a QA/QC audit to the Bordon air quality station carried out by AEA on 16/03/10 it was brought to the Council's attention that the FDMS analyser fitted in July 2009 had not been set up correctly. Incorrect configuration settings have resulted in data automatically being corrected to the wrong temperature and pressure which means the data is not compliant with Directive requirements and may carry an additional bias error of about 10%. A flow fault was also identified during the audit which will have also affected the quality of the data collected.

Attempts to address this issue are taking place at the time of writing this report (March/April 2010); investigations are being made into whether historical ambient temperature and pressure measurements from the FDMS have been recorded which would allow the mass concentration measurements to be corrected in Excel. Data is also currently being analysed to identify a step change since the flow leak was fixed. Depending on the findings of these actions, PM₁₀ data collected between July and December 2009 will either be corrected or deemed invalid. Should it be possible to correct the FDMS results, data from other nearby stations will also be analysed to consider the validity of the FDMS results and to ensure comparability.

Table 2.1 Details of Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref	Pollutants Monitored	Monitoring technique	In AQMA	Relevant Exposure	Distance to kerb of nearest road	Worst-case Location
Bordon	Urban background	479646, 135341	NO ₂	Chemiluminescent analyser	No	No	4m	N
			PM ₁₀	TEOM Jan-Jun/FDMS July-Dec				

The data from the Bordon air quality station is collected via a GSM modem. Data management is carried out by Casella ETi who screen and validate the raw data and provide the Council with written reports of the results on a quarterly basis. All monitoring data collected by East Hampshire District Council provided in report has been ratified.

QA/QC data is provided in Appendix 2.

2.1.2 Non-Automatic Monitoring

Nitrogen dioxide is also measured in East Hampshire using diffusion tubes. During 2009 nitrogen dioxide concentrations were measured at 19 locations in East Hampshire. The tubes are supplied and analysed by Gradko International Ltd and prepared by using 50% v/v TEA in acetone methodology. Gradko International Ltd is a UKAS accredited laboratory. Further details on the QA/QC of the diffusion tubes can be seen in Appendix 2. Appendix 2 also discusses the bias adjustment factor used in this report. Maps showing the locations of the diffusion tube monitoring sites can be seen in Appendix 3.

Changes to diffusion tube positions

In January 2009 additional diffusion tubes were placed at first floor level along the A325/High Street in Bordon to investigate whether ground floor concentrations measured at the façade of commercial premises are representative of higher floors with residential use. The new tubes are:

BR7 - Bordon, Corals (2)
BR8 - Bordon, High Street (2)

Additional tubes were also placed along the A325/High Street to investigate nitrogen dioxide concentrations away from the junction with Chalet Hill. The new tubes are:

BR9 - Bordon, 11 High Street (1)
BR10 - Bordon, 11 High Street (2)

No tubes were discontinued during 2009.

Table 2.2 Details of Non- Automatic Monitoring Sites

Site name	Site Type ^a	OS Grid Ref	In AQMA	Relevant Exposure	Tube height (m)	Distance from kerb (m)	Worst-case Location
AB1 Alton, Orchard House	UB	472109, 139487	N	Yes	3	N/A	N/A
BR4 Bordon, Corals (1) Chalet Hill	RS	479666, 135354	N	No Relevant exposure at 1 st /2 nd level	2.56	2.9	Yes
BR7 Bordon, Corals (2) Chalet Hill	RS	479666, 135354	N	Yes	3.31	2.9	Yes
BR1 Bordon, Ashmead	RS	479707, 135438	N	Yes	2	10	No
BR2 Bordon, Chalet Court	RS	479695, 135356	N	No	1.5	6	No
BR3 Bordon, 10 Chalet Hill	RS	479711, 135321	N	No Relevant exposure at 1 st floor level	2	2.4	Yes
BR5 Bordon, High Street (1)	RS	479654, 135312	N	No Representative of relevant exposure	2.26	1.9	Yes
BR8 Bordon, High Street (2)	RS	479654, 135312	N	Yes	3.17	1.9	Yes
BR6 Bordon, Air Quality Cabin (3 tubes co-located)	RS	479646, 135341	N	No Representative of relevant exposure	2	4.8	No
BR9 Bordon, 11 High Street (1)	RS	479642, 135278	N	No	2	6	Yes
BR10 Bordon, 11 High Street (2)	RS	479642, 135278	N	Representative of relevant exposure	2	1.4	No
BU1 Bordon, Bassenthwaite Gdns	UB	479795, 136267	N	Yes	1.7	N/A	N/A
WR1 Whitehill, Petersfield Rd	RS	479314, 134307	N	No Residential façade is approx 18m from road	3.25	1	Yes
BramR1 Bramshott A3 South, Chase Villas	RS	487134, 133881	N	Yes	1.7	10	Yes
PB1 Petersfield, Town Hall	UB	474989, 123241	N	No	2	N/A	N/A
PR1 Petersfield, Lavant Court	RS	474389, 123518	N	No Residential façade approx 3m away	2	3.6	Yes
HR1 Horndean, London Road	RS	470554, 113582	N	Yes	2.77 ^b	1.9	Yes
HR2 Horndean, Roundabout	RS	470676, 113174	N	No	2	1.9	Yes
HR3 Horndean Catherington Lane	RS	469766, 112636	N	Yes	1.7	3	Yes

a RS = roadside
UB = urban background

b tube moved higher on 30/07/09 due to vandalism. Was 2m, moved to 2.77m

2.2 Comparison of Monitoring Results with Air Quality Objectives

2.2.1 Nitrogen Dioxide

The Government and the Devolved Administrations have adopted two air quality objectives for nitrogen dioxide (NO₂); an annual mean concentration of 40 µg/m³, and a 1-hour mean concentration of 200 µg/m³ not to be exceeded more than 18 times per year.

Automatic Monitoring Data

The measured annual mean concentration of nitrogen dioxide at the Bordon air quality station for 2009 falls below the air quality objective of 40µg/m³ and there were no exceedances of the hourly mean objective of 200µg/m³. This is shown in tables 2.3a and 2.3b.

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

Site ID	Within AQMA?	Data Capture for full calendar year 2009 %	Annual mean concentrations (µg/m ³)		
			2007	2008	2009
Bordon	N	99.7	30.8* (40)	27.6	24.9

*Bordon station was switched off 25/05/07 – 11/10/07 due to the failure of the air conditioning unit. Data capture during this year was 58%. Annualised annual mean in given in brackets. Calculations showing adjustment to 2007 annual mean given in appendix H of 2008 Detailed Assessment.

