



2010 Air Quality Progress Report for *Dacorum Borough Council*

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

April 2010

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Executive Summary

A Progress Report covering the 2009 period has been produced following relevant guidance outlined in LAQM.TG(09). This is the latest LAQM review and assessment report to be submitted to DEFRA by Dacorum Borough Council since the Updating and Screening Assessment of July 2009.

Diffusion tube monitoring data for 2009 indicate that annual mean nitrogen dioxide (NO₂) concentrations continue to exceed the relevant air quality objective at three 'hot spot' areas in the borough, namely Lawn Lane, Hemel Hempstead, London Road, Apsley and Northchurch High Street. Consultation on the potential designation of air quality management areas (AQMA) at these three locations is currently underway, and it is anticipated that formal AQMA declarations will be made in late summer/early autumn 2010.

Annual mean NO₂ concentrations at other diffusion tube monitoring sites representative of relevant exposure did not exceed the relevant air quality objective in 2009, and therefore it was not considered necessary to proceed to a detailed assessment. No other pollutants were monitored in the borough in 2010.

A number of fuel storage companies are now beginning to start operations at the Buncefield depot following the explosion in December 2005. This conglomerate of emission sources will be considered in the next Updating and Screening Assessment. No other new local developments were identified.

The existing diffusion tube monitoring network will be augmented in the three (to be declared) AQMA and an automatic nitrogen oxides (NO_x) analyser will be installed in the (to be declared) Northchurch High Street AQMA in 2010.

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1 Introduction

1.1 Description of Local Authority Area

Dacorum borough comprises a mix of urban and rural land uses situated on the western edge of Hertfordshire. Located approximately 30 miles northwest of central London, the borough has a population of approximately 140,000¹, which is predominantly centred on the towns of Berkhamsted, Hemel Hempstead and Tring.

Major roads within the area include the M1, which crosses the eastern side of the borough, the M25, which is located near the southern boundary of the borough, and the A41, which closely bypasses Berkhamsted, Hemel Hempstead and Tring, linking Aylesbury to the west with Watford to the east. The area is well connected to London and the midlands via a major rail link that traverses the borough and terminates at London Euston.

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).

¹ Population at 2001 census

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

Dacorum Borough has undertaken and completed the following rounds of LAQM review and assessment:

1. Air Quality Progress Report (issued in April 2005 covering the period 2003 to 2004),
2. Updating and Screening Assessment (issued in April 2006 covering the 2005 period);
3. Detailed Assessment of Local Air Quality (issued in October 2007 covering the 2006 period); and,
4. Updating and Screening Assessment (issued in July 2009 covering the 2006 to 2008 period).

The 2009 Updating and Screening Assessment (USA) indicated that annual mean nitrogen dioxide (NO₂) concentrations continued to exceed the relevant air quality objective at three previously identified AQMAs (at Lawn Lane, Hemel Hempstead, London Road, Apsley and Northchurch High Street)². It was not considered necessary to proceed to a detailed assessment for any other pollutants or to consider the declaration of additional AQMAs at other locations within the borough.

In addition to the 2009 USA, Dacorum Borough Council commissioned the RSK Group to undertake a detailed dispersion modelling assessment of PM₁₀ emissions in the three identified AQMAs. Although not repeated in this Progress Report, the results of the 2009 modelling study indicate that both long- and short-term concentrations of PM₁₀ are anticipated to meet relevant air quality objectives in the study areas assessed.

The consultation process with regards to the declaration of the three AQMAs is currently underway. It is anticipated that, following completion of the consultation process and full council cabinet review in July 2010, the AQMAs will formally be declared in the late summer/early autumn of 2010.

² The three potential AQMAs were identified in the Detailed Assessment report of October 2007

2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Sites

No automatic monitoring was undertaken within Dacorum Borough in 2009. However, a continuous nitrogen oxides (NO_x) analyser will be installed within the (to be declared) Northchurch High Street AQMA in 2010.

2.1.2 Non-Automatic Monitoring

Dacorum Borough Council measured ambient nitrogen dioxide (NO₂) concentrations using passive diffusion tubes at 21 different locations across the local authority area in 2009. The monitoring sites/locations for 2009 are listed below in **Table 2.1**.

