Nitrogen Dioxide Diffusion Tube Survey: Annual Report 2010

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Executive Summary

The London Borough of Ealing Diffusion Tube Network was established several years ago to provide insight into the spatial and temporal variation of nitrogen dioxide (NO_2) concentrations throughout the Borough. The network currently comprises 100 sites, including several long-term monitoring sites, and supplements continuous monitoring activities undertaken at several locations within the Borough.

This report provides an analysis of the data collected during the 2010 monitoring period, running from the week commencing 4th January 2010 to the week commencing 3rd January 2011. The bias adjusted annual mean NO_2 concentrations are presented along with the raw monthly results and details of the bias adjustment calculation. The final results have been compared with the annual mean NO_2 objective to indicate areas of exceedence. A comparison is drawn with historical NO_2 concentration data from the network to look for evidence of long-term trends and significant changes in pollutant levels at specific locations.

Four new sites were established during the 2010 survey period in response to concerns raised by local residents of pollution concentrations in their area. Good data capture was achieved across the network with 95 sites having greater than 75% data capture and 87 sites having greater than 90%. All sites are classified according to the Practical Guidance for Diffusion Tube Monitoring. All sites are categorised as either “kerbside”, “roadside”, “near-road”, or “urban background”.

The highest recorded annual mean NO_2 concentration was measured at by the single tube site at Fernlea House, Hangar Lane (82.8 $\mu g/m^3$). In total 76 sites in the survey were found to exceed the annual mean NO_2 objective and 15 sites were determined to be likely to exceed the hourly objective.

1 Introduction

1.1 Overview

AECOM was commissioned in December 2009 to manage and maintain the operation of the London Borough of Ealing nitrogen dioxide diffusion tube monitoring network. The network covers 100 sites throughout the Borough, providing information on the spatial and temporal variation in NO_2 concentrations in the area. The diffusion tube network supplements data collected at six continuous monitoring stations within the Borough providing high-resolution real-time measurements of NO_2 concentrations. These sites are located at Horn Lane, Hangar Lane Gyratory, Acton Town Hall, Ealing Town Hall, Blair Peach School (Southall) and Western Avenue.

This report covers the 2010 diffusion tube monitoring period from January to December 2010. It describes details of bias adjustment of the raw diffusion tube results, reports upon the annual mean concentrations and analyses the spatial and temporal variations at locations in the Borough.

1.2 Legislation and Policy Background

Limit values and air quality objectives for nitrogen dioxide and oxides of nitrogen (NO_X) were set out in the First Daughter Directive (1999/30/EC) and subsequent revisions. An annual mean NO_2 objective was set at 40 µg/m^3 to be achieved by 1st January 2010. A 200 µg/m^3 hourly mean standard not to be exceeded more than 18 hours per year was also outlined, to be achieved by the same compliance date. These objectives were reiterated in the 2008 Directive on ambient air quality and cleaner air for Europe (2008/50/EC).

The UK published its own Air Quality Strategy, which detailed the UK's position on nitrogen dioxide. The UK air quality objectives differ from the European objectives only in their compliance dates; the UK objectives were to be achieved by the end of 2005. European and UK air quality objectives have also been set for oxides of nitrogen for the protection of vegetation and ecosystems. A summary of the principal air quality objectives for NO_2 and NO_X is given in Table 1.

Table 1: UK and EU Air Quality Objectives for NO_2 and NO_X

Pollutant	UK Air Quality Objectives		
	Standard / Concentration	**Measured as**	**Date to be achieved by and maintained thereafter**
Nitrogen Dioxide	200 µg/m^3 not to be exceeded more than 18 times a year	1 Hour Mean	31.12.2005
	40 µg/m^3	Annual Mean	
Nitrogen Oxides (for the protection of vegetation)	30 µg/m^3	Annual Mean	31.12.2000
	EU Air Quality Objectives		
	Standard / Concentration	**Measured as**	**Date to be achieved by and maintained thereafter**
Nitrogen Dioxide	200 µg/m^3 not to be exceeded more than 18 times per year	1 Hour Mean	1 January 2010
	40 µg/m^3	Annual Mean	
Nitrogen Oxides (assuming as nitrogen dioxide)	30 µg/m^3	Annual Mean	19 July 2001

2 Methodology

2.1 Procedures and Site Changes

At the beginning of 2010 the Ealing Diffusion Tube Network covered a total of 96 sites distributed throughout the Borough. In February 2010 a monitoring site at Haven Green Court residential care home was added to the network. Co-location study sites were set up at Ealing Horn Lane and Western Avenue continuous monitoring stations in March and April, respectively. The total number of sites was increased to 100 and the number of tubes deployed to 125 in June 2010 with the addition of one tube at Sinton Andrews Estate Agent, Haven Green.

Triplicate tubes are deployed at 12 sites with single tubes being deployed at the remaining sites. Of the triplicate sites, five are co-located with continuous analysers. At Wendover Court, Western Avenue, four tubes are installed, one on each floor of the building, to monitor the variation in NO_2 with height.

Tubes were collected and replaced every four to five weeks in accordance with the UK Diffusion Tube Calendar [1]. All tubes were stored in a refrigerator prior to deployment and after collection and were transported to and from site in a portable cooler. Any tubes exposed outside of the time frame dictated by the calendar have been removed from the dataset. Tubes subject to contamination (e.g. spider webs, foreign bodies etc.) or vandalised have also been excluded from the final dataset.

2.2 Tube Preparation, Analysis and QA/QC

The diffusion tubes were supplied and analysed by Gradko International Ltd. To maintain consistency with previous monitoring the preparation method used was 20% v/v triethanolamine in water. Gradko International Ltd. participate in the Health and Safety Laboratory's Workplace Analysis Scheme for Proficiency (WASP) scheme, which provides a Quality Assurance / Quality Control framework for local authorities carrying out diffusion tube monitoring as a part of their local air quality management process. Gradko International Ltd. achieved a Performance Criteria Score of "Good" in the laboratory performance testing rounds during 2010 [2].

2.3 Factors Affecting Diffusion Tube Performance

NO_2 diffusion tubes are an indicative monitoring technique, as they do not offer the same accuracy as the reference method for NO_2, the automatic chemiluminescence analyser. NO_2 diffusion tubes are affected by several factors, which may cause them to exhibit bias relative to the reference technique.

Over-estimation may be attributed to one of the three interfering factors:

- The shortening of the diffusive path length caused by the wind
- The blocking of UV light resulting in reduced NO_2 photolysis in the tube
- The interference effects of peroxyacetyl nitrate (PAN).

Under-estimation can be caused by the following factors:

- Increasing exposure period. This is thought to be due to degradation of the absorbed nitrate with time
- Insufficient extraction of nitrite from the meshes.
- The photochemical degradation of the triethanolamine-nitrite complex by light. This has been minimised by the use of opaque end-caps.
- The solution used. For example, 50% v/v solution of TEA in water has been reported to lead to comparatively reduced NO_2 uptake.

There are a number of additional factors that may also affect diffusion tube performance including time of the year, the exposure setting (i.e. sheltered or open sites), the proximity to roads, the preparation method and analytical laboratory used, the exposure concentration and the ratio of NO_2 to NO_X.

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[1] UK Diffusion Tube Calendar 2010. Details of exposure dates and tube changeover dates available from http://www.airquality.co.uk .

[2] WASP – Annual Performance Criteria for NO_2 Diffusion Tubes used in Local Air Quality Management (LAQM), 2008 onwards, and Summary of Laboratory Performance in Rounds 105-10. September 2010. Available from http://laqm1.defra.gov.uk .

2.4 Data Validation

Validation of diffusion tube readings is vital to ensure public confidence in the measurements produced. Validation is achieved through comparison of diffusion tube readings co-located alongside a continuous monitor. The comparison of the NO_2 concentration as measured by the diffusion tube with the continuous monitor measurement is used to derive a bias adjustment factor. Bias adjustment factors can also be obtained using the Nitrogen Dioxide Diffusion Tube Bias Adjustment spreadsheet [3], which is updated periodically and collates the bias-adjustment factors obtained in co-location studies conducted nationally.

There are six operational continuous NO_2 monitoring sites within the Borough which are affiliated to the London Air Quality Network (LAQN). Co-location studies were conducted at three of the six sites for the whole of 2010. Co-location at Ealing Horn Lane commenced in March 2010. The site at Western Avenue was commissioned in March 2010 with co-located tubes being positioned in April 2010. The results of the co-location studies have been used to derive a local bias adjustment factor to correct the raw diffusion tube measurements.

2.5 Site Details

2.5.1 Locations

Single and triplicate tubes are positioned at more than 90 locations throughout the Borough at locations representing kerbside, roadside, near road (intermediate) and urban background sites and, where possible, to be in locations of relevant exposure. See section 2.5.2 for details of site designations. The tube locations, along with a full list of period mean raw and bias adjusted NO_2 concentrations are listed in Appendix A.

2.5.2 Site Designations

The designation of site types was used to compare different locations statistically. Sites were categorised as kerbside, roadside, near road (intermediate) and urban background sites according to the definitions given in the "Practical Guidance for Diffusion Tube Monitoring" [4] report. These definitions are reproduced in Table 2 below. Site type designations are included in the site details in Appendix A.

Table 2: Site Type Designation Criteria, based on AEAT Practical Guidance [4]

Site Type	Definition
Kerbside	Within 1 m of the kerb.
Roadside	Between 1 m and 5 m from the kerb.
Near Road	More than 5 m from kerb of a nearby busy road but air quality is likely to be affected by the busy road.
Urban Background	>50 m from any major NO_2 source, e.g. multi-storey car parks; >30 m from any very busy road (>30,000 vehicles per day); >20 m from any busy road (10,000 – 30,000 vehicles per day) >10 m from any main road (quiet roads in residential estates are acceptable); >5m from any area where vehicles are likely to be idling.