Figure 2.3 Trends in Annual Mean Nitrogen Dioxide Concentration Measured at Bordon Air Quality Station

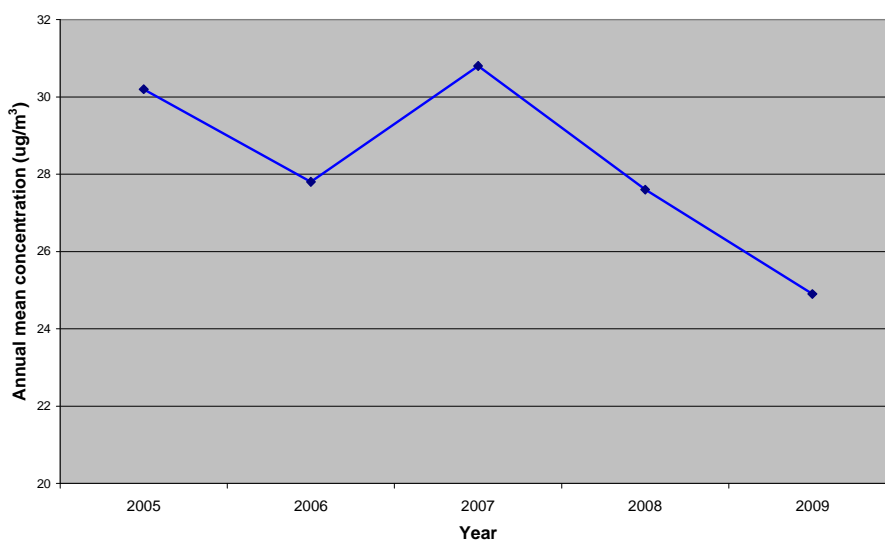


Figure 2.3 suggests that levels of nitrogen dioxide have decreased in this location since monitoring began in 2005.

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

Site ID	Within AQMA?	Data Capture for full calendar year 2009 %	Number of Exceedences of hourly mean (200 µg/m ³)		
			2007	2008	2009
Bordon	N	99.7	0 (117 µg/m ³)	0	0

*Bordon station was switched off 25/05/07 – 11/10/07 due to the failure of the air conditioning unit. Data capture during this year was 58% (99.8th %ile of hourly means in brackets)

The results for 2007 are discussed in more detail in the 2008 Detailed Assessment⁶. The 99.8th percentile for 2007 was calculated using the guidance contained in paragraph A1.218, Annex 1 of TG(09)¹⁰.

Diffusion Tube Monitoring Data

Annual means of nitrogen dioxide measured using diffusion tubes are shown in Table 2.4.

Where less than 9 months data was available for a monitoring location, the results have been annualised following the guidance contained in Box 3.2 of TG(09)¹⁰. Further details on how data was annualised is provided in Appendix 2. Results in bold indicate an exceedence of the annual mean objective for nitrogen dioxide of 40µgm³. A full dataset showing monthly mean values for 2009 is provided in Appendix 4.

All data has been reviewed and the most suitable bias-adjustment factor available has been applied. In deciding which bias adjustment factor to apply consideration has been given to guidance in Box 3.3 of TG(09)¹⁰ and the advice of the air quality helpdesks' websites. Further information on the choice of the bias adjustment factor used for 2009 data is provided in Appendix 2. Further information on bias adjustment factors used for earlier years' data can be found in previous review and assessment reports.

Local bias adjustment factors have been calculated using the AEA Group's spreadsheet "Checking Precision and Accuracy of Triplicate Tubes"¹¹. A copy of the spreadsheet completed for 2009 data is available in Appendix 5. National bias adjustment factors were obtained from the Review and Assessment Helpdesk's database (v03/10)¹².

Most of the nitrogen dioxide concentrations are measured at roadside locations. Concentrations of nitrogen dioxide at the location of nearest relevant exposure may be lower as they are further away from the road.

Table 2.4 Results of Nitrogen Dioxide Diffusion Tubes

Site ID	Site name	Within AQMA?	Data Capture 2009 %	Annual mean concentrations ($\mu\text{g}/\text{m}^3$)		
				2007 ^a	2008 ^b	2009 ^c
AB1	Alton, Orchard House	No	67	17.2	17	14.8
BR4	Bordon, Corals (1) Chalet Hill	No	100	48.3	48	44.9
BR7	Bordon, Corals (2) Chalet Hill	No	92			42.4
BR1	Bordon, Ashmead	No	100	26.3	25	22.0
BR2	Bordon, Chalet Court	No	100	28.8	26	24.6
BR3	Bordon, 10 Chalet Hill	No	100	31.4	30	29.5
BR5	Bordon, High Street (1)	No	92	47.8	43	41.3
BR8	Bordon, High Street (2)	No	100			36.2
BR6	Bordon, Air Quality Cabin (3 tubes co-located)	No	92	29.0	27	24.6
			92	28.8	27	24.1
			100	30.8	27	25.1
BR9	Bordon, 11 High Street (1)	No	83		33	34.4
BR10	Bordon, 11 High Street (2)	No	100			32.1
BU1	Bordon, Bassenthwaite Gdns	No	100		15	13.5
WR1	Whitehill, Petersfield Rd	No	100	40.7	33	33.7
BramR1	Bramshott A3 South, Chase Villas	No	100	23.9	17	15.0
PB1	Petersfield, Town Hall	No	92	18.7	16	15.3

East Hampshire District Council

Site ID	Site name	Within AQMA?	Data Capture 2009 %	Annual mean concentrations ($\mu\text{g}/\text{m}^3$)		
				2007 ^a	2008 ^b	2009 ^c
PR1	Petersfield, Lavant Court	No	100		34	29.7
HR1	Horndean, London Road	No	75	34.6	38	36.9
HR2	Horndean, Roundabout	No	100	36.1	36	32.5
HR3	Horndean Catherington Lane	No	100		24	21.5

a – Bias adjusted using the national bias adjustment factor of 0.98. No local bias adjustment factor available for 2007.

b – Bias adjusted using the locally derived factor of 0.94. Details of this bias adjustment factor available in Appendix 2 of 2009 USA.

c – Bias adjusted using the locally derived factor of 0.92. Details of this bias adjustment factor can be found in Appendix 2.

Blue cells indicate data has been annualised. Further information on the estimation of annual mean concentrations from short-term monitoring data for 2007 and 2008 can be found in 2008 Detailed Assessment and Progress Report and 2009 USA.

Further information on the estimation of 2009 annual mean concentrations can be found in Appendix 2

Green cells indicate new monitoring positions for 2009 which have been placed at height

With the exception of the tubes in Bordon which are discussed in the next section of this report, measured annual mean concentrations of nitrogen dioxide fall below the air quality objective of $40 \mu\text{g}/\text{m}^3$ at all locations.

The results for tube BramR1 which is located in Bramshott in the vicinity of the alterations to the A3 and construction of the Hindhead tunnel continue to show a reduction in concentrations of nitrogen dioxide.

Nitrogen dioxide diffusion tube data in Bordon, Hampshire

Table 2.4 shows exceedences of the annual air quality objective $40 \mu\text{g}/\text{m}^3$ at the following monitoring locations:

- BR4 - Corals (1) Chalet Hill;
- BR7 - Corals (2) Chalet Hill; and
- BR5 - High Street (1).