With the exception of the Sawyers Way monitoring site in Hemel Hempstead, the monitoring locations in 2009 were unchanged from those reported in the 2009 USA. Due to ongoing problems of vandalism at the Sawyers Way site in 2009, no measurement data are reported for this location.

It is proposed that, in 2010, the Sawyers Way diffusion tube monitoring site is relocated to try and prevent the ongoing vandalism and subsequent loss of measurement data. It is also proposed that additional diffusion tubes are deployed within the (to be declared) AQMAs at London Road, Apsley (3 additional tubes), Lawn Lane, Hemel Hempstead (2 additional tubes) and Northchurch High Street (2 additional tubes).

All the NO₂ diffusion tubes used by Dacorum Borough Council are supplied and analysed by Scientifics Ltd, Didcot, Oxfordshire, and are prepared using the 50:50 (TEA:acetone) method. Scientifics Ltd follow the procedures set out in the Practical Guidance document and, for analytical quality control, employ a Shewhart chart system with defined warning and action limits. Workplace Analysis Scheme for Proficiency (WASP) results for the 2009 period are presented in **Appendix A** for reference.

No local authority co-location studies have been undertaken within Dacorum borough since the 2009 USA was produced, and therefore a locally derived bias adjustment factor has not been generated for 2009. Annual average NO₂ concentrations presented in the main section of this report have been bias adjusted by a factor of 0.82, which was obtained from the LAQM Review and Assessment website (www.uwe.ac.uk/aqm/review) and is based on 9 co-location studies.

Table 2.1 Details of Non- Automatic (Diffusion Tube) Monitoring Sites (*within to be declared AQMA)

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?
Wood Lane End Hemel Hempstead	Background	X 508177 Y 207934	NO ₂	N	Y (12 m)	1 m	N
Roman Way, Markyate	Background	X 506197 Y 216506	NO ₂	N	N (10 m)	58 m	N
High Street Bovingdon	Kerbside	X 501541 Y 203659	NO ₂	N	Y (13 m)	N/A	N
High Street Berkhamsted	Kerbside	X 499365 Y 207724	NO ₂	N	N (20 m)	N/A	N
Prince Edward Street, Berkhamsted	Background	X 499207 Y 207754	NO ₂	N	N (12 m)	35 m	N
High Street, Northchurch	Kerbside	X 497346 Y 208835	NO ₂	N*	Y (1 m)	N/A	Y
Brook Street, Tring	Kerbside	X 492552 Y 211824	NO ₂	N	Y (8 m)	N/A	N
High Street, Tring	Kerbside	X 492335 Y 211386	NO ₂	N	N (30 m)	N/A	N
Charles Street, Tring	Background	X 492195 Y 211159	NO ₂	N	N (2 m)	50 m	N
Watford Road, Kings Langley	Kerbside	X 507606 Y 201624	NO ₂	N	N (34 m)	N/A	N
High Street, Kings Langley	Kerbside	X 507184 Y 202690	NO ₂	N	N (15 m)	N/A	N
Lawn Lane 1, Hemel Hempstead	Kerbside	X 505923 Y 205761	NO ₂	N*	Y (2 m)	N/A	N
Gammons Lane, Hemel Hempstead	Background	X 507058 Y 206727	NO ₂	N	N (6 m)	22 m	N
Wadley Close, Hemel Hempstead	Background	X 506981 Y 206829	NO ₂	N	N (10 m)	11 m	N
Field Road, Hemel Hempstead	Background	X 507483 Y 206898	NO ₂	N	Y (1 m)	17 m	N
St Agnells Lane, Hemel Hempstead	Roadside	X 507121 Y 209252	NO ₂	N	Y (10 m)	1 m	N
New Road, Northchurch	Kerbside	X 497335 Y 208860	NO ₂	N*	Y (1 m)	N/A	Y
Darrs Lane, Northchurch	Roadside	X 497264 Y 208927	NO ₂	N*	Y (5 m)	1 m	N
Lawn Lane 2, Hemel Hempstead	Roadside	X 505969 Y 205726	NO ₂	N*	Y (8 m)	1 m	N
Lawn Lane 3, Hemel Hempstead	Roadside	X 505930 Y 205740	NO ₂	N*	Y (1 m)	1 m	Y
London Road, Apsley	Roadside	X 505674 Y 205514	NO ₂	N*	Y (1 m)	1 m	Y

2.2 Comparison of Monitoring Results with Air Quality Objectives

The following section compares NO₂ diffusion tube monitoring results with relevant air quality objectives. Only annual average NO₂ data are presented, as no other parameters/averaging periods were monitored/assessed in Dacorum borough in 2009.