[3] Spreadsheet of Combined Bias Adjustment Factors. Available for download from http://laqm1.defra.gov.uk/review/tools/no2/baf-national.php .
[4] AEAT (2008). Diffusion Tubes for Ambient NO_2 Monitoring: Practical Guidance. Report to Defra & the Devolved Administrations. Report Ref: AEAT/ENV/R/2504

3 Results

3.1 Data Capture

Data capture for the whole network in 2010 was very good (95.7%) and is summarised in Table 3. Good data capture (greater than 90%) was achieved at 87 of the 100 sites. Wendover Court, Western Avenue – Top Floor suffered from numerous thefts, resulting in only 58.3% data capture. Data capture for the Sinton Andrews tube at Haven Green achieved 100% data capture from its installation in June 2010, giving an overall data capture rate for the year of 58.3%. The site at Brent Lodge was affected by construction work and vandalism leading to data capture for 2010 of 75%.

The co-located tubes at Western Avenue AQMS were introduced in April 2010 and 100% data capture was achieved for the period April to December 2010 (75% data capture for 2010 as a whole). Similarly, 100% data capture was achieved at Ealing Horn Lane after the tubes were installed in March 2010. Two months of data were lost at Southfields School due to access problems during holiday periods. The sites at 156 Horn Lane, Jubilee Gardens Library, 14 Bond Street, 181 Castle Road, 200 Boston Road and the middle of Haven Green were subject to thefts leading to less than 90% data capture.

Table 3: Data Capture Rates, Ealing Diffusion Tube Network, 2006 – 2010

Site Type	Data Capture (%)				
	2006	2007	2008	2009	2010
All Sites	96.1	93.4	91.4	93.7	95.7
Roadside / Kerbside	96.5	96.4	94.7	96.0	94.3
Near Roadside	98.8	95.9	90.9	94.3	96.8
Urban Background	90.1	87.5	86.1	89.6	97.2

3.2 Bias Adjustment

The results of the three co-location studies were used to calculate a local bias adjustment factor (Ealing Town Hall, Acton Town Hall and Blair Peach School, Southall). Data from Western Avenue and Horn Lane were not used due to insufficient data capture. The triplicate tubes at Hangar Lane are not strictly co-located with the continuous monitor and so this comparison was also excluded.

The AEA Diffusion Tube Precision Accuracy Bias Spreadsheet [5] tool was used to calculate bias adjustment factors for each co-location site. Continuous monitoring data was sourced from the London Air Quality Network (LAQN) website [6]. It should be noted that the continuous monitoring data used in the bias adjustment calculations has not been ratified for the entirety of 2010 and may therefore be subject to change (see Table 3 and associated footnotes). Further details can be found in Appendix B.

Data capture rates for the continuous analysers at Acton Town Hall in August and November at Ealing Town Hall were low and so were excluded from the bias adjustment calculation. The September data for Blair Peach School (Southall) were rejected on the grounds of poor tube precision.

[5] AEA Diffusion Tube Precision Accuracy Bias Spreadsheet. Downloaded from http://laqm1.defra.gov.uk/review/tools/no2/precision 14/02/2011.
[6] London Air Quality Network Website: http://www.londonair.org.uk accessed 14/02/2011.

Table 4: Summary of Continuous Monitoring Data and Local Bias Adjustment Factors, 2010

Site Name	Site Type	Annual Mean NO_2 Concentration (µg/m^3)	Data Capture (%)	Bias Adjustment Factor
Ealing Town Hall	Near Roadside	43.8	92.8	1.06
Acton Town Hall	Roadside / Kerbside	53.7	93.1	1.02
Southall (Blair Peach School)	Urban Background	30.1	99.1	1.01

Notes: Data from Ealing Town Hall and Acton Town Hall ratified to 18/02/2010;
Data from Southall ratified to 11/02/2010;

Bias adjustment factors were also sourced from the national Spreadsheet of Combined Bias Adjustment Factors [7] for comparison purposes. However, due to the acceptable data capture in the local co-location studies, the local bias adjustment factors in Table 3 have been applied to all of the raw diffusion tube data according to the site type designation.

Table 5: Summary of National Bias Adjustment Factors, 2010

Site Type Designation	Number of Studies	Bias Adjustment Factor
Roadside & Kerbside	27	0.93
Near Road (Urban Centre)	3	0.98
Urban Background	5	0.98

Note: Figures taken from Spreadsheet of Combined Bias Adjustment Factors (Version 04.2011).
Inputs used: Analysed By – Gradko International Ltd; Method – 20% TEA in Water; Year – 2010.

3.3 Annual Mean NO_2 Concentrations

Bias adjusted annual mean NO_2 concentrations during 2010 were highest at the roadside sites (56.8 µg/m^3). Mean kerbside site concentrations were slightly lower (56.6 µg/m^3). Near Road sites showed the next highest annual mean NO_2 concentrations (49.2 µg/m^3). The lowest concentrations, as expected, were recorded at the Urban Background sites (37.3 µg/m^3). The bias adjusted annual mean NO_2 concentration across the entire network was 50.3 µg/m^3. A summary of the bias adjusted results is presented in Table 6.

The 2010 results indicate that the annual mean NO_2 objective of 40 µg/m^3 continues to be exceeded throughout the Borough of Ealing, particularly at roadside locations. In keeping with historical trends, the highest annual mean concentration was recorded at Fernlea House, Hangar Lane (82.8 µg/m^3; Site 56, Appendix A). The mean NO_2 concentration across the entire network in 2010 was 4.1 µg/m^3 higher than 2009. A contributing factor to the higher concentrations may be the application of locally-derived bias adjustment factors to correct the raw diffusion tube data. The local bias adjustment factors used were higher than the national bias adjustment factors used to correct the raw data in the 2009 survey.

[7] Spreadsheet of Diffusion Tube Bias Adjustment Factors Version 04.11. Downloaded from http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html on 04/04/2011.

Table 6: Annual Mean NO_2 Concentrations in Ealing, 2010

Site Type	Bias Adjusted Annual Mean NO_2 Concentration ($\mu g/m^3$)	Data Capture (%)
Kerbside	56.6	96.5
Roadside	56.8	93.8
Near Road	49.2	96.8
Urban Background	37.3	97.2
All Sites	50.3	95.7

3.4 Comparison With Objectives

As reported in section 3.3 the annual mean NO_2 concentration for the whole of the Ealing diffusion tube network exceeded the annual mean NO_2 objective during 2010. Table 7 shows the number of sites exceeding the annual mean NO_2 objective. Sites with data capture rates of 75% and below have been excluded.

Table 7: Sites Exceeding Annual Mean NO_2 Objective, 2010

Site Type Designation	Total Number of Sites	Number of Sites Exceeding Objective
Kerbside	10	10
Roadside	36	30
Near Road	31	26
Urban Background	23	10
All Sites	100	76

It has been suggested in LAQM.TG(09) that sites where annual mean NO_2 concentrations are higher than 60 $\mu g/m^3$ it is likely that the hourly exceedances NO_2 objective (hourly mean NO_2 concentration of 200 $\mu g/m^3$ not to be exceeded on more than 18 occasions per year) may also be exceeded. A total of 15 sites in Ealing measured bias adjusted annual mean NO_2 concentrations greater than 60 $\mu g/m^3$ and therefore have the potential to breach the short-term objective. These are listed in Table 8.

Table 8: Sites With Bias Adjusted Annual Mean NO_2 Greater Than 60 µg/m^3, 2010

Site Name / Location	Bias Adjusted Annual Mean NO_2 Concentration (µg/m^3)
Wendover Court, Western Avenue, W3, 2nd Floor	68.4
Wendover Court, Western Avenue, W3, 1st Floor	68.8
Wendover Court, Western Avenue, W3, Ground Floor	67.4
18 Old Oak Common Lane, W3	76.0
Warple Road	61.6
Age Concern, Social Centre, High Street, Acton, W	64.9
17 Runnymede Gardens	79.3
8 The Broadway, Ealing, W5	66.4
143 Church Road, Northolt, UB5	65.8
11 Uxbridge Road, Southall, UB1	70.5
Fernlea House, Hanger Lane	82.8
2 Horsenden Lane South, Greenford, UB6	60.1
6 Western Avenue	79.8
Fernlea House, Hanger Lane (tri)	77.5
326 Western Avenue	62.6

3.5 Variation With Height

At Wendover Court, Western Avenue diffusion tubes are exposed on each floor of the four-storey building allowing the change in NO_2 concentration with height to be investigated. The bias adjusted results are presented in Table 9. It should be noted that there are no valid results for the top floor site from August to December, inclusive due to theft of the tubes, resulting in data capture of 58.3%, and so the data must be viewed with caution. However, these results indicate that there is no obvious decrease in NO_2 concentrations with height.

Table 9: Annual Mean NO_2 Concentrations in Ealing, 2010

Site Type	Bias Adjusted Annual Mean NO_2 Concentration (µg/m^3)	Data Capture (%)
Mean – All Floors	68.4	87.5
Top Floor	69.0	58.3
2nd Floor	68.4	100
1st Floor	68.8	91.7
Ground Floor	67.4	100

3.6 Seasonal Variation

The seasonal variation in NO_2 concentrations during 2010 are shown in Table 10. Due to seasonal variations in the bias adjustment that can occur at diffusion tube sites the results that have been presented are the raw concentrations with no bias adjustment applied.