The 2009 Air Quality Update report highlighted that concentrations were likely to exceed the annual air quality objective at these locations and proposed to review the results for 2009 once a full year's data had been collected.

Tubes BR4 and BR5 are not considered to be representative of relevant public exposure. They are located at ground floor level outside commercial premises. The closest relevant public exposures are residential premises located at first floor height. Tube BR4 is attached to a lamp post in front of a commercial façade and BR5 is located on rain water goods in front of a commercial façade. The Corals building is one of the tallest buildings in this area and is three storeys high. The majority of the other buildings in this commercial parade are two storeys high.

Tube BR7 forms part of a survey which began in January 2009. Additional diffusion tubes were located at the same location as BR4 (Corals (1) Chalet Hill) and BR5 (High Street (1)), but closer to first floor level to investigate whether ground floor concentrations are representative of levels at first floor height.

Figure 2.2.1a Photographs of BR4 Corals (1) (lower tube) and BR7 Corals (2) (higher tube)



Red circles mark position of diffusion tubes

Figure 2.2.1b Photograph of BR5 High Street (1) (lower tube) and BR8 High Street (2) (higher tube)



Red circles mark position of diffusion tubes

Additional tubes BR9 and BR10 were also located at 11 High Street to investigate concentrations further away from the A325/Chalet Hill junction.

The results for the new diffusion tubes in Bordon indicate that ground floor concentrations of nitrogen dioxide are not representative of higher floors. This is highlighted in table 2.5 below. The extent of the reduction in concentrations appears to fall off with distance from the A325/Chalet Hill junction as lower concentrations of nitrogen dioxide were measured at 11 High Street which is approximately 70m south west of the junction.

Table 2.5 Summary of results of 2009 diffusion tube survey at height, Bordon

Site ID	Site name	Height of tube from ground (m)	Annual mean concentrations ($\mu\text{g}/\text{m}^3$)	Reduction in concentration
BR4	Corals (1) Chalet Hill	2.56	44.9	Increase in height of 0.75m achieves reduction in concentration of 2.5 $\mu\text{g}/\text{m}^3$
BR7	Corals (2) Chalet Hill	3.31	42.4	
BR5	High Street (1)	2.26	41.3	Increase in height of 0.91m achieves reduction in concentration of 5.1 $\mu\text{g}/\text{m}^3$
BR8	High Street (2)	3.17	36.2	
BR9	11 High Street (1)	2.6	34.4	Increase in height of 0.65m achieves reduction in concentration of 2.3 $\mu\text{g}/\text{m}^3$
BR10	11 High Street (2)	3.25	32.1	

Table 2.5 shows that although concentrations of nitrogen dioxide exceed the $40\mu\text{g}/\text{m}^3$ air quality objective at BR5 (ground floor level), concentrations of nitrogen dioxide at BR8 (first floor level), fall below the air quality objective of $40\mu\text{g}/\text{m}^3$. BR8 is considered representative of relevant public exposure at this location.

The results for tubes BR4 and BR7 also show that concentrations of nitrogen dioxide decrease with height, however an exceedence of the $40\mu\text{g}/\text{m}^3$ objective still exists at the higher position of BR7.

It should be noted that tube BR7 is located a small distance away from the façade of the first floor flat. It was not safe to position the tube any higher, or closer to the window of the relevant receptor. It is likely that concentrations at the relevant receptor are lower than the measured $42.4\mu\text{g}/\text{m}^3$, however on the balance of probabilities it appears likely that an exceedence of the objective will still exist at the building façade of the residential premises.

The new sites at BR9 and BR10 fall below the annual air quality objective of $40\mu\text{g}/\text{m}^3$.

In light of the final results for the 2009 survey at height which show a likely exceedence of the annual mean objective for nitrogen dioxide at one location, East Hampshire District Council considers it necessary to declare an Air Quality Management Area in Bordon which will include the residential properties above Corals, High Street, Bordon.

As concentrations at tube BR8 fall below the annual air quality objective it is not necessary to declare an AQMA which includes the first floor flat at 9 High Street Bordon. The boundary of the AQMA should cover the residential properties above the Corals building only (1 - 5 High Street, Bordon).

Monitoring continues at all positions discussed above and results for BR5 and BR8 will be reviewed on an annual basis. In making the decision not to include the first floor flat close to BR8 within the AQMA regard has also been paid to the national bias adjustment factor. This would increase the concentration at BR8 from $36\mu\text{g}/\text{m}^3$ to $39\mu\text{g}/\text{m}^3$, however on the balance of probabilities it appears unlikely that an exceedence of the objective will exist at the building façade of the residential premises because tube BR8 is located a small distance away from the façade of the first floor flat.

Further information on the bias adjustment factors used in this report is provided in Appendix 2.

Estimate of population exposure

TG(09) requires local authorities to estimate the number of people exposed to pollution concentrations above the objectives and the maximum pollutant concentration (measured or modelled) at a relevant receptor location. This information is usually provided within a Detailed Assessment.

A full assessment of population exposure to exceedences and the magnitude of reduction required will be considered within the Further Assessment which will be submitted within 12 months of designating the AQMA. This course of action is suggested by DEFRA in their appraisal of the 2009 Air Quality Update¹³.

2.2.2 PM₁₀

The Government and the Devolved Administrations have adopted two Air Quality Objectives for fine particles (PM₁₀), which are equivalent to the EU Stage 1 limit values in the first Air Quality Daughter Directive. The objectives are $40\mu\text{g}/\text{m}^3$ as the annual mean, and $50\mu\text{g}/\text{m}^3$ as the fixed 24-hour mean to be exceeded on no more than 35 days per year, to be achieved by the end of 2004.

In view of the ongoing investigations to recover the FDMS PM₁₀ data from July to December 2009, no PM₁₀ data for the period July to December 2009 is provided in this report. Should the FDMS data be recoverable, an update on the concentrations for 2009 will be provided in the 2011 Progress Report. PM₁₀ concentrations provided in this report have been calculated from the monitoring period of six months from January to June 2009. Data has been annualised in accordance with the guidance contained in Box 3.2 of TG(09)¹⁰. Further details on how the data was annualised and the application of the VCM is provided in Appendix 2.

Table 2.5a Results of PM₁₀ Automatic Monitoring: Comparison with Annual Mean Objective

Site ID	Within AQMA	Data capture for calendar year 2009 %	Data Capture for monitoring period %	Annual mean concentrations ($\mu\text{g}/\text{m}^3$)	
				2008	2009 ^a
Bordon air quality station	No	50	100	19.8	21.4

^a - Results for 2009 have been annualised following the methodology contained in Box 3.2 of TG(09) because monitoring was not carried out for the full year.

