# 2015 Air Quality Updating and Screening Assessment for
# London Borough of Ealing

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

September 2015

Ealing
www.ealing.gov.uk

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London Borough of Ealing 2015 Updating and Screening Assessment

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# Executive Summary

In fulfilment of its Local Air Quality Management duties, the London Borough of Ealing commissioned AECOM Ltd to compile its 2015 Air Quality Updating and Screening Assessment (USA). This USA documents changes in monitored pollutant concentrations within the Borough since the publication of the London Borough of Ealing's 2014 Air Quality Progress Report. New local developments and planning applications which have the potential to affect air quality are also summarised, along with relevant local air quality policies, strategies, Local Transport Plans and Climate Change initiatives.

In 2014 the London Borough of Ealing undertook monitoring at four continuous monitoring sites and 98 $NO_2$ diffusion tube sites within the Borough.

Exceedances of the annual mean nitrogen dioxide ($NO_2$) air quality objective were monitored in 2014 at the Hanger Lane Gyratory, Horn Lane and Western Avenue automatic monitoring stations. Monitored hourly mean $NO_2$ concentrations at the Hanger Lane Gyratory site in 2014 also potentially exceeded the 1-hour $NO_2$ air quality objective, as the 99.8$^{th}$ percentile of hourly mean concentrations, determined because data capture for the full calendar year at this site was less than 90%, exceeded 200 µg/m$^3$. It should be noted however that the number of exceedances of the hourly mean standard at the Hanger Lane site in 2014 was significantly lower than in previous years. 17 exceedances of the hourly $NO_2$ standard of 200 µg/m$^3$ were recorded at the Western Avenue site in 2014, which is just within the 18 exceedances permitted by the objective.

Exceedances of the annual mean $NO_2$ objective (40 µg/m$^3$) were also monitored in 2014 at 40 diffusion tube sites. Of the 40 tubes exceeding the annual mean objective, 10 recorded concentrations above 60 µg/m$^3$ indicating potential exceedances of the hourly mean $NO_2$ objective at these locations.

The annual mean particulate matter ($PM_{10}$) objective (40 µg/m$^3$) was achieved at all monitoring sites in 2014. Monitored daily mean $PM_{10}$ concentrations at the Horn Lane site in 2014 however exceeded the daily mean $PM_{10}$ air quality objective (50 µg/m$^3$, not to be exceeded more than 35 times a year). The daily mean $PM_{10}$ air quality objective was however achieved at the remaining three sites.

A number of proposed new developments which form part of the local development plan may influence local air quality. The potential effect of these developments on local air quality will be considered in the 2016 Air Quality Progress Report.

In conclusion, the results of this 2015 Updating and Screening Assessment indicate that a Detailed Assessment is not currently required and the Air Quality Management Area is to be retained.

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# 1 Introduction

## 1.1 Description of Local Authority Area

The London Borough of Ealing, located in West London, is home to over 300,000 people and covers approximately 55 square kilometres. The Borough consists of seven main areas: Acton, Ealing, Greenford, Hanwell, Northolt, Perivale and Southall. It comprises of both urban and rural areas, has a large number of parks and open spaces, as well as large amounts of housing, commercial and industrial areas. The Borough contains more than 13,000 businesses and includes half of the largest industrial and business park in London, Park Royal.

The Council regulates 84 Part B industrial and other minor processes. There are two Part A installations within the Borough; Vale Europe Ltd and GW Neale Ltd. The main source of air pollution comes from busy and congested roads, including the A40, A406, A4020, A4127 and A4000 that run through the Borough.

The whole Borough has been declared an Air Quality Management Area (AQMA) for nitrogen dioxide ($NO_2$) and particulate matter less than 10 µm in diameter ($PM_{10}$).

## 1.2 Purpose of Report

This report fulfils the requirements of the Local Air Quality Management (LAQM) process as set out in Part IV of the Environment Act (1995), the Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007 and the relevant Policy and Technical Guidance documents. The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where exceedances are considered likely, the local authority must then declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives.

The objective of this Updating and Screening Assessment (USA) is to identify any changes within the local authority that may lead to the risk of an air quality objective being exceeded, and if so, the Local Authority should conduct a Detailed Assessment. In the intervening years between the three-yearly USA reports, Air Quality Progress Reports are required to be submitted yearly to maintain continuity in the LAQM process.

## 1.3 Air Quality Objectives

The air quality objectives applicable to LAQM in England are set out in the Air Quality (England) Regulations 2000 (SI 928), The Air Quality (England) (Amendment) Regulations 2002 (SI 3043), and are shown in Table 1.1. This table shows the objectives in units of micrograms per cubic metre µg/$m^3$ (milligrammes per cubic metre, mg/$m^3$ for carbon monoxide) with the number of exceedances in each year that are permitted (where applicable).

**Table 1.1 Air Quality Objectives included in Regulations for the purpose of LAQM in England**

| Pollutant | Air Quality Objective | | Date to be achieved by |
|---|---|---|---|
| | Concentration | Measured as | |
| **Benzene** | 16.25 µg/m$^3$ | Running annual mean | 31.12.2003 |
| | 5.00 µg/m$^3$ | Annual mean | 31.12.2010 |
| **1,3-Butadiene** | 2.25 µg/m$^3$ | Running annual mean | 31.12.2003 |
| **Carbon monoxide** | 10 mg/m$^3$ | Running 8-hour mean | 31.12.2003 |
| **Lead** | 0.50 µg/m$^3$ | Annual mean | 31.12.2004 |
| | 0.25 µg/m$^3$ | Annual mean | 31.12.2008 |
| **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 | 31.12.2005 |
| **Particulate Matter ($PM_{10}$) (gravimetric)** | 50 µg/m$^3$, not to be exceeded more than 35 times a year | 24-hour mean | 31.12.2004 |
| | 40 µg/m$^3$ | Annual mean | 31.12.2004 |
| **Sulphur dioxide** | 350 µg/m$^3$, not to be exceeded more than 24 times a year | 1-hour mean | 31.12.2004 |
| | 125 µg/m$^3$, not to be exceeded more than 3 times a year | 24-hour mean | 31.12.2004 |
| | 266 µg/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

A Borough-wide Air Quality Management Area (AQMA) was declared in 2000 as a result of exceedances of the $NO_2$ and $PM_{10}$ air quality objectives, the extent of which can be seen in Figure 1.1. An Air Quality Action Plan (AQAP)[1] was subsequently published in 2003.

The outcomes of previous rounds of LAQM review and assessment are summarised in Table 1.2. The most recent report produced by the London Borough of Ealing[2] highlighted the need to maintain the AQMA and continue monitoring of nitrogen dioxide and $PM_{10}$ concentrations within the Borough.

**Figure 1.1 Map of AQMA Boundaries**

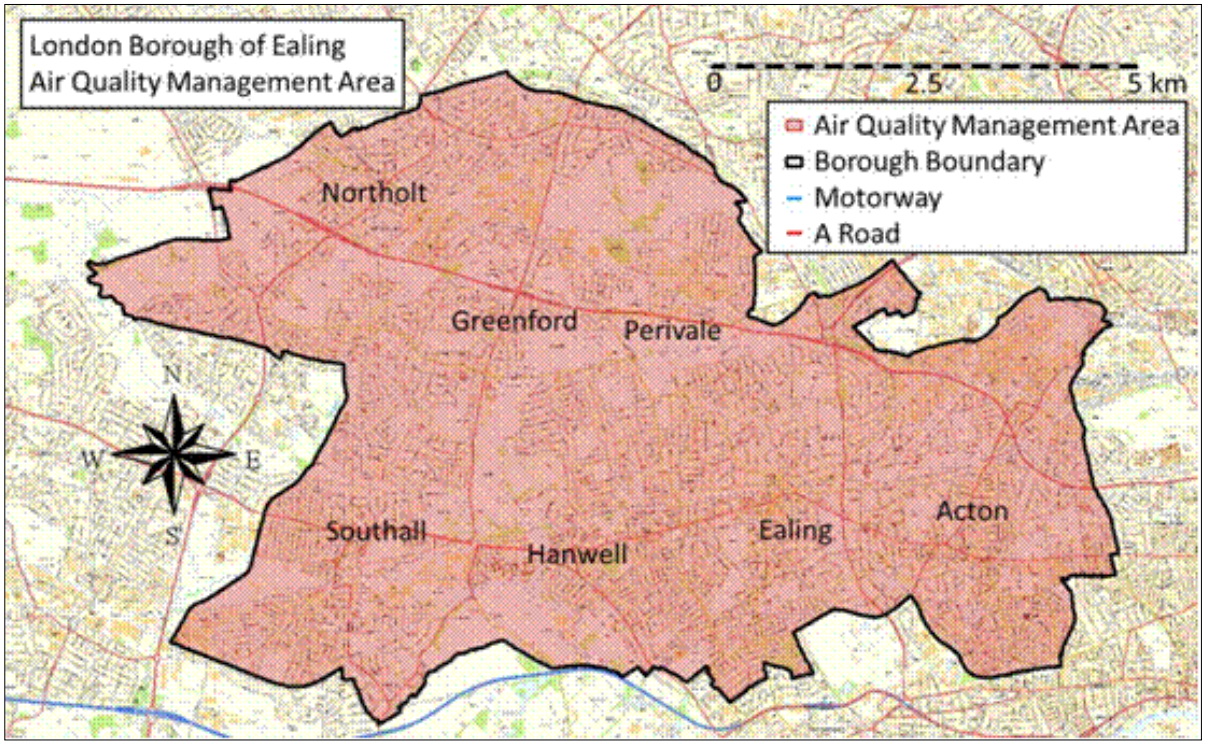


**Table 1.2 Summary of Previous Rounds of Review and Assessment**

| Report | Date produced | Outcome |
|---|---|---|
| Stage 1 and 2 | May-99 | Need for Stage 3 for $NO_2$, $PM_{10}$, SO, CO and Pb. |
| Stage 3 | Jan-00 | Need to declare AQMA for $NO_2$ and $PM_{10}$. |
| Stage 4 | Dec-00 | Declaration of whole Borough AQMA for $NO_2$ and $PM_{10}$ |
| Air Quality Action Plan | Apr-03 | Action Plan adopted. |
| USA 2004 | Apr-04 | Detailed assessment for PM required for EWS Goods Yard, Horn Lane. |
| USA 2006 | Apr-06 | AQMA retained for whole Borough. |
| Detailed Assessment of $PM_{10}$ | May-06 | AQMA retained for whole Borough. |
| Progress Report 2007 | Apr-07 | No other sources require detailed assessment. |
| Progress Report 2008 | Apr-08 | No other sources require detailed assessment. |
| USA 2009 | Jun-09 | AQMA retained and additional monitoring required. |
| Further Assessment of $NO_2$ | Feb-11 | Extend monitoring close to rail line at sites with relevant exposure. |
| Progress Report 2011 | June 2014 | AQMA retained |
| USA 2012 | Dec-12 | AQMA retained |
| Progress Report 2013 | June 2014 | AQMA retained |
| Progress Report 2014 | Sept-15 | AQMA retained |

# 2 New Monitoring Data

## 2.1 Summary of Monitoring Undertaken

### 2.1.1 Automatic Monitoring Sites

The London Borough of Ealing previously operated five automatic monitoring stations, however the monitoring site at Southall Railway closed during 2014, so currently only four are in operation. Two of the operational sites are situated at roadside sites, one at an industrial site, and one at an urban background location.

During 2014, all sites were operated as part of the London Air Quality Network[3]. Details of the relevant Quality Assurance / Quality Control (QA/QC) procedures that were followed during the monitoring are provided in Appendix A. Figure 2.1 and Table 2.1 provide details of the automatic monitoring sites located in the Borough.

**Figure 2.1 Map of Automatic Monitoring Sites**

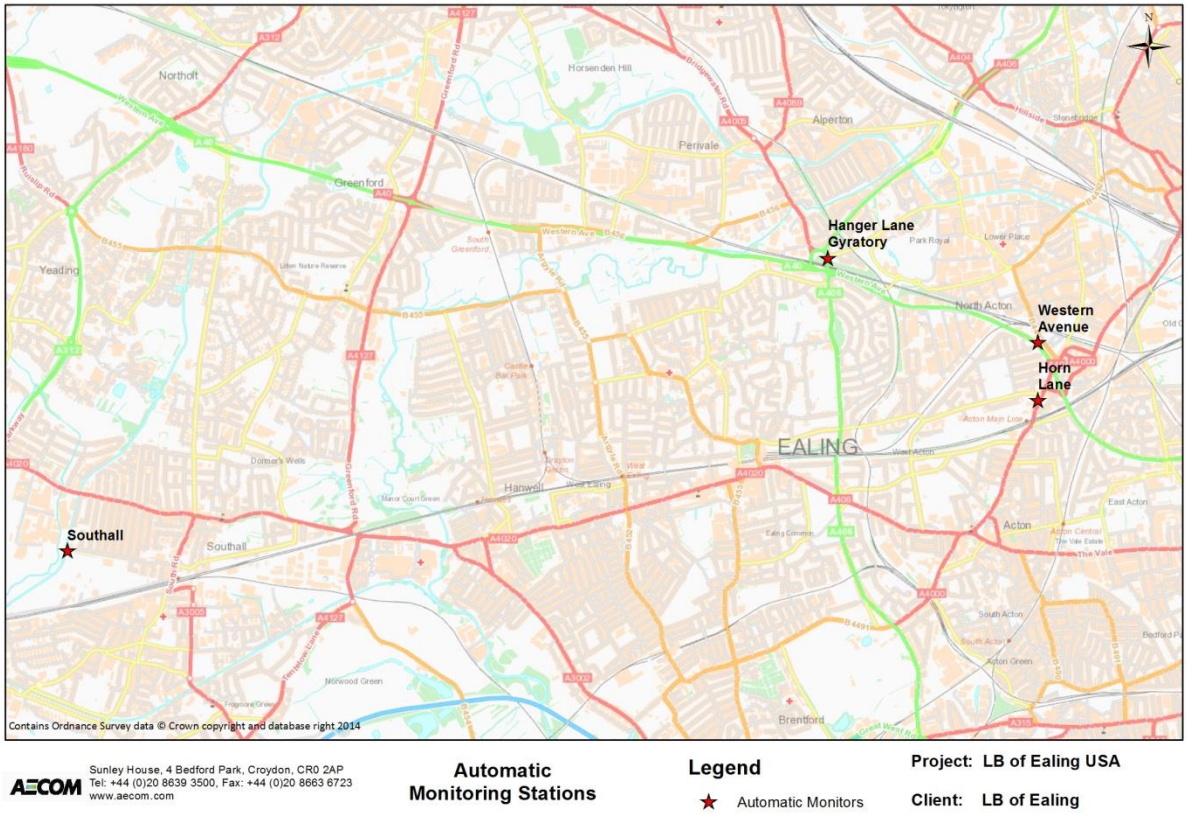


**Table 2.1 Details of Automatic Monitoring Sites**

| Site Name | Site Type | X OS Grid Refer-ence | Y OS Grid Refer-ence | Pollutants Monitored | In AQMA ? | Monitoring Technique | Relevant Exposure? (Y/N with distance (m) from monitoring site to relevant exposure) | Distance to Kerb of Nearest Road (m) (N/A if not applicable) | Does this Location Represent Worst-Case Exposure ? |
|---|---|---|---|---|---|---|---|---|---|
| Hanger Lane Gyratory | Roadside | 518537 | 182708 | $NO_2$, $PM_{10}$ | Y | Chemiluminescence, TEOM | N (4) | 3 | Y |
| Horn Lane | Industrial | 520432 | 181428 | $NO_2$, $PM_{10}$ | Y | Chemiluminescence, TEOM | N (8) | 2.5 | Y |
| Southall | Urban Background | 511677 | 180071 | $NO_2$, $PM_{10}$, $PM_{2.5}$, $O_3$ | Y | Chemiluminescence, FDMS | N (17) | N/A | N |
| Western Avenue | Roadside | 520430 | 181950 | $NO_2$, $PM_{10}$ | Y | Chemiluminescence, TEOM | N (4) | 4 | Y |

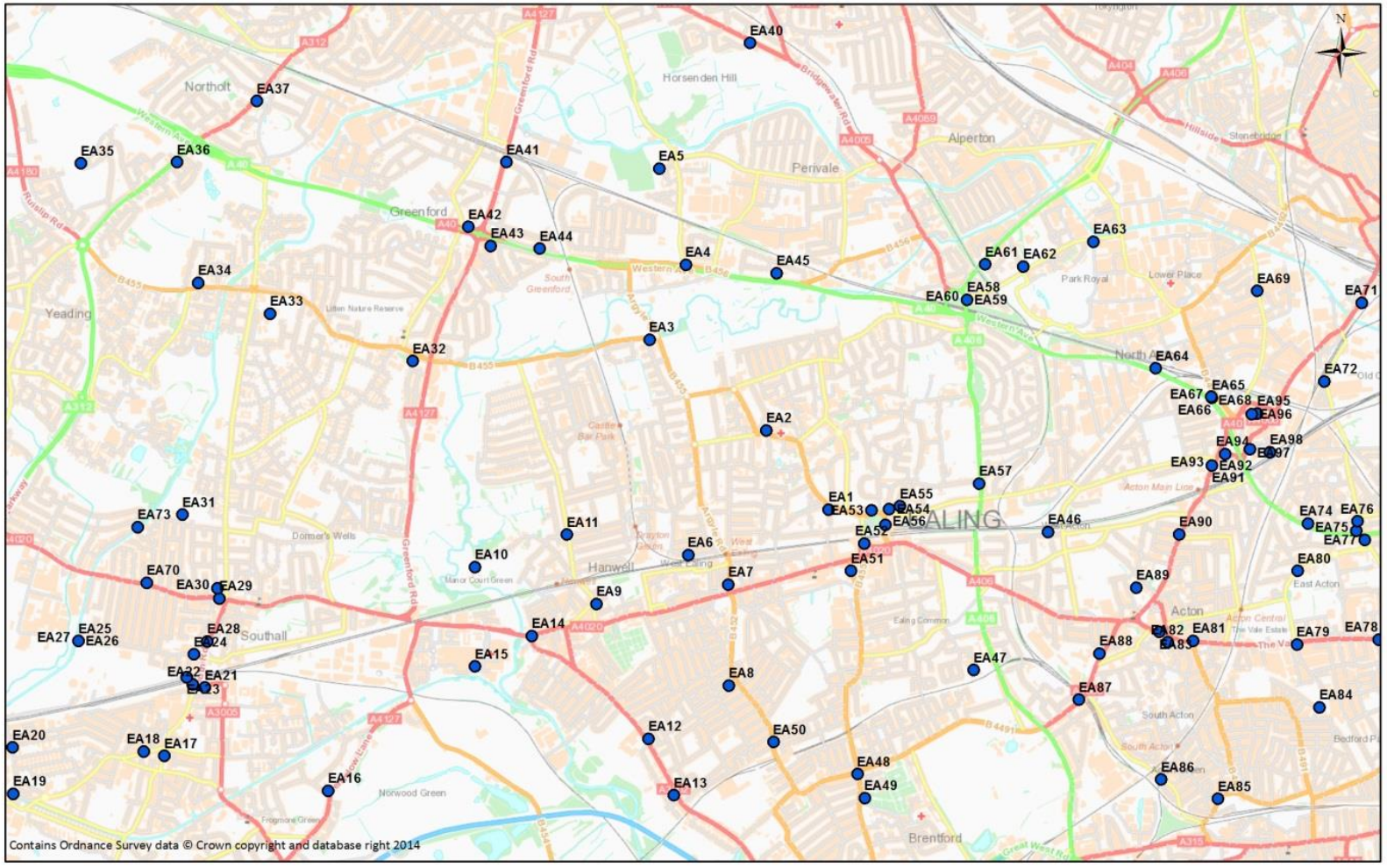
### 2.1.2 Non-Automatic Monitoring Sites

The London Borough of Ealing historically monitored annual mean nitrogen dioxide concentrations using passive diffusion tubes at 126 sites located throughout the Borough. This was reduced to 98 diffusion tubes in 2012, 95 tubes in 2013, and then increased again to 98 tubes in 2014. Four triplicate sites are co-located with the four air quality monitoring stations (Southall, Hanger Lane, Horn Lane and Western Avenue) meaning the actual number of separate diffusion tube sites is 90, as there are four triplicate sites each with two additional tubes.

Seven new diffusion tube sites were set up in 2013/2014, which includes four sites that changed location. The three new diffusion tube sites added were Bollo Lane, Chiswick (EA86), Poulton Court, Acton (EA95) and Lyra Court, Acton (EA96).

Figure 2.2 and Table 2.2 provides details of the diffusion tube sites operated within the Borough during 2014.