Table 10: Monthly Mean Raw NO_2 Concentrations in Ealing, 2010

Site Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Kerbside	74.5	66.3	54.8	53.0	53.5	52.4	42.3	46.7	56.0	51.0	59.8	55.8
Roadside	66.2	64.4	59.7	58.1	48.0	51.2	44.3	47.7	56.1	52.9	59.0	59.7
Near-Road	54.6	56.5	49.9	47.2	42.2	42.3	33.8	37.4	44.0	43.0	52.7	50.3
Urban Background	50.2	47.1	38.4	35.6	31.6	29.1	25.9	29.4	34.3	34.7	43.4	43.9
All	58.1	56.6	50.1	48.4	42.3	43.1	36.4	39.7	47.0	45.0	52.9	52.6

Table 11: Raw Winter and Summer Period Mean Concentrations in Ealing, 2010

Site Type	Winter Mean Concentration (Jan – Mar, Oct – Dec) ($\mu g/m^3$)	Summer Mean Concentration (Apr – Sep) ($\mu g/m^3$)	Ratio Winter : Summer
Kerbside	60.4	50.7	1.19
Roadside	60.3	50.9	1.19
Near-Road	51.1	41.2	1.24
Urban Background	42.9	31.0	1.39
All	52.6	42.8	1.23

Considering all site types in the network, the highest monthly mean NO_2 concentrations were measured in January followed by February. July and August displayed the lowest monthly mean NO_2 concentrations. In all cases the winter mean NO_2 concentrations (Jan – Mar and Oct – Dec) were higher than summer mean concentrations (Apr – Sep). The ratio of winter to summer mean concentrations ranged from 1.19 for kerbside and roadside site types to 1.39 for urban background sites. For all sites collectively the ratio of winter to summer mean NO_2 concentration was 1.23.

3.7 Historical Trends in NO_2

The annual mean NO_2 concentrations since 2005 at 13 long-term monitoring locations in Ealing are shown in Figure 1. The results displayed are uncorrected for bias due to the change in the monitoring period in 2008 from April – March to January – December. Despite the results showing year to year variations there are few discernible upward or downward trends over time in uncorrected annual mean concentrations at any of the long-term sites.

At site 51, Ealing Town Hall annual mean NO_2 concentrations increased from 2007 to 2009 before falling again in 2010 to approximately the 2007 level. At site 46, 143 Church Road Northolt NO_2 concentrations show some evidence of a reduction since 2007. The annual mean NO_2 concentration at site 53 Bond Street peaked in 2007 and has since fallen to concentrations similar to those observed in 2005.

Capabilities on project:
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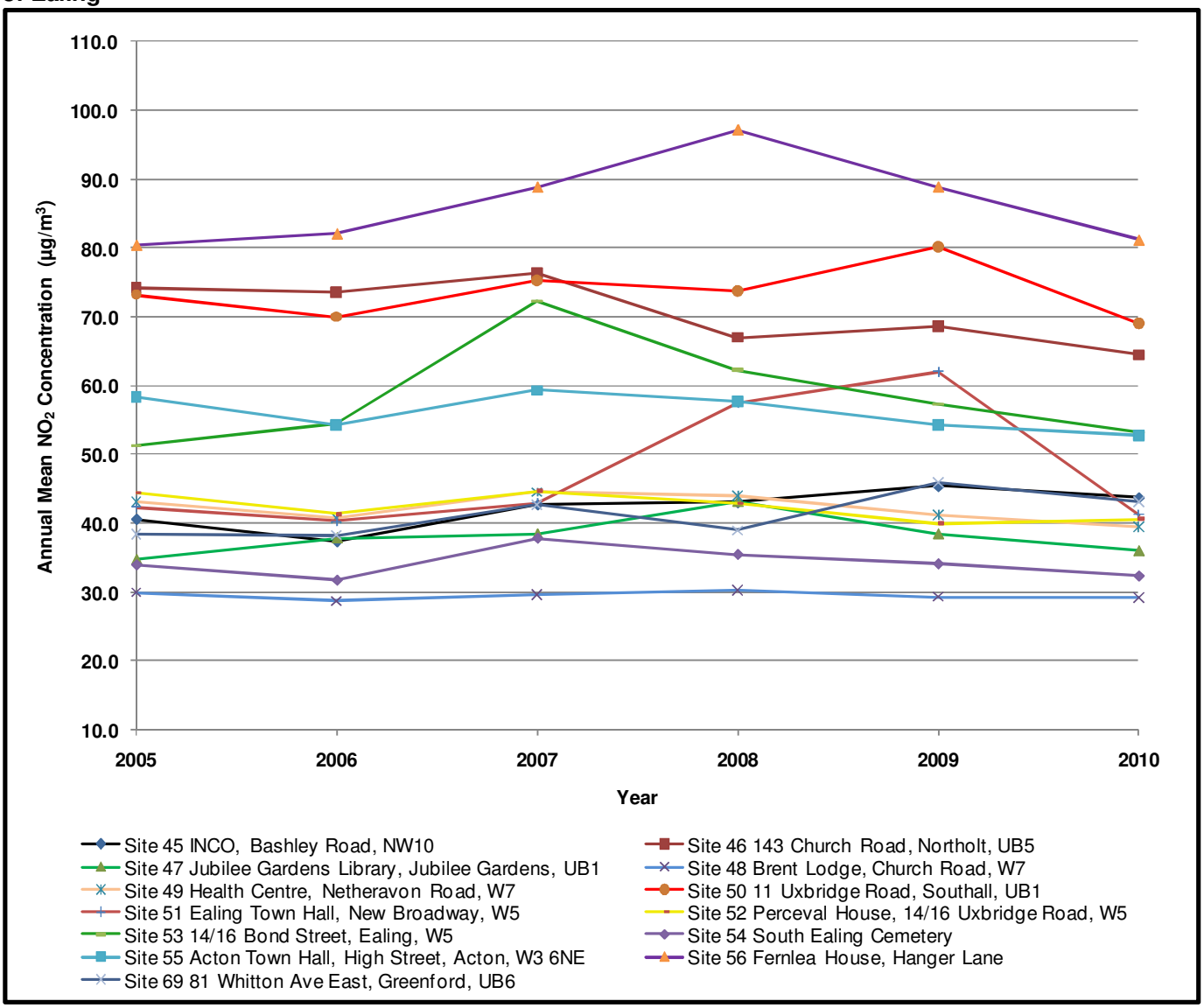
Figure 1: Historic NO_2 Diffusion Tube Concentrations (Annual Mean, Uncorrected) in the London Borough of Ealing



4 Conclusions and Recommendations

The main conclusions of the 2010 Ealing Diffusion Tube Survey are as follows:

- The annual mean NO_2 concentration for all sites in the network was 50.3 µg/m^3. This represents an increase of 4.1 µg/m^3 relative to 2009. This may be due to the use of local bias adjustment factors, which were higher than the corresponding figures from the national spreadsheet of bias adjustment factors in 2009 and 2010
- Roadside sites showed the highest annual mean NO_2 concentration (56.8 µg/m^3) followed by kerbside sites (56.6 µg/m^3). This is consistent with 2009. However, annual mean concentrations in 2010 were higher than 2009 (Roadside 50.7 µg/m^3 and kerbside 49.8 µg/m^3);
- The annual mean NO_2 objective of 40 µg/m^3 was exceeded at 76 sites;
- The maximum annual mean NO_2 concentration was 82.8 µg/m^3, recorded at Fernlea House, Hangar Lane (Site 56);
- 15 sites recorded annual mean NO_2 concentrations of greater than 60 µg/m^3 making it likely that the hourly objective for NO_2 may have been exceeded at these locations;
- Good data capture (greater than 90%) was achieved at 87 out of 100 sites;
- Winter mean concentrations were higher than summer mean concentrations at all sites in the network. The ratio of winter to summer concentrations was 1.23 for all sites.

On the basis of the findings of the 2010 survey the following recommendations are suggested:

- Continue the present level of monitoring within the Borough, in particular the long-term monitoring sites in order to preserve and continue historical trends;
- Relocate the tube at the top floor of Wendover Court, Western Avenue to reduce the incidence of tube theft;
- Relocate a number of tubes that are currently mounted on lamp posts and street furniture to building facades where possible to improve the representativeness of the results obtained.

Appendix A: Diffusion Tube Sites Details

Table 12: Ealing Diffusion Tube Network Monitoring Site Details, 2010

Site Number	Site Name	Site Designation	Grid Reference (X,Y)	Annual Mean NO_2 Concentration			Data Capture (%)
				Raw (µg/m^3)	Local Bias Adjusted (µg/m^3)	National Bias Adjusted (µg/m^3)	
1	39 Old Oak Lane	R	521587,182684	55.6	**56.7**	**51.5**	91.7
2	101 Wells House Road	UB	521238,181942	36.5	36.9	35.6	100
3	Jenner Avenue	R	520724,181552	51.9	**52.9**	**48.1**	91.7
4	5 Leamington Park	R	520532,181517	46.6	**47.5**	**43.2**	100
5	John Perryn First and Middle School, Long Drive, W3	UB	521139,181436	40.7	**41.1**	39.8	100
6.1	Wendover Court, Western Avenue – Top Floor	N	519997,182178	65.1	**69.0**	**63.8**	58.3
6.2	Wendover Court, Western Avenue – 2nd Floor	N	519997,182178	64.5	**68.4**	**63.3**	100
6.3	Wendover Court, Western Avenue – 1st Floor	N	519997,182178	64.9	**68.8**	**63.7**	91.7
6.4	Wendover Court, Western Avenue – Ground Floor	N	519997,182178	63.6	**67.4**	**62.4**	100
7	45 Park Avenue	N	518600,183000	46.8	**49.6**	**45.9**	100
8	6 Brentmead Gardens	UB	518970,182964	40.1	**40.5**	39.2	100
9	Iveagh Avenue	N	519117,183379	46.7	**49.5**	**45.8**	91.7
10	57-75 Old Oak Common Lane (PO)	R	521557,180996	55.4	**56.5**	**51.4**	100
11	2 St. Andrews Road, W3	R	521381,180946	49.7	**50.7**	**46.1**	100
12.1	18 Old Oak Common Lane, W3 (triplicate)	R	521602,180856	75.3	**76.9**	**69.9**	91.7
12.2	18 Old Oak Common Lane, W3 (triplicate)	R	521602,180856	73.7	**75.2**	**68.3**	100
12.3	18 Old Oak Common Lane, W3 (triplicate)	R	521602,180856	74.5	**76.0**	**69.1**	100
13	East Acton Primary School, East Acton Lane	N	521112,180617	35.6	37.8	34.9	100
14	First Avenue	N	521761,180132	42.4	**45.0**	**41.6**	100
15	177 The Vale, W3	K	521088,180046	60.4	**61.6**	**56.0**	100
17	Maples Nursery, East Churchfield Road, W3	UB	520754,180316	37.8	38.1	36.9	100