TG(09)¹⁰ recommends that for short term objectives, if data capture is less than 90% it is only appropriate to present the results as percentiles. The 90th percentile roughly equates to the 24-hour PM₁₀ objective. As data capture for PM₁₀ at the Bordon station during 2009 was less than 90% the data in Table 2.5b is presented as the 90th percentile. The 90th percentile was calculated following the guidance contained in paragraphs A1.218 of TG(09)¹⁰.

East Hampshire District Council

Table 2.5b Results of PM₁₀ Automatic Monitoring: Comparison with 24-hour Mean Objective

Site ID	Within AQMA?	Data capture for calendar year 2009 %	Data capture for monitoring period %	90th percentile for comparison against hourly mean objective of 50 µg/m³ 2009
Bordon air quality station	No	50	100	40.3

The results show that the annual mean concentration of PM₁₀ in 2009 was less than the annual mean objective of 40µg/m³ and the 90th percentile was less than the 24-hour objective of 50µg/m³.

2.2.3 Other pollutants monitored

No monitoring of carbon monoxide, benzene, 1,3-butadiene, lead or sulphur dioxide is currently undertaken by East Hampshire District Council.

2.2.4 Summary of Compliance with Air Quality Strategy Objectives

East Hampshire District Council has measured concentrations of nitrogen dioxide above the annual mean objective at one relevant location and **needs to declare an Air Quality Management** that includes the residential properties above Corals, High Street, Bordon.

3 New Local Developments

3.1 Road Traffic Sources

There have been no new road traffic sources in East Hampshire since the 2009 USA.

3.2 Other Transport Sources

There have been no new transport sources in East Hampshire since the 2009 USA.

3.3 Industrial Sources

There have been no new or newly identified industrial sources since the 2009 USA.

3.4 Commercial and Domestic Sources

There have been no new or newly identified commercial or domestic sources since the 2009 USA.

3.5 New Developments with Fugitive or Uncontrolled Sources

There have been no new or newly identified developments with sources of fugitive or uncontrolled particulate matter since the 2009 USA.

East Hampshire District Council confirms that there are no new or newly identified local developments which may have an impact on air quality within the Local Authority area.

4 Planning Applications

There have been no new housing, commercial or public developments approved in East Hampshire since the 2009 USA which are likely to have an impact on air quality, for example as a result of significantly changed traffic flows. There have however been recent pre-application consultations and requests for screening opinions for possible future developments which could impact air quality. These are detailed in Table 4.1.

Table 4.1 Possible future developments with an impact on air quality

EH ref	Date	Planning ref	Site address or location	Proposal	Possible impact on air quality?	Current stage of proposal
SERV/53300/09	Jul-09	None	Waterbrook Estate, Waterbrook Road, Alton, GU34 2UD	Possible waste transfer station	Dust - air quality assessment requested	Pre-application advice
SERV/58832/09	Jul-09	F30667/012	Bass Sports & Social Club, Anstey Road, Alton, GU34 2RL	Request for Screening Opinion - Supermarket (5270sqm), Parking, Loading Area, Associated landscaping and access	Introduction of new car parking and alterations to traffic flows close to sensitive receptors. Possible impact on local air quality by increasing emissions	Request for screening opinion
SERV/55811/10	Feb-10	F24076/010	Former George Gale Brewery site, London Road, Horndean, Waterlooville, PO8 0DA	Request for Screening Opinion - Residential Development	Close to A3 and inside area where concentrations of nitrogne dioxide are close to annual objective. Possible changes to traffic flow	Request for screening opinion

These will be considered in more detail in the next Updating and Screening Assessment.

5 Conclusions and Proposed Actions

5.1 Conclusions from New Monitoring Data

The final results for 2009 support the conclusions of the 2009 Air Quality Update which reviewed all nitrogen dioxide data held for Bordon and reported the initial results of a new monitoring survey at height.

An exceedence of the annual mean NO₂ objective has been identified at one location in East Hampshire at:

- Tube BR7 Corals (2) Chalet Hill, Bordon.

This location is considered representative of relevant public exposure.

East Hampshire District Council therefore considers it necessary that an Air Quality Management Area is created in Bordon which includes the residential properties at this location. Current evidence suggests that an exceedence of the annual mean objective for NO₂ is only likely at this location in Bordon; therefore at this time the boundary of the AQMA will cover the residential properties above Corals, 1-5 High Street, Bordon only.

The results for tube BR8 High Street 2 suggest there is not a strong case for declaring an AQMA which includes the first floor flat at this location. East Hampshire District Council will continue to monitor concentrations of NO₂ at this location and will review this decision on an annual basis.

The results for the remainder of monitoring positions fall below the air quality objectives, therefore a Detailed Assessment for these locations is not currently required.

Measured concentrations of NO₂ at tube HR1 London Road, Horndean are close to the annual mean objective when the national bias adjustment factor is applied. The data capture rate at this location was poor in 2009 with only 9 months data being available due to vandalism. The diffusion tube has been raised in height to improve data collection. East Hampshire District Council will continue to monitor concentrations of NO₂ at this location and will review the concentrations in the 2011 Progress Report.

5.2 Conclusions relating to New Local Developments

No new local developments have been identified that require more detailed consideration in the next USA.

5.3 Other Conclusions

There are three possible future developments which if granted planning approval will need to be considered in the next USA. These are summarised in section 4 of this report.

5.4 Proposed Actions

- 1) East Hampshire District Council plan to declare an AQMA in Bordon at the junction of the A325 with Chalet Hill which includes the residential properties above Corals, 1-5 High Street, Bordon. The aim is for the AQMA to be declared during Summer 2010.

- 2) A Further Assessment will be produced in accordance with the legislative requirements of the Environment Act 1995 and will be submitted within 12 months of the declaration of the Bordon AQMA.
- 3) Concentrations of NO₂ will continue to be monitored at Bramshott Chase during the final stages of the construction of the A3 Hindhead Tunnel and these will be reported again in the 2011 Progress Report.
- 4) Concentrations of NO₂ will continue to be monitored at tube HR1 London Road, Horndean and these will be reported again in the 2011 Progress Report.
- 5) An update on PM₁₀ concentrations for 2009 will be provided in the 2011 Progress Report.

