2017 Air Quality Annual Status Report (ASR) for Sandwell Metropolitan Borough Council

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

December 2017

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Executive Summary: Air Quality in Our Area

Sandwell Metropolitan Borough Council (SMBC) lies in the heart of the West Midlands, in an area of the UK known as "The Black Country". It is part of the West Midlands Combined Authority (WMCA) sharing full membership with six other authorities; Birmingham, Coventry, Dudley, Solihull, Walsall and Wolverhampton. It is a densely populated area covering approximately 8,600 hectares and approximately 309,000[1] residents.

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 national air quality objectives are likely to be achieved. Where exceedances are demonstrated or 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.

This report presents details on changes in air quality in 2016 and describes measures that Sandwell is currently undertaking to improve air quality now or in the future.

Air Quality in Sandwell

Sandwell Key Priority Zones

The draft Air Quality Action Plan for 2018 to 2023 describes seven key priority zones and two individual hot spot locations of Mallin street, Smethwick and Gorsty Hill, Blackheath. The following table describes how these zones relate to the historic nitrogen dioxide exceedance areas.

[1] 2011 Census

Sandwell MBC NO_2 Key Priority Zones for 2018 to 2023		
Zone	**Area**	**Description of Area**
1	13	High Street / Powke Lane, Blackheath
2	11	Bearwood Road, Smethwick
3	1	Area between M5, Birmingham Road and Blakeley Hall Road - Oldbury
4	10	Newton Road / Birmingham Road (A34), Great Barr
5	14	Bromford Lane (including the Kelvin Way / Brandon Way Junction), West Bromwich
6	16	All Saints Way / Expressway, West Bromwich
7	15	Trinity Way / Kenrick Way, West Bromwich

Air pollution is associated with a number of adverse health impacts. It is recognised as a contributing factor in the onset of heart disease and cancer. Additionally, air pollution particularly affects the most vulnerable in society: children and older people, and those with heart and lung conditions. There is also often a strong correlation with equalities issues, because areas with poor air quality are also often the less affluent areas[2,3].

The annual health cost to society of the impacts of particulate matter alone in the UK is estimated to be around £16 billion[4].

Air pollution in Sandwell is an ongoing problem and Sandwell Council declared a borough wide Air Quality Management Area for exceedances of the annual mean Nitrogen Dioxide (NO_2) in 2005. The borough is characterised by large areas of established industry and a complex road network of major arterial roads, including the M5 and M6 motorways, which are amongst the most utilised and congested roads in Europe.

[2] Environmental equity, air quality, socioeconomic status and respiratory health, 2010
[3] Air quality and social deprivation in the UK: an environmental inequalities analysis, 2006
[4] Defra. Abatement cost guidance for valuing changes in air quality, May 2013

Sandwell maintains an extensive monitoring network and has undertaken 12 months of continuous monitoring at six locations and 97 individual diffusion tube locations.

In 2016 nine of the original 22 exceedance areas continued to exceed the NO_2 objective. However, exceedances at these nine locations are persistent, demonstrating no significant evidence of a downward trend in NO_2 concentrations throughout the previous 5 years.

Sandwell MBC NO_2 Annual Mean Exceedance Areas in 2016	
Area	**Description of Area**
1	Area between M5, Birmingham Road and Blakeley Hall Road - Oldbury
8	Dudley Road East / Roway Lane (A457), Oldbury
10	Newton Road / Birmingham Road (A34), Great Barr
11	Bearwood Road, Smethwick
13	High Street / Powke Lane, Blackheath
14	Bromford Lane (including the Kelvin Way / Brandon Way Junction), West Bromwich
15	Trinity Way / Kenrick Way, West Bromwich
16	All Saints Way / Expressway, West Bromwich
22	Gorsty Hill, Blackheath

The following locations which originally exceeded the annual mean NO_2 objective following the declaration of the Air Quality Management Area (AQMA) were compliant with the objectives in 2016:

Area	Areas Compliant with the NO_2 Objective - Description
2	Area to North of the M6 – Yew Tree Estate (Inc. Woodruff Way, Snapdragon Drive and Pimpernel Drive
3	Area to North of M6 Junction 8 – Wilderness Lane and Birmingham Road – Great Barr
4	Area to South of M6 Junction 8 (Inc. Longleat Cl, Ragley Dr and Himley Cl–Great Barr
5	Area to Southeast of M6 Junction 7 (Inc. Scott Rd and Birmingham Rd) - Great Barr
6	Area to Southwest of M6 Junction 7 (Birmingham Road and Hillside Road) – Great