Site Number	Site Name	Site Designation	Grid Reference (X,Y)	Annual Mean NO_2 Concentration			Data Capture (%)
				Raw (µg/m^3)	Local Bias Adjusted (µg/m^3)	National Bias Adjusted (µg/m^3)	
19	Lantry Court, Acton, W3	UB	519883,180459	33.1	33.4	32.3	100
20	Age Concern / Social Centre, High Street, Acton, W3	R	519928,180173	63.6	**64.9**	**59.0**	91.7
21	Acton Health Centre, Church Road, Acton, W3	N	520128,180016	37.3	39.6	36.6	100
22	Gunnersbury Unit, Acton Hospital, Gunnersbury Lane	K	519547,179948	51.0	**52.0**	**47.3**	100
23	156 Horn Lane, W3	R	520180,180896	48.4	**49.4**	**44.9**	83.3
24	Peal Gardens	R	516089,182400	38.3	39.1	35.5	100
25	17 Runnymede Gardens	K	515255,183098	77.8	**79.3**	**72.1**	91.7
26	13 Blenheim Close	N	514866,183116	45.5	**48.3**	**44.7**	100
27	203 Windmill Lane, Greenford, UB6	N	514259,182234	41.8	**44.3**	**41.0**	100
28	Social Services, Ruislip Road, Greenford, UB6	N	513182,182741	42.0	**44.6**	**41.2**	100
29	2 Shadwell Drive, Northolt, UB5	UB	512603,182837	41.7	**42.1**	**40.7**	91.7
30	Bengarth Road, Northolt, UB5	R	512108,183540	47.0	**48.0**	**43.6**	100
32	Lilliput Avenue, UB5	UB	512499,183805	41.7	**42.1**	**40.7**	100
33	Northolt Primary School, Compton Crescent, UB5	UB	512050,184073	51.0	**51.6**	**49.8**	100
34	8 The Broadway, Ealing, W5	K	517887,180914	65.1	**66.4**	**60.4**	100
35	Acton Town Medical Centre, Gunnersbury Lane, W3	K	519373,179593	50.1	**51.1**	**46.4**	100
36	Hanwell Nursery, 25A Laurel Gardens, W7	N	515242,180158	46.6	**49.4**	**45.7**	100
37	Ealing Hospital, St Bernard's Wing, Uxbridge Road, UB1	UB	514705,180022	45.8	**46.3**	**44.7**	100
38	Hobbayne First School, Greenford Avenue, W7	UB	515477,181081	33.3	33.6	32.5	100
39	McDonalds Drive-Thru, Uxbridge Road, Southall	R	512206,180522	40.4	**41.2**	37.4	100
40.1	Hambrough Primary and Nursery School, South Road, UB1 (triplicate)	N	512673,180069	50.7	**53.7**	**49.7**	100

Capabilities on project:
Environment

Site Number	Site Name	Site Designation	Grid Reference (X,Y)	Annual Mean NO_2 Concentration			Data Capture (%)
				Raw (µg/m^3)	Local Bias Adjusted (µg/m^3)	National Bias Adjusted (µg/m^3)	
40.2	Hambrough Primary and Nursery School, South Road, UB1 (triplicate)	N	512673,180069	51.2	**54.3**	**50.3**	100
40.3	Hambrough Primary and Nursery School, South Road, UB1 (triplicate)	N	512673,180069	49.2	**52.2**	**48.3**	100
41	4 Merrick Road, Southall, UB2	N	512657,179712	43.1	**45.7**	**42.3**	100
44	Perivale Wood, r/o 36-38 Sunley Gardens, UB6	UB	516166,183578	25.4	25.7	24.8	91.7
45	INCO, Bashley Road, NW10	R	520915,182464	43.8	**44.6**	**40.6**	100
46	143 Church Road, Northolt, UB5	R	512690,183983	64.5	**65.8**	**59.8**	100
47	Jubilee Gardens Library, Jubilee Gardens, UB1	UB	513229,181513	36.0	36.3	35.1	83.3
48	Brent Lodge, Church Road, W7	UB	514740,180643	29.1	29.4	28.4	75.0
49	Health Centre, Netheravon Road, W7	N	515680,180360	39.5	**41.9**	38.7	100
50	11 Uxbridge Road, Southall, UB1	R	512768,180400	69.1	**70.5**	**64.1**	100
51.1	Ealing Town Hall, New Broadway, W5 (co-located triplicate)	N	517534,180737	41.7	**44.2**	**40.9**	100
51.2	Ealing Town Hall, New Broadway, W5 (co-located triplicate)	N	517534,180737	41.0	**43.4**	**40.2**	100
51.3	Ealing Town Hall, New Broadway, W5 (co-located triplicate)	N	517534,180737	41.0	**43.4**	**40.2**	100
52	Perceval House, 14/16 Uxbridge Road, W5	N	517440,180677	40.6	**43.1**	39.9	100
53	14/16 Bond Street, Ealing, W5	R	517644,180613	53.2	**54.3**	**49.4**	83.3
54	South Ealing Cemetery,	UB	517750,178860	32.3	32.6	31.6	100
55.1	Acton Town Hall, High Street, Acton, W3 6NE (co-located triplicate)	R	520306,180055	53.9	**54.9**	**49.9**	100
55.2	Acton Town Hall, High Street, Acton, W3 6NE (co-located triplicate)	R	520306,180055	52.8	**53.9**	**49.0**	100
55.3	Acton Town Hall, High Street, Acton, W3 6NE (co-located triplicate)	R	520306,180055	51.8	**52.8**	**48.0**	100
56	Fernlea House, Hanger Lane	R	518540,182700	81.2	**82.8**	**75.3**	91.7

Capabilities on project:
Environment

Site Number	Site Name	Site Designation	Grid Reference (X,Y)	Annual Mean NO_2 Concentration			Data Capture (%)
				Raw (µg/m^3)	Local Bias Adjusted (µg/m^3)	National Bias Adjusted (µg/m^3)	
57	106/116 St Pauls Close	UB	518577,179865	39.9	**40.3**	39.0	100
58	44 Acton Lane, W4	K	520481,178826	56.1	**57.2**	**52.0**	100
59	Clayponds Hospital and Day Treatment Centre, Sterling Place	UB	518153,178709	35.8	36.1	34.9	100
60	51/53 Old Oak Common Lane	R	521573,180932	55.2	**56.3**	**51.2**	100
61	14 Balfour Road, W13	UB	516703,179728	35.5	35.9	34.7	100
62	Kirn Road/Drayton Green Road, W13	R	516700,180522	56.8	**57.9**	**52.6**	100
63	St David's Home, 12 Castlebar Hill, W5	UB	516992,181698	32.0	32.3	31.2	100
64	St John Fisher Primary School, Thirlmere Avenue, G	UB	517072,182912	41.0	**41.4**	**40.0**	100
65	2 Horsenden Lane South, Greenford, UB6	R	516368,182978	58.9	**60.1**	**54.6**	100
66	57 Woodville Gardens, W5	N	518633,181314	52.8	**56.0**	**51.8**	91.7
67.1	Oldfield Primary School, Oldfield Lane North, Greenford (triplicate)	UB	514753,183342	41.4	**41.8**	**40.4**	100
67.2	Oldfield Primary School, Oldfield Lane North, Greenford (triplicate)	UB	514753,183342	40.9	**41.3**	39.9	100
67.3	Oldfield Primary School, Oldfield Lane North, Greenford (triplicate)	UB	514753,183342	38.1	38.5	37.2	100
68	Gainsboro Gardens, UB6	N	515395,185292	49.0	**52.0**	**48.1**	91.7
69	81 Whitton Ave East, Greenford, UB6	K	516858,184691	43.2	**44.1**	**40.0**	100
70	126 Petts Hill, Northolt,	N	513794,185348	39.9	**42.3**	39.1	100
71	181 Castle Road, Northolt, UB5	R	514102,184521	35.1	35.9	32.6	83.3
72	2/4 Minterne Avenue	R	513587,178915	42.0	**42.8**	38.9	100
73.1	Nr. Glebe Nursery School, Western Road, Southall, UB2 (triplicate)	K	511468,178898	53.5	**54.6**	**49.6**	100
73.2	Nr. Glebe Nursery School, Western Road, Southall, UB2 (triplicate)	K	511468,178898	55.5	**56.6**	**51.4**	91.7