6 References

- 1 East Hampshire District Council. (1999). First Stage Air Quality Review & Assessment. East Hampshire District Council
- 2 East Hampshire District Council (2003). Updating and Screening Assessment of Air Quality in East Hampshire. East Hampshire District Council
- 3 East Hampshire District Council (2004). Air Quality Progress Report for East Hampshire. East Hampshire District Council
- 4 Casella Stanger (2005). East Hampshire District Council Local Air Quality Management – Detailed Assessment Report. Casella Stanger
- 5 East Hampshire District Council (2006) Updating Screening and Assessment of Air Quality in East Hampshire. East Hampshire District Council
- 6 East Hampshire District Council (2009). 2008 Detailed Assessment of Nitrogen Dioxide for East Hampshire including 2008 Progress Report. East Hampshire District Council
- 7 East Hampshire District Council (2009). Air Quality Update: Shortened Detailed Assessment of nitrogen dioxide in Bordon. East Hampshire District Council
- 8 Highways Agency (2004) A3 Hindhead Environmental Statement. Highways Agency
- 9 East Hampshire District Council (2009) Updating Screening and Assessment of Air Quality in East Hampshire. East Hampshire District Council
- 10 DEFRA (2009) Local Air Quality Management LAQM.TG(09). Department for Environment, Food and Rural Affairs
- 11 AEA Energy & Environment (2006) AEA_DifTPAB_V02.xls Checking Precision and Accuracy of Triplicate Tubes. AEA
- 12 Air Quality Review & Assessment Helpdesk (2010) Spreadsheet of Bias Adjustment Factors (v.03/10). Accessed 07/04/10 at: <http://www.uwe.ac.uk/aqm/review/R&Asupport/diffusiontube310310.xls>
- 13 DEFRA (2009) Review & Assessment Appraisal Report ref : DA3-239. DEFRA.
- 14 Kings College (2009). Volatile Correction Model Accessed 25/03/10 at: <http://www.volatile-correction-model.info/Default.aspx>
- 15 AEA (2010) WASP – Annual Performance Criteria for NO₂ Diffusion Tubes used in Local Air Quality Management (LAQM), 2008 onwards, and Summary of Laboratory Performance in Rounds 103-107. Accessed on 15/04/10 at: http://www.laqmsupport.org.uk/Summary_of_Laboratory_Performance_in_WASP_R1003-107.pdf

Appendices

Appendix 1: Map of East Hampshire

Appendix 2: QA/QC Data (including bias adjustment factors and short-term to long-term data adjustment).

Appendix 3: Maps showing the location of nitrogen dioxide diffusion tubes in East Hampshire

Appendix 4: Full Raw Dataset for Diffusion Tubes 2009 (monthly)

Appendix 5: Precision and Accuracy of Triplicate Tubes

Appendix 6: 2009 Diffusion Tube Data with Local and National Bias Adjustment Factors Applied

Appendix 1: Map of East Hampshire

Appendix 2: QA:QC Data

Diffusion Tube Bias Adjustment Factors

The diffusion tubes used by East Hampshire District Council are supplied and analysed by Gradko International Ltd and prepared by using 50% v/v TEA in acetone methodology. Gradko International Ltd is a UKAS accredited laboratory.

The bias adjustment factor for 2009 available from the R&A Helpdesk Database (version 03/10)¹² at the time of writing this report was 0.99. This was based on 15 studies which include East Hampshire District Council's co-location study.

Factor from Local Co-location Studies

East Hampshire District Council carries out its own investigation of diffusion tube accuracy each year by carrying out a co-location study of nitrogen dioxide at the Bordon air quality station. The local bias adjustment factor is calculated using the spreadsheet available on the "LAQM tools" section of the Air Quality Archive at www.airquality.co.uk/archive/laqm/laqm.php¹¹. The precision and accuracy of the co-located tubes is also calculated. For 2009 the spreadsheet provided a bias adjustment factor of 0.92 with a 95% confidence interval and this was used to adjust the annual means of single tubes. This is the same as the local bias adjustment factor which was calculated for 2008.

A copy of the spreadsheet used can be seen in Appendix 5.

Annual means for each site can be seen in Table 2.4a of the report.

Discussion of Choice of Factor to Use

For 2009 both local and national bias adjustment factors are available. The locally obtained bias adjustment factor has been applied to the 2009 data as the co-location study was conducted at a site typical of all of the tubes' positions.

In the review of diffusion tube data for 2009 both bias adjustment factors have been considered because it is recognised that the application of the national bias factor results in higher final annual mean concentrations.

A summary of the annual mean concentrations of nitrogen dioxide for 2009 with the different bias adjustment factors applied to them is provided in Appendix 6.

PM₁₀ Monitoring Adjustment

TEOM data provided in this report has been corrected using the Kings College Volatile Correction Model¹⁴ as recommended in TG(09)¹⁰. This correction is applied to correct TEOM measurements for the loss of volatile components of the particulate matter that occur due to the high sampling temperatures employed by this instrument. The corrected measurements are considered to provide a gravimetric-equivalent result.

The VCM was run on 23/03/10 and used the following stations in the correction:

FDMS site 1 – Portsmouth Background AURN

FDMS site 2 – Reading AURN – New Town

FDMS site 3 – Average of remaining sites (contained some unrated data)

East Hampshire District Council

The uncorrected averaged PM₁₀ value (24hr mean) was 17.2µg/m³ and the average corrected value was 24.1 µg/m³.

This means an average correction factor of 1.4 was applied to the TEOM data by the VCM model.

Short-term to Long-term Data adjustment

Where less than 9 months data was available for a monitoring location, the results have been annualised following the guidance contained in Box 3.2 of TG(09)¹⁰. The monitoring results detailed in the table below have been annualised in this report:

Monitoring location	Pollutant	Data capture of calendar year %	Dates for short term means	Reason for poor data capture
Bordon air quality station	PM ₁₀	50	January to June 2009	FDMS instrument incorrectly set up in July 2009
AB1 - Alton, Orchard House	NO ₂	67	February, May, June, August to December 2009	Vandalism and operator error (double exposure)

The long term sites chosen for the calculations were Reading New Town and Portsmouth due to their proximity to the monitoring locations.

Bordon air quality station – PM₁₀

Site	Site Type	Annual Mean	Period Mean	Ratio
Portsmouth	Background	27.3	30.1	0.907
Reading	Background	16.5	19	0.868
			Average	0.888

Alton, Orchard House – nitrogen dioxide

Site	Site Type	Annual Mean	Period Mean	Ratio
Portsmouth	Background	25.6	27.47	0.93
Reading	Background	33.0	31.87	1.04
			Average	0.98

QA/QC of automatic monitoring

The Bordon air quality station is serviced every 6 months by Casella ETi. QA/QC audits are also carried by AEA through its calibration club. These audits involve checking the analyser linearity, NO_x converter efficiency and comparing the site cylinders with audit cylinders. AEA follow procedures adopted within the quality programme of the UK national Automatic Urban and Rural Monitoring Network (AURN).

The analysers are also checked and calibrated using gases by the Council every 2 weeks in accordance with the Council's written procedure and the results are recorded in the site log.

Using the spreadsheet available on the "LAQM tools" section of the Air Quality Archive at www.airquality.co.uk/archive/laqm/laqm.php automatic monitoring was found to show overall good precision. This spreadsheet can be seen in Appendix 5.