## Figure 2.2 Map of Non-Automatic Monitoring Sites



## Table 2.2 Details of Non- Automatic Monitoring Sites

| Site ID | Site Name | Site Type | X OS Grid Ref | Y OS Grid Ref | Pollutants Monitored | In AQMA? | Is Monitoring Co-located with a Continuous Analyser (Y/N) | Relevant Exposure? (Y/N with distance (m) from monitoring site to relevant exposure) | Distance to Kerb of Nearest Road (m) (N/A if not applicable) | Does this Location Represent Worst-Case Exposure? |
|---|---|---|---|---|---|---|---|---|---|---|
| EA1 | 31 Castlebar Road, Ealing,W5 2DJ | NR | 517472 | 181088 | $NO_2$ | Y | N | Y (F) | 19.28 | Y |
| EA2 | 12 Castlebar Hill, Ealing,W5 1TE | B | 516992 | 181698 | $NO_2$ | Y | N | Y (F) | 20.00 | Y |
| EA3 | 1-4 Peal Gardens West Ealing,W13 OBA | R | 516089 | 182400 | $NO_2$ | Y | N | Y (F) | 5.00 | Y |
| EA4 | 2 Horsenden Lane South Greenford, UB6 8AB | R | 516368 | 182978 | $NO_2$ | Y | N | Y (F) | 5.00 | Y |
| EA5 | 1-11 Clover House, Gilbert White Close, Perivale, UB6 7FH | B | 516163 | 183719 | $NO_2$ | Y | N | Y (F) | 44.70 | N |
| EA6 | 41 Manor Road West Ealing,W13 OJA | NR | 516387 | 180738 | $NO_2$ | Y | N | Y (F) | 4.00 | Y |
| EA7 | 1 Kirn Road, Ealing, W13 0UB | R | 516699 | 180509 | $NO_2$ | Y | N | Y (F) | 8.00 | Y |
| EA8 | 12 Balfour Road, Ealing, W13 9TN | R | 516703 | 179728 | $NO_2$ | Y | N | Y (F) | 4.00 | Y |
| EA9 | 20 Church Road, Hanwell, W7 1DR | NR | 515680 | 180360 | $NO_2$ | Y | N | Y (F) | 6.00 | Y |
| EA10 | Brent Lodge Park, Church Road, Hanwell, W7 3BP | B | 514740 | 180643 | $NO_2$ | Y | N | Y (F) | 30.00 | N |
| EA11 | 74a Greenford Avenue Hanwell, W7 3QS | R | 515451 | 180894 | $NO_2$ | Y | N | Y (F) | 5.00 | Y |
| EA12 | 255 Boston Road, Hanwell,W7 2AT | R | 516080 | 179318 | $NO_2$ | Y | N | Y (F) | 9.34 | Y |
| EA13 | 6 Boston Gardens, Boston Road, Hanwell, W7 2AN | NR | 516277 | 178882 | $NO_2$ | Y | N | Y (F) | 10.00 | Y |
| EA14 | 200 Uxbridge Road Hanwell, W7 3TB | R | 515180 | 180111 | $NO_2$ | Y | N | Y (F) | 3.30 | Y |
| EA15 | Ealing Hospital Uxbridge Road, Southall, UB1 3HW | B | 514740 | 179876 | $NO_2$ | Y | N | Y (F) | N/A | N |

| Site ID | Site Name | Site Type | X OS Grid Ref | Y OS Grid Ref | Pollutants Monitored | In AQMA? | Is Monitoring Co-located with a Continuous Analyser (Y/N) | Relevant Exposure? (Y/N with distance (m) from monitoring site to relevant exposure) | Distance to Kerb of Nearest Road (m) (N/A if not applicable) | Does this Location Represent Worst-Case Exposure? |
|---|---|---|---|---|---|---|---|---|---|---|
| EA16 | 4 Minterne Avenue Southall,UB2 4LL | R | 513606 | 178917 | $NO_2$ | Y | N | Y (F) | 2.00 | Y |
| EA17 | 55 King Street, Southall, UB2 4DQ | R | 512341 | 179186 | $NO_2$ | Y | N | Y (F) | 3.30 | Y |
| EA18 | 18 Western Road, Southall,UB2 5DU | NR | 512181 | 179219 | $NO_2$ | Y | N | Y (F) | 7.50 | Y |
| EA19 | 22 Bulls Bridge Road Southall, UB2 5LU | B | 511176 | 178893 | $NO_2$ | Y | N | Y (F) | 20.00 | Y |
| EA20 | 150 Brent Road, Southall, UB2 5LD | NR | 511170 | 179251 | $NO_2$ | Y | N | Y (F) | 7.70 | Y |
| EA21 | 2 Merrick Road, Southall, UB2 4AU | NR | 512657 | 179712 | $NO_2$ | Y | N | Y (F) | 12.00 | Y |
| EA22 | Martin Court, Southbridge Way, Southall, UB2 4QW | NR | 512560 | 179739 | $NO_2$ | Y | N | Y (F) | 30.45 | Y |
| EA23 | 1 Randolph Road,Southall,UB1 1BL | R | 512514 | 179795 | $NO_2$ | Y | N | Y (F) | 2.00 | Y |
| EA24 | 16 Beaconsfield Road Southall, UB1 1DW | R | 512570 | 179969 | $NO_2$ | Y | N | Y (F) | 5.81 | Y |
| EA25 | Blair Peach School, Beaconsfield Road, UB1 1DD(***AQMS***) (**Tri**) | B | 511680 | 180071 | $NO_2$ | Y | Y | Y | 50.00 | N |
| EA26 | Blair Peach School, Beaconsfield Road,UB1 1DD (***AQMS***) (**Tri**) | B | 511680 | 180071 | $NO_2$ | Y | Y | Y | 50.00 | N |
| EA27 | Blair Peach School, Beaconsfield Road, UB1 1DD(***AQMS***) (**Tri**) | B | 511680 | 180071 | $NO_2$ | Y | Y | Y | 50.00 | N |
| EA28 | Hambrough Primary School South Road, Southall,UB1 1SF | NR | 512673 | 180069 | $NO_2$ | Y | N | Y (F) | 10.00 | Y |
| EA29 | 11 The Broadway Southall, UB1 3PX | R | 512768 | 180400 | $NO_2$ | Y | N | Y (F) | 4.00 | Y |
| EA30 | 7 Greenford Avenue Southall, UB1 2AA | NR | 512753 | 180478 | $NO_2$ | Y | N | Y (F) | 7.00 | Y |
| EA31 | Spike Bridges Park, West Avenue, Southall, UB1 2AR | B | 512482 | 181047 | $NO_2$ | Y | N | Y (F) | N/A | N |

| Site ID | Site Name | Site Type | X OS Grid Ref | Y OS Grid Ref | Pollutants Monitored | In AQMA? | Is Monitoring Co-located with a Continuous Analyser (Y/N) | Relevant Exposure? (Y/N with distance (m) from monitoring site to relevant exposure) | Distance to Kerb of Nearest Road (m) (N/A if not applicable) | Does this Location Represent Worst-Case Exposure? |
|---|---|---|---|---|---|---|---|---|---|---|
| EA32 | 205 Windmill Lane, Greenford, UB6 9DW | NR | 514259 | 182234 | $NO_2$ | Y | N | Y (F) | 8.00 | Y |
| EA33 | Greenford High School, Lady Margaret Road, Southall, UB1 2GU | B | 513158 | 182600 | $NO_2$ | Y | N | Y (L) | N/A | N |
| EA34 | 2 Shadwell Drive, Northolt, UB5 6DB | NR | 512603 | 182837 | $NO_2$ | Y | N | Y (F) | 28.50 | Y |
| EA35 | 32 Irving Avenue, Northolt, UB5 5LX | B | 511698 | 183760 | $NO_2$ | Y | N | Y (F) | N/A | N |
| EA36 | 213 Church Road, Northolt, UB5 5BE | NR | 512442 | 183769 | $NO_2$ | Y | N | Y (F) | 12.38 | Y |
| EA37 | 31 Mandeville Road Northolt, UB5 5HF | NR | 513056 | 184241 | $NO_2$ | Y | N | Y (F) | 9.00 | Y |
| EA38 | 126 Petts Hill, Northolt, UB5 4NW | NR | 513794 | 185348 | $NO_2$ | Y | N | Y (F) | 9.00 | Y |
| EA39 | 1504 Greenford Road Greenford, UB6 0HR | NR | 515402 | 185313 | $NO_2$ | Y | N | Y (F) | 5.30 | Y |
| EA40 | 79 Whitton Avenue East Greenford, UB6 0QD | NR | 516867 | 184689 | $NO_2$ | Y | N | Y (F) | 5.00 | Y |
| EA41 | 914 Greenford Road Greenford,UB6 8QN | R | 514985 | 183770 | $NO_2$ | Y | N | Y (F) | 2.30 | Y |
| EA42 | 6 Karoline Gardens Greenford, UB6 9JP | R | 514691 | 183269 | $NO_2$ | Y | N | Y (F) | 5.00 | Y |
| EA43 | 12 Blenheim Close Greenford, UB6 8ET | R | 514863 | 183122 | $NO_2$ | Y | N | Y (F) | 2.50 | Y |
| EA44 | 19 Runnymede Gardens, Greenford,UB6 8SX | R | 515240 | 183102 | $NO_2$ | Y | N | Y (F) | 1.20 | Y |
| EA45 | 4 Thirlmere Avenue, Perivale, UB6 8EF | B | 517072 | 182912 | $NO_2$ | Y | N | Y (F) | 46.50 | Y |
| EA46 | Oakley House, Oakley Avenue,Ealing,W5 3SB | NR | 519167 | 180915 | $NO_2$ | Y | N | Y (F) | 20.47 | Y |
| EA47 | 53 - 61 St Pauls Close Ealing,W5 3JX | NR | 518594 | 179848 | $NO_2$ | Y | N | Y (F) | 11.00 | Y |

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|---|---|---|---|---|---|---|---|---|---|---|
| EA48 | 158 South Ealing Road Ealing, W5 4QL | R | 517694 | 179045 | $NO_2$ | Y | N | Y (F) | 3.50 | Y |
| EA49 | South Ealing Cemetery Popes Lane, Ealing, W5 4NA | B | 517750 | 178860 | $NO_2$ | Y | N | Y (F) | 32.00 | N |
| EA50 | 213 Northfields Ave West Ealing, W13 9QU | R | 517045 | 179292 | $NO_2$ | Y | N | Y (F) | 5.21 | Y |
| EA51 | 12 Bond Street, Ealing, W5 5AP | R | 517644 | 180613 | $NO_2$ | Y | N | Y (F) | 2.70 | Y |
| EA52 | 8 Spring Bridge Road,Ealing,W5 2AA | R | 517745 | 180827 | $NO_2$ | Y | N | Y (F) | 3.00 | Y |
| EA53 | Haven Green Court, Haven Green, Ealing, W5 2UZ | NR | 517803 | 181082 | $NO_2$ | Y | N | Y (F) | 16.93 | Y |
| EA54 | 27 Haven Green, Ealing,W5 2NZ | R | 517940 | 181092 | $NO_2$ | Y | N | Y (F) | 1.00 | Y |
| EA55 | 21 Haven Lane, Ealing,W5 2HZ | NR | 518022 | 181114 | $NO_2$ | Y | N | Y (F) | 2.35 | Y |
| EA56 | 41 - 42 Haven Green Ealing,W5 2NX | R | 517909 | 180971 | $NO_2$ | Y | N | Y (F) | 3 | Y |
| EA57 | 64 Hanger Lane,Ealing,W5 2JH | NR | 518635 | 181288 | $NO_2$ | Y | N | Y (F) | 5.00 | Y |
| EA58 | Fernlea House, Hanger Lane, Ealing,W5 1EF (***AQMS***) (**Tri**) | R | 518541 | 182707 | $NO_2$ | Y | Y | Y | 4.00 | Y |
| EA59 | Fernlea House, Hanger Lane, Ealing,W5 1EF (***AQMS***) (**Tri**) | R | 518541 | 182707 | $NO_2$ | Y | Y | Y | 4.00 | Y |
| EA60 | Fernlea House, Hanger Lane, Ealing,W5 1EF (***AQMS***) (**Tri**) | R | 518541 | 182707 | $NO_2$ | Y | Y | Y | 4.00 | Y |
| EA61 | 25 Waverley Gardens Park Royal, NW10 7EX | R | 518680 | 182979 | $NO_2$ | Y | N | Y (F) | 1.80 | Y |
| EA62 | 3 Iveagh Terrace Park Royal, NW10 7SY | NR | 518976 | 182963 | $NO_2$ | Y | N | Y (F) | 33.00 | Y |
| EA63 | Rainsford Court, Rainsford Road, Park Royal, NW10 7RJ | NR | 519515 | 183155 | $NO_2$ | Y | N | Y (F) | 12.90 | Y |

| Site ID | Site Name | Site Type | X OS Grid Ref | Y OS Grid Ref | Pollutants Monitored | In AQMA? | Is Monitoring Co-located with a Continuous Analyser (Y/N) | Relevant Exposure? (Y/N with distance (m) from monitoring site to relevant exposure) | Distance to Kerb of Nearest Road (m) (N/A if not applicable) | Does this Location Represent Worst-Case Exposure? |
|---|---|---|---|---|---|---|---|---|---|---|
| EA64 | 5 Wendover Court, Western Avenue, Acton,W3 0TG | NR | 519997 | 182178 | $NO_2$ | Y | N | Y (F) | 11.00 | Y |
| EA65 | 322 & 324 Western Avenue Acton, W3 OPL (***AQMS***) (***Tri***) | R | 520430 | 181950 | $NO_2$ | Y | Y | Y | 5 | Y |
| EA66 | 322 & 324 Western Avenue Acton, W3 OPL (***AQMS***) (***Tri***) | R | 520430 | 181950 | $NO_2$ | Y | Y | Y | 5 | Y |
| EA67 | 322 & 324 Western Avenue, Acton, W3 OPL (***AQMS***) (***Tri***) | R | 520430 | 181950 | $NO_2$ | Y | Y | Y | 5 | Y |
| EA68 | 326 Western Avenue, Acton, W3 0PL | NR | 520426 | 181958 | $NO_2$ | Y | N | Y (F) | 11.35 | Y |
| EA69 | 94 North Acton Road Park Royal, NW10 7AY | NR | 520780 | 182775 | $NO_2$ | Y | N | Y (F) | 6.00 | Y |
| EA70 | 1 Shaftesbury Gardens Park Royal, NW10 6LJ | R | 512206 | 180522 | $NO_2$ | Y | N | Y (F) | 5.00 | Y |
| EA71 | 39 Old Oak Lane Park Royal, NW10 6EJ | R | 521587 | 182684 | $NO_2$ | Y | N | Y (F) | 5.00 | Y |
| EA72 | 165 Wells House Road Park Royal, NW10 6EA | R | 521301 | 182076 | $NO_2$ | Y | N | Y (F) | 5.00 | Y |
| EA73 | 4 St Andrews Road, Acton,W3 7NE | K | 512138 | 180953 | $NO_2$ | Y | N | Y (F) | 5.00 | Y |
| EA74 | 98 Western Avenue, Acton, W3 7TZ | NR | 521173 | 180981 | $NO_2$ | Y | N | Y (F) | 10.00 | Y |
| EA75 | 6 Western Avenue, Acton, W3 7UD | R | 521549 | 180923 | $NO_2$ | Y | N | Y (F) | 4.00 | Y |
| EA76 | 57 Old Oak Common Lane Acton, W3 7DD | NR | 521557 | 180996 | $NO_2$ | Y | N | Y (F) | 11.00 | Y |
| EA77 | 205 Old Oak Road, Acton, W3 7HH | R | 521614 | 180852 | $NO_2$ | Y | N | Y (F) | 4.73 | Y |
| EA78 | 17 The Vale, Acton, W3 7SH | NR | 521720 | 180084 | $NO_2$ | Y | N | Y (F) | 19.35 | Y |
| EA79 | 3 Warple Way, Acton, W3 0RH | R | 521088 | 180046 | $NO_2$ | Y | N | Y (F) | 3.00 | Y |

| Site ID | Site Name | Site Type | X OS Grid Ref | Y OS Grid Ref | Pollutants Monitored | In AQMA? | Is Monitoring Co-located with a Continuous Analyser (Y/N) | Relevant Exposure? (Y/N with distance (m) from monitoring site to relevant exposure) | Distance to Kerb of Nearest Road (m) (N/A if not applicable) | Does this Location Represent Worst-Case Exposure? |
|---|---|---|---|---|---|---|---|---|---|---|
| EA80 | Old School House, East Acton Lane, Acton, W3 7HA | NR | 521093 | 180613 | $NO_2$ | Y | N | Y (F) | 11.55 | Y |
| EA81 | 88 High Street, Acton, W3 6QX | R | 520285 | 180075 | $NO_2$ | Y | N | Y (F) | 5.00 | Y |
| EA82 | 15a Church Road,Acton,W3 8QE | R | 520092 | 180063 | $NO_2$ | Y | N | Y (F) | 10.00 | Y |
| EA83 | 182 High Street, Acton, W3 9NN | R | 520026 | 180141 | $NO_2$ | Y | N | Y (F) | 4.00 | Y |
| EA84 | 26 Hawkshead Road Chiswick, W4 1AD | B | 521264 | 179560 | $NO_2$ | Y | N | Y (F) | 8.00 | Y |
| EA85 | 44 Acton Lane, Chiswick, W4 5ED | R | 520480 | 178854 | $NO_2$ | Y | N | Y (F) | 5.00 | Y |
| EA86 | 98 Bollo Lane, Chiswick, W4 5LX | R | 520038 | 179003 | $NO_2$ | Y | N | Y (F) | 5.00 | Y |
| EA87 | 122 Gunnersbury Lane Acton,W3 9BA | R | 519404 | 179620 | $NO_2$ | Y | N | Y (F) | 8.86 | Y |
| EA88 | 48 Gunnersbury Lane Acton,W3 8EG | R | 519562 | 179977 | $NO_2$ | Y | N | Y (F) | 10.00 | Y |
| EA89 | 15 Lantry Court, Lexden Road, Acton, W3 9PE | B | 519849 | 180485 | $NO_2$ | Y | N | Y (F) | N/A | N |
| EA90 | 156 Horn Lane,Acton,W3 6PH | NR | 520180 | 180896 | $NO_2$ | Y | N | Y (F) | 6.00 | Y |
| EA91 | 317 Horn Lane, Acton,W3 0BU (***AQMS***) (***Tri***) | R | 520432 | 181428 | $NO_2$ | Y | Y | Y | 3 | Y |
| EA92 | 317 Horn Lane, Acton,W3 0BU (***AQMS***) (***Tri***) | R | 520432 | 181428 | $NO_2$ | Y | Y | Y | 3 | Y |
| EA93 | 317 Horn Lane, Acton,W3 0BU (***AQMS***) (***Tri***) | R | 520432 | 181428 | $NO_2$ | Y | Y | Y | 3 | Y |
| EA94 | 5 Leamington Park, Acton, W3 6TJ | NR | 520532 | 181517 | $NO_2$ | Y | N | Y (F) | 11.00 | Y |
| EA95 | Poulton Court, Victoria Road Acton, W3 6EJ | NR | 520783 | 181830 | $NO_2$ | Y | N | Y (F)) | 29.00 | Y |

| Site ID | Site Name | Site Type | X OS Grid Ref | Y OS Grid Ref | Pollutants Monitored | In AQMA? | Is Monitoring Co-located with a Continuous Analyser (Y/N) | Relevant Exposure? (Y/N with distance (m) from monitoring site to relevant exposure) | Distance to Kerb of Nearest Road (m) (N/A if not applicable) | Does this Location Represent Worst-Case Exposure? |
|---|---|---|---|---|---|---|---|---|---|---|
| EA96 | Lyra Court, Portal Way Acton, W3 6DB | R | 520739 | 181824 | $NO_2$ | Y | N | Y (L) | 5.00 | Y |
| EA97 | 36 Wales Farm Road, Acton,W3 6UE | R | 520724 | 181552 | $NO_2$ | Y | N | Y (F) | 5.00 | Y |
| EA98 | 67-72 Seaclose Close Acton, W3 6TF | B | 520880 | 181531 | $NO_2$ | Y | N | Y (F) | 5.00 | N |

Notes: For 'Site Type' NR = Near Road, R = Roadside, B = Background (Urban) and K = Kerbside.

In Relevant Exposure column, diffusion tubes located on residential façades are shown with an F in brackets, those on lampposts with an L in brackets

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## 2.2 Comparison of Monitoring Results with Air Quality Objectives

### 2.2.1 Nitrogen Dioxide ($NO_2$)

**Automatic Monitoring Data**

In 2012, the London Borough of Ealing reduced its number of automatic monitoring stations, closing the stations at Acton Town Hall (roadside) and Ealing Town Hall (urban background). In 2014, another automatic monitoring station was closed – Southall Railway – and so currently there are four automatic monitoring stations in operation which measure $NO_2$: Southall, Hanger Lane Gyratory, Horn Lane and Western Avenue, the results from which in recent years are shown in Table 2.3 and Table 2.4.

Data capture was generally good in 2014, with three monitoring stations reporting 90% or above, however the Hanger Lane station required annualisation as data capture was 88%. Details are provided in Appendix A.

Exceedances of the 40 µg/m$^3$ annual mean objective were observed at three of the four monitoring stations (Hanger Lane Gyratory, Horn Lane and Western Avenue) in all years between 2010 and 2014. The highest annual mean concentration in 2014 (70.8 µg/m$^3$) was recorded at the Hanger Lane Gyratory Site.

Monitored hourly mean $NO_2$ concentrations at the Hanger Lane Gyratory site in 2014 also potentially exceeded the 1-hour $NO_2$ air quality objective, as the 99.8$^{th}$ percentile of hourly mean concentrations, determined because data capture for the full calendar year at this site was less than 90%, exceeded 200 µg/m$^3$. In addition, 17 exceedances of the hourly $NO_2$ standard of 200 µg/m$^3$ were recorded at the Western Avenue site, falling just short of the 18 permitted. The Horn Lane and Southall sites however did not monitor any exceedances of the 1 hour $NO_2$ standard in 2014.

Figure 2.3 shows trends in monitored annual mean $NO_2$ concentrations at each of the automatic monitoring sites over the last five years. Concentrations appear to have remained relatively constant at most sites, albeit with some year to year variability, although the Horn Lane and Hanger Lane Gyratory sites appear to show a slight downward trend, despite a peak in concentration at Hanger Lane in 2012.

**Table 2.3 Results of Automatic Monitoring for $NO_2$: Comparison with Annual Mean Objective**

| Site ID | Site Type | Within AQMA? | Valid Data Capture 2014 % | Annual Mean $NO_2$ Concentration ($\mu g/m^3$) | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | 2010 | 2011 | 2012 | 2013 | 2014 |
| Hanger Lane Gyratory | Roadside | Y | 88.2 | **91.5** | **79.2** | **95.0** | **74.3** | **70.8**[a] |
| Horn Lane | Industrial | Y | 91.5 | **54.2**[a] | **58.1**[a] | **53.4** | **56.6** | **47.6** |
| Southall | Urban Background | Y | 90.7 | 30.8 | 28.6 | 34.7 | 31.8 | 28.9 |
| Southall Railway | Near road | Y | - | - | 37.2 | 35.4 | 33.7 | -[b] |
| Western Avenue | Roadside | Y | 94.0 | **67.7** | **61.7** | **69.8**[a] | **63.9** | **65.7** |

Notes: In bold, exceedance of the $NO_2$ annual mean AQS objective of 40 $\mu g/m^3$

[a] Where data captures are less than 90%, data have been annualised.

[b] Southall Railway monitoring site closed in 2014.