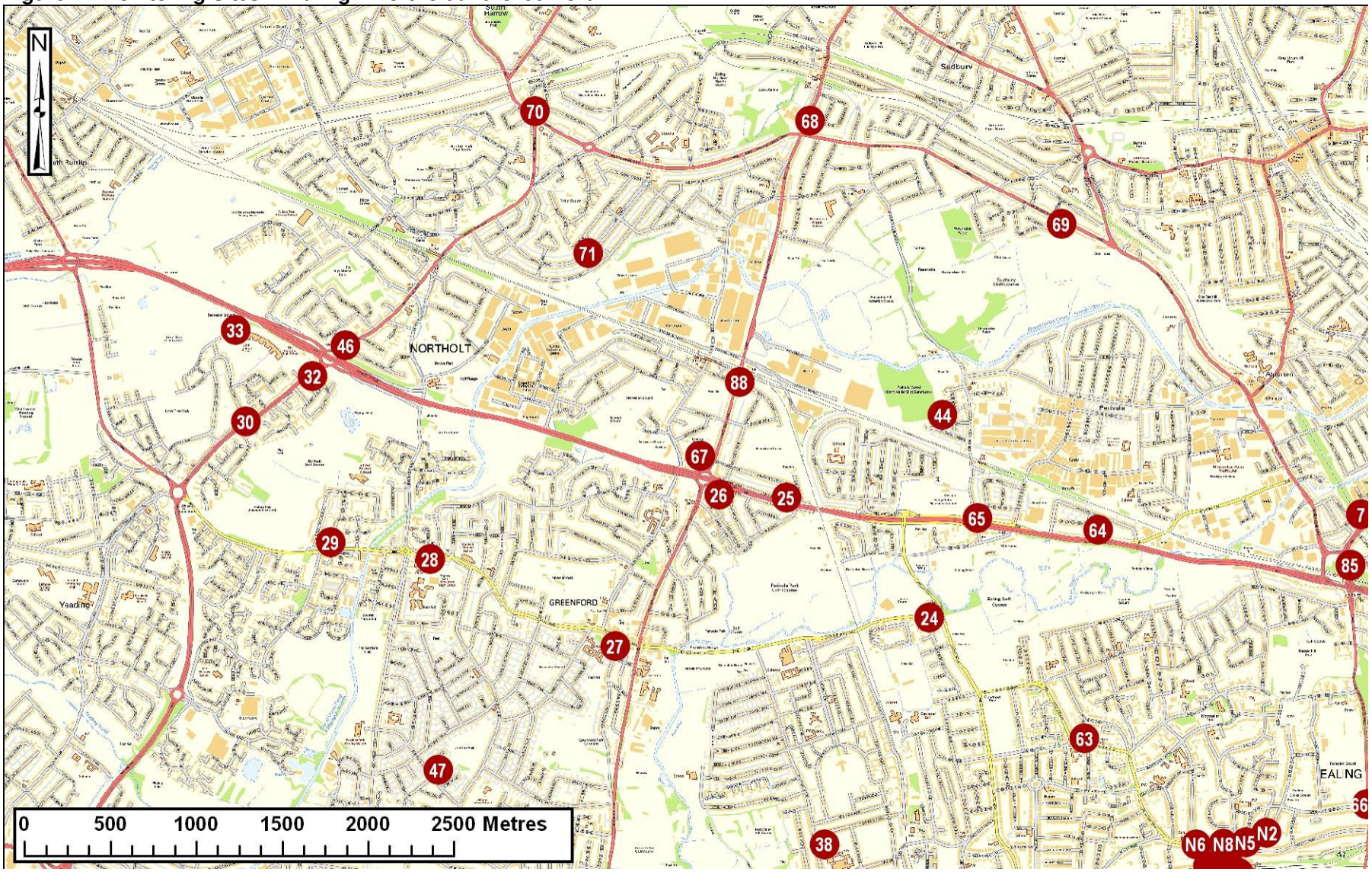
Site Number	Site Name	Site Designation	Grid Reference (X,Y)	Annual Mean NO_2 Concentration			Data Capture (%)
				Raw (µg/m^3)	Local Bias Adjusted (µg/m^3)	National Bias Adjusted (µg/m^3)	
73.3	Nr. Glebe Nursery School, Western Road, Southall, UB2 (triplicate)	K	511468,178898	51.2	**52.3**	**47.5**	91.7
74	132 Brent Road, Southall, UB2	R	511173,179203	51.1	**52.2**	**47.4**	100
75	6 Boston Gardens Hanwell, W7	N	516277,178882	37.2	39.5	36.5	100
76	200 Boston Road, W7	K	516100,179300	46.0	**46.9**	**42.6**	83.3
77	7 Greenford Avenue, Southall	N	512753,180478	37.0	39.2	36.3	100
78	119 Twyford Avenue, W3	R	519275,180869	38.9	39.7	36.1	91.7
79	Albert Dane Centre, 19-21 Western Road, Southall	N	512234,179201	40.5	**43.0**	39.8	100
80	6 Western Avenue	R	521549,180923	78.3	**79.8**	**72.6**	91.7
81	54 Western Avenue (Dental Surgery)	N	521391,180922	54.3	**57.6**	**53.3**	100
82	98/100 Western Avenue	N	521173,180981	53.9	**57.1**	**52.9**	100
83	171 Old Oak Road	R	521646,180800	50.8	**51.8**	**47.1**	100
84	Southfields First and Middle School	UB	521200,179500	35.8	36.1	34.9	83.3
85.1	Fernlea House, Hangar Lane (triplicate)	R	518541,182707	76.3	**77.9**	**70.8**	100
85.2	Fernlea House, Hangar Lane (triplicate)	R	518541,182707	77.1	**78.6**	**71.5**	100
85.3	Fernlea House, Hangar Lane (triplicate)	R	518541,182707	74.6	**76.1**	**69.2**	100
86	27 Wells House Road	UB	521305,181966	43.0	**43.4**	**42.0**	100
87	94 North Acton Road	N	520780,182775	40.5	**42.9**	39.7	100
88	914 Greenford Road (Bennetts Avenue)	R	514985,183770	42.3	**43.2**	39.2	100
89.1	Blair Peach School, Beaconsfield Road, Southall (co-located triplicate)	UB	511680,180071	31.0	31.3	30.3	100
89.2	Blair Peach School, Beaconsfield Road, Southall (co-located triplicate)	UB	511680,180071	30.2	30.5	29.5	100
89.3	Blair Peach School, Beaconsfield Road, Southall (co-located triplicate)	UB	511680,180071	27.7	28.0	27.1	100

Capabilities on project:
Environment

Site Number	Site Name	Site Designation	Grid Reference (X,Y)	Annual Mean NO_2 Concentration			Data Capture (%)
				Raw (µg/m^3)	Local Bias Adjusted (µg/m^3)	National Bias Adjusted (µg/m^3)	
90.1	The Straight, opposite Randolph Road, Southall (triplicate)	N	512514,179795	41.8	**44.3**	**41.0**	100
90.2	The Straight, opposite Randolph Road, Southall (triplicate)	N	512514,179795	41.5	**43.9**	**40.7**	100
90.3	The Straight, opposite Randolph Road, Southall (triplicate)	N	512514,179795	42.1	**44.6**	**41.3**	100
91.1	Manor Road (Opposite 40 Manor Rd) (triplicate)	R	516405,180710	40.0	**40.8**	37.1	100
91.2	Manor Road (Opposite 40 Manor Rd) (triplicate)	R	516405,180710	38.3	39.1	35.6	91.7
91.3	Manor Road (Opposite 40 Manor Rd) (triplicate)	R	516405,180710	39.0	39.8	36.2	91.7
92.1	Ealing Horn Lane AQMS (co-located triplicate)	R	520432,181428	58.4	**59.6**	**54.2**	100 (83.3)
92.2	Ealing Horn Lane AQMS (co-located triplicate)	R	520432,181428	56.0	**57.1**	**51.9**	100 (83.3)
92.3	Ealing Horn Lane AQMS (co-located triplicate)	R	520432,181428	57.5	**58.6**	**53.3**	100 (83.3)
93.1	Western Avenue AQMS (co-located triplicate)	R	520430,181950	71.0	**72.4**	**65.8**	100 (75.0)
93.2	Western Avenue AQMS (co-located triplicate)	R	520430,181950	71.7	**73.1**	**66.4**	100 (75.0)
93.3	Western Avenue AQMS (co-located triplicate)	R	520430,181950	66.6	**67.9**	**61.7**	88.9 (66.7)
N1	326 Western Avenue	N	520424,181957	59.0	**62.6**	**57.9**	83.3
N2	21 Haven LANE	R	518023,181115	39.3	**40.1**	36.4	100
N3	1a Haven Green	R	517747,180903	52.4	**53.5**	**48.6**	100
N4	Middle of Green	N	517826,180981	48.1	**51.0**	**47.2**	83.3
N5	Woodvale Road	R	517928,181089	41.9	**42.7**	38.8	100
N6	6 Castlebar Road	K	517636,181079	56.2	**57.3**	**52.1**	100
N7	Gordon Road	R	517707,180953	44.9	**45.8**	**41.6**	100
N8	Haven Green Court, Haven Green, Ealing	N	517803,181082	40.0	**42.4**	39.2	100 (91.7)
N9	Sinton Andrews Estate Agent, Haven Green	R	517747,180822	66.9	**68.2**	**62.0**	100 (58.3)