2.2.1 Nitrogen Dioxide

Diffusion Tube Monitoring Data

Table 2.2 below presents annual average NO₂ concentrations as measured at the 21 diffusion monitoring sites in 2009. Annual average concentrations for 2009 have been bias adjusted by applying the factor of 0.82 referenced above in Section 2.1.2.

Due to the low data capture (<90%) apparent at each monitoring site for the 2009 calendar year, the bias adjusted NO₂ concentrations were annualised by following the methodology outlined in Box 3.2 of LAQM.TG(09). Specifically, average annual mean/period mean ratios were derived from 2009 measurement data from four automatic monitoring stations within 50 miles of the diffusion tube sites and were applied to the measured, bias adjusted NO₂ concentrations.

The diffusion tube measurement data for 2009 indicate that the annual mean air quality objective for NO₂ was exceeded at all monitoring sites situated within the (to be declared) AQMAs. Specifically, that is the monitoring sites at New Road and the High Street, Northchurch (DC62 and DC50), Lawn Lane, Hemel Hempstead (DC57 and DC65) and London Road, Apsley (DC66).

An exceedance was also observed outside of the (to be declared) AQMAs, at Watford Road, Kings Langley (DC54). However, as identified in **Table 2.1**, no relevant exposure is apparent at this site. Following the guidance/calculation outlined in Box 2.3 of LAQM.TG(09), the annual average NO₂ concentration at the nearest receptor is estimated to be approximately 30 µg/m³, and therefore below the relevant air quality objective.

No exceedance of the annual mean air quality objective for NO₂ was observed at the other diffusion tube monitoring stations in 2009. An annual mean NO₂ concentration of 40 µg/m³ was recorded at Lawn Lane 2, Hemel Hempstead (DC64) and at Berkhamsted High Street (DC47). However, as identified in **Table 2.1**, there is no relevant exposure at the Berkhamsted High Street monitoring site, and the Lawn Lane 2 monitoring site is located within the (to be declared) Lawn Lane AQMA.

Section 2.34 of LAQM.TG(09) indicates that if annual mean NO₂ concentrations are 60 µg/m³ or above, then it is likely that exceedances of the 1-hour mean air quality objective for NO₂ will occur.

Although the annual mean NO₂ concentration at Lawn Lane 1, Hemel Hempstead (DC57) in 2009 was 60 µg/m³, this is considered to be a minor exceedance of the 'guideline value' and therefore well within the typical diffusion tube measurement

uncertainty of 25% referenced in Section A1.40 of LAQM.TG(09). Annual mean NO₂ concentrations at all other monitoring sites were below 60 µg/m³ in 2009.

Also presented in **Table 2.2** are annual mean NO₂ concentrations for 2007 and 2008. The annualisation and bias adjustment processes for these previously reported data are detailed in the 2009 USA.

Appendix B presents, for 2009, monthly NO₂ measurement data for each diffusion tube site and the annual mean/period mean ratios that were applied to the annual mean NO₂ concentrations presented in **Table 2.2**.