**Figure 2.3 Trends in Annual Mean $NO_2$ Concentrations Measured at Automatic Monitoring Sites**

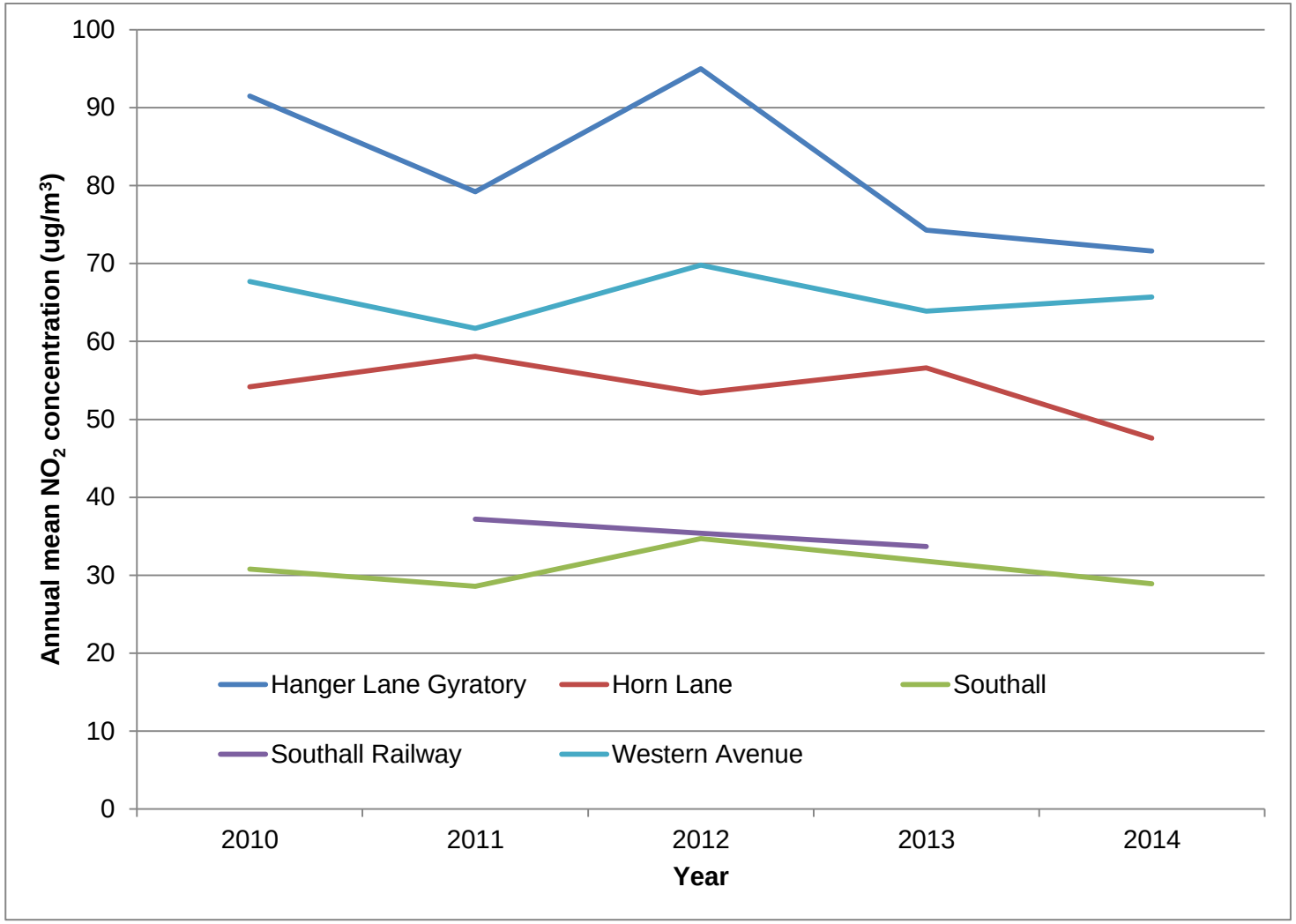


**Table 2.4 Results of Automatic Monitoring for $NO_2$: Comparison with 1-hour Mean Objective**

| Site ID | Site Type | Within AQMA? | Valid Data Capture 2014 % | Number of Hourly Means > 200µg/m$^3$ | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | 2010 | 2011 | 2012 | 2013 | 2014 |
| Hanger Lane Gyratory | Roadside | Y | 88.2 | **134 (231)** | **66** | **173** | **56** | 17 (**205**) |
| Horn Lane | Industrial | Y | 91.5 | 0 (138) | 14 (192) | 2 | 0 (152) | 0 |
| Southall | Urban Background | Y | 90.7 | 0 | 0 | 0 | 0 (121) | 0 |
| Southall Railway | Near road | Y | - | - | 0 (126) | 0 | 1 (116) | - |
| Western Avenue | Roadside | Y | 94.0 | 9 (185) | 2 (168) | 10 | 17 (**202**) | 17 |

Notes: In bold, exceedance of the $NO_2$ hourly mean AQS objective (200 µg/m$^3$ – not to be exceeded more than 18 times per year)

Where data capture for the full calendar year was less than 90%, the 99.8$^{th}$ percentile of hourly means is shown in brackets.

## Diffusion Tube Monitoring Data

Currently, the London Borough of Ealing operates a network of 98 diffusion tubes across 90 sites (including 4 triplicate sites co-located with continuous analysers). The diffusion tubes are prepared and analysed by Environmental Scientifics Group (using the 20% Triethanolamine (TEA) in water method). Details of the QA/QC procedures applied to the diffusion tube results are summarised in Appendix A. Data capture for the diffusion tubes was generally good with all diffusion tubes recording a data capture of 9 months (i.e. 75% of the calendar year) or greater.

The results of the annual mean $NO_2$ concentrations recorded at the diffusion tube sites in 2014 are shown in Table 2.5. In total, 40 of the diffusion tubes recorded concentrations greater than the 40 µg/m$^3$ air quality objective in 2014. Of the 40 tubes exceeding the annual mean air quality objective, 10 recorded concentrations above 60 µg/m$^3$. Concentrations greater than 60 µg/m$^3$ indicate the likelihood of the 1-hour $NO_2$ objective (200 µg/m$^3$, not to be exceeded more than 18 times per year) being exceeded. The new diffusion tube sites (EA86, EA95 and EA96) recorded annual mean $NO_2$ concentrations of 33.5 µg/m$^3$, 40.5 µg/m$^3$ and 43.1 µg/m$^3$ respectively.

The maximum recorded value in 2014 was 81.6 µg/m$^3$ at site EA59 at the triplicate site Fernlea House, Hanger Lane, Ealing. This location has recorded concentrations above 70 µg/m$^3$ in each of the last five years.

The results of annual mean $NO_2$ concentrations from 2010 to 2014, for locations at which monitoring is currently undertaken and has been undertaken in previous years, are shown in Table 2.6.

**Table 2.5 Results of $NO_2$ Diffusion Tubes 2014**

| Site ID | Location | Site Type | Within AQMA? | Triplicate or Co-located Tube | Full Calendar Year Data Capture 2014 (%) | 2014 Annual Mean Concentration ($\mu g/m^3$) – Bias Adjustment Factor = 0.78 |
|---|---|---|---|---|---|---|
| EA1 | 31 Castlebar Road, Ealing,W5 2DJ | NR | Y | N | 100.0 | 30.7 |
| EA2 | 12 Castlebar Hill, Ealing,W5 1TE | B | Y | N | 100.0 | 25.7 |
| EA3 | 1-4 Peal Gardens, West Ealing,W13 OBA | R | Y | N | 100.0 | 31.6 |
| EA4 | 2 Horsenden Lane South, Greenford, UB6 8AB | R | Y | N | 100.0 | **61.7** |
| EA5 | 1-11 Clover House, Gilbert White Close Perivale, UB6 7FH | B | Y | N | 91.7 | 21.7 |
| EA6 | 41 Manor Road, West Ealing,W13 OJA | NR | Y | N | 91.7 | 29.4 |
| EA7 | 1 Kirn Road, Ealing, W13 0UB | R | Y | N | 100.0 | **48.9** |
| EA8 | 12 Balfour Road, Ealing, W13 9TN | R | Y | N | 100.0 | 26.1 |
| EA9 | 20 Church Road, Hanwell, W7 1DR | NR | Y | N | 100.0 | 28.1 |
| EA10 | Brent Lodge Park, Church Road, Hanwell,W7 3BP | B | Y | N | 100.0 | 23.5 |
| EA11 | 74a Greenford Avenue, Hanwell, W7 3QS | R | Y | N | 100.0 | 37.4 |
| EA12 | 255 Boston Road, Hanwell,W7 2AT | R | Y | N | 100.0 | 29.4 |
| EA13 | 6 Boston Gardens, Boston Road, Hanwell, W7 2AN | NR | Y | N | 100.0 | 32.4 |
| EA14 | 200 Uxbridge Road, Hanwell, W7 3TB | R | Y | N | 100.0 | **54.5** |
| EA15 | Ealing Hospital, Uxbridge Road, Southall, UB1 3HW | B | Y | N | 100.0 | 25.2 |
| EA16 | 4 Minterne Avenue, Southall,UB2 4LL | R | Y | N | 91.7 | 25.0 |
| EA17 | 55 King Street, Southall, UB2 4DQ | R | Y | N | 100.0 | **47.9** |

| Site ID | Location | Site Type | Within AQMA? | Triplicate or Co-located Tube | Full Calendar Year Data Capture 2014 (%) | 2014 Annual Mean Concentration (µg/m$^3$) – Bias Adjustment Factor = 0.78 |
|---|---|---|---|---|---|---|
| EA18 | 18 Western Road, Southall,UB2 5DU | NR | Y | N | 100.0 | 36.3 |
| EA19 | 22 Bulls Bridge Road, Southall, UB2 5LU | B | Y | N | 100.0 | 35.3 |
| EA20 | 150 Brent Road, Southall, UB2 5LD | NR | Y | N | 100.0 | 39.5 |
| EA21 | 2 Merrick Road, Southall, UB2 4AU | NR | Y | N | 100.0 | 30.5 |
| EA22 | Martin Court, Southbridge Way, Southall, UB2 4QW | NR | Y | N | 100.0 | 34.1 |
| EA23 | 1 Randolph Road,Southall,UB1 1BL | R | Y | N | 100.0 | 35.1 |
| EA24 | 16 Beaconsfield Road, Southall, UB1 1DW | R | Y | N | 91.7 | 37.6 |
| EA25 | Blair Peach School, Beaconsfield Road, UB1 1DD(***AQMS***) (**Tri**) | B | Y | Y | 100.0 | 23.5 |
| EA26 | Blair Peach School, Beaconsfield Road,UB1 1DD (***AQMS***) (**Tri**) | B | Y | Y | 100.0 | 23.6 |
| EA27 | Blair Peach School, Beaconsfield Road, UB1 1DD(***AQMS***) (**Tri**) | B | Y | Y | 100.0 | 23.6 |
| EA28 | Hambrough Primary School, South Road Southall,UB1 1SF | NR | Y | N | 100.0 | 39.2 |
| EA29 | 11 The Broadway, Southall, UB1 3PX | R | Y | N | 100.0 | **54.2** |
| EA30 | 7 Greenford Avenue, Southall, UB1 2AA | NR | Y | N | 91.7 | 30.7 |
| EA31 | Spike Bridges Park, West Avenue, Southall, UB1 2AR | B | Y | N | 91.7 | 21.7 |
| EA32 | 205 Windmill Lane, Greenford, UB6 9DW | NR | Y | N | 100.0 | 33.7 |
| EA33 | Greenford High School, Lady Margaret Road Southall, UB1 2GU | B | Y | N | 100.0 | 28.7 |

| Site ID | Location | Site Type | Within AQMA? | Triplicate or Co-located Tube | Full Calendar Year Data Capture 2014 (%) | 2014 Annual Mean Concentration (µg/m$^3$) – Bias Adjustment Factor = 0.78 |
|---|---|---|---|---|---|---|
| EA34 | 2 Shadwell Drive, Northolt, UB5 6DB | NR | Y | N | 100.0 | 28.7 |
| EA35 | 32 Irving Avenue, Northolt, UB5 5LX | B | Y | N | 91.7 | 23.8 |
| EA36 | 213 Church Road, Northolt, UB5 5BE | NR | Y | N | 100.0 | **41.7** |
| EA37 | 31 Mandeville Road, Northolt, UB5 5HF | NR | Y | N | 100.0 | 39.6 |
| EA38 | 126 Petts Hill, Northolt, UB5 4NW | NR | Y | N | 100.0 | 35.6 |
| EA39 | 1504 Greenford Road, Greenford, UB6 0HR | NR | Y | N | 100.0 | 34.4 |
| EA40 | 79 Whitton Avenue East, Greenford, UB6 0QD | NR | Y | N | 100.0 | 26.3 |
| EA41 | 914 Greenford Road,Greenford,UB6 8QN | R | Y | N | 91.7 | 39.1 |
| EA42 | 6 Karoline Gardens, Greenford, UB6 9JP | R | Y | N | 100.0 | **47.5** |
| EA43 | 12 Blenheim Close, Greenford, UB6 8ET | R | Y | N | 100.0 | 36.6 |
| EA44 | 19 Runnymede Gardens, Greenford,UB6 8SX | R | Y | N | 100.0 | **41.2** |
| EA45 | 4 Thirlmere Avenue, Perivale, UB6 8EF | B | Y | N | 100.0 | 32.1 |
| EA46 | Oakley House, Oakley Avenue,Ealing,W5 3SB | NR | Y | N | 100.0 | 26.3 |
| EA47 | 53 - 61 St Pauls Close, Ealing,W5 3JX | NR | Y | N | 100.0 | 24.4 |
| EA48 | 158 South Ealing Road, Ealing, W5 4QL | R | Y | N | 100.0 | **60.3** |
| EA49 | South Ealing Cemetery, Popes Lane, Ealing, W5 4NA | B | Y | N | 100.0 | 25.6 |
| EA50 | 213 Northfields Ave, West Ealing, W13 9QU | R | Y | N | 100.0 | 34.6 |
| EA51 | 12 Bond Street, Ealing, W5 5AP | R | Y | N | 100.0 | **47.3** |

| Site ID | Location | Site Type | Within AQMA? | Triplicate or Co-located Tube | Full Calendar Year Data Capture 2014 (%) | 2014 Annual Mean Concentration (µg/m$^3$) – Bias Adjustment Factor = 0.78 |
|---|---|---|---|---|---|---|
| EA52 | 8 Spring Bridge Road,Ealing,W5 2AA | R | Y | N | 100.0 | **61.3** |
| EA53 | Haven Green Court, Haven Green, Ealing, W5 2UZ | NR | Y | N | 100.0 | 33.7 |
| EA54 | 27 Haven Green, Ealing,W5 2NZ | R | Y | N | 100.0 | 33.0 |
| EA55 | 21 Haven Lane, Ealing, W5 2HZ | NR | Y | N | 100.0 | 32.4 |
| EA56 | 41 - 42 Haven Green, Ealing, W5 2NX | R | Y | N | 91.7 | **51.4** |
| EA57 | 64 Hanger Lane,Ealing,W5 2JH | NR | Y | N | 100.0 | 39.4 |
| EA58 | Fernlea House, Hanger Lane Ealing, W5 1EF (***AQMS***) (**Tri**) | R | Y | Y | 100.0 | **79.6** |
| EA59 | Fernlea House, Hanger Lane Ealing, W5 1EF (***AQMS***) (**Tri**) | R | Y | Y | 100.0 | **81.6** |
| EA60 | Fernlea House, Hanger Lane Ealing, W5 1EF (***AQMS***) (**Tri**) | R | Y | Y | 100.0 | **79.6** |
| EA61 | 25 Waverley Gardens, Park Royal, NW10 7EX | R | Y | N | 100.0 | **50.0** |
| EA62 | 3 Iveagh Terrace, Park Royal,NW10 7SY | NR | Y | N | 100.0 | **40.9** |
| EA63 | Rainsford Court, Rainsford Road Park Royal, NW10 7RJ | NR | Y | N | 100.0 | 34.4 |
| EA64 | 5 Wendover Court, Western Avenue,Acton,W3 0TG | NR | Y | N | 100.0 | **56.0** |
| EA65 | 322 & 324 Western Avenue Acton, W3 OPL (***AQMS***) (***Tri***) | R | Y | Y | 100.0 | **70.5** |
| EA66 | 322 & 324 Western Avenue Acton, W3 OPL (***AQMS***) (***Tri***) | R | Y | Y | 100.0 | **70.0** |

| Site ID | Location | Site Type | Within AQMA? | Triplicate or Co-located Tube | Full Calendar Year Data Capture 2014 (%) | 2014 Annual Mean Concentration (µg/m$^3$) – Bias Adjustment Factor = 0.78 |
|---|---|---|---|---|---|---|
| EA67 | 322 & 324 Western Avenue Acton, W3 OPL (***AQMS***) (***Tri***) | R | Y | Y | 100.0 | **70.6** |
| EA68 | 326 Western Avenue, Acton, W3 0PL | NR | Y | N | 100.0 | **55.6** |
| EA69 | 94 North Acton Road, Park Royal, NW10 7AY | NR | Y | N | 100.0 | 35.5 |
| EA70 | 1 Shaftesbury Gardens, Park Royal, NW10 6LJ | R | Y | N | 100.0 | 36.5 |
| EA71 | 39 Old Oak Lane, Park Royal, NW10 6EJ | R | Y | N | 100.0 | **53.0** |
| EA72 | 165 Wells House Road, Park Royal, NW10 6EA | R | Y | N | 100.0 | **41.3** |
| EA73 | 4 St Andrews Road, Acton,W3 7NE | K | Y | N | 100.0 | **40.2** |
| EA74 | 98 Western Avenue, Acton, W3 7TZ | NR | Y | N | 100.0 | **50.8** |
| EA75 | 6 Western Avenue, Acton, W3 7UD | R | Y | N | 100.0 | **77.4** |
| EA76 | 57 Old Oak Common Lane (PO), Acton,W3 7DD | NR | Y | N | 83.3 | **47.8** |
| EA77 | 205 Old Oak Road, Acton, W3 7HH | R | Y | N | 91.7 | **57.4** |
| EA78 | 17 The Vale, Acton, W3 7SH | NR | Y | N | 91.7 | **40.3** |
| EA79 | 3 Warple Way, Acton, W3 0RH | R | Y | N | 83.3 | 39.8 |
| EA80 | Old School House, East Acton Lane, Acton,W3 7HA | NR | Y | N | 100.0 | 31.9 |
| EA81 | 88 High Street, Acton, W3 6QX | R | Y | N | 100.0 | **56.9** |
| EA82 | 15a Church Road,Acton,W3 8QE | R | Y | N | 100.0 | 36.4 |
| EA83 | 182 High Street, Acton, W3 9NN | R | Y | N | 100.0 | **53.9** |
| EA84 | 26 Hawkshead Road, Chiswick, W4 1AD | B | Y | N | 83.3 | 26.4 |

| Site ID | Location | Site Type | Within AQMA? | Triplicate or Co-located Tube | Full Calendar Year Data Capture 2014 (%) | 2014 Annual Mean Concentration (µg/m$^3$) – Bias Adjustment Factor = 0.78 |
|---|---|---|---|---|---|---|
| EA85 | 44 Acton Lane, Chiswick, W4 5ED | R | Y | N | 100.0 | 38.0 |
| EA86 | 98 Bollo Lane, Chiswick, W4 5LX | R | Y | N | 91.7 | 33.5 |
| EA87 | 122 Gunnersbury Lane,Acton,W3 9BA | R | Y | N | 91.7 | 33.4 |
| EA88 | 48 Gunnersbury Lane, Acton,W3 8EG | R | Y | N | 100.0 | 31.8 |
| EA89 | 15 Lantry Court, Lexden Road, Acton, W3 9PE | B | Y | N | 91.7 | 25.9 |
| EA90 | 156 Horn Lane,Acton,W3 6PH | NR | Y | N | 91.7 | **42.3** |
| EA91 | 317 Horn Lane, Acton,W3 0BU (***AQMS***) (***Tri***) | R | Y | Y | 91.7 | **48.2** |
| EA92 | 317 Horn Lane, Acton,W3 0BU (***AQMS***) (***Tri***) | R | Y | Y | 83.3 | **50.7** |
| EA93 | 317 Horn Lane, Acton,W3 0BU (***AQMS***) (***Tri***) | R | Y | Y | 83.3 | **46.4** |
| EA94 | 5 Leamington Park, Acton, W3 6TJ | NR | Y | N | 91.7 | **40.9** |
| EA95 | Poulton Court, Victoria Road, Acton, W3 6EJ | NR | Y | N | 75.0 | **40.5** |
| EA96 | Lyra Court, Portal Way, Acton, W3 6DB | R | Y | N | 83.3 | **43.1** |
| EA97 | 36 Wales Farm Road, Acton,W3 6UE | R | Y | N | 100.0 | **43.2** |
| EA98 | 67-72 Seaclose Close, Acton, W3 6TF | B | Y | N | 100.0 | 36.5 |

Notes: For Site Type NR = Near Road, R = Roadside, B = Background (Urban) and K = Kerbside.

In bold, exceedance of the $NO_2$ annual mean AQS objective of 40 µg/m$^3$. Underlined, annual mean > 60 µg/m$^3$, indicating a potential exceedance of the $NO_2$ hourly mean AQS objective.

**Table 2.6 Results of $NO_2$ Diffusion Tubes (2010 to 2014)**

| Site ID | Site Name | Site Type | Within AQMA? | Annual Mean $NO_2$ Concentration ($\mu g/m^3$) – Bias-Adjusted | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | 2010[a] | 2011 (Bias Adjustment Factor = 1.01) | 2012 (Bias Adjustment Factor = 0.96) | 2013 (Bias Adjustment Factor = 0.76) | 2014 (Bias Adjustment Factor = 0.78) |
| EA01 | 31 Castlebar Road, Ealing,W5 2DJ | NR | Y | **57.3** | 38.1 | 36.8 | 30.8 | 30.7 |
| EA02 | 12 Castlebar Hill, Ealing,W5 1TE | B | Y | 32.3 | 33 | 30.4 | 26.5 | 25.7 |
| EA03 | 1-4 Peal Gardens, West Ealing,W13 OBA | R | Y | 39.1 | 38.8 | 36 | 31.1 | 31.6 |
| EA04 | 2 Horsenden Lane South, Greenford, UB6 8AB | R | Y | **60.1** | **61.9** | **61.4** | **53.1** | **61.7** |
| EA05 | 1-11 Clover House, Gilbert White Close, Perivale, UB6 7FH | NR | Y | 24.8 | 28.2 | 27.7 | 22.2 | 21.7 |
| EA06 | 41 Manor Road, West Ealing,W13 OJA | R | Y | 39.9 | 35.1 | 35.2 | 29.6 | 29.4 |
| EA07 | 1 Kirn Road, Ealing, W13 0UB | R | Y | **57.9** | **52.1** | **51.4** | **46.8** | **48.9** |
| EA08 | 12 Balfour Road, Ealing, W13 9TN (kerbside until 2011) | R | Y | 35.9 | 29.3 | 29.8 | 26.9 | 26.1 |
| EA09 | 20 Church Road, Hanwell, W7 1DR | NR | Y | **41.9** | 36 | 38.3 | 30.1 | 28.1 |
| EA10 | Brent Lodge Park, Church Road, Hanwell,W7 3BP | B | Y | 29.4 | 27.2 | 28.9 | 23.5 | 23.5 |
| EA11 | 74a Greenford Avenue Hanwell, W7 3QS | R | Y | N/A | N/A | N/A | 36.5 | 37.4 |
| EA12 | 255 Boston Road, Hanwell,W7 2AT | NR | Y | N/A | 33.7 | 34.6 | 30.9 | 29.4 |
| EA13 | 6 Boston Gardens, Boston Road Hanwell, W7 2AN | NR | Y | 39.5 | 37.1 | 36.5 | 33.1 | 32.4 |

| Site ID | Site Name | Site Type | Within AQMA? | Annual Mean $NO_2$ Concentration ($\mu g/m^3$) – Bias-Adjusted | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | 2010[a] | 2011 (Bias Adjustment Factor = 1.01) | 2012 (Bias Adjustment Factor = 0.96) | 2013 (Bias Adjustment Factor = 0.76) | 2014 (Bias Adjustment Factor = 0.78) |
| EA14 | 200 Uxbridge Road Hanwell, W7 3TB | R | Y | **48.5** | **47.9** | N/A | **52.6** | **54.5** |
| EA15 | Ealing Hospital Uxbridge Road, Southall, UB1 3HW | B | Y | **46.3** | 28.6 | 29.2 | 29.4 | 25.2 |
| EA16 | 4 Minterne Avenue, Southall,UB2 4LL | NR | Y | **42.8** | 30.2 | 28.9 | 25.1 | 25 |
| EA17 | 55 King Street, Southall, UB2 4DQ | R | Y | N/A | **63.3** | **56.3** | **47.3** | **47.9** |
| EA18 | 18 Western Road, Southall,UB2 5DU | NR | Y | N/A | 38.6 | **41.9** | 36.4 | 36.3 |
| EA19 | 22 Bulls Bridge Road Southall, UB2 5LU | B | Y | N/A | N/A | N/A | 34.5 | 35.3 |
| EA20 | 150 Brent Road, Southall, UB2 5LD | NR | Y | N/A | **42.8** | **41** | 37.6 | 39.5 |
| EA21 | 2 Merrick Road, Southall, UB2 4AU | NR | Y | **45.7** | **43.1** | 38.4 | 32.6 | 30.5 |
| EA22 | Martin Court, Southbridge Way Southall, UB2 4QW | NR | Y | N/A | **42.3** | 38.6 | 33.2 | 34.1 |
| EA23 | 1 Randolph Road,Southall,UB1 1BL | R | Y | N/A | N/A | 39.9 | 34.0 | 35.1 |
| EA24 | 16 Beaconsfield Road Southall, UB1 1DW | R | Y | N/A | N/A | N/A | 39.6[a] | 37.6 |
| EA25 | Blair Peach School, Beaconsfield Road, Southall, UB1 1DD (*AQMS*) (Tri) | B | Y | 31.3 | 30.8 | 28.2 | 25.2 | 23.5 |
| EA26 | Blair Peach School, Beaconsfield Road, Southall, UB1 1DD (*AQMS*) (Tri) | B | Y | 30.5 | 28.7 | 28.7 | 23.8 | 23.6 |