7	Oldbury Ringway / Birmingham Road (A457), Oldbury
9	Area surrounding the M6/M5, Junctions 7- 8 Great Barr and 1-2 West Bromwich
12	Oldbury Road / Birmingham Road, Blackheath
17	All Saints Way / Newton Road, West Bromwich
18	Soho Way / Grove Lane / Cranford Street, Smethwick
19	Horseley Heath, Tipton
20	Sedgley Road East /Dudley Port – Tipton
21	Myvod Road / Wood Green Road – Wednesbury

During 2016 Sandwell Council found that exceedances of the annual mean NO_2 objective remained persistent at a small number of locations. Exceedances were identified in two locations additional to the original 22 exceedance areas. These additional exceedances were an ongoing exceedance at Mallin Street, Smethwick and a new exceedance at Burnt Tree Junction/Birmingham New Road, Oldbury. There are not currently any receptors at the Burnt Tree Junction monitoring location but there may be in the future. The Council will continue to monitor air quality at key locations to confirm the trends in pollutant concentrations and compliance with published objectives. Monitoring will also inform future revisions of the air quality action plan. Sandwell confirms compliance with the following pollutant objectives: Benzene, 1-3 Butadiene, Sulphur Dioxide, Carbon Monoxide, Particulate Matter (PM_{10}) and Lead. National air quality objectives for PM10 are believed to be currently met in Sandwell despite poor data capture in 2015/6 due to technical problems. It is recognised there is lack of evidence to indicate there is a concentration of particulate matter below which health effects do not occur and therefore our aim is to achieve a reduction in the overall exposure of the population. PM2.5 is currently monitored in one location.

Actions to Improve Air Quality

The principal source of air pollution in Sandwell is a direct result of emissions from the road network (petrol and diesel engines). Exceedances are observed at busy junctions, narrow congested streets and in town centres.

Sandwell published its first air quality action plan (AQAP) in 2009, which focused on a number of key areas:

- Improvements to Urban Traffic Control Systems.

- Red routing of major arterial roads through the borough (with associated control of parking to ease congestion) including Bearwood, Blackheath, Great Barr, Oldbury, Smethwick, West Bromwich and Tipton.
- Major junction improvements on the A41 Expressway West Bromwich and Burnt Tree Island/Dudley Port in Tipton.
- Major bypass and traffic management works at Blackheath and Cradley Heath.
- Investment programmes aimed at easing traffic flows and reducing congestion and improving the efficiency of junctions, signalling and pedestrian crossings in West Bromwich, Bearwood and Blackheath.
- Enhancing conditions for both vehicles and pedestrians using shopping centres and high streets in Bearwood and West Bromwich.
- Promotion of modal shift including walking and cycling.

Since the implementation of the action plan, there was initially a worsening of air quality in 2010/11, but in subsequent years there has been a gradual improvement in NO_2 and Particulate Matter ($PM_{10/2.5}$) concentrations and a reduction in the number of locations which exceed the NO_2 annual mean objective. The 2009 action plan has drawn to the end of its working life. It can be reviewed on the Sandwell Council website Sandwell Air Quality. Sandwell is currently in the process of updating its air quality action plan and is working in partnership with key stakeholders to develop a comprehensive set of measures with key target outcomes and predicted reduction in pollutant concentrations. The revised action plan will set out what action the council will take to improve air quality in Sandwell between 2018 and 2023.

Conclusions and Priorities

The council's aims are:

- To reduce the overall health impacts and burdens or poor air quality.
- To achieve the national air quality NO_2 annual mean objective across the borough in the shortest possible timeframe.
- To reduce PM_{10} and $PM_{2.5}$ concentrations to protect human health.

These are supported by the following priority actions:

Priority 1 - Hot-spot Locations

To develop an air pollution model of the borough to ensure all hot spot locations are identified. These locations will be prioritised and trend analysis and source apportionment undertaken as necessary. Transport planning and traffic infrastructure management will be reviewed at each hot-spot location to identify where additional resource is needed and prepare a programme of works for each zone, identifying timeframes and goals for each intervention identified.