Table 2.2 Results of Nitrogen Dioxide Diffusion Tubes

Site ID	Location	Within AQMA?	Data Capture for monitoring period %	Data Capture for full calendar year 2009 %	Annual mean NO ₂ concentrations (µg/m ³)		
					2007	2008	2009
DC42	Wood Lane End HH	N	83 [^]	83	27	26	27
DC43	Roman Way, Markyate	N	58 ^{^^}	58	21	19	20
DC46	High Street Bovington	N	67 ^{^^^}	67	25	24	24
DC47	High Street Berkhamsted	N	75 ^{^^^^}	75	40	39	40
DC48	Prince Edward Street, Berkhamsted	N	83 [^]	83	23	19	21
DC50	High Street, Northchurch	N*	83 [^]	83	46	42	42
DC51	Brook Street, Tring	N	75 ^{^^^^}	75	31	29	29
DC52	High Street, Tring	N	75 ^{^^^^}	75	34	34	32
DC53	Charles Street, Tring	N	75 ^{^^^^}	75	20	16	18
DC54	Watford Road, Kings Langley	N	67 ^{^^^}	67	49	49	48
DC55	High Street, Kings Langley	N	75 ^{^^^^}	75	35	32	32
DC57	Lawn Lane 1, Hemel Hempstead	N*	75 ^{^^^^}	75	58	56	60
DC58	Gammons Lane, Hemel Hempstead	N	83 [^]	83	30	30	29
DC59	Wadley Close, Hemel Hempstead	N	75 ^{^^^^}	75	33	30	34
DC60	Field Road, Hemel Hempstead	N	83 [^]	83	28	25	25
DC61	St Agnells Lane, Hemel Hempstead	N	83 [^]	83	32	32	30
DC62	New Road, Northchurch	N*	83 [^]	83	41	38	42
DC63	Darrs Lane, Northchurch	N*	83 [^]	83	30	29	33
DC64	Lawn Lane 2, Hemel Hempstead	N*	75 ^{^^^^}	75	40	38	40
DC65	Lawn Lane 3, Hemel Hempstead	N*	83 [^]	83	61	54	56
DC66	London Road, Apsley	N*	75 ^{^^^^}	75	60	56	57

Note: *within to be declared AQMA; Source for 2009 data: Hertfordshire and Bedfordshire Air Quality Network (www.hertsbedsair.org.uk); Source for 2007 and 2008 data: Dacorum Borough Council USA (2009); 2009 data bias adjusted by a factor of 0.82 and annualised by the annual mean/period mean ratios presented in Appendix B; [^]10 months of monitoring; ^{^^}7 months of monitoring; ^{^^^}8 months of monitoring; ^{^^^^}9 months of monitoring.

2.2.2 Summary of Compliance with AQS Objectives

Dacorum Borough Council has examined the results from monitoring in the borough. Concentrations of NO₂ outside of the (to be declared) AQMAs are all below the objectives at relevant locations, therefore there is no need to proceed to a Detailed Assessment.

3 New Local Developments

3.1 Road Traffic Sources

Dacorum Borough Council has not identified any new road traffic sources since the 2009 Updating and Screening Assessment.

3.2 Other Transport Sources

Dacorum Borough Council has not identified any other new transport sources since the 2009 Updating and Screening Assessment.

3.3 Industrial Sources

Following the widely publicised explosion at the Buncefield oil/fuel storage depot in December 2005, a number of different companies are now beginning to operate again at the Buncefield site. Relevant emissions from this conglomeration of operators will be assessed as required in future LAQM assessment reports.

Dacorum Borough Council has not identified any other new industrial sources since the 2009 Updating and Screening Assessment.

3.4 Commercial and Domestic Sources

Dacorum Borough Council has not identified any new commercial or domestic sources since the 2009 Updating and Screening Assessment.

3.5 New Developments with Fugitive or Uncontrolled Sources

Dacorum Borough Council has not identified any new developments with fugitive or uncontrolled sources since the 2009 Updating and Screening Assessment.

Dacorum Borough Council has identified the following new or previously unidentified local developments which may impact on air quality in the Local Authority area:

Buncefield fuel storage depot

This will be taken into consideration in the next Updating and Screening Assessment, scheduled for 2012.

4 Air Quality Planning Policies

Policy 11 of Dacorum Borough Council's Adopted Local Plan makes specific reference to the potential impact of development proposals on air quality. Specifically, criterion (j) of policy 11 states the following:

Development will not be permitted unless it avoids harm arising from pollution in all its forms, including air, water, noise and light pollution. In particular there should be no detrimental effect on air quality in sensitive areas (especially where traffic related pollution problems arise).

Although Dacorum Borough Council's Local Plan policies are currently being reviewed as a Local Development Framework (LDF) for the borough is progressed, it is anticipated that the Core Strategy of the LDF will include policies relating to the control/reduction of air pollution and carbon emissions through planning/development control mechanisms.