Section 2.1.1 on 'Automatic Monitoring Sites' highlights issues on the incorrect set up of a FDMS instrument which was installed in July 2009. This error was identified in an AEA audit of the Bordon air quality station that took place on 16/03/10. At the time of writing this report

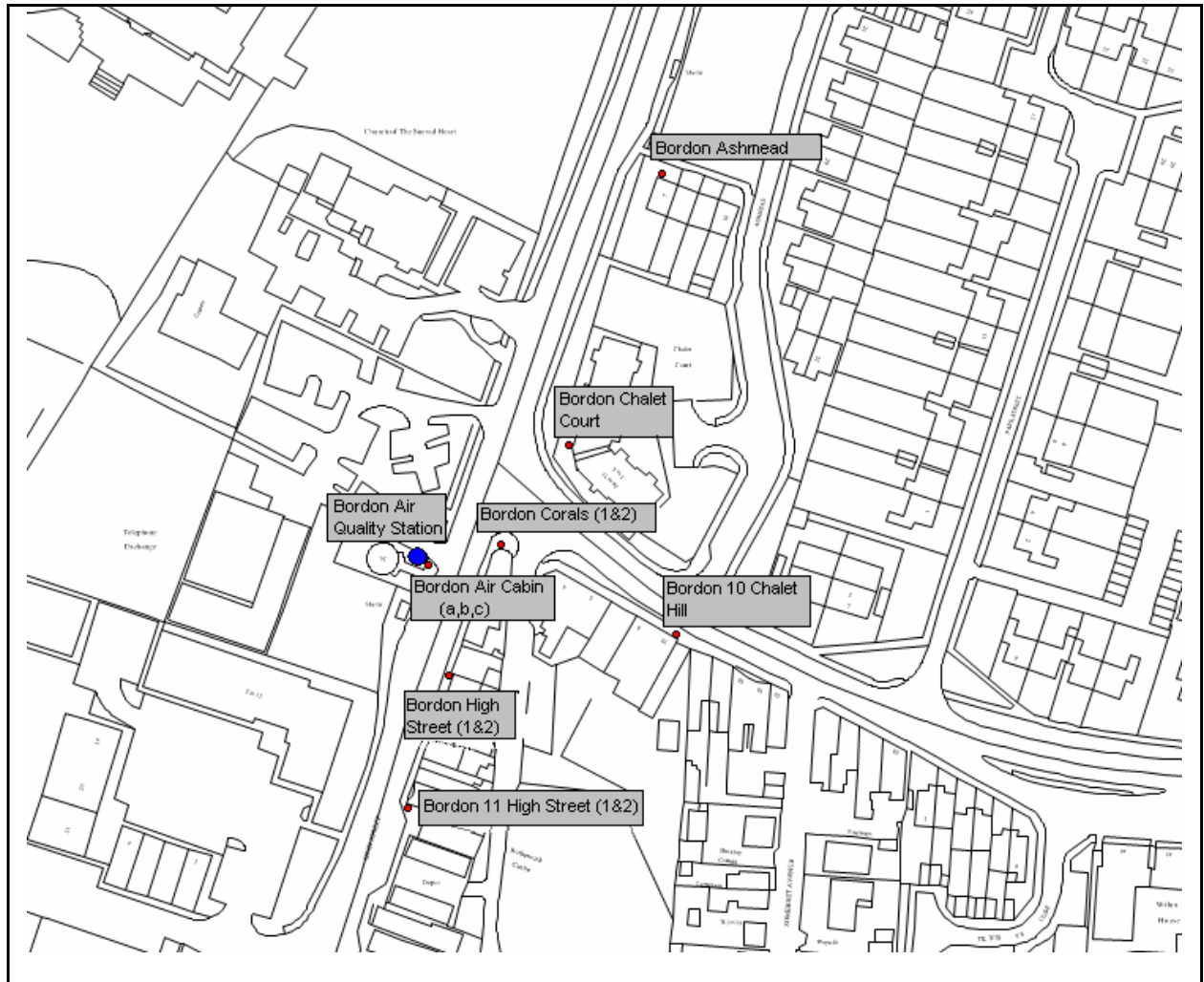
efforts are underway to try to recover PM₁₀ measurements from July to December 2009. An update on this issue will be provided in the 2011 Progress Report.

QA/QC of diffusion tube monitoring

The most recent summary of laboratories' performance in the Workplace Analysis Scheme for Proficiency (WASP)¹⁵ prepared by AEA on behalf of Defra and the Devolved Administrations published in January 2010 shows that Gradko have demonstrated good performance in the analysis of NO₂ diffusion tubes. Gradko follows the procedures set out in the Practical Guidance document.

East Hampshire District Council has compared the diffusion tubes with the reference method in a co-location study. Using the spreadsheet available on the "LAQM tools" section of the Air Quality Archive at www.airquality.co.uk/archive/laqm/laqm.php diffusion tube monitoring was found to show overall good precision during 2009. This spreadsheet can be seen in Appendix 5.