| Site ID | Site Name | Site Type | Within AQMA? | Annual Mean $NO_2$ Concentration ($\mu g/m^3$) – Bias-Adjusted | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | 2010[a] | 2011 (Bias Adjustment Factor = 1.01) | 2012 (Bias Adjustment Factor = 0.96) | 2013 (Bias Adjustment Factor = 0.76) | 2014 (Bias Adjustment Factor = 0.78) |
| EA27 | Blair Peach School, Beaconsfield Road, Southall, UB1 1DD (*AQMS*) (Tri) | B | Y | 28 | 29.4 | 29.1 | 24.5 | 23.6 |
| EA28 | Hambrough Primary School South Road,Southall,UB1 1SF | NR | Y | **53.7** | **47.2** | **44.9** | **41.1** | 39.2 |
| EA29 | 11 The Broadway, Southall, UB1 3PX | R | Y | **66.4** | **69.3** | **60.9** | **55.2** | **54.2** |
| EA30 | 7 Greenford Avenue, Southall, UB1 2AA | NR | Y | 39.2 | 38.8 | 36.8 | 29.2 | 30.7 |
| EA31 | Spike Bridges Park, West Avenue, Southall, UB1 2AR | B | Y | N/A | N/A | N/A | 30.4 | 21.7 |
| EA32 | 205 Windmill Lane, Greenford, UB6 9DW | R | Y | **44.3** | **40.9** | 37.9 | 33.2 | 33.7 |
| EA33 | Greenford High School Lady Margaret Road, Southall, UB1 2GU | B | Y | **44.6** | 35 | 37.1 | 31.1 | 28.7 |
| EA34 | 2 Shadwell Drive, Northolt | NR | Y | **42.1** | 32.9 | 32.5 | 27.8 | 28.7 |
| EA35 | 32 Irving Avenue, Northolt, UB5 5LX | B | Y | N/A | N/A | 29.9 | 22.6 | 23.8 |
| EA36 | 213 Church Road, Northolt, UB5 5BE | NR | Y | N/A | **45.3** | **44.6** | **42.1** | **41.7** |
| EA37 | 31 Mandeville Road Northolt, UB5 5HF | NR | Y | N/A | N/A | **46.2** | **40.2** | 39.6 |
| EA38 | 126 Petts Hill, Northolt, UB5 4NW | NR | Y | **42.3** | **40.1** | **40.8** | 32.5 | 35.6 |
| EA39 | 1504 Greenford Road Greenford, UB6 0HR | NR | Y | **52.0** | 39.5 | 38.6 | 33.5 | 34.4 |

| Site ID | Site Name | Site Type | Within AQMA? | Annual Mean $NO_2$ Concentration ($\mu g/m^3$) – Bias-Adjusted | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | 2010[a] | 2011 (Bias Adjustment Factor = 1.01) | 2012 (Bias Adjustment Factor = 0.96) | 2013 (Bias Adjustment Factor = 0.76) | 2014 (Bias Adjustment Factor = 0.78) |
| EA40 | 79 Whitton Avenue East, Greenford, UB6 0QD | NR | Y | **44.1** | 30.3 | 30.4 | 26.1 | 26.3 |
| EA41 | 914 Greenford Road,Greenford,UB6 8QN | NR | Y | **43.2** | **41.8** | 39.5 | 36.5 | 39.1 |
| EA42 | 6 Karoline Gardens Greenford, UB6 9JP | R | Y | N/A | N/A | N/A | **42.2** | **47.5** |
| EA43 | 12 Blenheim Close, Greenford, UB6 8ET | NR | Y | **48.3** | 39.9 | **43.2** | 38.6 | 36.6 |
| EA44 | 19 Runnymede Gardens, Perivale | R | Y | **79.3** | **43.3** | **44.7** | 39.4 | **41.2** |
| EA45 | 4 Thirlmere Avenue, Perivale, UB6 8EF | B | Y | **41.4** | 38.5 | 35.7 | 31 | 32.1 |
| EA46 | Oakley House, Oakley Avenue Ealing,W5 3SB | NR | Y | N/A | 33.6 | 32.3 | 28.6 | 26.3 |
| EA47 | 53-61 St Pauls Close, Ealing,W5 3JX | NR | Y | **40.3** | 29.1 | 30.9 | 24.4 | 24.4 |
| EA48 | 158 South Ealing Road Ealing, W5 4QL | R | Y | N/A | N/A | N/A | **57.3** | **60.3** |
| EA49 | South Ealing Cemetery, Popes Lane, Ealing, W5 4NA | B | Y | 32.6 | 30.2 | 31.2 | 26.6 | 25.6 |
| EA50 | 213 Northfields Ave West Ealing, W13 9QU | R | Y | N/A | N/A | N/A | 37.9 | 34.6 |
| EA51 | 12 Bond Street, Ealing, W5 5AP | R | Y | **54.3** | **57** | **49.3** | **50.7** | **47.3** |
| EA52 | 8 Spring Bridge Road,Ealing,W5 2AA | R | Y | **68.2** | **71.8** | **66.8** | **61.4** | **61.3** |
| EA53 | Haven Green Court, Haven Green Ealing, W5 2UZ | NR | Y | **42.4** | 39.5 | **50.4** | 33.5 | 33.7 |

| Site ID | Site Name | Site Type | Within AQMA? | Annual Mean $NO_2$ Concentration ($\mu g/m^3$) – Bias-Adjusted | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | 2010[a] | 2011 (Bias Adjustment Factor = 1.01) | 2012 (Bias Adjustment Factor = 0.96) | 2013 (Bias Adjustment Factor = 0.76) | 2014 (Bias Adjustment Factor = 0.78) |
| EA54 | 27 Haven Green, Ealing,W5 2NZ | R | Y | **42.7** | 39.6 | 38.7 | 32.5 | 33.0 |
| EA55 | 21 Haven Lane, Ealing,W5 2HZ | NR | Y | **40.1** | **41.4** | 36.8 | 33.8 | 32.4 |
| EA56 | 41-42 Haven Green, Ealing,W5 2NX | R | Y | N/A | N/A | **52.1** | **48.4** | **51.4** |
| EA57 | 64 Hanger Lane,Ealing,W5 2JH | NR | Y | 38.8 | **42.7** | **44.4** | 38.7 | 39.4 |
| EA58 | Fernlea House, Hanger Lane Ealing,W5 1EF (AQMS) (Tri) | R | Y | **77.9** | **77.1** | **75** | **75.1** | **79.6** |
| EA59 | Fernlea House, Hanger Lane Ealing,W5 1EF (AQMS) (Tri) | R | Y | **78.6** | **80.6** | **81.7** | **74.3** | **81.6** |
| EA60 | Fernlea House, Hanger Lane Ealing, W5 1EF (AQMS) (Tri) | R | Y | **76.1** | **78.5** | **79.3** | **74.7** | **79.6** |
| EA61 | 25 Waverley Gardens Park Royal, NW10 7EX | R | Y | **49.6** | **54.9** | **51.8** | **49.7** | **50** |
| EA62 | 3 Iveagh Terrace, Park Royal | NR | Y | **49.5** | **44.5** | **45** | **40.6** | **40.9** |
| EA63 | Rainsford Court, Rainsford Road Park Royal, NW10 7RJ | NR | Y | N/A | N/A | N/A | N/A | 34.4 |
| EA64 | 5 Wendover Court, Western Avenue, Acton, W3 0TG | NR | Y | **67.4** | 38.9 | **56** | **59.3** | **56** |
| EA65 | 322 & 324 Western Avenue Acton, W3 OPL (*AQMS*) (*Tri*) | R | Y | **72.4** | **77.8** | **73.8** | **68.2** | **70.5** |

| Site ID | Site Name | Site Type | Within AQMA? | Annual Mean $NO_2$ Concentration ($\mu g/m^3$) – Bias-Adjusted | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | 2010[a] | 2011 (Bias Adjustment Factor = 1.01) | 2012 (Bias Adjustment Factor = 0.96) | 2013 (Bias Adjustment Factor = 0.76) | 2014 (Bias Adjustment Factor = 0.78) |
| EA66 | 322 & 324 Western Avenue Acton, W3 OPL (*AQMS*) (*Tri*) | R | Y | **67.9** | **72.8** | **75.1** | **66.7** | **70** |
| EA67 | 322 & 324 Western Avenue Acton, W3 OPL (*AQMS*) (*Tri*) | R | Y | **73.1** | **73.5** | **74.5** | **67.6** | **70.6** |
| EA68 | 326 Western Avenue, Acton, W3 0PL | NR | Y | **62.6** | **62.5** | **59.9** | **57.3** | **55.6** |
| EA69 | 94 North Acton Road Park Royal, NW10 7AY | NR | Y | **42.9** | 39.8 | 38.9 | 34.2 | 35.5 |
| EA70 | 1 Shaftesbury Gardens Park Royal, NW10 6LJ | NR | Y | **40.6** | **42.1** | **43.4** | 37.8 | 36.5 |
| EA71 | 39 Old Oak Lane, Park Royal, NW10 6EJ | NR | Y | **56.7** | **54.1** | **51.1** | **50.5** | **53** |
| EA72 | 165 Wells House Road Park Royal, NW10 6EA | R | Y | N/A | N/A | N/A | N/A | **41.3** |
| EA73 | 4 St Andrews Road, Acton, W3 7NE | NR | Y | **50.7** | **43.4** | **42.3** | 35.8 | **40.2** |
| EA74 | 98 Western Avenue, Acton, W3 7TZ | NR | Y | **57.1** | **51.4** | **51.8** | **48.2** | **50.8** |
| EA75 | 6 Western Avenue, Acton, W3 7UD | R | Y | **79.8** | **70.4** | **70.8** | **69.2** | **77.4** |
| EA76 | 57 Old Oak Common Lane Acton, W3 7DD | NR | Y | **56.5** | **53.2** | **49.6** | **48.1** | **47.8** |
| EA77 | 205 Old Oak Road, Acton, W3 7HH | R | Y | **76.9** | **59.7** | **55.2** | **58.6** | **57.4** |
| EA78 | 17 The Vale, Acton, W3 7SH | R | Y | **45** | **50.1** | **49.5** | **44.3** | **40.3** |

| Site ID | Site Name | Site Type | Within AQMA? | Annual Mean $NO_2$ Concentration ($\mu g/m^3$) – Bias-Adjusted | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | 2010[a] | 2011 (Bias Adjustment Factor = 1.01) | 2012 (Bias Adjustment Factor = 0.96) | 2013 (Bias Adjustment Factor = 0.76) | 2014 (Bias Adjustment Factor = 0.78) |
| EA79 | 3 Warple Way, Acton, W3 0RH | R | Y | **56** | **50.2** | **48.3** | **43.1** | 39.8 |
| EA80 | Old School House, East Acton Lane, Acton, W3 7HA | NR | Y | 37.8 | **40.4** | 35.9 | 29.5 | 31.9 |
| EA81 | 88 High Street, Acton, W3 6QX | R | Y | N/A | N/A | **54.7** | **56.2** | **56.9** |
| EA82 | 15a Church Road,Acton,W3 8QE | R | Y | 36.6 | 32.9 | 39.5 | 30.6 | 36.4 |
| EA83 | 182 High Street, Acton, W3 9NN | R | Y | **64.9** | **67.4** | **48.9** | **59** | **53.9** |
| EA84 | 26 Hawkshead Road Chiswick, W4 1AD | B | Y | N/A | N/A | N/A | 27.7 | 26.4 |
| EA85 | 44 Acton Lane, Chiswick, W4 5ED | NR | Y | **57.2** | **41.8** | **40.1** | 38.4 | 38 |
| EA86 | 98 Bollo Lane, Chiswick, W4 5LX | R | Y | N/A | N/A | N/A | N/A | 33.5 |
| EA87 | 122 Gunnersbury Lane,Acton,W3 9BA | NR | Y | **51.1** | 38.1 | 37.6 | 33.5 | 33.4 |
| EA88 | 48 Gunnersbury Lane, Acton,W3 8EG | NR | Y | **52** | 37 | 36.1 | 33.4 | 31.8 |
| EA89 | 15 Lantry Court, Lexden Road Acton, W3 9PE | B | Y | 33.4 | 30.5 | 31.7 | 26.9 | 25.9 |
| EA90 | 156 Horn Lane, Acton, W3 6PH | NR | Y | **49.4** | **46.6** | **40.7** | **42.2** | **42.3** |
| EA91 | 317 Horn Lane Acton,W3 0BU (*AQMS*) (*Tri*) | R | Y | **59.6** | **59.6** | **54.7** | **51.8** | **48.2** |
| EA92 | 317 Horn Lane Acton,W3 0BU (Horn Lane *AQMS*) (*Tri*) | R | Y | **57.1** | **56.8** | **47** | **50.1** | **50.7** |

| Site ID | Site Name | Site Type | Within AQMA? | Annual Mean $NO_2$ Concentration ($\mu g/m^3$) – Bias-Adjusted | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | 2010[a] | 2011 (Bias Adjustment Factor = 1.01) | 2012 (Bias Adjustment Factor = 0.96) | 2013 (Bias Adjustment Factor = 0.76) | 2014 (Bias Adjustment Factor = 0.78) |
| EA93 | 317 Horn Lane Acton,W3 0BU (Horn Lane *AQMS*) (*Tri*) | R | Y | **58.6** | **54** | **53.2** | **51.5** | **46.4** |
| EA94 | 5 Leamington Park, Acton, W3 6TJ | NR | Y | **47.5** | **48.6** | **46.6** | **41.9** | **40.9** |
| EA95 | Poulton Court, Victoria Road Acton, W3 6EJ | NR | Y | N/A | N/A | N/A | N/A | **40.5** |
| EA96 | Lyra Court, Portal Way Acton, W3 6DB | R | Y | N/A | N/A | N/A | N/A | **43.1** |
| EA97 | 36 Wales Farm Road, Acton, W3 6UE | NR | Y | **52.9** | **48.5** | **44.8** | **44.7** | **43.2** |
| EA98 | 67-72 Seaclose Close Acton, W3 6TF | B | Y | N/A | N/A | **40.3** | 33.7 | 36.5 |

Notes: For Site Type NR = Near Road, R = Roadside, B = Background (Urban) and K = Kerbside. In bold, exceedance of the $NO_2$ annual mean AQS objective of 40 $\mu g/m^3$. Underlined, annual mean > 60 $\mu g/m^3$, indicating a potential exceedance of the $NO_2$ hourly mean AQS objective.

[a] 2010 data bias adjusted using local factors of 1.02 for roadside and kerbside sites, 1.06 for near road sites and 1.01 for urban background sites. The bias adjustment methods for 2010 are presented in previous LAQM reports.

Figure 2.4 to Figure 2.9 show trends in annual mean $NO_2$ concentrations recorded at diffusion tubes in the LB of Ealing from 2010 to 2014. Figure 2.4 shows trends at urban background sites, Figures 2.5 to 2.7 are for near-road sites, and Figures 2.8 to 2.9 are for roadside sites. The general trend for all site types appears to be a slight reduction in annual mean $NO_2$ concentrations over the five year period. This trend is strongest at urban background and near-road sites. A small number of sites have experienced large year to year variability or a slight rise in concentrations since 2011. Due to differences in diffusion tube referencing over the past five years, addresses have been used to describe the locations of the diffusion tubes shown.