5 Local Transport Plans and Strategies

Hertfordshire County Council's *Local Transport Plan (LTP) 2006/07 – 2010/11* recognises the importance of addressing local air quality issues through transport planning, particularly where AQMAs have been, or will be, declared. Consultation with district and borough councils within the Hertfordshire area, including Dacorum Borough Council, is identified as being a key mechanism by which local air quality concerns can be addressed at the county council level through transport planning initiatives such as area plans, cycling strategies and other initiatives to promote non-polluting modes of transport.

6 Implementation of Action Plans

As discussed in Section 1.4, it is anticipated that formal AQMA declarations for the three previously identified areas of exceedance of the annual mean objective for NO₂ in London Road, Apsley, Lawn Lane, Hemel Hempstead and Northchurch High Street will take place in late summer/early autumn 2010.

Following the AQMA declarations, a Further Assessment of each AQMA will be completed within 12 months, and an Action Plan(s) will be developed in parallel with the Further Assessment(s). Progress on the implementation of any future Action Plan(s) will therefore be detailed in subsequent LAQM review and assessment reports.

7 Conclusions and Proposed Actions

7.1 Conclusions from New Monitoring Data

The diffusion tube monitoring results for 2009 indicate that the annual mean air quality objective for NO₂ continues to be exceeded at Lawn Lane, Hemel Hempstead, London Road, Apsley and Northchurch High Street. Exceedances of the long-term air quality objective for NO₂ have occurred at each of these sites over the previous three years, and it is therefore recognised that the AQMAs for these locations must be declared without delay in 2010.

Measured annual mean NO₂ concentrations were, with the exception of Watford Road, Kings Langley, at or below the relevant air quality objective at all other diffusion tube monitoring sites in 2009. Although annual mean NO₂ concentrations are observed to be above the relevant air quality objective in 2007, 2008 and 2009 at Watford Road, there is no relevant exposure at this site, and therefore it is not deemed necessary to proceed to a detailed assessment for this location. Annual mean NO₂ concentrations continue to be close to the long-term air quality objective at the High Street in Berkhamsted but, as previously discussed, there is no relevant exposure at this site.

Although the annual mean NO₂ concentration at Lawn Lane, Hemel Hempstead and London Road, Apsley has been measured at, or marginally above, 60 µg/m³ in 2007 and 2009, these are considered to be minor exceedances of the 'guideline value' (for potential breaches of the short-term air quality objective for NO₂) and well within the typical diffusion tube measurement uncertainty range. Annual mean NO₂ concentrations at all other monitoring sites were below 60 µg/m³ in 2007, 2008 and 2009.

7.2 Conclusions relating to New Local Developments

Dacorum Borough Council has identified that a number of different fuel storage companies are now beginning to start operations at the Buncefield depot following the explosion in December 2005. It is not considered necessary at this stage to proceed to a detailed assessment for this conglomerate of emission sources. However, these will be considered in the next Updating and Screening Assessment.

7.3 Proposed Actions

The 2009 monitoring data has not identified the need to proceed to a detailed assessment for any pollutants at any locations within Dacorum borough. However, it is recognised that the declaration of the three AQMAs at Lawn Lane, Hemel Hempstead, London Road, Apsley and Northchurch High Street must be declared without delay in 2010.

Following the AQMA declarations, Dacorum Borough Council will undertake a Further Assessment of each AQMA and, simultaneously, develop an air quality action plan(s) that will contain a number of measures aimed at reducing emissions to air and improving local air quality in the designated AQMAs. In line with the review and

assessment timetable referenced in Box 1.3 of LAQM.TG(09), a Progress Report will also be produced in 2011.

As detailed in Sections 2.1.1 and 2.1.2, an automatic NO_x analyser will be installed within the (to be declared) Northchurch High Street AQMA in 2010, and additional diffusion tubes will be deployed in the three (to be declared) AQMAs. The diffusion tube monitoring site on Sawyers Way, Hemel Hempstead will be relocated in 2010 in an attempt to avoid the vandalism (and associated data loss) experienced in 2009.