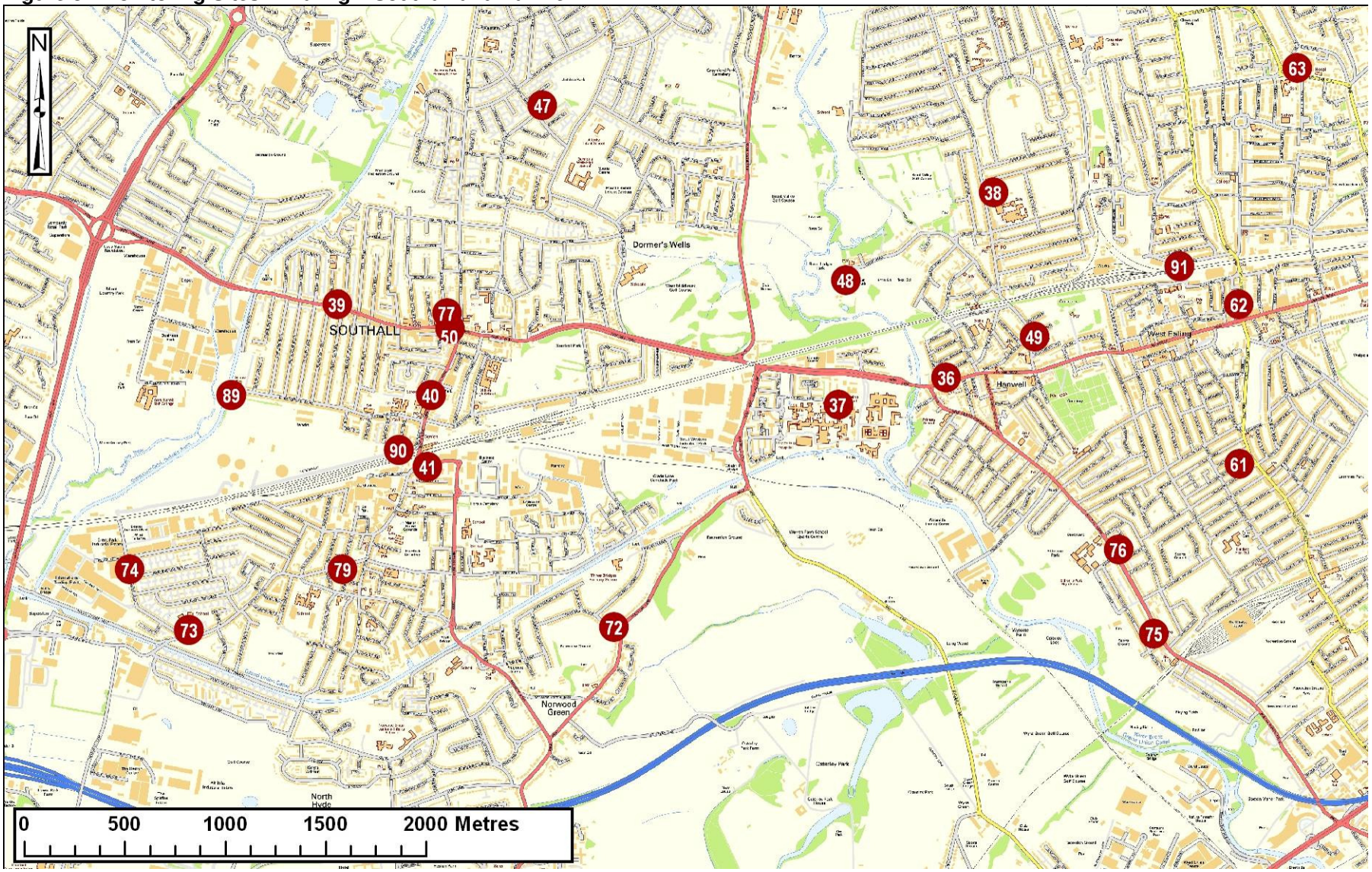
Capabilities on project:
Environment

Figure 2: Monitoring Sites in Ealing – Northolt and Greenford



Capabilities on project:
Environment

Figure 3: Monitoring Sites in Ealing – Southall and Hanwell

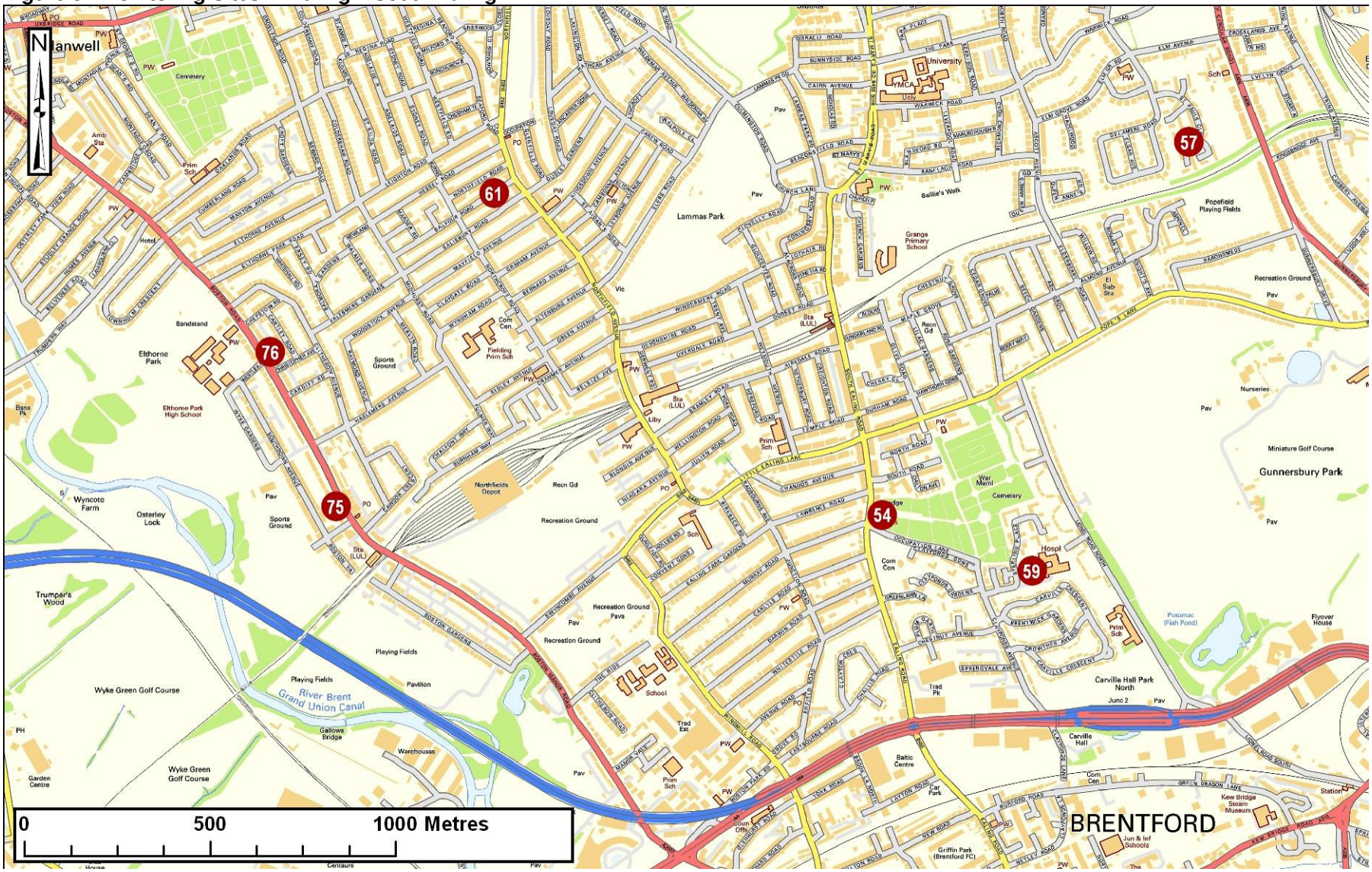


Capabilities on project:
Environment

Figure 4: Monitoring Sites in Ealing – Ealing Town and Haven Green

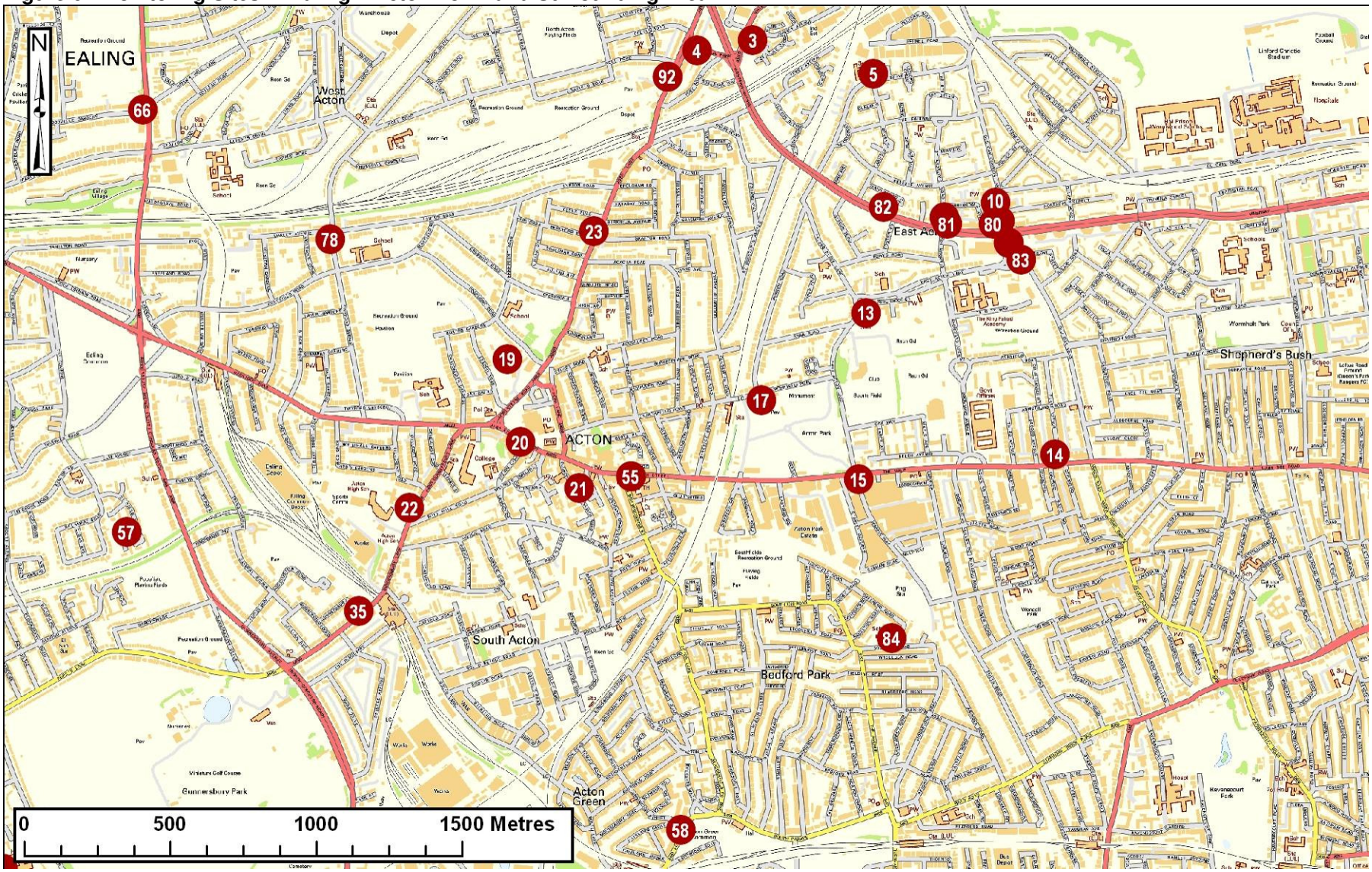
Capabilities on project:
Environment

Figure 5: Monitoring Sites in Ealing – South Ealing



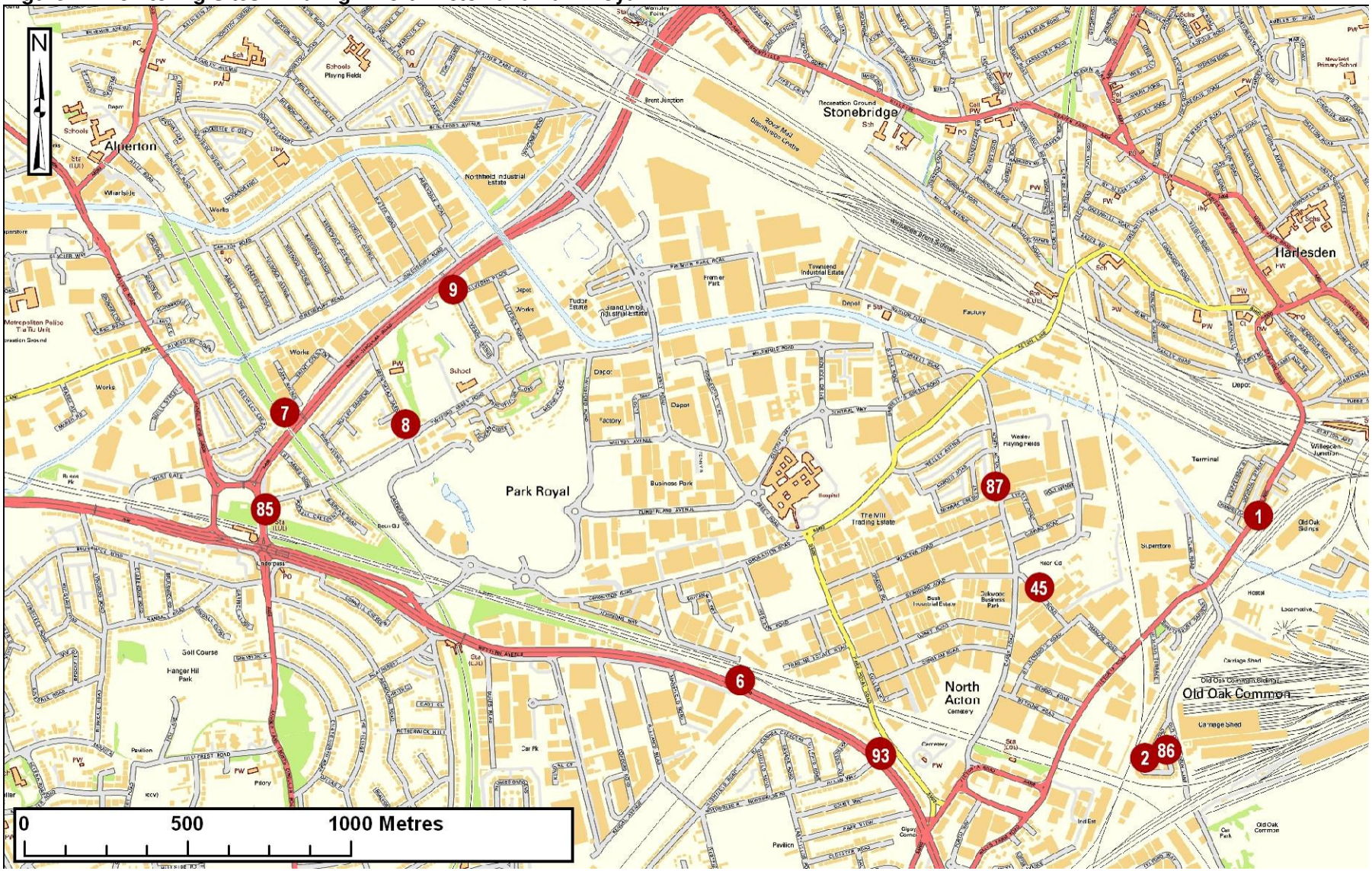
Capabilities on project:
Environment

Figure 6: Monitoring Sites in Ealing – Acton Town and Surrounding Area



Capabilities on project:
Environment

Figure 7: Monitoring Sites in Ealing – North Acton and Park Royal



Appendix B: Bias Adjustment Calculations

Table 13: Local Bias Adjustment Factor Calculation, Ealing Town Hall

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements										Automatic Method		Data Quality Check	
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 μgm^{-3}	Tube 2 μgm^{-3}	Tube 3 μgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean	Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
1	08/01/2010	05/02/2010	46.9	45.5	51.8	48	3.3	7	8.3	54.1	99.4047619	Good	Good
2	05/02/2010	05/03/2010	47.8	46.6	46.9	47	0.6	1	1.6	54.6	99.25595238	Good	Good
3	05/03/2010	01/04/2010	44.0	44.5	44.0	44	0.3	1	0.8	42.1	86.41975309	Good	Good
4	01/04/2010	29/04/2010	44.3	40.7	41.9	42	1.8	4	4.6	45.3	99.70238095	Good	Good
5	29/04/2010	04/06/2010	35.3	32.3	34.3	34	1.5	4	3.8	36.5	99.76851852	Good	Good
6	04/06/2010	02/07/2010	39.5	36.0	33.8	36	2.9	8	7.2	33.0	85.26785714	Good	Good
7	02/07/2010	05/08/2010	23.1	26.1	23.8	24	1.6	6	3.9	26.4	99.50980392	Good	Good
8	05/08/2010	03/09/2010	28.8	30.0	30.2	30	0.7	2	1.8	27.9	98.99425287	Good	Good
9	03/09/2010	01/10/2010	38.4	46.6	41.3	42	4.1	10	10.3	37.8	96.875	Good	Good
10	01/10/2010	04/11/2010	43.8	40.3	41.5	42	1.8	4	4.4	48.3	88.84803922	Good	Good
11	04/11/2010	01/12/2010	47.8	46.5	53.5	49	3.7	7	9.2	59.0	52.77777778	Good	or Data Capture
12	01/12/2010	07/01/2011	60.7	56.5	48.7	55	6.1	11	15.1	64.3	99.54954955	Good	Good
13													
											Overall survey -->	Good precision	Good Overall DC