Priority 2 - Sustainable Transport Initiatives

To continue promoting walking, cycling, car sharing and public transport initiatives and undertake additional health promotion campaigns (including walking and cycling) to increase physical activity and the use of low emission vehicles.

Priority 3 - Review what impact the council has on air quality in its role of as a provider of public services and develop a plan to reduce emissions from its activities.

To carry out a full review of council vehicle fleets, licencing activities and employee vehicle use in order to understand and prioritise council related air quality initiatives.

Table 2.3 shows the Sandwell Council draft Air Quality Action Plan measures for 2018 to 2023.

A number of projects have been undertaken to supplement the work of the Air Quality Action Plan and improve the Air Quality in the borough.

The Low Emissions Towns & Cities Programme (LETCP) is a Defra funded project established in 2011. It is a partnership comprising the seven West Midlands Local Authorities, (Birmingham CC, Coventry CC, Dudley MBC, Sandwell MBC, Solihull MBC, Walsall MBC, Wolverhampton CC) working together to reduce vehicle emissions, through the acceleration of the uptake of cleaner vehicle fuels and technologies. The programme included the following:

- The Good Practice Air Quality Planning Guidance – a model approach to integrate air quality considerations into land use planning.
- The Good Practice Procurement Guidance – how public-sector procurement can influence vehicle emissions.
- The Low Emission Zone Technical Feasibility Study – an investigation into different highway scenarios to determine the suitability for a low emission zone.

All reports produced by the LETCP can be found on the LETCP website:
Low emissions towns and cities programme

- A bespoke Low Emission Strategy technical feasibility study was undertaken at Bearwood Road and reported in 2016 to determine the best scenario for targeting the high bus emissions which are contributing to the ongoing exceedance of the NO_2 objective. The best strategy would reduce NO_2 concentrations by 15% and would result in a £57,000 health impact saving. A reduction in particulate matter is also anticipated.
- Sandwell carried out a Social Marketing Campaign aimed at reducing the amount of air pollution in selected areas of the borough. The campaign ran for one calendar year June 2016 - June 2017 and aimed to encourage modal shift behavioural change in those that use the car for short journeys, including for work, leisure or the school run. As a secondary objective, the project intended to discourage engine idling and encourage traffic to reroute away from major air pollution hotspots.
- The four Black Country councils (Sandwell, Dudley, Walsall and Wolverhampton) adopted the Black Country Air Quality Supplementary Planning Document (SPD) in October 2016.
- Sandwell secured planning conditions that require the provision of electric vehicle charging points on 25 developments in 2016 representing an increase to the previous year. These included residential, commercial and industrial developments. Conditions requiring a travel plan for air quality purposes were attached to a further six planning permissions.
- The Black Country Ultra Low Emission Vehicle Strategy was published in January 2017. (Black Country Ultra Low Emission Vehicle Strategy)

Local Priorities and Challenges

The priorities for Sandwell MBC are:

- To improve air quality in order to achieve the national air quality NO_2 annual mean objective across the Borough in the shortest possible timeframe and to maintain and improve PM_{10} and $PM_{2.5}$ concentrations in order to protect human health.
- To publish and implement a new Air Quality Action Plan, which will provide a range of measures to promote alternative and sustainable travel, achieve compliance with the annual mean NO_2 air quality objective and reduce particulate matter concentrations as much as practicably possible. The plan should also reduce transport emissions, reduce emissions associated with new development, raise air quality awareness and work in partnership with key stakeholders to improve air quality.
- To fully participate in the West Midlands Combined Authority to achieve air quality improvements across the region. (The West Midlands Combined Authority (WMCA) replaced the Integrated Transport Authority (ITA) and Centro/Passenger Transport Executive (PTE) from 1st June 2016).
- To continue to monitor for NO_2, PM_{10} and $PM_{2.5}$ to enable the prioritisation of resources and focus attention on the most relevant locations for air quality improvements.
- To implement the Black Country Air Quality SPD and assess all planning applications in accordance with the guidance to ensure all development is sustainable in terms of air quality.
- To promote the uptake of alternative sustainable travel methods, including cleaner vehicle technologies through a range of measures to be included within the new air quality action plan.