8 References

- Dacorum Borough Council (2009). 2009 Air Quality Updating and Screening Assessment for Dacorum Borough Council
- Dacorum Borough Council website: www.dacorum.gov.uk
- DEFRA (2009). Part IV of the Environment Act 1995 Environment (Northern Ireland) Order 2002 Part III Local Air Quality Management Technical Guidance LAQM.TG(09)
- Hertfordshire and Bedfordshire Air Quality network: www.hertsbedsair.org.uk
- Hertfordshire County Council (2005). Local Transport Plan 2006/07 – 2010/11
- Local Air Quality Management Review and Assessment website: www.uwe.ac.uk/aqm/review
- RSK Group (2009): Detailed Air Dispersion Modelling Assessment of PM₁₀ Road Traffic Emissions in Dacorum Borough

Appendices

Appendix A: 2009 WASP Results

Year	WASP Round	Period	HSL Calculations (Pre-Sendout)		Harwell Analysis					
			Sample A		Tubes A					
			Calculated Spiked Value	Measured Value	Result Tube 1	Result Tube 2	Average	Standard Deviation	RSD	Z-Score
2009	107	Oct-Dec	2.03	2.04	1.905	1.914	1.91	0.007	0.4%	-0.8
	106*	Jul-Sept	1.84	1.84	1.88	1.439	1.66	0.312	18.8%	-1.3
	106*	Jul-Sept	1.84	1.84	1.88	1.88	1.88	0	0.0%	
	105	Apr-Jun	1.68	1.69	1.795	1.784	1.79	0.008	0.4%	0.8
	104	Jan-Feb	2.02	2.01	2.017	2.047	2.032	0.022	1.1%	0.0

Notes: all results in ug; *results disputed

Year	WASP Round	Period	HSL Calculations (Pre-Sendout)		Harwell Analysis					
			Sample A		Tubes B					
			Calculated Spiked Value	Measured Value	Result Tube 1	Result Tube 2	Average	Standard Deviation	RSD	Z-Score
2009	107	Oct-Dec	2.20	2.20	2.049	2.046	2.048	0.003	0.1%	-0.9
	106*	Jul-Sept	1.42	1.44	1.88	1.429	1.655	0.319	19.3%	2.1
	106*	Jul-Sept	1.42	1.44	1.439	1.429	1.434	0.007	0.5%	
	105	Apr-Jun	1.68	1.69	1.031	1.035	1.033	0.003	0.3%	0.9
	104	Jan-Feb	1.22	1.19	1.269	1.23	1.252	0.024	1.9%	0.2

Notes: all results in ug; *results disputed

Appendix B: Monthly Diffusion Tube Data and Annual Mean/Period Mean Ratios

The table below presents monthly mean NO₂ concentrations as measured at the 21 diffusion tube monitoring sites in 2009. The presented data have not been bias adjusted or annualised.

Code	Address	Site Classification	2009 Monthly Mean NO ₂ (ug/m ³)											
			Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
DC42	Wood Lane End HH	Background	48	41	28	36	24		28		24	40	36	41
DC43	Roman Way Markyate	Background	41		24	22	13		19				27	29
DC46	High Street Bovington	Kerbside	46	36	29	26					25	39	34	39
DC47	High Street Berkhamsted	Kerbside	63	52	49	51	38		49		41		56	57
DC48	Prince Edward Street Berkhamsted	Background	41	33	26	28	16		14		17	34	26	40
DC50	High Street Northchurch	Kerbside	61	60	41	62	37		57		47	56	69	54
DC51	Brook Street Tring	Kerbside	52	42	32	36	20		30		36	42		46
DC52	High Street Tring	Kerbside	47	58	42	41	29				37	49	40	46
DC53	Charles Street Tring	Background	30	31	22	20	12		15		19	27		32
DC54	Watford Road Kings Langley	Kerbside	73	74	58	64	40		42		54	71		
DC55	High Street Kings Langley	Kerbside	15	86	41	46	27		30		31	48		52
DC57	Lawn Lane 1 HH	Kerbside	83		71	72	53		84		70	79	72	79
DC58	Gammons Lane HH	Background	45	45	39	33	20		34		35	33	38	48
DC59	Wadley Close HH	Background	59	49	42	42			38		30	48	50	47
DC60	Field Road HH	Background	36	33	29	35	23		27		24	32	35	40
DC61	St Agnells Lane HH	Roadside	49	38	34	40	26		31		31	44	48	45
DC62	New Road Northchurch	Kerbside	62	57	61	38	32		43		52	73	53	61
DC63	Darrs Lane Northchurch	Roadside	59	48	34	50	28		41		33	40	42	44
DC64	Lawn Lane 2 HH	Roadside	57	56	44	42			70		46	58	52	56
DC65	Lawn Lane 3 HH	Roadside	71	98	69	70	63				67	84	81	71
DC66	London Road Apsley	Roadside	83	80	67	80	63				63	86	88	75