**Figure 2.4 Trends in Annual Mean $NO_2$ Concentrations at Urban Background Diffusion Tube Monitoring Sites**

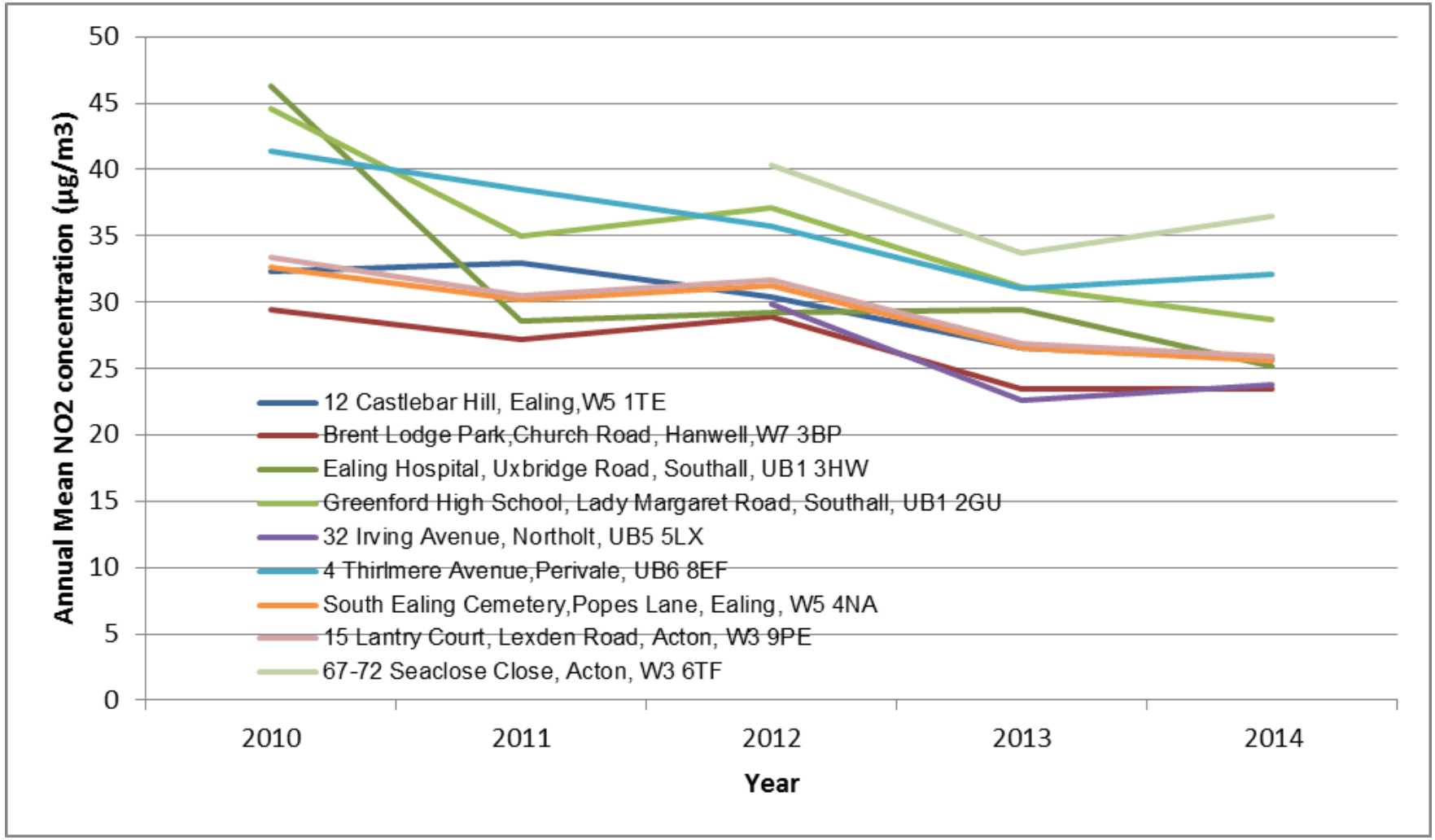


**Figure 2.5 Trends in Annual Mean $NO_2$ Concentrations at Near Road Diffusion Tube Monitoring Sites**

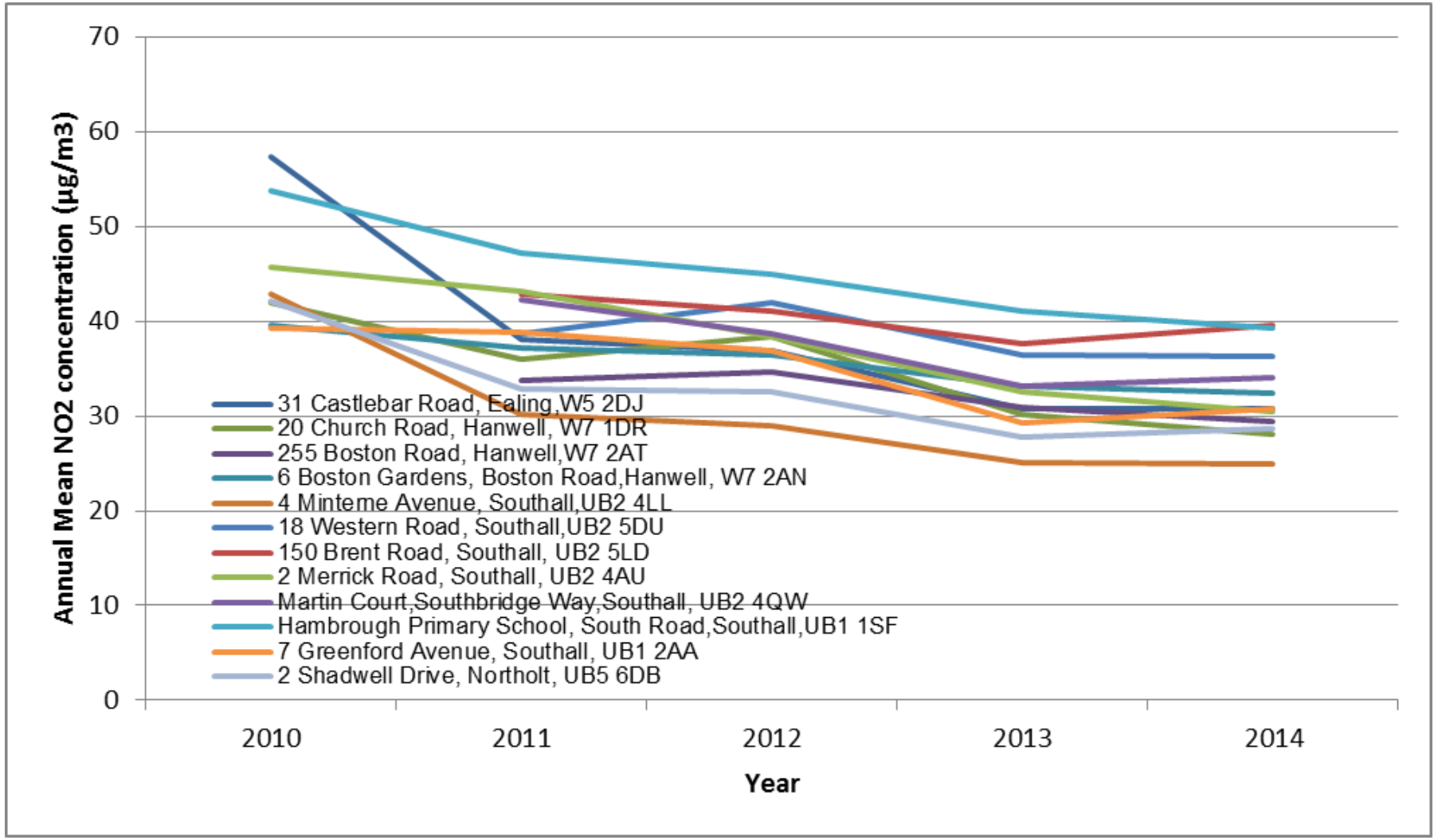


**Figure 2.6 Trends in Annual Mean $NO_2$ Concentrations at Near Road Diffusion Tube Monitoring Sites**

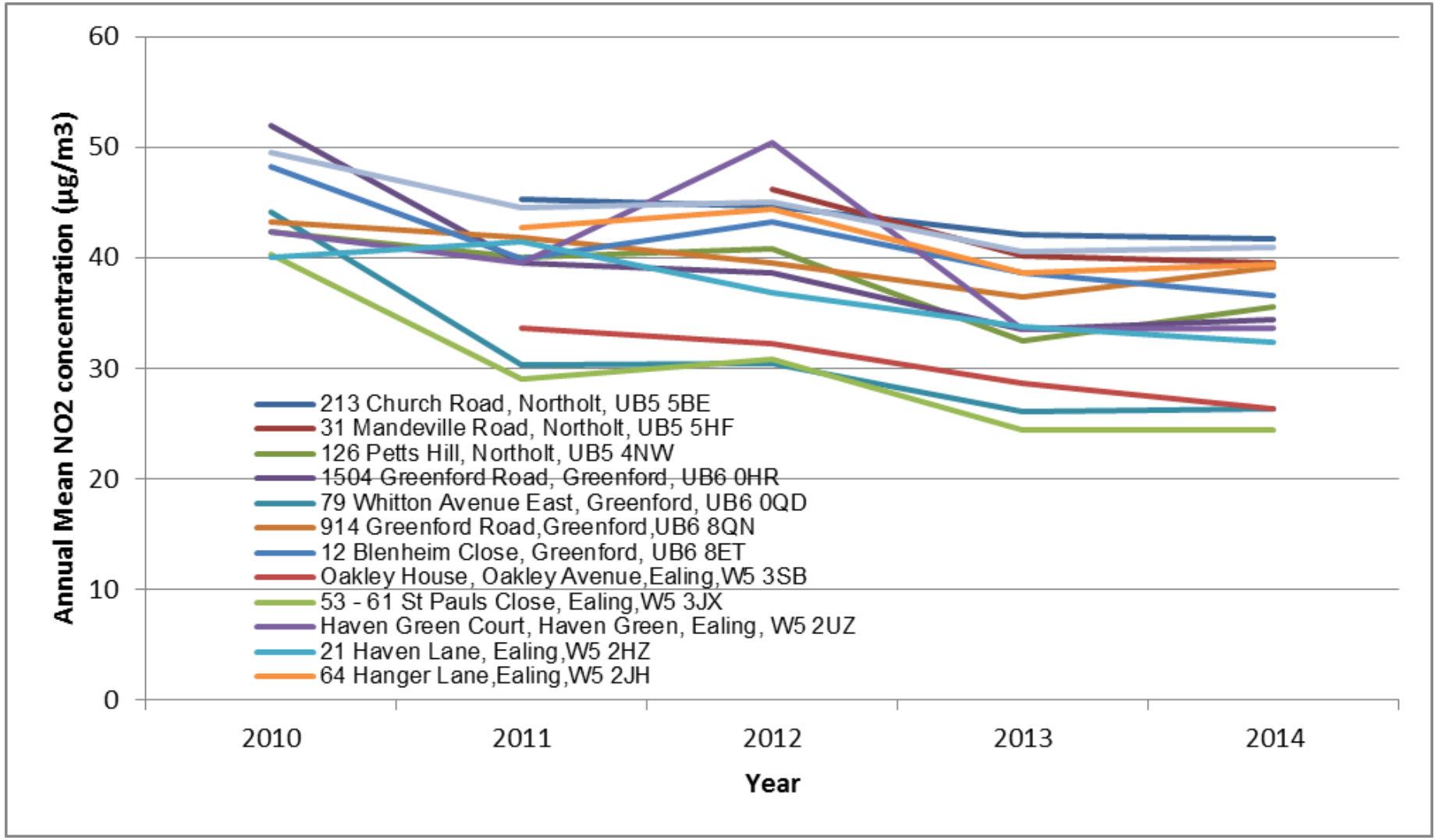


**Figure 2.7 Trends in Annual Mean $NO_2$ Concentrations at Near Road Diffusion Tube Monitoring Sites**

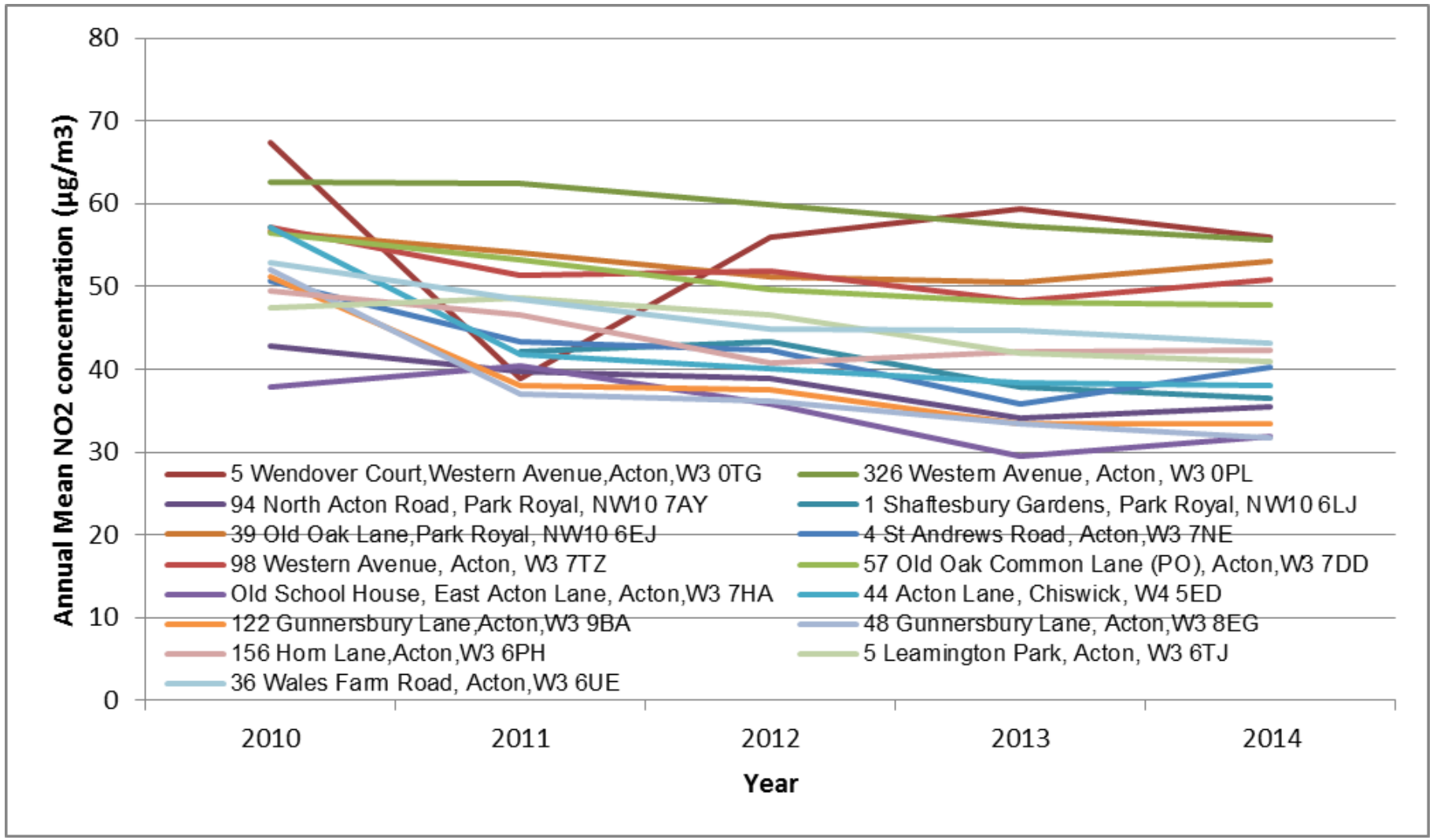


**Figure 2.8 Trends in Annual Mean $NO_2$ Concentrations at Roadside Diffusion Tube Monitoring Sites**

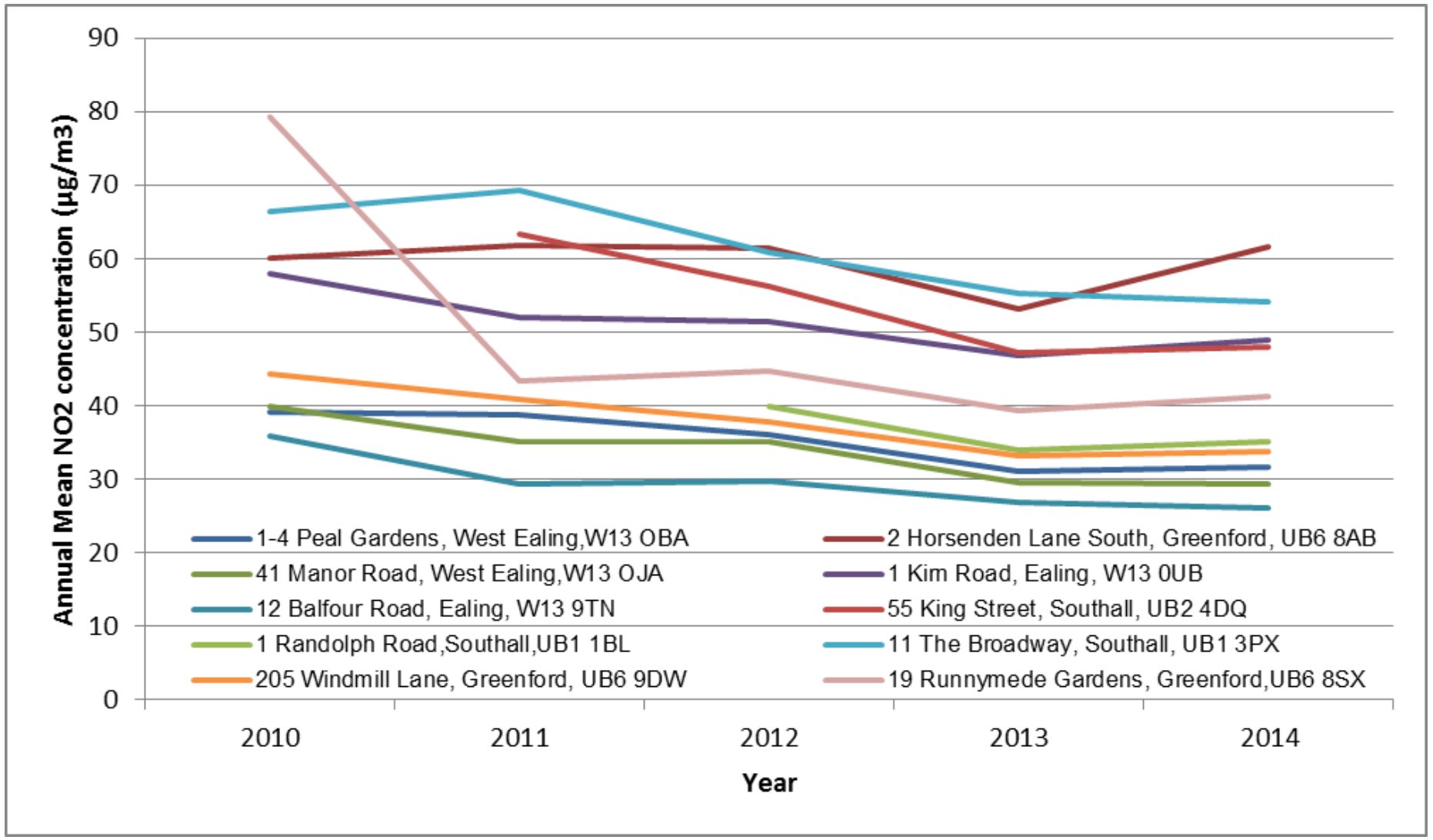
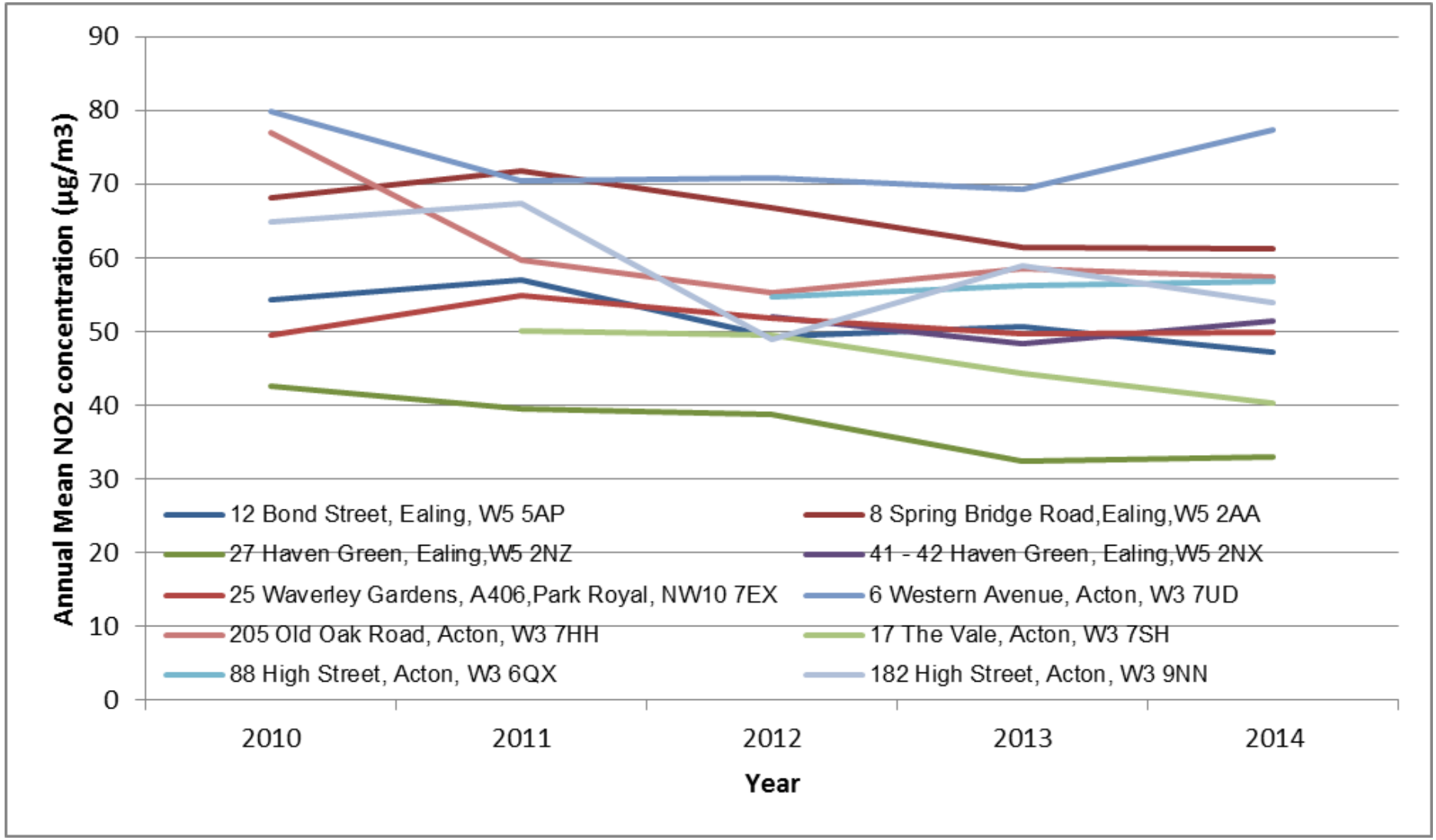


**Figure 2.9 Trends in Annual Mean $NO_2$ Concentrations at Roadside Diffusion Tube Monitoring Sites**



### 2.2.2 Particulate Matter ($PM_{10}$)

$PM_{10}$ concentrations are currently measured at four locations in the LB of Ealing, as shown in Table 2.7, although the Southall Railway site, which closed in 2014, is also shown for reference purposes. TEOMs are used to monitor $PM_{10}$ at all sites except for Southall where an FDMS is also used. Where applicable therefore, monitoring data has been corrected for the use of TEOMs using the Volatile Correction Model[4]. Data capture in 2014 was good (i.e. >90%) at all locations.

$PM_{10}$ concentrations in 2014 at all sites were found to achieve the annual mean objective of 40 µg/m$^3$. The highest annual mean $PM_{10}$ concentration in 2014 was at Horn Lane, 36.3 µg/m$^3$, which is similar to concentrations recorded between 2011 and 2013.

Figure 2.10 shows the trends in $PM_{10}$ concentrations between 2010 and 2014 for the five monitoring locations, which appear to suggest that annual $PM_{10}$ concentrations have decreased slightly over this period at all sites, with the exception of Southall, which has remained relatively constant with noticeable year to year variability.

The daily mean $PM_{10}$ air quality objective (50 µg/m$^3$, not to be exceeded more than 35 times a year) was, however, exceeded at the Horn Lane site in 2014, with a total of 68 days with a 24-hour mean $PM_{10}$ concentration above 50 µg/m$^3$. The number of daily exceedances in 2014 is similar to those in 2010 and 2011, but considerably higher than in 2012 and 2013. The daily mean $PM_{10}$ air quality objective was however achieved at the remaining three operational sites.

**Table 2.7: Results of Automatic Monitoring for $PM_{10}$: Comparison with Annual Mean Objective**

| Site ID | Site Type | Within AQMA? | Valid Data Capture 2014 % | Confirm Gravimetric Equivalent (Y or N/A) | Annual Mean $PM_{10}$ Concentration ($\mu g/m^3$) | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2010 | 2011 | 2012 | 2013 | 2014 |
| Hanger Lane Gyratory | Roadside | Y | 98.3 | Y | - | 30.8 | 29.1 | 28.6 | 25.4 |
| Horn Lane | Industrial | Y | 95.4 | Y | **41.5** | 36.3 | 35.6 | 37.5 | 36.3 |
| Southall | Urban Background | Y | 92.6 | Y | 20 | 21.7 | 17.7 | 22.5 | 19.4 |
| Southall Railway | Near road | Y | - | Y | - | 23.3 | 22.9 | 20.8 | - |
| Western Avenue | Roadside | Y | 95.8 | Y | - | 31.2 | 30.4 | 31.1 | 29.4 |

Note: In bold, exceedance of the $PM_{10}$ annual mean AQS objective of 40 $\mu g/m^3$

**Figure 2.10 Trends in Annual Mean $PM_{10}$ Concentrations**

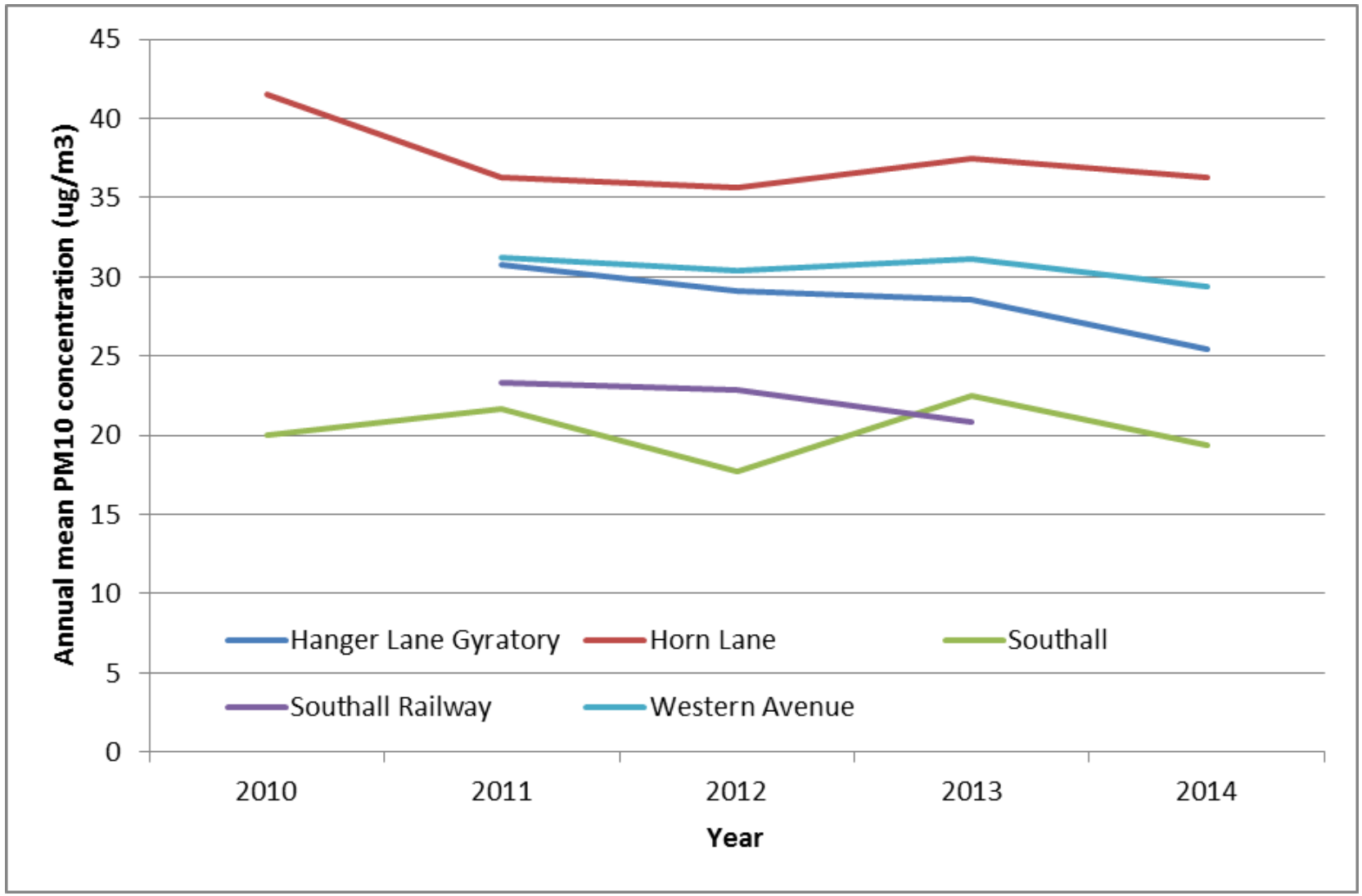


**Table 2.8 Results of Automatic Monitoring for $PM_{10}$: Comparison with 24-hour Mean Objective**

| Site ID | Site Type | Within AQMA? | Valid Data Capture 2014 (%) | Gravimetric Equivalent (Y or N/A) | Number of Daily Means > 50 µg/m$^3$ | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2010 | 2011 | 2012 | 2013 | 2014 |
| Hanger Lane Gyratory | Roadside | Y | 98.3 | Y | - | 29 (47) | 8 | 9 | 7 |
| Horn Lane | Near Road | Y | 95.4 | Y | **91** | **59** | 22 | 24 | **68** |
| Southall | Background | Y | 92.6 | Y | 2 | 9 | 9 | 9 | 3 |
| Southall Railway | Roadside | Y | - | Y | - | 5 (31) | 4 | 5 | - |
| Western Avenue | Roadside | Y | 95.8 | Y | - | 23 (45) | 10 (45) | 22 (46) | 22 |

Notes: In bold, exceedance of the $PM_{10}$ daily mean AQS objective (50 µg/m$^3$ – not to be exceeded more than 35 times per year)

Where data capture for the full calendar year was less than 90%, the 90.4$^{th}$ percentile of 24-hour means is shown in brackets

### 2.2.3 Sulphur Dioxide ($SO_2$)

Historically, the London Borough of Ealing operated one site (Ealing Town Hall) that monitored sulphur dioxide in the Borough. The site was however closed in January 2012 and no monitoring has since been conducted.