How to Get Involved

There is a wide range of information available to encourage the general public to use different modes of travel in order to improve air quality and improve health. For example:-

- Sandwell Council's TravelWise page provides information on making journeys by low carbon and healthy methods of transport, such as cycling, walking, public transport and car sharing. There is also travel related assistance for businesses and schools, and information for people and organisations making planning applications. TravelWise in Sandwell
- West Midlands Combined Authority (WMCA) has been granted a sustainable transport fund called 'Smart Network, Smart Choices' to increase walking, cycling and public transport within the West Midlands. Further information can be found at: TfWM (Transport for West Midlands) Sustainable Travel
- Walking helps to reduce the risk of disease, to lose weight, and to live longer. It can also save money by being the cheapest way of getting from place to place. Sandwell published its updated Walking Strategy in 2015 to promote walking, target resources and deliver improvements and enhancements to the walking environment, over a five-year period. Further information can be found at Sandwell Walking Strategy
- Sandwell Council is currently in the process of updating its air quality action plan, to incorporate new measures to improve air quality within Sandwell. The draft revised action plan has been approved by cabinet and a full public consultation will be undertaken commencing in early 2018. Please visit www.sandwell.gov.uk for further details regarding the consultation dates.

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1 Local Air Quality Management

This report provides an overview of air quality in Sandwell during 2016. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) 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 an exceedance is considered likely the local authority must 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. This Annual Status Report (ASR) is an annual requirement showing the strategies employed by Sandwell to improve air quality and any progress that has been made.

The statutory air quality objectives applicable to LAQM in England can be found in Table E.1 in Appendix E.

2 Actions to Improve Air Quality

2.1 Air Quality Management Areas

Air Quality Management Areas (AQMAs) are declared when there is an exceedance or likely exceedance of an air quality objective. After declaration, the authority must prepare an Air Quality Action Plan (AQAP) within 12-18 months setting out measures it intends to put in place in pursuit of the objectives.

In 2003, Sandwell declared 6 individual AQMAs for exceedances of the Annual Mean Nitrogen Dioxide (NO_2) objective, listed as Areas 1 – 6 in Table 2.2. Further Review and Assessment work subsequently identified 10 new areas (Areas 7-16 in Table 2.2) which exceeded the objective. In 2005 the 6 original AQMA declarations were revoked and replaced with a single borough wide declaration for exceedances of the NO_2 annual mean objective, with road traffic the primary source of emissions.

Sandwell MBC's AQMA order and boundary can be viewed online at:

Air Quality Management Area Designation Order 2005

Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Pollutants and Air Quality Objectives	City / Town	One Line Description	Action Plan
Sandwell AQMA Order 2005	NO_2 Annual Mean	Borough wide	Borough wide Designation	Sandwell Air Quality Action Plan 2009 View online at: Air Quality Action Plan 2009

Since 2005 a further 5 areas have been identified as exceeding the NO_2 annual mean objective and were included in list of exceedance areas (Areas 17-21)

Table 2.2 Locations of Nitrogen Dioxide Annual Mean Exceedance in SMBC.

Sandwell MBC Nitrogen Dioxide Annual Mean Exceedance Areas	
Area	**Description Of Area**
1	Area between M5, Birmingham Road and Blakeley Hall Road - Oldbury
2	Area to North of the M6 – Yew Tree Estate (including Woodruff Way, Snapdragon Drive and Pimpernel Drive
3	Area to North of M6 Junction 8 – Wilderness Lane and Birmingham Road – Great Barr
4	Area to South of M6 Junction 8 (Including Longleat Close, Ragley Drive and Himley Close –Great Barr
5	Area to Southeast of M6 Junction 7 (including Scott Road and Birmingham Road) - Great Barr
6	Area to Southwest of M6 Junction 7 (including Birmingham Road and Hillside Road) – Great Barr
7	Oldbury Ringway / Birmingham Road (A457), Oldbury
8	Dudley Road East / Roway Lane (A457), Oldbury
9	Area surrounding the M6/M5, Junctions 7- 8 Great Barr and 1-2 West Bromwich respectively
10	Newton Road / Birmingham Road (A34), Great Barr
11	Bearwood Road, Smethwick
12	Oldbury Road / Birmingham Road, Blackheath
13	High Street / Powke Lane, Blackheath
14	Bromford Road (including the Kelvin Way / Brandon Way Junction), West Bromwich
15	Trinity Way / Kenrick Way, West Bromwich
16	All Saints Way / Expressway, West Bromwich
17	All Saints Way / Newton Road, West Bromwich
18	Soho Way / Grove Lane / Cranford Street, Smethwick
19	Horseley Heath, Tipton
20	Sedgley Road East /Dudley Port – Tipton
21	Myvod Road / Wood Green Road – Wednesbury
22	Gorsty Hill, Blackheath