Source: Hertfordshire and Bedfordshire Air Quality Network (www.hertsbedsair.org.uk)

The table below presents, for 2009, monthly and annual mean NO₂ concentrations as measured at four urban background automatic monitoring stations located within 50 miles of the diffusion tube monitoring sites in Dacorum borough. Also presented are the average annual mean (AM)/period mean (PM) ratios that have been derived from the automatic monitoring data and subsequently applied to the diffusion tube measurement data.

Site	Data Capture for 2009 (%)	Site Type	2009 Monthly Mean NO ₂ (ug/m ³)												2009 Annual Mean NO ₂ (ug/m ³)
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hertsmere – Borehamwood	98	Urban Background	40.9	33.7	26.4	21.6	12.9	16.4	13.4	19.5	19.5	33.2	29.3	36.4	25.3
Luton – Challney College	86	Urban Background	47.4	56.5	43.8	36.9	27.3	31.0	26.7	29.2	28.4	41.6	35.2	41.1	37.1
St Albans – Fleetville	100	Urban Background	40.7	35.4	27.7	24.7	13.9	16.4	14.5	18.6	15.9	30.3	26.7	35.3	25.0
South Beds – Dunstable	92	Urban Background	37.2	44.8	31.5	32.5	18.2	28.3	13.2	15.2	24.5	36.8	22.8	35.5	28.4

Source: Hertfordshire and Bedfordshire Air Quality Network (www.hertsbedsair.org.uk)

Automatic Monitoring Site	AM/PM Ratio	AM/PM Ratio	AM/PM Ratio	AM/PM Ratio	AM/PM Ratio	AM/PM Ratio	AM/PM Ratio	AM/PM Ratio	AM/PM Ratio	AM/PM Ratio	AM/PM Ratio
	Wood Lane End HH	Roman Way Markyate	High Street Bovingdon	High Street Berkhamsted	Prince Edward Street Berkhamsted	High Street Northchurch	Brook Street Tring	High Street Tring	Charles Street Tring	Watford Road Kings Langley	High Street Kings Langley
Hertsmere – Borehamwood	0.945	0.978	0.839	0.971	0.945	0.945	0.955	0.896	0.955	1.002	0.955
Luton – Challney College	0.963	1.005	0.897	0.972	0.963	0.963	0.954	0.932	0.954	0.961	0.954
St Albans – Fleetville	0.943	0.954	0.845	0.959	0.943	0.943	0.944	0.898	0.944	0.985	0.944
South Beds – Dunstable	0.956	1.041	0.855	0.982	0.956	0.956	0.931	0.900	0.931	0.951	0.931
Average AM/PM Ratio	0.952	0.994	0.859	0.971	0.952	0.952	0.946	0.906	0.946	0.975	0.946

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Automatic Monitoring Site	AM/PM Ratio	AM/PM Ratio	AM/PM Ratio	AM/PM Ratio	AM/PM Ratio	AM/PM Ratio	AM/PM Ratio	AM/PM Ratio	AM/PM Ratio	AM/PM Ratio
	Lawn Lane 1 HH	Gammons Lane HH	Wadley Close HH	Field Road HH	St Agnells Lane HH	New Road Northchurch	Darrs Lane Northchurch	Lawn Lane 2 HH	Lawn Lane 3 HH	London Road Apsley
Hertsmere – Borehamwood	0.973	0.945	0.894	0.945	0.945	0.945	0.945	0.894	0.945	0.896
Luton – Challney College	1.016	0.963	0.933	0.963	0.963	0.963	0.963	0.933	0.963	0.932
St Albans – Fleetville	0.980	0.943	0.896	0.943	0.943	0.943	0.943	0.896	0.943	0.898
South Beds – Dunstable	1.013	0.956	0.916	0.956	0.956	0.956	0.956	0.916	0.956	0.900
Average AM/PM Ratio	0.996	0.952	0.910	0.952	0.952	0.952	0.952	0.910	0.952	0.906