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

(Check average CV & DC from Accuracy calculations)

Site Name/ ID:	EA 1 Ealing Town Hall

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 11 periods of data	
Bias factor A	1.06 (0.99 - 1.14)
Bias B	-5% (-12% - 1%)
Diffusion Tubes Mean:	40 μgm^{-3}
Mean CV (Precision):	5
Automatic Mean:	43 μgm^{-3}
Data Capture for periods used:	96%
Adjusted Tubes Mean:	43 (40 - 46) μgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA	
Bias calculated using 11 periods of data	
Bias factor A	1.06 (0.99 - 1.14)
Bias B	-5% (-12% - 1%)
Diffusion Tubes Mean:	40 μgm^{-3}
Mean CV (Precision):	5
Automatic Mean:	43 μgm^{-3}
Data Capture for periods used:	96%
Adjusted Tubes Mean:	43 (40 - 46) μgm^{-3}

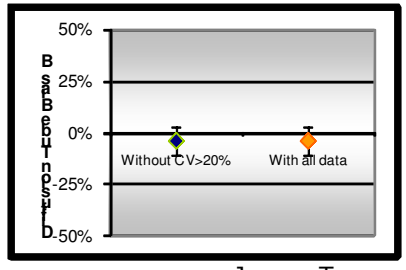


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Table 14: Local Bias Adjustment Factor Calculation, Acton Town Hall

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements										Automatic Method		Data Quality Check	
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 μgm^{-3}	Tube 2 μgm^{-3}	Tube 3 μgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean	Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
1	08/01/2010	05/02/2010	66.9	68.9	66.1	67	1.5	2	3.7	67.9	84.22619048	Good	Good
2	05/02/2010	05/03/2010	66.7	69.3	66.4	67	1.6	2	3.9	61.3	92.55952381	Good	Good
3	05/03/2010	01/04/2010	58.9	56.8	45.9	54	7.0	13	17.3	52.0	98.91975309	Good	Good
4	01/04/2010	29/04/2010	59.5	59.7	53.7	58	3.4	6	8.4	63.9	99.70238095	Good	Good
5	29/04/2010	04/06/2010	55.6	53.2	52.5	54	1.6	3	4.1	51.6	96.41203704	Good	Good
6	04/06/2010	02/07/2010	49.7	43.4	48.5	47	3.3	7	8.3	46.6	97.4702381	Good	Good
7	02/07/2010	05/08/2010	37.8	37.7	41.0	39	1.9	5	4.7	33.1	98.65196078	Good	Good
8	05/08/2010	03/09/2010	40.8	45.1	43.8	43	2.2	5	5.4	41.1	62.78735632	Good	or Data Capture
9	03/09/2010	01/10/2010	51.3	47.2	52.0	50	2.6	5	6.5	47.6	99.10714286	Good	Good
10	01/10/2010	04/11/2010	41.4	42.5	49.8	45	4.6	10	11.4	51.4	99.50980392	Good	Good
11	04/11/2010	01/12/2010	49.2	56.7	51.3	52	3.8	7	9.5	63.7	93.82716049	Good	Good
12	01/12/2010	07/01/2011	68.4	53.4	50.1	57	9.8	17	24.3	66.0	82.20720721	Good	Good
13													
											Overall survey -->	Good precision	Good Overall DC