### 2.2.4 Benzene

Until 2011, the London Borough of Ealing operated three roadside passive diffusion tube sites that measured benzene within the Borough. The benzene monitoring continued at Fernlea House, Hanger Lane until the end of 2012. These sites have since been discontinued and no benzene monitoring is carried out within the Borough.

### 2.2.5 Other Pollutants Monitored

#### 2.2.5.1 Ozone ($O_3$)

Ozone monitoring is conducted at the Southall automatic monitoring station. Local objectives for improving ground level ozone are not included in the Air Quality Regulations as it is considered to be a regional pollutant. The UK Air Quality Strategy does however suggest a running 8-hour average of 100 µg/m$^3$ should not be exceeded more than 10 times per year. In 2014, there was only 1 day that recorded an 8-hour running hourly mean greater than 100 µg/m$^3$, and so the objective was achieved. The objective was also achieved in 2012, but was only just breached in 2013.

**Table 2.9 Results of Automatic Monitoring for $O_3$**

| Site ID | Site Type | Within AQMA? | Valid Data Capture 2014 (%) | Number of days with an 8-hour running mean > 100 µg/m$^3$ | | |
|---|---|---|---|---|---|---|
| | | | | 2012 | 2013 | 2014 |
| Southall | Urban Background | Y | 93 | 9 | **10** | 1 |

### 2.2.5.2 Particulate Matter ($PM_{2.5}$)

The London Borough of Ealing commenced $PM_{2.5}$ monitoring in 2012 at the Southall urban background site. Concentrations for the first three years of monitoring are shown in Table 2.10.

**Table 2.10 Results of Automatic Monitoring for $PM_{2.5}$**

| Site ID | Site Type | Within AQMA? | Valid Data Capture 2014 (%) | Confirm Gravimetric Equivalent (Y or N/A) | Annual Mean $PM_{2.5}$ Concentration ($\mu g/m^3$) | | |
|---|---|---|---|---|---|---|---|
| | | | | | 2012 | 2013 | 2014 |
| Southall | Urban Background | Y | 85.1 | Y | 9.7[a] | 9.9[a] | 14.6 |

[a] Gravimetric equivalent $PM_{2.5}$ concentrations were not measured in these years.

### 2.2.6 Summary of Compliance with AQS Objectives

The London Borough of Ealing has examined the results from air quality monitoring in the Borough.

Annual mean and hourly mean concentrations of nitrogen dioxide remain in exceedance of the air quality objectives at numerous locations within the current borough-wide AQMA.

Measured $PM_{10}$ concentrations did not exceed the annual mean objective at any continuous monitoring site, however the daily mean $PM_{10}$ objective was exceeded at the Horn Lane site.

The basis for the declaration of the current AQMA therefore remains unchanged and the AQMA should remain.

# 3 Road Traffic Sources

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

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

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

London Borough of Ealing confirms that there are no new/newly identified busy streets where people may spend 1 hour or more close to traffic.

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

London Borough of Ealing confirms that there are no new/newly identified roads with high flows of buses/HDVs.

## 3.4 Junctions

London Borough of Ealing confirms that there are no new/newly identified busy junctions/busy roads.

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

London Borough of Ealing confirms that there are no new/proposed roads.

## 3.6 Roads with Significantly Changed Traffic Flows

London Borough of Ealing confirms that there are no new/newly identified roads with significantly changed traffic flows.

## 3.7 Bus and Coach Stations

London Borough of Ealing confirms that there are no relevant bus stations in the Local Authority area.

# 4 Other Transport Sources

## 4.1 Airports

The London Borough of Ealing confirms that there are no airports in the Local Authority area.

## 4.2 Railways (Diesel and Steam Trains)

The London Borough of Ealing confirms that there are no locations where diesel or steam trains are regularly stationary for periods of 15 minutes or more, with potential for relevant exposure within 15m, and that there are no locations with a large number of movements of diesel locomotives, and potential long-term relevant exposure within 30m.

## 4.3 Ports (Shipping)

The London Borough of Ealing confirms that there are no ports or shipping that meet the specified criteria within the Local Authority area.

# 5 Industrial Sources

## 5.1 Industrial Installations

The London Borough of Ealing confirms that there are no new or proposed industrial installations for which planning approval has been granted within its area or nearby in a neighbouring authority.

## 5.2 Major Fuel (Petrol) Storage Depots

There are no major fuel (petrol) storage depots within the Local Authority area.

## 5.3 Petrol Stations

The London Borough of Ealing confirms that there are no petrol stations meeting the specified criteria**.**

## 5.4 Poultry Farms

The London Borough of Ealing confirms that there are no poultry farms meeting the specified criteria.

# 6 Commercial and Domestic Sources

## 6.1 Biomass Combustion – Individual Installations

A biomass boiler has been operational at the Cardinal Wiseman School in Greenford since 2013. According to Defra LAQM.TG(09) technical guidance, all biomass burning plants in the range 50 kW to 20 MW require screening to determine whether emissions of $NO_2$ and $PM_{10}$ are likely to contribute significantly to overall concentrations.

The biomass boiler in question is rated at a heat output of 156 kW. The boiler was assessed in accordance with LAQM.TG(09) and was found to be **not significant** as a source of $NO_2$ and $PM_{10}$. Details of the assessment can be found in Appendix B.

The London Borough of Ealing has assessed the biomass combustion plant, and concluded that it will not be necessary to proceed to a Detailed Assessment.

## 6.2 Biomass Combustion – Combined Impacts

The London Borough of Ealing confirms that there are no biomass combustion plant in the Local Authority area.

## 6.3 Domestic Solid-Fuel Burning

The London Borough of Ealing confirms that there are no areas of significant domestic fuel use in the Local Authority area.

# 7 Fugitive and Uncontrolled Sources

The London Borough of Ealing confirms that there are no potential sources of fugitive particulate matter emissions in the Local Authority area.

# 8 Local, regional and national air quality plans

## 8.1 Local / Regional Air Quality Strategy

A number of air quality projects have been undertaken by the London Borough of Ealing in recent years as shown in Table 8.1. Summaries of completed and ongoing projects listed in Table 4.1 are included below. The results of these projects will be used to inform the revision of LB Ealing's Air Quality Action Plan during 2016. Projects such as the final one in the table 'Transforming a hotspot' has the potential to reduce the significant number of exceedances for $PM_{10}$ seen in the Horn Lane area of Acton.

**Table 8.1 Summary of New Air Quality Strategy Actions**

| Year | Title of Project |
|---|---|
| 2011/2012 | Emissions from diesel trains in London **(completed)** |
| 2011/2012 | Remote sensing of $NO_2$ exhaust emissions from road vehicles **(completed)** |
| 2012/2013 | Scenario development to inform air quality action planning in the London Borough of Ealing **(completed)** |
| 2013/2014 | Transforming a Hotspot - Developing a Low Emissions Strategy for Horn Lane, Acton (**completed**) |
| 2014/2015 | Ealing Broadway Air Quality Exemplar (ongoing) |
| 2014/2015 | Transforming a Hotspot - Developing a Low Emissions Strategy for Horn Lane, Acton (**completed**) |

**Emissions from Diesel Trains in London[5]**

This project was undertaken to investigate the significance of emissions from diesel trains along the Great Western Mainline through residential areas of Ealing. Modelling that was conducted, based on the London Atmospheric Emissions Inventory (LAEI) suggested that diesel trains may have been responsible for breaches of the $NO_2$ annual air quality objective up to 200 m either side of the line. This was however not supported by real world measurements, which lacked a clear

signal from train emissions, and the report concluded that diesel trains do not make a significant contribution to local air pollution concentrations.

**Remote Sensing of $NO_2$ exhaust emissions from road vehicles[7]**

A series of measurement campaigns were carried out in the summer of 2012 in London to measure vehicle emissions using a remote sensing detector (RSD), focusing in particular on nitrogen-containing compounds such as $NO_x$, $NO_2$ and $NH_3$. Of key importance was the direct measurement of $NO_2$ emissions by the RSD, as modern vehicle technologies result in high emissions of directly-emitted $NO_2$, which can contribute significantly to near-road $NO_2$ exceedances of EU limit values given that it acts as a primary pollutant.

The project report finds that using instruments that only measure NO to estimate vehicle emissions, particularly from modern fleets with their higher direct $NO_2$ emissions, risks providing unreliable or even misleading information on $NO_2$ levels. The report also finds complex and varying trends over time in $NO_x$ and $NO_2$ emissions as fractions of $CO_2$ emissions, which are highly dependent on vehicle class and fuel type – for example the $NO_x/CO_2$ ratio for petrol/petrol hybrids has fallen dramatically over the past two decades whilst it has not done for any diesel classes, and $NO_2/CO_2$ has actually increased.

The report recommends the use of annual RSD surveys to better quantify real-world emissions from modern vehicle fleets as emissions control technologies are implemented, detailed comparisons between the new RSD measurements and NAEI and LAEI emissions factors, and targeted case studies using RSD measurements (e.g. a bus retrofitting scheme) to better evaluate the impacts of emissions control technologies.

**Scenario development to inform air quality action planning in the London Borough of Ealing[6]**

This project aimed to develop future year policy scenarios to inform the development of the Ealing air quality action plan. Recent remote sensing of NO and $NO_2$ emissions in Ealing and other locations in London[7] has helped quantify, with greater confidence, the likely impacts and effectiveness of interventions to particular vehicle

classes and operation modes (e.g. conversion of Tfl London buses from diesel to hybrid), as previously there was insufficient empirical data on urban road vehicle fleet emissions.

The report focused in particular on light duty vehicle, commercial heavy duty vehicle, and Tfl London Bus emissions, and included a scenario whereby an 'Ultra Low Emission Zone' (ULEZ) was implemented. Given the considerable uncertainty in the transferability of vehicle emissions rates derived from laboratory-based tests to 'real-world' driving conditions, the report also recommended the implementation of a systematic monitoring regime to ensure empirical data are consistent with assumed laboratory test-derived vehicle emissions rates.

**Ealing Broadway Air Quality Exemplar**

Poor air quality (including exceedances of national objectives for $NO_2$) is caused by high volumes of slow moving traffic at Ealing Broadway. The situation is compounded by poor dispersion of emissions due to the narrow carriageway bounded by high buildings at this location. As a result of these issues Ealing Broadway is a designated Air Quality Focus Area. There are also very high levels of pedestrian footfall here which result in extremely high levels of exposure to emissions.

This project will develop a 'toolkit', in partnership with the Ealing BID, to enable businesses to reduce their emissions. This will focus on: reducing emissions from transport, reducing emissions from buildings, business engagement/awareness raising and communications. This toolkit will use existing best practice experience including from the City Air and Zero Emissions Network (Shoreditch) initiatives.

The following have been identified as 'quick-win' solutions:

- Production and distribution of local walking and public transport maps to businesses
- Setting up a website and publicity summarising 'quick wins' for business
- Use of cycle couriers
- Free cycle skills and maintenance training

- Free cycle security marking
- Free/discounted car club membership for an introductory period

The project will seek local businesses as partners to provide the reduced emission solutions through the Ealing BID. The following 'step change' measures could be included:

- Consolidation of servicing including deliveries and waste –implementation of delivery and servicing plans (DSPs)
- Subsidised trials for electric vehicles, electric bikes and cargo bikes
- Free energy and waste audits
- Establish a local freecycle for unwanted items
- Extend the 'quick win' solutions above

**Transforming a Hotspot - Developing a Low Emissions Strategy for Horn Lane, Acton[8]**

The Horn Lane automatic monitoring station has for many years measured unusually elevated concentrations of $PM_{10}$ in particular, often in exceedance of EU limit values and national air quality objectives (mainly the short-term or daily objective). The major factor causing these high PM10 concentrations is believed to be the Acton Goods Yard, located just to the west (and therefore usually upwind) of the monitoring station, where there is a considerable amount of dust generated by on-site operations and track-out of dust by exiting vehicles. The Low Emissions Strategy (LES) for Horn Lane seeks to control local sources of $PM_{10}$ from the Goods Yard. Some suggested areas for control measures include:

- Agreed Dust Management Plans in place at all sites within the Yard
- Having a Responsible Person for managing dust on site
- Water Dust Suppression
- Adapt the access road to minimise dust lofting
- Vehicle Washing

## 8.2 Planning Applications

There are a number of large developments in the LB of Ealing that have received planning permission for a first phase of multi phase schemes. The largest of these developments are documented below.

**Havelock estate, Southall**

900 residential homes with first phase approved by the council and construction due to begin in summer 2014. The developer for this scheme is Catalyst Housing. Construction is due to be completed by 2025.

**Copley Close Estate, West Ealing**

The council's 2008 estates review highlighted that Copley Close needs a lot of work to bring it up to the government's Decent Homes standard. The LB of Ealing proposes the demolition of the current 76 units and the construction of 211 new residential units. This redevelopment is due to be constructed with the planning application currently in the consultation phase.

**South Acton Estate, Acton**

A house redevelopment scheme with a total of 2,600 residential properties over 11 phases due for completion in 2026. LB of Ealing granted the phase 3 planning application in March 2014. The first two phases are currently under construction.

**Green Man Estate, West Ealing**

Redevelopment of the Green Man Estate in West Ealing due to be completed from 2009 – 2018 over four phases. Currently Phase one and two are in construction and the planning application is being prepared for Phase three. The Phase four planning application will be submitted at some point in the future. Once completed the development will comprise of 706 new residential properties, a new gym, community cafe, energy centre and 401 car parking spaces. The project includes the demolition of the 464 current properties and multi-storey car park on site.

**Southall Gasworks development**

This is an 85 acre Brownfield site which is seeking planning permission for 20,000sqm of residential, 14,200sqm for non-food retail, 5,850sqm of food retail, 1,750sqm of Class A3-A5 uses; 650sqm of hotel, 3,000 sqm of conference and banqueting, 24,450sqm of multi-storey car park, 2,550sqm of health care facilities, 3,450sqm of education facilities, 3,500sqm of office/studio units, 390sqm of sports pavilion, 600sqm of energy centre, associated car and cycle parking, landscaping, public realm, open space and children's play-space. Phase one is due for completion in 2019.

**Thames Tunnel - Acton Storm Tanks, Canham Road, Acton**

Construction is assumed to start in 2018 and be complete by 2021. Work includes construction of underground structures to connect the existing Acton Storm Relief combined sewer overflow to a shaft approximately 31 m deep and with an internal diameter of approximately 15 m.

**High Speed 2 (HS2)**

Construction is due to begin on the North Acton and Park Royal section of HS2 railway line in 2018.

## 8.3 Air Quality Planning Policies

These section details any planning policies that make reference to air quality, together with any new policies or guidance of relevance to air quality.

On 10 December 2013 the LB of Ealing's new Local Plan[9] superseded any saved policies in the Unitary Development Plan (UDP) that was adopted on 12 October 2004. The existing development plan for the LB of Ealing currently comprises the following documents (together with an associated Adopted Policies Map[10]):

- London Plan
- Development (or Core Strategy) DPD, April 2012
- Development Sites DPD, December 2013
- Development Management DPD, December 2013

The relevant air quality is Policy 7A which discusses amenities and planning decisions.

"***A*** *Development which in the course of its operations will cause emissions of any sort must;*

- *not erode the amenity of surrounding uses or the site itself*
- *take all reasonable steps to ameliorate these emissions*
- *provide all necessary evidence of mitigation that is requested by the local planning authority*

***B*** *The requirement to properly regulate and ameliorate emissions applies also to functionally separate areas within a given development, for instance between separate flats or dwellings.*

***C*** *Sensitive uses will not be permitted where these would achieve acceptable levels of amenity only by substantially sealing residents or users off from their surrounding environment.*

***D*** *Development that is sensitive to operational emissions of a particular type must avoid locating in areas in which there are established concentrations of such emissions that cannot be properly"*

**London Plan policy 7.14**

*Developers are to design their schemes so that they are at least 'air quality neutral'.*

**London Plan policy 5.3, 7.14**

*Developments should be designed to minimise the generation of air pollution.*

**London Plan policy 3.2, 5.3, 7.14**

*Developments should be designed to minimise and mitigate against increased exposure to poor air quality.*

**London Plan policy 5.3, 7.14**

*Developers should select plant that meets the standards for emissions from combined heat and power and biomass plants set out in Appendix 7.*

The London Plan and the Mayor's Air quality Strategy set out that developments are to be at least 'air quality neutral'. To enable the implementation of this policy, Building emission benchmarks (BEB) have been produced for buildings' operation and transport across London based on the latest technology (including its effectiveness and viability). Developments that do not exceed these benchmarks will be considered to avoid any increase in NOx and PM emissions across London as a whole and therefore be 'air quality neutral'. The benchmarks will be kept under review and will be updated in line with technological and commercial advances.

All planning development should comply with London Plan policy 7.14. A minimum benchmark requirement is the provision and installation of Ultra Low NOx boilers with maximum NOx Emissions of under 0.040 g/kWh in addition to enhanced fabric insulation in exceedance of Building Regulations Part L 2010.

In April 2013 the Cabinet pledged the London Borough of Ealing to commit to take action to improve local air quality, and become an air quality exemplar borough, in accordance with the Air Quality Exemplar Qualifying Criteria.

In order to comply with the Council commitment to being an 'Air Quality Exemplar Borough' the Pollution-Technical Team recommends that all development complies with emission standards as stated in the Sustainable Design and Construction SPG, April 2014.

## 8.4 Local Transport Plans and Strategies

This is a statutory document prepared by each London Borough under the Greater London Authority Act 1999, and sets out the policy context and proposals of the Borough for the implementation of the Mayor of London's Transport Strategy.

The main relevant policy in terms of air quality in the updated Local Implementation Plan (LIP) for 2014 - 2017 for transport strategies and plans[11] is LIP Objective 4 i.e. 'Improve quality of life for residents, businesses and visitors to the borough, protecting and enhancing the urban and natural environment'. Other policies that affect air quality are:

- *Objective 2 – Increase sustainable travel capacity and key links in the borough*
- *Objective 3 - Smooth the flow of traffic and improve journey time reliability for all road-users, particularly bus passengers, cyclists and pedestrians*
- *Objective 5: - Promote healthy travel behaviour through a shift to more walking and cycling."*

The LIP notes roads which are known as particularly poor areas for air quality, these areas include road corridors with heavy vehicle flows such as the A40, A406 and A4020 (Uxbridge Road).

## 8.5 Climate Change Strategies

The London Borough of Ealing set out its Climate Change policy for 2011 to 2014 in a document released on September 18th 2008. This strategy aimed to reduce Ealing borough's contribution to climate change with a target to achieve a 10% reduction in per capita carbon dioxide emissions by 2010/11 from a 2005 baseline.

The adopted development management plan[12] for LB of Ealing sets out the updated Climate change strategy as Policy 5.2.

Policy 5.2: Minimising Carbon Dioxide Emissions: Planning Decisions

- *"With regards to planning permission, all major new-build residential developments are required to achieve the following standards under the Code for Sustainable Homes, or equivalent:*
    - *2012 onwards - Level 4*
    - *2016 onwards - Level 5*
- *all other new residential development in Ealing must achieve Code for Sustainable Homes Level 4 as a minimum.*
- *major residential developments consisting of the refurbishment of existing buildings, including the conversion of existing buildings to form flats, are required to achieve a BREEAM Domestic Refurbishment Scheme rating of Excellent, or equivalent.*
- *major non-residential developments are required to achieve a minimum Very Good rating under the most up-to-date BREEAM or equivalent scheme and make reasonable endeavours to achieve Excellent and Outstanding.*
- *other new development including residential extensions and conversions should undertake energy efficiency improvements up to 10% of the value of the proposed works."*

## 8.6 Implementation of Action Plans

The LB of Ealing is in the process of updating its Air Quality Action Plan, which will take into account the ongoing project work. The updated plan is now due to be published in 2016.

# 9 Conclusions and Proposed Actions

## 9.1 Conclusions from New Monitoring Data

In 2014 the London Borough of Ealing undertook monitoring at four continuous monitoring sites and 98 $NO_2$ diffusion tube sites (including four triplicate sites) within the Borough.

The results from the air quality monitoring show annual mean concentrations of nitrogen dioxide remain in exceedance of the AQS objective within the AQMA. Exceedances occurred at 40 diffusion tube sites and the automatic monitoring stations at Hanger Lane Gyratory, Horn Lane and Western Avenue. The 1-hour nitrogen dioxide standard of 200 µg/$m^3$ was also potentially exceeded at the Hanger Lane Gyratory and at ten diffusion tube sites.

The annual mean $PM_{10}$ air quality objective was achieved at all of the continuous monitoring stations, however the daily mean objective was exceeded at the Horn Lane site.

The basis for declaration of the AQMA with regards to $NO_2$ and $PM_{10}$ remains unchanged and the borough-wide AQMA should therefore remain.

## 9.2 Conclusions relating to New Local Developments

The London Borough of Ealing has identified a number of significant local developments that have the potential to impact upon local air quality once operational. These include two major infrastructure projects (Acton Storm Tanks as part of the Thames Tideway Tunnel project and the HS2 rail link) and a large number of new residential schemes. A number of the residential schemes are regeneration projects which will replace current housing stock and therefore the cumulative impact will be less than if construction was occurring on a brownfield site.

Impacts relating to the two major infrastructure projects will have been modelled as part of the planning application and therefore their impacts have already been assessed in detail. No further action is therefore considered necessary.

## 9.3 Proposed Actions

On the basis of the findings of the Updating and Screening Assessment the London Borough of Ealing proposes the following actions:

- Submit an Action Plan Progress Report in 2015/2016 and an Air Quality Progress Report in 2016, in accordance with the LAQM Review and Assessment process.
- Continue to operate a network of diffusion tubes and continuous monitoring sites throughout the Borough to monitor $NO_2$ and $PM_{10}$ concentrations in the Borough.
- Maintain the extent of the existing AQMA for $NO_2$ and $PM_{10}$.