Sandwell published its Air Quality Action Plan (AQAP) in September 2009 in order to discharge its obligations under Part IV of the Environment Act 1995. The action plan

detailed how the Council intended to improve air quality within the Air Quality Management Area. The AQAP has been subject to regular review (as part of the LAQM reporting process) however the document recently reached the end of its working life, with a significant number of actions completed or unlikely to be completed due to a range of factors including lack of evidence for the air quality benefits to support implementation, funding, lack of Council / Stakeholder support.

Sandwell is currently in the process of developing a new air quality action plan and is working in partnership with key stakeholders to develop a comprehensive set of measures to include key target outcomes and where appropriate, predicted reductions in pollutant concentrations. The draft revised action plan has been approved by cabinet. A full public and stakeholder consultation will be carried out in early 2018 prior to publication.

The 2009 Action Plan can be found at:

Air Quality Action Plan 2009

Further details regarding the consultation on Sandwell MBC's new Air Quality Action Plan will be made available at:

Sandwell's Air Quality Action Plan

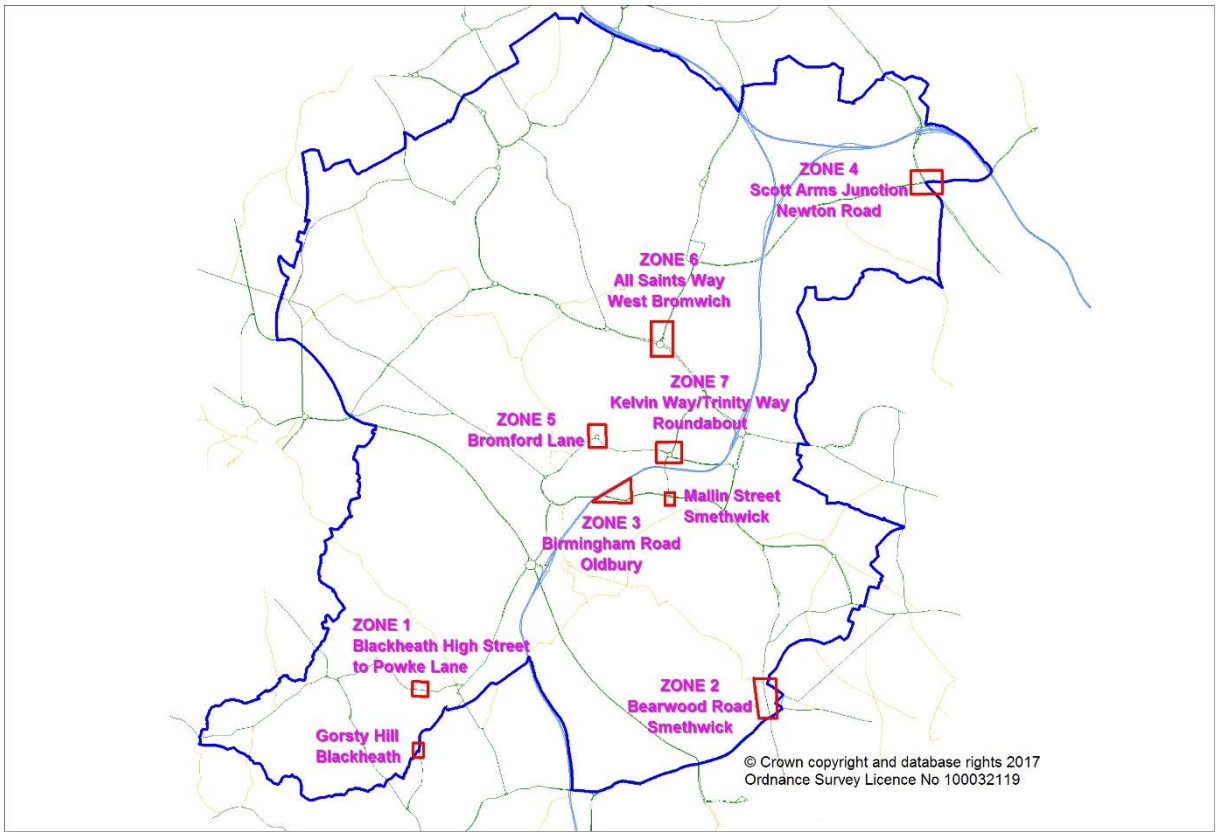
Sandwell Key Priority Zones

The draft Air Quality Action Plan for 2018 to 2023 describes seven key priority zones and two individual hot spot locations of Mallin street, Smethwick and Gorsty Hill, Blackheath. The following table describes how these zones relate to the historic nitrogen dioxide exceedance areas.

Table 2.3 Nitrogen Dioxide Annual Mean Exceedance Areas and Priority Zones

Sandwell MBC NO_2 Key Priority Zones for 2018 to 2023		
Zone	**Area**	**Description of Area**
1	13	High Street / Powke Lane, Blackheath
2	11	Bearwood Road, Smethwick
3	1	Area between M5, Birmingham Road and Blakeley Hall Road - Oldbury
4	10	Newton Road / Birmingham Road (A34), Great Barr
5	14	Bromford Lane (including the Kelvin Way / Brandon Way Junction), West Bromwich
6	16	All Saints Way / Expressway, West Bromwich
7	15	Trinity Way / Kenrick Way, West Bromwich

Figure 2.0 - Sandwell Key Priority Zones



2.2 Progress and Impact of Measures to address Air Quality in Sandwell Metropolitan Borough

Defra's appraisal of last year's ASR concluded future reports could be improved through the inclusion of information on recent planning applications and new developments. Environmental Health have examined records of air quality consultation responses to the Planning Department and compared these to the planning decision notices to produce the following information. Sandwell secured planning conditions that require the provision of electric vehicle charging points on 25 developments in 2016. Conditions requiring a travel plan for air quality purposes were attached to a further six planning permissions. These included residential, commercial and industrial developments and it represents an increase to the previous year. More detailed information will be provided in future ASRs.

Sandwell has taken forward a number of measures during 2016 in pursuit of improving local air quality. Details of all ongoing or planned measures are set out in Table2.4. The table of measures has been taken from the draft 2018 to 2023 Air Quality Action Plan. More detail on these measures can be found in the Action Plan and the West Midlands Combined Authority Strategic Transport Plan "Movement for Growth".