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

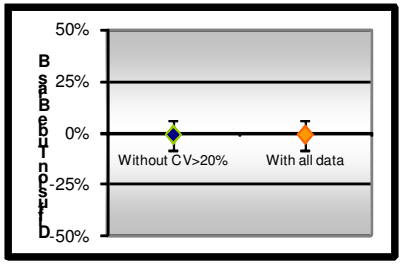
(Check average CV & DC from Accuracy calculations)

Site Name/ ID:	EA 2 Acton Town Hall

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 11 periods of data	
Bias factor A	1.02 (0.95 - 1.11)
Bias B	-2% (-10% - 5%)
Diffusion Tubes Mean:	54 μgm^{-3}
Mean CV (Precision):	7
Automatic Mean:	55 μgm^{-3}
Data Capture for periods used:	95%
Adjusted Tubes Mean:	55 (51 - 60) μgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA	
Bias calculated using 11 periods of data	
Bias factor A	1.02 (0.95 - 1.11)
Bias B	-2% (-10% - 5%)
Diffusion Tubes Mean:	54 μgm^{-3}
Mean CV (Precision):	7
Automatic Mean:	55 μgm^{-3}
Data Capture for periods used:	95%
Adjusted Tubes Mean:	55 (51 - 60) μgm^{-3}



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Version 03 - November 2006

Capabilities on project:
Environment

Table 15: Local Bias Adjustment Factor Calculation, Southall (Blair Peach School)

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements										Automatic Method		Data Quality Check	
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 μgm^{-3}	Tube 2 μgm^{-3}	Tube 3 μgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean	Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
1	08/01/2010	05/02/2010	43.1	42.8	36.4	41	3.8	9	9.4	44.5	99.70	Good	Good
2	05/02/2010	05/03/2010	49.2	39.7	38.4	42	5.9	14	14.6	41.2	99.11	Good	Good
3	05/03/2010	01/04/2010	28.4	28.0	28.3	28	0.2	1	0.5	28.7	99.69	Good	Good
4	01/04/2010	29/04/2010	29.8	27.2	29.0	29	1.4	5	3.4	30.1	99.55	Good	Good
5	29/04/2010	04/06/2010	23.9	24.4	24.9	24	0.5	2	1.3	22.0	97.34	Good	Good
6	04/06/2010	02/07/2010	20.9	22.0	22.1	22	0.7	3	1.7	20.7	97.62	Good	Good
7	02/07/2010	05/08/2010	20.1	21.1	19.1	20	1.0	5	2.5	16.4	99.39	Good	Good
8	05/08/2010	03/09/2010	24.1	25.6	23.0	24	1.3	5	3.2	18.7	97.70	Good	Good
9	03/09/2010	01/10/2010	29.1	29.4	16.2	25	7.5	30	18.7	26.3	100.00	Poor Precision	Good
10	01/10/2010	04/11/2010	25.1	26.7	29.0	27	2.0	7	4.9	31.2	99.88	Good	Good
11	04/11/2010	01/12/2010	39.3	37.4	29.3	35	5.3	15	13.3	39.5	100.00	Good	Good
12	01/12/2010	07/01/2011	39.2	38.2	36.9	38	1.1	3	2.9	42.3	99.89	Good	Good
13													
												Good precision	Good Overall DC

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

Overall survey -->

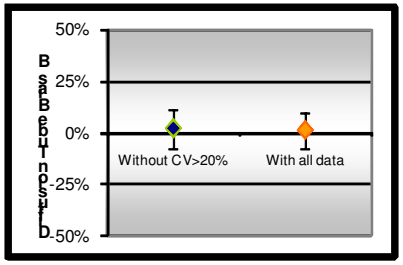
(Check average CV & DC from Accuracy calculations)

Site Name/ ID:	EA 7 Southall (Blair Peach)

Precision	11 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 11 periods of data	
Bias factor A	1.01 (0.93 - 1.12)
Bias B	-1% (-11% - 8%)
Diffusion Tubes Mean:	30 μgm^{-3}
Mean CV (Precision):	6
Automatic Mean:	30 μgm^{-3}
Data Capture for periods used:	99%
Adjusted Tubes Mean:	30 (28 - 34) μgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA	
Bias calculated using 12 periods of data	
Bias factor A	1.02 (0.93 - 1.12)
Bias B	-2% (-10% - 7%)
Diffusion Tubes Mean:	30 μgm^{-3}
Mean CV (Precision):	8
Automatic Mean:	30 μgm^{-3}
Data Capture for periods used:	99%
Adjusted Tubes Mean:	30 (28 - 33) μgm^{-3}



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Version 03 - November 2006

Table 16: National Bias Adjustment Factor Calculation, Roadside and Kerbside Sites

Analysed By[1]	Method To undo your selection, choose (All) from the pop-up list	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m^3)	Automatic Monitor Mean Conc. (Cm) (µg/m^3)	Bias (B)	Tube Precision[6]	Bias Adj Factor (A) (Cm/Dm)
Gradko	20% TEA in Water	R	Nottingham CC	12	45	43	4.9%	G	**0.95**
Gradko	20% TEA in Water	R	Nottingham CC	12	44	41	6.3%	G	**0.94**
Gradko	20% TEA in Water	K	South Lakeland DC	12	46	42	8.1%	G	**0.92**
Gradko	20% TEA in Water	R	Gedling BC	12	43	39	9.1%	G	**0.92**
Gradko	20% TEA in Water	R	Dudley MBC	12	42	45	-5.9%	G	**1.06**
Gradko	20% TEA in Water	R	Dudley MBC	10	47	46	2.4%	G	**0.98**
Gradko	20% TEA in Water	R	Carlisle CC	12	41	33	25.5%	G	**0.80**
Gradko	20% TEA in Water	R	Nottingham CC	12	45	43	4.9%	G	**0.95**
Gradko	20% TEA in Water	R	Nottingham CC	12	44	41	6.3%	G	**0.94**
Gradko	20% TEA in Water	K	Wandsworth Council	11	136	162	-16.4%	G	**1.20**
Gradko	20% TEA in Water	R	Newtownabbey BC	11	36	35	4.3%	G	**0.96**
Gradko	20% TEA in Water	R	Cheshire East Council	12	58	45	29.2%	G	**0.77**
Gradko	20% TEA in Water	R	Cheshire East Council	11	30	30	-1.8%	G	**1.02**
Gradko	20% TEA in Water	R	Gateshead Council	9	38	34	10.4%	G	**0.91**
Gradko	20% TEA in Water	R	Gateshead Council	9	35	33	6.0%	G	**0.94**
Gradko	20% TEA in Water	R	Gateshead Council	9	34	34	-0.6%	G	**1.01**
Gradko	20% TEA in Water	R	Gateshead Council	9	32	35	-9.9%	G	**1.11**
Gradko	20% TEA in Water	R	Gosport BC	10	31	23	35.3%	na	**0.74**
Gradko	20% TEA in Water	R	Rhondda Cynon Taf CBC	10	35	35	0.4%	G	**1.00**
Gradko	20% TEA in Water	R	South Norfolk Council	9	28	17	63.7%	G	**0.61**
Gradko	20% TEA in Water	R	Chelmsford BC	12	33	21	55.0%	G	**0.65**
Gradko	20% TEA in Water	R	Chelmsford BC	10	37	32	14.6%	G	**0.87**
Gradko	20% TEA in Water	R	Wokingham BC	10	37	36	4.1%	G	**0.96**
Gradko	20% TEA in Water	R	West Dunbartonshire Council	9	22	22	0.1%	G	**1.00**
Gradko	20% TEA in Water	R	Scarborough BC	12	35	29	18.2%	G	**0.85**
Gradko	20% TEA in Water	R	Sandwell MBC	11	45	45	-0.9%	na	**1.01**
Gradko	20% TEA in Water	R	Sandwell MBC	11	37	36	2.0%	na	**0.98**
								Average	**0.93**

Capabilities on project:
Environment

Table 17: National Bias Adjustment Factor Calculation, Near-Road Sites

Analysed By[1]	Method To undo your selection, choose (All) from the pop-up list	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (mg/m^3)	Automatic Monitor Mean Conc. (Cm) (mg/m^3)	Bias (B)	Tube Precision[6]	Bias Adjustment Factor (A) (Cm/Dm)
Gradko	20% TEA in Water	UC	Nottingham CC	12	40	40	-1.0%	G	**1.01**
Gradko	20% TEA in Water	UC	Nottingham CC	12	40	40	-1.0%	G	**1.01**
Gradko	20% TEA in Water	UC	Belfast CC	11	38	35	8.4%	P	**0.92**
								Average	**0.98**

Table 18: National Bias Adjustment Factor Calculation, Urban Background Sites

Analysed By[1]	Method To undo your selection, choose (All) from the pop-up list	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m^3)	Automatic Monitor Mean Conc. (Cm) (µg/m^3)	Bias (B)	Tube Precision[6]	Bias Adjustment Factor (A) (Cm/Dm)
Gradko	20% TEA in Water	UB	Luton Borough Council	12	37	34	9.8%	G	**0.91**
Gradko	20% Tea in Water	UB	Wandsworth Council	12	47	53	-9.9%	P	**1.11**
Gradko	20% TEA in Water	UB	LB Ealing	10	39	41	-3.8%	G	**1.04**
Gradko	20% TEA in Water	UB	Sandwell MBC	11	31	28	11.4%	na	**0.90**
Gradko	20% TEA in Water	UB	Sandwell MBC	10	22	21	8.1%	na	**0.93**
								Average	**0.98**