# 10 References


1 London Borough of Ealing (2003) London Borough of Ealing Air Quality Action Plan

2 London Borough of Ealing (2014) Air Quality Progress Report for London Borough of Ealing.

3 LAQN (2012) London Air Quality Network, Available online: www.londonair.org.uk. Accessed: 07/07/2015

4 Volatile Correction Model http://www.volatile-correction-model.info/Default.aspx Accessed: 07/07/2015

5 Environmental Research Group, King's College London (2014), Air Pollution emissions from diesel trains in London.

6 LB of Ealing (2014), Scenario development to inform air quality action planning in the London Borough of Ealing.

7 King's College London & Newcastle University (2013), Remote sensing of $NO_2$ exhaust emissions from road vehicles.

8 Brook Cottage Consultants Ltd., Low Emissions Strategy, Acton Goods Yard, Horn Lane, Acton (2015)

9 LB of Ealing- Local Plan. Available at: http://www.ealing.gov.uk/info/200921/local_plans Accessed: 07/07/2015

10 LB of Ealing, Adopted Policies map. Available at: http://www.ealing.gov.uk/info/200921/local_plans/1513/policies_map Accessed 07/07/2015

11 LB of Ealing, Transport Strategies and Plans. Available at: http://www.ealing.gov.uk/info/100011/transport_and_streets/620/transport_strategies_and_plans/2 Accessed 07/07/2015

12 LB of Ealing, Adopted Development Management Plan (2013).

13 Defra, National Diffusion Tube Bias Adjustment Factor Spreadsheet, Spreadsheet Version Number: 03/15. Available at http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html

14 Defra, Local Diffusion Tube Bias Adjustment Factor Spreadsheet. Available at: http://laqm.defra.gov.uk/bias-adjustment-factors/local-bias.html

# Appendices

# Appendix A: QA:QC Data

### QA/QC of diffusion tube monitoring

AIR is an independent analytical proficiency-testing (PT) scheme[10], operated by LGC Standards and supported by the Health and Safety Laboratory (HSL). AIR PT is a new scheme, started in April 2014, which combines two long running PT schemes: LGC Standards STACKS PT scheme and HSL Workplace Analysis Scheme for Proficiency (WASP) PT scheme.

AIR $NO_2$ PT forms an integral part of the UK $NO_2$ Network's QA/QC, and is a useful tool in assessing the analytical performance of those laboratories supplying diffusion tubes to Local Authorities for use in the context of Local Air Quality Management (LAQM). Defra and the Devolved Administrations advise that diffusion tubes used for LAQM should be obtained from laboratories that have demonstrated satisfactory performance in the AIR-PT scheme.

The results for Environmental Scientifics Group (ESG) in WASP Round 124 (January – March 2014) were 100% satisfactory, as well as AIR-PT rounds AR001 (April – May 2014), AR003 (July – August 2014), and AR004 (October – November 2014). ESG Didcot scored 87.5% satisfactory results for AIR-PT round AR006 (January – February 2015).

### Diffusion Tube Bias Adjustment Factors

Bias adjustment is effectively a calculated factor which shows whether diffusion tubes are over or under reading ambient concentrations and therefore allows for a correction to be made.

In 2014 the London Borough of Ealing used an averaged local bias adjustment factor, calculated from four co-location studies of triplicate tubes and automatic monitors.

The national factor for Environmental Scientifics Group, Didcot, is given in Figure A.1 from the review and assessment help desk website[13]. The diffusion tube preparation method is 20% TEA/Water. Adjustment factors for the last four years were as follows:

- 2011 – 1.01
- 2012 – 0.96
- 2013 – 0.76
- 2014 – 0.78

## Diffusion Tube Bias Adjustment Factors

### Figure A.1 National Bias Adjustment Factor 2014

**National Diffusion Tube Bias Adjustment Factor Spreadsheet** — **Spreadsheet Version Number: 03/15**

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

This spreadsheet will be updated at the end of June 2015

LAQM Helpdesk Website

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

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

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

| Analysed By[1] | Method (To undo your selection, choose (All) from the pop-up list) | Year[5] (To undo your selection, choose (All)) | 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| ESG Didcot | 20% TEA in water | 2014 | KS | Marylebone Road Intercomparison | 10 | 114 | 80 | 42.6% | G | **0.70** |
| ESG Didcot | 20% TEA in water | 2014 | R | North East Lincolnshire Council | 11 | 40 | 31 | 26.9% | G | **0.79** |
| ESG Didcot | 20% TEA in water | 2014 | R | Rhondda Cynon Taf CBC | 11 | 34 | 30 | 10.5% | G | **0.90** |
| ESG Didcot | 20% TEA in water | 2014 | KS | South Lakeland District Council | 9 | 41 | 32 | 29.2% | G | **0.77** |
| ESG Didcot | 20% TEA in water | 2014 | UB | Wigan Council | 13 | 28 | 22 | 27.5% | P | **0.78** |
| ESG Didcot | 20% TEA in water | 2014 | | **Overall Factor[3] (5 studies)** | | | | **Use** | | **0.79** |

## Factor from Local Co-location Studies

There are four triplicate diffusion tube sites co-located with a continuous analyser in the London Borough of Ealing. These are Southall, Hanger Lane, Horn Lane, and Western Avenue. The local bias adjustment factors derived from these co-location studies, using the local bias adjustment factor spreadsheet from Defra[14], are given in Figures A.2 to A.5 respectively. The average of the four local bias adjustment factors was used as the final local bias adjustment factor.

### Figure A.2: Results of 2014 Co-location Study at Southall Monitoring Station

**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 $\mu gm^{-3}$ | Tube 2 $\mu gm^{-3}$ | Tube 3 $\mu gm^{-3}$ | Triplicate Mean | Standard Deviation | Coefficient of Variation (CV) | 95% CI of mean | Period Mean | Data Capture (% DC) | Tubes Precision Check | Automatic Monitor Data |
| 1 | 07/01/2014 | 04/02/2014 | 32.6 | 35.4 | 36.1 | 35 | 1.9 | 5 | 4.6 | 36.1 | 97.3 | Good | Good |
| 2 | 04/02/2014 | 04/03/2014 | 30.2 | 32.7 | 28.8 | 31 | 2.0 | 6 | 4.9 | 27.5 | 98.2 | Good | Good |
| 3 | 04/03/2014 | 01/04/2014 | 40.7 | 37.6 | 39.8 | 39 | 1.6 | 4 | 4.0 | 34.5 | 100.0 | Good | Good |
| 4 | 01/04/2014 | 29/04/2014 | 32.6 | 31.4 | 32.0 | 32 | 0.6 | 2 | 1.5 | 28.0 | 85.3 | Good | Good |
| 5 | 29/04/2014 | 27/05/2014 | 24.2 | 24.6 | 24.2 | 24 | 0.2 | 1 | 0.6 | 22.7 | 99.9 | Good | Good |
| 6 | 27/05/2014 | 03/07/2014 | 23.5 | 21.0 | 21.7 | 22 | 1.3 | 6 | 3.2 | 20.3 | 99.8 | Good | Good |
| 7 | 03/07/2014 | 29/07/2014 | 20.6 | 20.5 | 17.7 | 20 | 1.6 | 8 | 4.1 | 16.1 | 96.3 | Good | Good |
| 8 | 29/07/2014 | 26/08/2014 | 22.6 | 24.5 | 24.7 | 24 | 1.2 | 5 | 2.9 | 18.0 | 10.1 | Good | or Data Capture |
| 9 | 26/08/2014 | 30/09/2014 | 32.4 | 34.6 | 33.8 | 34 | 1.1 | 3 | 2.8 | 30.6 | 93.0 | Good | Good |
| 10 | 30/09/2014 | 28/10/2014 | 29.9 | 31.7 | 35.8 | 32 | 3.0 | 9 | 7.5 | 29.0 | 100.0 | Good | Good |
| 11 | 28/10/2014 | 04/12/2014 | 36.0 | 36.4 | 35.9 | 36 | 0.3 | 1 | 0.7 | 38.0 | 99.8 | Good | Good |
| 12 | 04/12/2014 | 06/01/2015 | 38.3 | 34.6 | 34.8 | 36 | 2.1 | 6 | 5.2 | 35.5 | 98.1 | Good | Good |
| 13 | | | | | | | | | | | | | |
| | | | | | | | | | | | Overall survey --> | Good precision | Poor Overall DC |

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

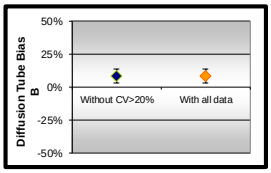
(Check average CV & DC from Accuracy calculations)

**Site Name/ ID:**

**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 0.93 (0.89 - 0.98)
Bias B 7% (2% - 12%)
Diffusion Tubes Mean: 31 $\mu gm^{-3}$
Mean CV (Precision): 5
Automatic Mean: 29 $\mu gm^{-3}$
Data Capture for periods used: 97%
Adjusted Tubes Mean: 29 (28 - 30) $\mu gm^{-3}$

**Accuracy (with 95% confidence interval) WITH ALL DATA**
Bias calculated using 11 periods of data
Bias factor A 0.93 (0.89 - 0.98)
Bias B 7% (2% - 12%)
Diffusion Tubes Mean: 31 $\mu gm^{-3}$
Mean CV (Precision): 5
Automatic Mean: 29 $\mu gm^{-3}$
Data Capture for periods used: 97%
Adjusted Tubes Mean: 29 (28 - 30) $\mu gm^{-3}$

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## Figure A.3: Results of 2014 Co-location Study at Hanger Lane Gyratory Monitoring Station

**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 | 09/01/2014 | 07/02/2014 | 117.8 | 116.4 | 135.4 | 123 | 10.6 | 9 | 26.3 | 66.1 | 59.8 | Good | or Data Capture |
| 2 | 07/02/2014 | 06/03/2014 | 126.8 | 124.0 | 122.3 | 124 | 2.3 | 2 | 5.6 | 76.9 | 99.7 | Good | Good |
| 3 | 06/03/2014 | 03/04/2014 | 115.1 | 115.4 | 120.0 | 117 | 2.7 | 2 | 6.8 | 55.9 | 99.9 | Good | Good |
| 4 | 03/04/2014 | 02/05/2014 | 103.1 | 101.6 | 104.8 | 103 | 1.6 | 2 | 4.0 | 61.7 | 82.1 | Good | Good |
| 5 | 02/05/2014 | 29/05/2014 | 110.4 | 105.9 | 106.6 | 108 | 2.4 | 2 | 6.0 | 73.9 | 98.9 | Good | Good |
| 6 | 29/05/2014 | 04/07/2014 | 87.9 | 84.5 | 82.6 | 85 | 2.7 | 3 | 6.7 | 73.3 | 91.8 | Good | Good |
| 7 | 04/07/2014 | 31/07/2014 | 96.7 | 91.3 | 90.5 | 93 | 3.4 | 4 | 8.4 | 72.0 | 50.1 | Good | or Data Capture |
| 8 | 31/07/2014 | 28/08/2014 | 94.5 | 103.2 | 106.2 | 101 | 6.1 | 6 | 15.1 | 70.2 | 96.9 | Good | Good |
| 9 | 28/08/2014 | 02/10/2014 | 84.2 | 87.7 | 85.6 | 86 | 1.8 | 2 | 4.4 | 66.5 | 99.0 | Good | Good |
| 10 | 02/10/2014 | 30/10/2014 | 105.5 | 104.4 | 97.0 | 102 | 4.6 | 5 | 11.5 | 84.2 | 99.9 | Good | Good |
| 11 | 30/10/2014 | 04/12/2014 | 90.7 | 104.1 | 98.4 | 98 | 6.7 | 7 | 16.7 | 75.1 | 99.8 | Good | Good |
| 12 | 04/12/2014 | 06/01/2015 | 100.5 | 124.6 | 82.4 | 103 | 21.2 | 21 | 52.6 | 79.9 | 99.9 | Poor Precision | 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 | Poor Overall DC

(Check average CV & DC from Accuracy calculations)

Site Name/ ID:

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 9 periods of data

Bias factor A: 0.69 (0.6 - 0.81)

Bias B: 45% (23% - 67%)

Diffusion Tubes Mean: 103 µgm$^{-3}$

Mean CV (Precision): 3

Automatic Mean: 71 µgm$^{-3}$

Data Capture for periods used: 96%

Adjusted Tubes Mean: 71 (62 - 83) µgm$^{-3}$

**Accuracy (with 95% confidence interval) WITH ALL DATA**

Bias calculated using 10 periods of data

Bias factor A: 0.7 (0.61 - 0.81)

Bias B: 43% (23% - 63%)

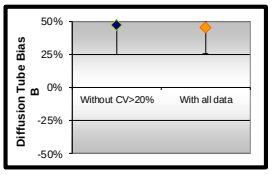
Diffusion Tubes Mean: 103 µgm$^{-3}$

Mean CV (Precision): 5

Automatic Mean: 72 µgm$^{-3}$

Data Capture for periods used: 97%

Adjusted Tubes Mean: 72 (63 - 83) µgm$^{-3}$

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## Figure A.4: Results of 2014 Co-location study at Horn Lane Monitoring Station

**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 | 09/01/2014 | 07/02/2014 | 33.7 | 43.0 | 31.7 | 36 | 6.0 | 17 | 15.0 | 45.1 | 90.1 | Good | Good |
| 2 | 07/02/2014 | 06/03/2014 | 66.6 | 68.8 | 68.9 | 68 | 1.3 | 2 | 3.2 | 43.3 | 98.8 | Good | Good |
| 3 | 06/03/2014 | 03/04/2014 | 85.0 | 90.8 | 77.3 | 84 | 6.8 | 8 | 16.8 | 55.9 | 91.7 | Good | Good |
| 4 | 03/04/2014 | 02/05/2014 | 62.1 | 69.6 | 64.5 | 65 | 3.8 | 6 | 9.5 | 48.3 | 96.8 | Good | Good |
| 5 | 02/05/2014 | 29/05/2014 | | | 63.0 | | | | | 46.1 | 45.6 | | or Data Capture |
| 6 | 29/05/2014 | 04/07/2014 | 53.8 | 62.4 | 57.3 | 58 | 4.3 | 7 | 10.7 | 45.8 | 95.8 | Good | Good |
| 7 | 04/07/2014 | 31/07/2014 | 56.9 | 51.0 | 56.0 | 55 | 3.2 | 6 | 7.9 | 36.4 | 97.1 | Good | Good |
| 8 | 31/07/2014 | 28/08/2014 | 54.9 | 59.4 | 55.9 | 57 | 2.4 | 4 | 5.9 | 38.8 | 99.3 | Good | Good |
| 9 | 28/08/2014 | 02/10/2014 | 73.7 | 72.9 | 59.5 | 69 | 8.0 | 12 | 19.8 | 56.7 | 93.2 | Good | Good |
| 10 | 02/10/2014 | 30/10/2014 | 69.4 | 62.4 | 65.0 | 66 | 3.5 | 5 | 8.8 | 49.2 | 90.8 | Good | Good |
| 11 | 30/10/2014 | 05/12/2014 | 67.5 | | | | | | | 55.9 | 95.7 | | Good |
| 12 | 05/12/2014 | 08/01/2015 | 60.6 | 74.3 | | 67 | 9.7 | 14 | 87.0 | 50.9 | 97.2 | 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:

Precision: 10 out of 10 periods have a CV smaller than 20%

**Accuracy (with 95% confidence interval) without periods with CV larger than 20%**

Bias calculated using 10 periods of data

Bias factor A: 0.75 (0.67 - 0.85)

Bias B: 33% (17% - 49%)

Diffusion Tubes Mean: 62 µgm$^{-3}$

Mean CV (Precision): 8

Automatic Mean: 47 µgm$^{-3}$

Data Capture for periods used: 95%

Adjusted Tubes Mean: 47 (42 - 53) µgm$^{-3}$

**Accuracy (with 95% confidence interval) WITH ALL DATA**

Bias calculated using 10 periods of data

Bias factor A: 0.75 (0.67 - 0.85)

Bias B: 33% (17% - 49%)

Diffusion Tubes Mean: 62 µgm$^{-3}$

Mean CV (Precision): 8

Automatic Mean: 47 µgm$^{-3}$

Data Capture for periods used: 95%

Adjusted Tubes Mean: 47 (42 - 53) µgm$^{-3}$

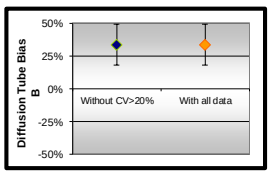


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**Figure A.5: Results of 2014 Co-location study with Western Avenue Monitoring Station**

**Checking Precision and Accuracy of Triplicate Tubes**

AEA Energy & Environment
From the AEA group

**Diffusion Tubes Measurements**

| Period | Start Date dd/mm/yyyy | End Date dd/mm/yyyy | Tube 1 µgm$^{-3}$ | Tube 2 µgm$^{-3}$ | Tube 3 µgm$^{-3}$ | Triplicate Mean | Standard Deviation | Coefficient of Variation (CV) | 95% CI of mean | Automatic Method: Period Mean | Automatic Method: Data Capture (% DC) | Data Quality Check: Tubes Precision Check | Data Quality Check: Automatic Monitor Data |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 09/01/2014 | 07/02/2014 | 91.4 | 73.6 | 77.9 | 81 | 9.3 | 11 | 23.1 | 69.3 | 95.6 | Good | Good |
| 2 | 07/02/2014 | 06/03/2014 | 100.8 | 102.2 | 103.8 | 102 | 1.5 | 1 | 3.7 | 59.0 | 98.2 | Good | Good |
| 3 | 06/03/2014 | 03/04/2014 | 105.8 | 104.1 | 96.7 | 102 | 4.8 | 5 | 12.0 | 62.9 | 95.5 | Good | Good |
| 4 | 03/04/2014 | 02/05/2014 | 83.6 | 90.0 | 91.8 | 88 | 4.3 | 5 | 10.7 | 60.0 | 99.0 | Good | Good |
| 5 | 02/05/2014 | 29/05/2014 | 89.0 | 95.8 | 88.4 | 91 | 4.1 | 5 | 10.2 | 65.2 | 98.3 | Good | Good |
| 6 | 29/05/2014 | 04/07/2014 | 79.8 | 82.0 | 84.4 | 82 | 2.3 | 3 | 5.7 | 58.5 | 95.6 | Good | Good |
| 7 | 04/07/2014 | 31/07/2014 | 81.7 | 72.9 | 71.5 | 75 | 5.5 | 7 | 13.7 | 51.4 | 97.8 | Good | Good |
| 8 | 31/07/2014 | 28/08/2014 | 85.4 | 85.0 | 85.7 | 85 | 0.4 | 0 | 0.9 | 58.1 | 76.4 | Good | Good |
| 9 | 28/08/2014 | 02/10/2014 | 70.0 | 88.4 | 87.1 | 82 | 10.3 | 13 | 25.5 | 69.5 | 96.0 | Good | Good |
| 10 | 02/10/2014 | 30/10/2014 | 95.5 | 108.6 | 102.6 | 102 | 6.6 | 6 | 16.3 | 81.2 | 98.1 | Good | Good |
| 11 | 30/10/2014 | 05/12/2014 | 97.0 | 86.8 | 94.4 | 93 | 5.3 | 6 | 13.2 | 75.3 | 96.6 | Good | Good |
| 12 | 05/12/2014 | 08/01/2015 | 111.9 | 95.0 | 108.2 | 105 | 8.9 | 8 | 22.1 | 82.7 | 82.0 | 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:

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: 0.73 (0.67 - 0.79)

Bias B: 37% (26% - 49%)

Diffusion Tubes Mean: 91 µgm$^{-3}$

Mean CV (Precision): 6

Automatic Mean: 66 µgm$^{-3}$

Data Capture for periods used: 94%

Adjusted Tubes Mean: 66 (61 - 72) µgm$^{-3}$

**Accuracy (with 95% confidence interval) WITH ALL DATA**

Bias calculated using 12 periods of data

Bias factor A: 0.73 (0.67 - 0.79)

Bias B: 37% (26% - 49%)

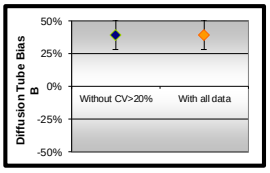
Diffusion Tubes Mean: 91 µgm$^{-3}$

Mean CV (Precision): 6

Automatic Mean: 66 µgm$^{-3}$

Data Capture for periods used: 94%

Adjusted Tubes Mean: 66 (61 - 72) µgm$^{-3}$

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## Discussion of Choice of Factor to Use

Co-location studies with triplicate diffusion tubes were carried out at all four operational air quality monitoring stations in Ealing. There was good data capture at all sites. The average of the local bias adjustment factors for the four sites is 0.78, which is almost identical to the national bias adjustment factor of 0.79, and so we have high confidence in the suitability of either factor for use.

## PM Monitoring Adjustment

Monitoring is conducted using TEOMs at all four of the air quality monitoring stations. There is therefore a need to eliminate the effect of changing humidity on the mass measurement; the TEOM is required to maintain the sample filter at an elevated temperature which may lead to losses of semi-volatile species such as ammonium nitrate. The Volatile Correction Model[4] uses local FDMS monitoring sites to correct TEOM measurements for the loss of volatile components of particulate matter that occur due to the high sampling temperatures employed by this instrument. This adjustment has already been performed for $PM_{10}$.

**Short-term to Long-term Data adjustment**

As $NO_2$ data capture for 2014 was slightly lower than adequate (88%) at the Hanger Lane automatic monitoring site, a seasonal adjustment factor was calculated to estimate the annual mean $NO_2$ concentration from the measured period mean. In accordance with LAQM.TG(09) guidance, period and annual mean $NO_2$ concentrations were calculated from three nearby background $NO_2$ AURN monitoring sites, with all sites having data capture rates of greater than 90%. The seasonal adjustment factor was calculated by using the average annual mean / period mean ratio determined. The calculated adjustment factor for the annual mean $NO_2$ concentration at Hanger Lane was 0.99. Details of the calculation are given below in Table A.1.

**Table A.1 Short-Term to Long-Term Monitoring Data Adjustment in 2014 for $NO_2$ at Hanger Lane automatic monitoring site.**

| | $NO_2$ Concentration ($\mu g/m^3$) | | | Average Ratio of Annual Mean to Period Mean |
|---|---|---|---|---|
| | Ealing Southall | London Harlington | London Bloomsbury | |
| **Data Capture** | 90.7% | 94.2% | 99.0% | |
| **Annual Mean** | 28.9 | 36.5 | 51.2 | |
| **Period Mean** | 29.3 | 36.9 | 51.8 | |
| **Annual mean to period mean ratio** | 0.99 | 0.99 | 0.99 | **0.99** |

# Appendix B: Screening Assessment for Cardinal Wiseman School Biomass Boiler

A screening assessment was carried out for the 156 kW biomass boiler currently operating at the Cardinal Wiseman School in Greenford.

To establish background concentrations of $NO_2$ and $PM_{10}$, Table B.1 shows the Defra mapped background concentrations for the year 2015 over the grid squares containing the Cardinal Wiseman School (approx. 514400, 182000). The grid squares used in the background mapping were 514500, 181500 and 514500, 182500, and the average concentration of the two squares was used.

**Table B.1: Forecast Annual Mean Background Pollutant Concentrations**

| Pollutant | 2015 Concentration (µg/m$^3$) |
|---|---|
| $NO_x$ | 42.3 |
| $NO_2$ | 26.7 |
| $PM_{10}$ | 20.1 |

Information including volumetric $NO_2$ and PM emission rates from the technical specification of the biomass boiler is listed below in Table B.2.

**Table B.2: Biomass Boiler Technical Information**

| Parameter | Value |
|---|---|
| Make | Hoval |
| Model | Biolyt 160 |
| Appliance Output (kW) | 156 |
| Exhaust Exit Diameter / Stack Diameter (m) | 0.2 |
| Exhaust NO emission (mg/Nm$^3$) | 0 |
| Exhaust $NO_2$ emission (mg/Nm$^3$) | 139 |
| Exhaust PM emission (mg/Nm$^3$) | 15 |
| Exhaust gas moisture content (%) | 13.0 |
| Exhaust gas $O_2$ content (%) | 8.0 |

Using the above parameters in Table B.2, the volumetric emissions rates provided were converted to emissions rates in g/s, and are shown in Table B.3.