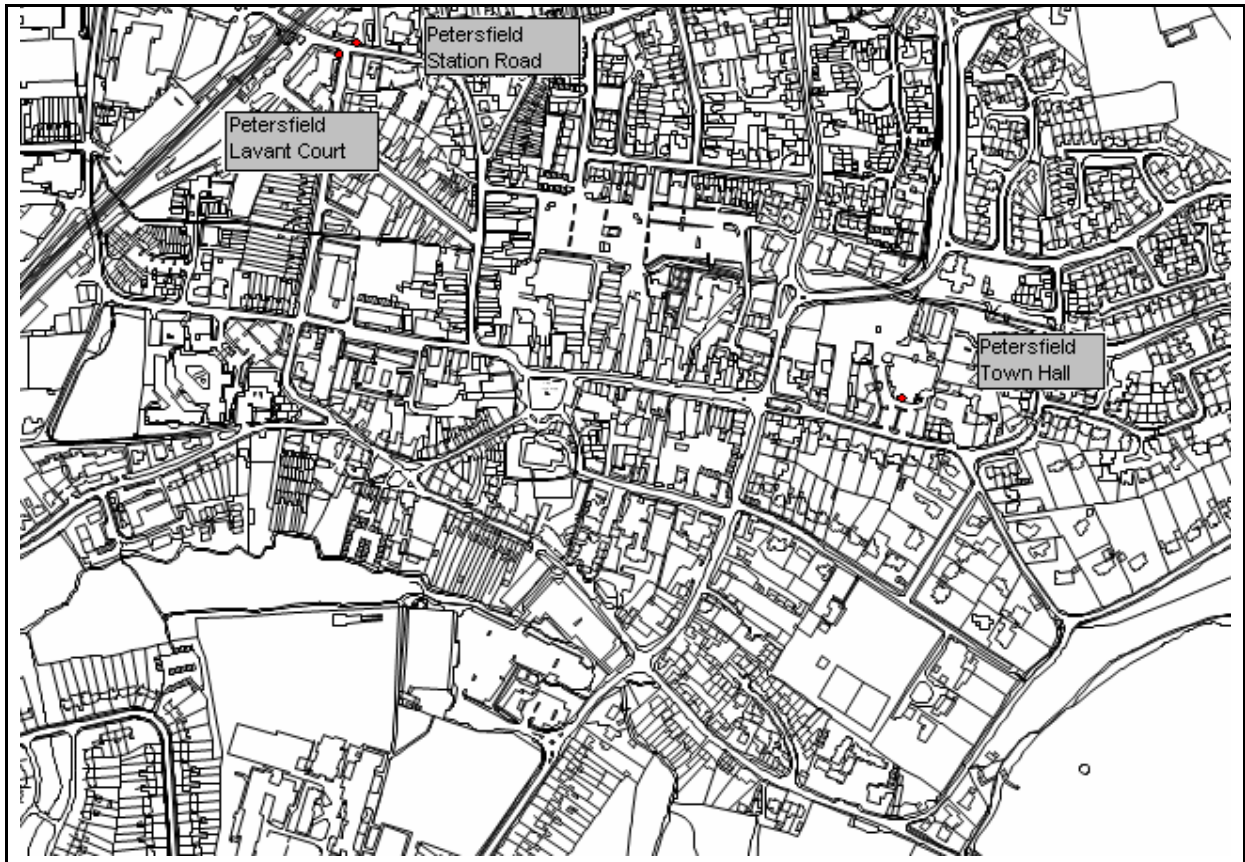
Bordon, A325/Chalet Hill



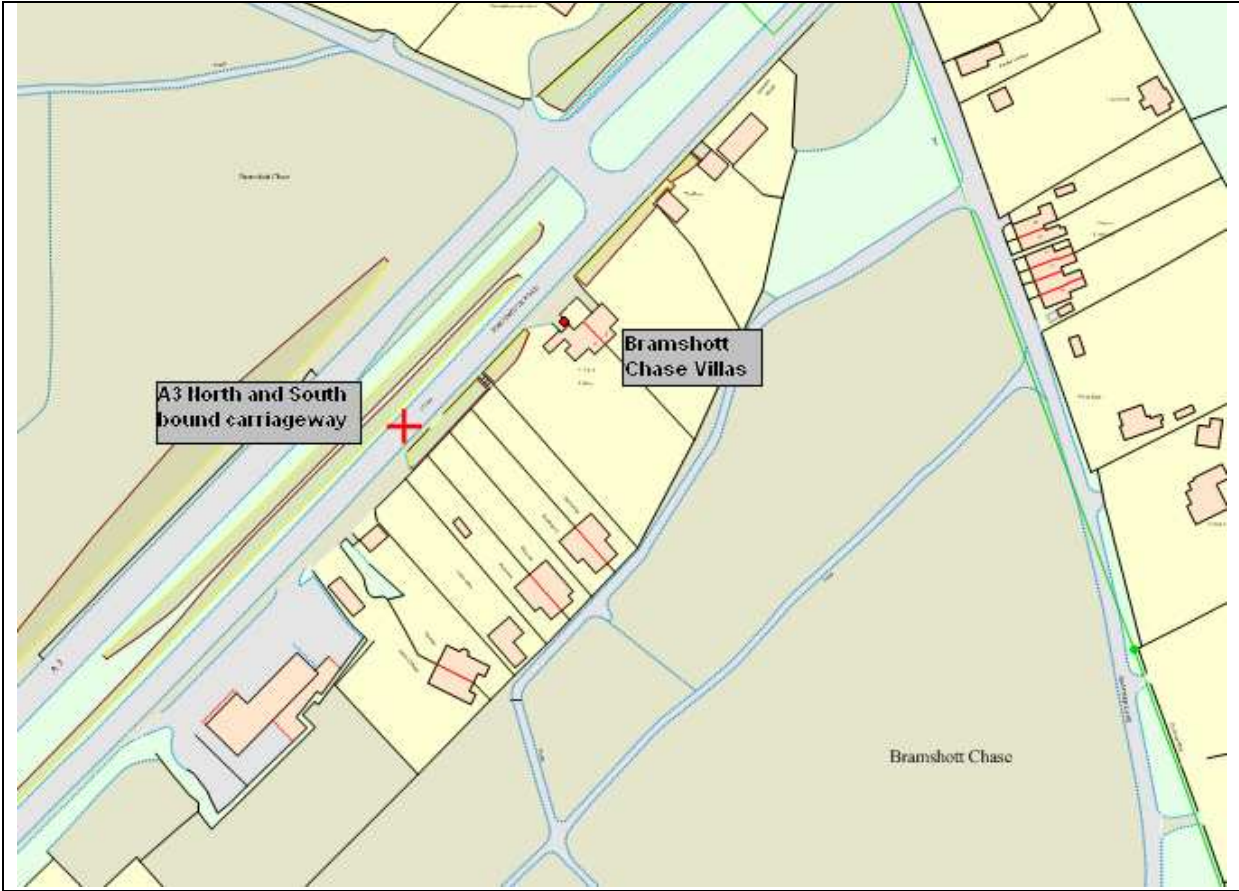
Whitehill, Petersfield Road



Petersfield



Bramshott Chase



Horndean Roundabout



Horndean, London Road



Appendix 4: Full Raw Dataset for Diffusion Tubes 2009 (monthly)