**Table B.3: Biomass Boiler Calculated Parameters**

| Parameter | Value Assessed |
|---|---|
| Height of stack (m) | 17.0 |
| Diameter of stack (m) | 0.2 |
| $NO_x$ Emission Rate (g/s) | 0.0109 |
| $PM_{10}$ Emission Rate (g/s) | 0.0012 |

Table B.4 below shows the dimensions of nearby buildings for the calculation of the effective stack height.

**Table B.4: Dimensions of Nearby Buildings (within 85 m of the stack)**

| Building | Width (m) | Height (m) |
|---|---|---|
| Building the stacks are attached to | 20-30 | 15.2 |

'Background-adjusted' emission rates were determined separately for $PM_{10}$, $NO_2$ (annual mean) and $NO_2$ (1 hour mean) using the methodology outlined in the AEA Guidance (AEA, 2008) and LAQM.TG(09) (Defra, 2009), (see Table B.5 below).

**Table B.5: Background-adjusted emissions rates ($E_A$) for $NO_2$ and $PM_{10}$**

| Objective | Calculation equation | $E_A$ (g/s) |
|---|---|---|
| $PM_{10}$ (annual mean) | $E_A = E / (32 - G)$ | 0.000101 |
| $NO_2$ (annual mean) | $E_A = E / (40 - G)$ | 0.00082 |
| $NO_2$ (1-hour mean) | $E_A = 40\ E / (200 - 2G)$ | 0.003 |

Note: E is the emission rate (g/s) for the biomass boiler operating at capacity and G is the annual average background concentration (µg/$m^3$).

**Calculation of effective stack height**

AEA guidance (AEA, 2008) states that if the actual stack above ground height is less than 2.5 times the height of the building to which it is attached or any other building within 5 times the stack height then it will be necessary to calculate an effective stack height.

The effective stack height should be calculated using the following formula:
C = 1.66 (U – H)
where:
H is the height (m) of the tallest building within a distance of 5 times the actual (physical) stack height
C is the effective stack height and U is the actual (physical) stack height.

Otherwise, if the stack is more than 2.5 times the building height then C = U.

An actual stack height of **17.0 m** is proposed, while the height of the tallest building within a distance of 5 times the actual stack height is **15.2 m**. This equates to an effective stack height of **2.99 m**.

Table B.6 shows the threshold emissions rates for $NO_2$ and $PM_{10}$ that would constitute a significant effect, derived from nomographs in LAQM.TG(09), based on the stack diameter and effective stack height of the biomass boiler.

**Table B.6: Threshold emissions rates for $NO_2$ and $PM_{10}$**

| Objective | Stack diameter (m) | Effective stack height (m) | Threshold emission rate (g/s) |
|---|---|---|---|
| $PM_{10}$ (annual mean) | 0.2 | 2.99 | < 0.001 |
| $NO_2$ (annual mean) | | | < 0.003 |
| $NO_2$ (1-hour mean) | | | < 0.01 |

**Conclusion**

As the estimated background-adjusted emission rates for $NO_2$ and $PM_{10}$ for the biomass boiler were found to be lower than the threshold emission rates in Table B.6, it can be concluded that emissions of pollutants from the biomass boiler at Cardinal Wiseman School will not have a significant effect on local air quality.

# Appendix C: Monthly $NO_2$ Diffusion Tube Results

**Table C.1: Raw Monthly $NO_2$ Diffusion Tube Results, 2014 ($\mu g/m^3$)**

| Site ID | Jan | Feb | Mar | Apr | May | June | July | Aug | Sept | Oct | Nov | Dec | Raw Annual Mean |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EA1 | 45.8 | 38.3 | 51.7 | 41.1 | 36.1 | 34.6 | 31 | 28.7 | 43.8 | 35.7 | 49 | 40.1 | 39.7 |
| EA2 | 44.9 | 34.9 | 45.3 | 22 | 29.1 | 18.6 | 20.3 | 25 | 38 | 35 | 40.1 | 45 | 33.2 |
| EA3 | 51.7 | 45.2 | 51 | 39.1 | 34.3 | 33.2 | 30.9 | 31.7 | 44.8 | 41 | 40.1 | 45.6 | 40.7 |
| EA4 | 84.9 | 78.6 | 86.5 | 65.4 | 76.7 | 60.8 | 68.6 | 86.5 | 110.8 | 82 | 66.2 | 88.8 | 79.7 |
| EA5 | 34.9 | 31.1 | <0.6 | 29.5 | 22.6 | 20.7 | 19.1 | 22.6 | 28.2 | 30.5 | 36 | 33.5 | 28.1 |
| EA6 | 45.1 | 32 | 43.1 | 38.8 | 192.5 | 30.3 | 27.1 | 31.3 | 39.4 | 38.5 | 45.6 | 46.1 | 37.9 |
| EA7 | 73 | 62.8 | 76.2 | 51.2 | 64.5 | 53.8 | 56.8 | 58.6 | 65.4 | 61.4 | 67.7 | 66.2 | 63.1 |
| EA8 | 36.5 | 31.5 | 42.6 | 29.4 | 27.3 | 37.9 | 24.4 | 24.9 | 37.6 | 28.7 | 41.6 | 41.3 | 33.6 |
| EA9 | 39.7 | 42 | 50.3 | 35.2 | 29.4 | 31.3 | 30 | 27.5 | 30.7 | 29.7 | 43.6 | 45.7 | 36.3 |
| EA10 | 39.1 | 34 | 37.4 | 30.7 | 24.9 | 24.6 | 21 | 24.7 | 29.3 | 28.9 | 39.8 | 29.9 | 30.4 |
| EA11 | 52.4 | 43.8 | 57.3 | 50.6 | 46.3 | 41.6 | 42.4 | 38.2 | 52.5 | 41.7 | 60 | 51.6 | 48.2 |
| EA12 | 47.6 | 34.8 | 47.7 | 37.1 | 36.7 | 31 | 28.8 | 32.9 | 39.7 | 35.6 | 42 | 41.3 | 37.9 |
| EA13 | 49.5 | 43.7 | 53.7 | 43.8 | 34.3 | 34.8 | 31.8 | 28.8 | 46.4 | 38 | 50.3 | 46.8 | 41.8 |
| EA14 | 84.1 | 68.2 | 97 | 72.3 | 70.9 | 62.8 | 60 | 57.6 | 67.6 | 67.1 | 73.1 | 63.6 | 70.4 |
| EA15 | 37.2 | 28.9 | 44.8 | 34.4 | 24.7 | 27.5 | 23.5 | 24.3 | 36.8 | 27.9 | 43.1 | 37.6 | 32.6 |
| EA16 | 37 | 29 | 46.4 | 33.8 | 27.8 | 26.5 | 21.5 | 24.5 | 37.3 | 30.5 | ND | 41.1 | 32.3 |
| EA17 | 68.3 | 60.8 | 63.1 | 64.4 | 64.1 | 57.8 | 58.4 | 55.6 | 65.7 | 62.8 | 62.7 | 58.1 | 61.8 |
| EA18 | 48.9 | 43.9 | 59 | 49.1 | 43.8 | 42.2 | 42.7 | 38.2 | 53.1 | 40.9 | 51.5 | 49.2 | 46.9 |
| EA19 | 51.3 | 48.3 | 60.4 | 42.5 | 40.1 | 34.5 | 31.6 | 41.6 | 46.3 | 51.5 | 48 | 49.8 | 45.5 |
| EA20 | 57.6 | 52.1 | 59.4 | 52.5 | 47 | 45.4 | 38.1 | 43.6 | 53.5 | 46.4 | 63.3 | 52.9 | 51.0 |
| EA21 | 37.5 | 34.6 | 48.3 | 38 | 30.8 | 37.3 | 37.7 | 37 | 46 | 37 | 44.3 | 44.3 | 39.4 |
| EA22 | 45.6 | 39.7 | 55.4 | 48.9 | 43.8 | 42.9 | 38.2 | 34.5 | 54.3 | 42.2 | 36.6 | 45.7 | 44.0 |
| EA23 | 46.6 | 45.5 | 56.3 | 48.2 | 43.9 | 35.6 | 35.2 | 35 | 56.4 | 43.9 | 52.4 | 44.8 | 45.3 |
| EA24 | 49.2 | 41.2 | 54.5 | 48.6 | 45.1 | 46.9 | 46.3 | 42.7 | 64.3 | 48.1 | 14 | 46.9 | 48.5 |
| EA25 | 32.6 | 30.2 | 40.7 | 32.6 | 24.2 | 23.5 | 20.6 | 22.6 | 32.4 | 29.9 | 36 | 38.3 | 30.3 |

| Site ID | Jan | Feb | Mar | Apr | May | June | July | Aug | Sept | Oct | Nov | Dec | Raw Annual Mean |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EA26 | 35.4 | 32.7 | 37.6 | 31.4 | 24.6 | 21 | 20.5 | 24.5 | 34.6 | 31.7 | 36.4 | 34.6 | 30.4 |
| EA27 | 36.1 | 28.8 | 39.8 | 32 | 24.2 | 21.7 | 17.7 | 24.7 | 33.8 | 35.8 | 35.9 | 34.8 | 30.4 |
| EA28 | 56.7 | 49.4 | 64.8 | 55 | 46.3 | 46.8 | 37.4 | 36.2 | 58.4 | 55.3 | 57.8 | 43.3 | 50.6 |
| EA29 | 91.3 | 82.9 | 97.3 | 75.8 | 80.3 | 64.9 | 57.6 | 47.7 | 53.8 | 54 | 66.3 | 66.7 | 69.9 |
| EA30 | 49.7 | 44.5 | 49.3 | 41.1 | ND | 27.1 | 24.8 | 29.9 | 39.7 | 38.6 | 45.3 | 45.8 | 39.6 |
| EA31 | ND | 21.4 | 39.2 | 29.6 | 23.8 | 21.3 | 17.3 | 22.9 | 30.5 | 25.6 | 37.1 | 38.7 | 27.9 |
| EA32 | 48 | 40.4 | 49.9 | 44.7 | 39.4 | 40.3 | 37.5 | 34.6 | 48.3 | 41.1 | 50.2 | 47 | 43.5 |
| EA33 | 38.4 | 36.2 | 48.6 | 38.9 | 29 | 29.4 | 27.3 | 30.6 | 43.6 | 36.6 | 47.4 | 38 | 37.0 |
| EA34 | 45.3 | 37 | 44.8 | 34.6 | 31.2 | 30.2 | 25.4 | 30.2 | 36.2 | 39.7 | 47.5 | 42.8 | 37.1 |
| EA35 | 40.2 | 33.8 | 38.2 | ND | 24.3 | 21.2 | 19.8 | 21.1 | 28.9 | 30.8 | 44.1 | 35.2 | 30.7 |
| EA36 | 59.5 | 55.6 | 67.8 | 52.4 | 44.4 | 51.3 | 44.9 | 43.7 | 62.2 | 52.7 | 52.5 | 58.8 | 53.8 |
| EA37 | 55.8 | 50.1 | 66.3 | 51.1 | 46.7 | 46.7 | 44.8 | 49.3 | 53.4 | 50.9 | 38.7 | 58.6 | 51.0 |
| EA38 | 56.4 | 50.2 | 50.2 | 46.6 | 34.7 | 34.6 | 35.3 | 38.3 | 41.1 | 53.2 | 55.2 | 55.3 | 45.9 |
| EA39 | 54.2 | 49.2 | 53.2 | 44.5 | 40.7 | 36.1 | 32.2 | 35.7 | 44.3 | 44.1 | 46.9 | 51.1 | 44.4 |
| EA40 | 34.9 | 32.6 | 46.8 | 36.4 | 24.4 | 27.3 | 22.9 | 22.8 | 37 | 35.9 | 47.6 | 38.5 | 33.9 |
| EA41 | 56 | 48.3 | 58.3 | 53.2 | 45.2 | 40.2 | <0.7 | 55.3 | 47.6 | 52.6 | 48.8 | 49.9 | 50.5 |
| EA42 | 89.4 | 73.2 | 66.1 | 56.4 | 61.8 | 49.9 | 47.2 | 55.4 | 46.8 | 57.9 | 60.8 | 70 | 61.2 |
| EA43 | 50.6 | 41 | 62.7 | 52.8 | 39.5 | 43.8 | 42.8 | 32.7 | 57 | 36.2 | 49.5 | 58.5 | 47.3 |
| EA44 | 68.3 | 52.9 | 68.8 | 50.2 | 49.8 | 40.7 | 38.6 | 48.8 | 48.9 | 52.8 | 58.5 | 60.2 | 53.2 |
| EA45 | 56 | 43.7 | 51.8 | 43 | 36.9 | 35.2 | 27 | 32.7 | 39.4 | 37.8 | 50 | 43 | 41.4 |
| EA46 | 39.5 | 28.7 | 43.6 | 30 | 30.6 | 30.8 | 26.4 | 27.3 | 41.4 | 30.3 | 41.1 | 38 | 34.0 |
| EA47 | 37.9 | 26.7 | 48.9 | 34.4 | 26.3 | 25 | 21.6 | 20.8 | 38.3 | 28.7 | 34.1 | 35 | 31.5 |
| EA48 | 97.7 | 84.6 | 93.4 | 78.5 | 73 | 69.2 | 70.9 | 58.2 | 67.4 | 81.5 | 74.3 | 84.8 | 77.8 |
| EA49 | 37.6 | 35.6 | 41.2 | 34 | 29.2 | 28.3 | 25.6 | 25.9 | 36.7 | 29.6 | 32.2 | 40.9 | 33.1 |
| EA50 | 54.1 | 39.9 | 62.2 | 45.2 | 44.2 | 37.1 | 36.4 | 25.9 | 52.3 | 40 | 58.6 | 40.6 | 44.7 |
| EA51 | 58.6 | 60.2 | 78.3 | 64.2 | 50.3 | 53.8 | 59.4 | 57.4 | 68.2 | 57.8 | 64 | 60.4 | 61.1 |
| EA52 | 81.8 | 78.4 | 84.9 | 77 | 80.4 | 75.9 | 74.7 | 83 | 82.3 | 77.2 | 75.4 | 78.8 | 79.2 |
| EA53 | 50.5 | 42.1 | 50 | 44.4 | 38.8 | 36.4 | 34.9 | 40 | 44.8 | 42 | 53.9 | 44.7 | 43.5 |

| Site ID | Jan | Feb | Mar | Apr | May | June | July | Aug | Sept | Oct | Nov | Dec | Raw Annual Mean |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EA54 | 53.4 | 46.7 | 52.2 | 42.8 | 38 | 33.8 | 27.9 | 35.5 | 41.8 | 42.7 | 47.4 | 48.9 | 42.6 |
| EA55 | 46.9 | 44.2 | 54.6 | 41.8 | 40 | 32.2 | 31.5 | 35.6 | 44.5 | 37.1 | 45 | 48.3 | 41.8 |
| EA56 | 78 | 61.9 | 77.5 | 61 | 68.4 | 63.3 | 56.1 | 68.3 | 63.8 | 62 | 11.5 | 69.7 | 66.4 |
| EA57 | 58.6 | 55.2 | 71.3 | 51.7 | 49 | 44.3 | 36.6 | 30.7 | 51.2 | 49.4 | 55.5 | 57.1 | 50.9 |
| EA58 | 117.8 | 126.8 | 115.1 | 103.1 | 110.4 | 87.9 | 96.7 | 94.5 | 84.2 | 105.5 | 90.7 | 100.5 | 102.8 |
| EA59 | 116.4 | 124 | 115.4 | 101.6 | 105.9 | 84.5 | 91.3 | 103.2 | 87.7 | 104.4 | 104.1 | 124.6 | 105.3 |
| EA60 | 135.4 | 122.3 | 120 | 104.8 | 106.6 | 82.6 | 90.5 | 106.2 | 85.6 | 97 | 98.4 | 82.4 | 102.7 |
| EA61 | 51.6 | 59.5 | 75.5 | 65.3 | 60.7 | 64.7 | 71.2 | 62.9 | 73.9 | 56.2 | 59 | 74.1 | 64.6 |
| EA62 | 60.1 | 51.6 | 66.9 | 52.2 | 45.9 | 46.5 | 46.9 | 42.5 | 60.4 | 42.6 | 57.2 | 61.1 | 52.8 |
| EA63 | 60.7 | 44.9 | 54.4 | 38.7 | 35.5 | 37.6 | 34.5 | 33.5 | 51.3 | 38.6 | 48.2 | 55 | 44.4 |
| EA64 | 68.4 | 53.3 | 90.3 | 80.5 | 68.6 | 76.5 | 57.4 | 64.4 | 89.6 | 57.7 | 84.1 | 76.4 | 72.3 |
| EA65 | 91.4 | 100.8 | 105.8 | 83.6 | 89 | 79.8 | 81.7 | 85.4 | 70 | 95.5 | 97 | 111.9 | 91.0 |
| EA66 | 73.6 | 102.2 | 104.1 | 90 | 95.8 | 82 | 72.9 | 85 | 88.4 | 108.6 | 86.8 | 95 | 90.4 |
| EA67 | 77.9 | 103.8 | 96.7 | 91.8 | 88.4 | 84.4 | 71.5 | 85.7 | 87.1 | 102.6 | 94.4 | 108.2 | 91.0 |
| EA68 | 57.7 | 73.4 | 84.6 | 73.5 | 65.6 | 71.7 | 65.5 | 70 | 76.1 | 77.8 | 73 | 72.7 | 71.8 |
| EA69 | 48.6 | 44.9 | 56.5 | 46.4 | 43.8 | 36.3 | 41.3 | 44.6 | 49.2 | 45.9 | 48.4 | 44.5 | 45.9 |
| EA70 | 43 | 41.1 | 57.9 | 46.1 | 43 | 41.2 | 36.7 | 43.9 | 48.7 | 46.2 | 55.2 | 62.1 | 47.1 |
| EA71 | 69.6 | 66.5 | 74.6 | 68.4 | 68.1 | 65.5 | 58.7 | 61.9 | 67.4 | 72 | 74 | 73.9 | 68.4 |
| EA72 | 47.8 | 47.5 | 77.7 | 55.6 | 51.2 | 50.5 | 45.1 | 46.1 | 59.6 | 45.4 | 54.6 | 58.9 | 53.3 |
| EA73 | 70.3 | 59.4 | 50.2 | 48 | 46.5 | 41.3 | 38.1 | 49.2 | 48.8 | 52.2 | 56.5 | 61.3 | 51.8 |
| EA74 | 34.4 | 59.8 | 72 | 68.9 | 99 | 58.6 | 61.2 | 57.2 | 72.1 | 64 | 64.6 | 75.4 | 65.6 |
| EA75 | 56.6 | 84.6 | 113 | 109.5 | 92.8 | 114.6 | 104.7 | 90.6 | 121.5 | 105.1 | 106.7 | 99.4 | 99.9 |
| EA76 | 48 | 68.2 | 71.4 | 64.9 | 68.3 | 56.8 | 57.8 | 60.8 | 58.8 | 62.3 | 1.3 | ND | 61.7 |
| EA77 | 48.5 | 72.7 | 87.9 | 79.3 | 78.3 | 78.8 | 74.6 | 67.9 | 0.9 | 65.6 | 81.7 | 79.2 | 74.0 |
| EA78 | 36 | 49 | 83.2 | 50.4 | 50.3 | 48.4 | 44 | 44.7 | 59.8 | 45.8 | 60.7 | 7.9 | 52.0 |
| EA79 | 63.9 | 46.6 | 66.1 | 50 | 47.3 | 50.1 | 48.7 | 42.4 | 56.9 | 41.5 | ND | 2.7 | 51.4 |
| EA80 | 69.9 | 39.1 | 51.9 | 39 | 33.7 | 32.9 | 31 | 29.8 | 44.2 | 35.3 | 43.7 | 43 | 41.1 |
| EA81 | 66.9 | 66.5 | 81.9 | 70 | 71.9 | 82.4 | 75 | 69.6 | 84.8 | 61.5 | 72.9 | 77.8 | 73.4 |

| Site ID | Jan | Feb | Mar | Apr | May | June | July | Aug | Sept | Oct | Nov | Dec | Raw Annual Mean |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EA82 | 79.4 | 37.4 | 59.6 | 42.8 | 37.3 | 44.5 | 39.2 | 34 | 49.9 | 35.8 | 51.8 | 52.1 | 47.0 |
| EA83 | 63.3 | 56.7 | 92.8 | 77.1 | 64 | 76.5 | 67.1 | 56.1 | 84.7 | 57.7 | 72.3 | 66.7 | 69.6 |
| EA84 | 67 | 32.1 | 44.4 | 32.5 | 26.6 | 24.7 | 24.4 | 24.2 | 36.9 | 27.2 | ND | <0.6 | 34.0 |
| EA85 | 62.3 | 53.3 | 61 | 46.4 | 47.4 | 41.7 | 37.1 | 38 | 50.2 | 43.5 | 54.2 | 52.8 | 49.0 |
| EA86 | ND | 43.8 | 55 | 38.9 | 40.9 | 36.5 | 34 | 39.1 | 48.3 | 44.1 | 51.1 | 44.1 | 43.3 |
| EA87 | 61.4 | ND | 53.9 | 38.8 | 36.7 | 34.5 | 30.9 | 34.4 | 46.5 | 41.1 | 50.9 | 45 | 43.1 |
| EA88 | 51.8 | 43 | 53.3 | 38.3 | 34.5 | 35.1 | 26.9 | 30.5 | 45.3 | 40.2 | 46 | 47.4 | 41.0 |
| EA89 | 1.2 | 34 | 47.1 | 33.9 | 26.4 | 25.2 | 23.6 | 24.7 | 36.2 | 30.6 | 44.4 | 41.5 | 33.4 |
| EA90 | 2 | 52.7 | 68.7 | 56.9 | 52.6 | 50.7 | 49.6 | 44.8 | 61 | 51.1 | 61.1 | 51.8 | 54.6 |
| EA91 | 33.7 | 66.6 | 85 | 62.1 | ND | 53.8 | 56.9 | 54.9 | 73.7 | 69.4 | 67.5 | 60.6 | 62.2 |
| EA92 | 43 | 68.8 | 90.8 | 69.6 | ND | 62.4 | 51 | 59.4 | 72.9 | 62.4 | ND | 74.3 | 65.5 |
| EA93 | 31.7 | 68.9 | 77.3 | 64.5 | 63 | 57.3 | 56 | 55.9 | 59.5 | 65 | ND | <0.5 | 59.9 |
| EA94 | 14.6 | 49.7 | 66.6 | 54.7 | 53.7 | 50.7 | 43.6 | 45.5 | 64.1 | 52.6 | 47.2 | 52.1 | 52.8 |
| EA95 | 53.9 | 59 | ND | 53.8 | 51.9 | 47.8 | 39.3 | 49.4 | 59.3 | 56.2 | ND | 0.7 | 52.3 |
| EA96 | 55 | 56.7 | 71.7 | 51.8 | 53.2 | 49.7 | 40.4 | 51.9 | 64.1 | 61.7 | ND | <0.6 | 55.6 |
| EA97 | 41.9 | 64.2 | 66.2 | 54.8 | 55.3 | 51.5 | 44.7 | 54 | 58.7 | 60 | 56.6 | 60.4 | 55.7 |
| EA98 | 70.5 | 44.6 | 63 | 43 | 39.4 | 35.7 | 33.3 | 39.9 | 48.7 | 42 | 51 | 54.5 | 47.1 |

Yellow highlighted cells indicate measurements that were deemed unreliable and were not included in the analysis of results.
Note: ND = No Data