Tube information		Monthly mean (ug/m3)											
Site ID	Site	January	February	March	April	May	June	July	August	September	October	November	December
AB1	Alton, Orchard House		19.67			11.73	13.57		11.28	14.24	16.53	17.19	24.47
BR4	Bordon, o/s Corals (1), Chalet Hill	53.39	41.62	54.06	54.13	44.24	50.45	46.66	46.14	41.33	53.69	49.6	50.48
BR7	Bordon, o/s Corals (2), Chalet Hill	52.69	44.92	47.76	45.87	40.49	45.68	52.41	41.15	40.14	44.03	51.26	
BR1	Bordon, Ashmead	29.29	29.23	28.07	22.66	16.94	18.47	18.17	16.85	22.38	25.8	26.69	32.84
BR2	Bordon, Chalet Court	35	19.12	30.77	27.89	23.93	27.15	23.07	20.47	25.14	31.04	24.57	32.78
BR3	Bordon, o/s 10 Chalet Hill	53.69	25.66	32.08	33.86	26.63	31.14	24.14	21.74	27.82	34.69	33.73	39.01
BR5	Bordon, High Street (1)	57.91	26.34	46.31	58.76	40.97	50.18		35.51	41.85	47.29	39.26	48.84
BR8	Bordon, High Street (2)	47.78	24.29	38.36	51.5	37.17	48.4	34.22	31.35	40.79	42.15	32.65	43.83
	Bordon, Air Quality Cabin (1)	33.53	22.16	20.54	30.32	26.91	29.54	20.16	21.42		30.71	26.71	31.78
	Bordon, Air Quality Cabin (2)	33.51	23.2	23.41	29.41	25.75	31.33	21.45	21.29	24.16	29.61	24.76	
BR6	Bordon, Air Quality Cabin (3)	29.95	22.06	25.87	28.84	26.34	29.93	21.99	21.24	28.38	30.3	26.33	36.34
BR9	Bordon, 11 High Street (1)	49.89	34.15	38.81	38.94	31.15		34.2		29.32	40.59	35.87	40.65
BR10	Bordon, 11 High Street (2)	40.81	33.33	39.07	36.97	30.89	34.58	32.91	30.07	30.88	34.86	32.9	41.89
BU1	Bordon, o/s Bassenthwaite Gdns	22.6	12.66	15.36	15.95	11.16	15.68	7.66	9.04	14.05	16.3	13	23.09
WR1	Whitehill, Petersfield Road	44.87	27.47	41.55	41.44	32.96	36.57	29.22	30.01	41.08	38.69	30.55	44.68
BramR1	Bramshott A3 South, Chase Villas	20.79	13.22	24.3	19.2	12.36	12.98	9.88	10.69	19.8	17.46	14.81	20.49
PB1	Petersfield, Town Hall	22.77		18.04	16.85	12.8	14.19	10.54	11.14	16.96	17.55	14.83	27.19
PR1	Petersfield, Lavant Court	38.2	29.53	36.84	31.11	29.12	28.44	27.85	28.27	30.55	35.37	33.65	39.04
HR1	Horndean, London Road ^a	49.92	42.06		38.71	37.7			31.52	36.32	37.1	38.7	48.82
HR2	Horndean, Roundabout	47.09	17.91	40.4	38.86	30.83	33.92	29.59	25.93	35.83	42.39	37.03	44.15
HR3	Horndean, Catherington Lane	35.01	13.83	23.01	24.46	18.88	26.25	19.02	20.15	19.54	26.96	22.7	30.69

Appendix 5: Precision and Accuracy of Triplicate Tubes

Checking Precision and Accuracy of Triplicate Tubes										Automatic Method		Data Quality Check	
Diffusion Tubes Measurements										Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
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	01/01/2009	31/01/2009	33.5	33.5	30.0	32	2.1	6	5.1	33.8	99.9	Good	Good
2	01/02/2009	28/02/2009	22.2	23.2	22.1	22	0.6	3	1.6	23.5	100	Good	Good
3	01/03/2009	31/03/2009	20.5	23.4	25.9	23	2.7	11	6.6	22.2	99.5	Good	Good
4	01/04/2009	30/04/2009	30.3	29.4	28.8	30	0.7	3	1.9	31.1	99.7	Good	Good
5	01/05/2009	31/05/2009	26.9	25.8	26.3	26	0.6	2	1.4	22	99.6	Good	Good
6	01/06/2009	30/06/2009	29.5	31.3	29.9	30	0.9	3	2.3	25	100	Good	Good
7	01/07/2009	31/07/2009	20.2	21.5	22.0	21	0.9	4	2.3	17	99.5	Good	Good
8	01/08/2009	31/08/2009	21.4	21.3	21.2	21	0.1	0	0.2	18	100	Good	Good
9	01/09/2009	30/09/2009		24.2	28.4	26	3.0	11	26.8	23	99.9	Good	Good
10	01/10/2009	31/10/2009	30.7	29.6	30.3	30	0.6	2	1.4	29	99.6	Good	Good
11	01/11/2009	30/11/2009	26.7	24.8	26.3	26	1.0	4	2.6	21	99.7	Good	Good
12	01/12/2009	31/12/2009	31.8		36.3	34	3.2	9	29.0	32.4	99.7	Good	Good
13													

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

Overall survey -->	Good precision	Good Overall DC
--------------------	----------------	-----------------

(Check average CV & DC from Accuracy calculations)

Site Name/ID: Bordon air quality station	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 12 periods of data Bias factor A 0.92 (0.86 - 0.99) Bias B 8% (1% - 16%) <hr/> Diffusion Tubes Mean: 27 μgm^{-3} Mean CV (Precision): 5 Automatic Mean: 25 μgm^{-3} Data Capture for periods used: 100% Adjusted Tubes Mean: 25 (23 - 27) μgm^{-3}	Accuracy (with 95% confidence interval) WITH ALL DATA Bias calculated using 12 periods of data Bias factor A 0.92 (0.86 - 0.99) Bias B 8% (1% - 16%) <hr/> Diffusion Tubes Mean: 27 μgm^{-3} Mean CV (Precision): 5 Automatic Mean: 25 μgm^{-3} Data Capture for periods used: 100% Adjusted Tubes Mean: 25 (23 - 27) μgm^{-3}
---	--

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

Appendix 6: 2009 Diffusion Tube Data with Local and National Bias Adjustment Factors Applied

Site ID	Site name	Annual mean concentrations of nitrogen dioxide 2009		
		Raw data	Corrected using local bias adjustment factor 0.94	Corrected using national bias adjustment factor 0.99
AB1	Alton, Orchard House	16.1	14.8	15.9
BR4	Bordon, Corals (1) Chalet Hill	48.8	44.9	48.3
BR7	Bordon, Corals (2) Chalet Hill	46.0	42.4	45.6
BR1	Bordon, Ashmead	23.9	22.0	23.7
BR2	Bordon, Chalet Court	26.7	24.6	26.5
BR3	Bordon, 10 Chalet Hill	32.0	29.5	31.7
BR5	Bordon, High Street (1)	44.8	41.3	44.4
BR8	Bordon, High Street (2)	39.4	36.2	39.0
BR6	Bordon, Air Quality Cabin (3 tubes co-located)	26.7	24.6	26.4
		26.2	24.1	25.9
		27.3	25.1	27.0
BR9	Bordon, 11 High Street (1)	37.4	34.4	37.0
BR10	Bordon, 11 High Street (2)	34.9	32.1	34.6
BU1	Bordon, Bassenthwaite Gdns	14.7	13.5	14.6
WR1	Whitehill, Petersfield Rd	36.6	33.7	36.2
BramR1	Bramshott A3 South, Chase Villas	16.3	15.0	16.2
PB1	Petersfield, Town Hall	16.6	15.3	16.5
PR1	Petersfield, Lavant Court	32.3	29.7	32.0
HR1	Horndean, London Road	40.1	36.9	39.7

HR2	Horndean, Roundabout	35.3	32.5	35.0
HR3	Horndean Catherington Lane	23.4	21.5	23.1

Blue cells indicate data has been annualised. Further information on the estimation of annual mean concentrations from short-term monitoring data for 2007 and 2008 can be found in 2008 Detailed Assessment and Progress Report and 2009 USA. Further information on the estimation of 2009 annual mean concentrations can be found in Appendix 2