Movement for Growth

Key completed measures:

- The Black Country Air Quality SPD has been developed in order to clarify the air quality position within the Black Country Core Strategy following the publication of the Low Emission Towns and Cities Best Practice Planning Guidance for the West Midlands. The SPD was adopted in October 2016. The principle aim of the SPD is to ensure all new development is sustainable in terms of air quality and where appropriate, secures mitigation measures that should be incorporated into developments. Mitigation requirements range from Electric Vehicle charging points at minor developments to a full Low Emission Strategy (in scale and kind) at 'Major' developments.
- Bearwood Road traffic survey and emission source apportionment study (using ANPR) was carried out in 2014 to investigate vehicle fleet makeup, test LETCP LEZ Feasibility projections for Bearwood Road, and to understand the age and type of heavy duty vehicles (particularly buses) using the street canyon.

- A follow on bespoke Low Emission Strategy technical feasibility study was undertaken at Bearwood Road (reported in 2016) in order to understand current NO_2 exceedance boundaries and to forecast the air quality impacts and improvements from a range of low emission strategies and scenarios. The primary source of emissions at Bearwood Road is from a significantly aging bus fleet (Euro III and older) which contribute 57% of nitrogen oxides (NO_x) and 32% of particulate emissions despite only totalling 6% of the vehicle flow. The assessment concluded that the NO_2 objectives would be met if all buses attained Euro VI standard by 2020. A full cost benefit analysis was undertaken resulting in a health impact saving of £57,000 (in present values) in Bearwood Rd alone, with a modelled annual mean NO_2 concentration reduction of 15%. A reduction in PM_{10} and $PM_{2.5}$ would also reduce human health exposure. Findings were used to influence prioritisation of key bus routes and areas in the 'West Midlands Combined Authority Low emission bus strategy' (where buses were known to be a major contributor) for accelerated bus replacement / upgrading.
- Traffic signals, road markings and pedestrian routes were upgraded at Bearwood Road, Smethwick. Bearwood Road suffers from high NO_2 concentrations as a direct result of congestion and a high percentage of bus emissions. The new upgrading works are intended to improve traffic flow, reducing queueing traffic, congestion and improve safety. The works were completed during 2017 and is hoped will promote walking and cycling at Bearwood Road, a local shopping destination. The measures should reduce levels of NO_2 along Bearwood Rd, currently designated as a street canyon.
- Sandwell's Public Health department in conjunction with Environmental Health carried out a Social Marketing Campaign aimed at reducing the amount of air pollution in selected areas of the borough. The campaign took place from June 2016 to June 2017 and aimed to encourage modal shift behavioural change in those that use the car for short journeys, including for work, leisure or the school run. As a secondary objective, the project intended to discourage engine idling and encourage traffic to reroute away from major air pollution hotspots. The project included the following:

  - Undertake insight work to determine current transport behaviours, understanding of air pollution/engine idling and alternative transport options and identify motivations and barriers to leaving the car at home.
  - Develop a campaign message and concept to raise awareness of poor air quality and encourage modal shift behavioural change.
  - Implement the campaign.
  - Develop a baseline evaluate framework to determine the success of the campaign.
- Sandwell secured planning conditions that require the provision of electric vehicle charging points on 25 developments which represents an increase to the previous year. Conditions requiring a travel plan for air quality purposes were attached to a further six planning permissions. These included residential, commercial and industrial developments.

Key Outcomes of the above measures:

- Improved air quality sustainability at new developments.
- Improved awareness and access to alternative vehicle technologies.
- Improved awareness of poor air quality and measures residents can take to improve air quality.
- An improvement in the health and fitness of the residents of Sandwell due to increased walking and cycling and improved air quality.
- Detailed understanding of key emission sources at Bearwood Road and identification of appropriate low emission strategy to secure compliance with air quality objectives.

Sandwell MBC expects the following measures to be completed over the course of the next reporting year:

- A full public consultation of the revised air quality action plan will be undertaken commencing in early 2018.
- It is planned to carry out a full review of internal council vehicle use in 2018 to catalogue and understand fleet composition, age and emission profiling. This will enable formulation of department specific strategies for prioritising fleet improvements in terms of air quality and the setting of emission based targets for reducing air pollution impacts. A review of electric charging and other low emission re-fuelling provision will also be carried out in 2018.

- A full review of the taxi fleet licenced by Sandwell will be carried out in 2018 to understand fleet make-up, age and emission profiling to enable formulation of a low emission taxi strategy. This will also include a review of electric charging and other low emission re-fuelling provision.
- It is intended to repeat and strengthen efforts to engage with Sandwell employees to promote and educate on low and ultra-low emission vehicle technologies and to work with departments across the Council to improve low and ultra-low emission vehicle uptake in 2018.
- The Black Country Air Quality SPD is due to be updated in 2018 when the Black Country Core Strategy is reviewed. The aim is for online tools (to enable reward scheme and travel plan accreditation) to be included, along with other improvements such as a review of parking standards.
- It is planned to perform a local vehicle fleet profiling exercise including a source apportionment study using ANPR (Automatic Number Plate Recognition) to age and determine the type of vehicles using roads in high priority zones in 2018. This work is proposed for Zone 1 (Blackheath High Street/Powke Lane), Zone 3 (Birmingham Road) and Zone 4 (Scott Arms Junction, Great Barr).
- Provision of a segregated cycle track for Birmingham Road, Oldbury (Zone 3) will be considered in 2018.
- A signalised junction at Bromford Road/Fountain Lane (Zone 5) is proposed for 2018 to improve safety for cyclists and will potentially increase cycle use on route between Oldbury and West Bromwich.
- Improvements to a roundabout in Zone 7 (Kelvin Way/Trinity Way West Bromwich) are proposed in 2018 which may improve air quality to be determined from future monitoring in this area.
- A local profiling exercise is to be carried out at the locations of Mallin Street, Smethwick and Gorsty Hill, Blackheath in 2018 to better understand bus emission impacts at these locations of persistent individual Nox diffusion tube exceedance.

Sandwell MBC's priorities for the coming year are:

- Identify new measures to improve air quality at site specific locations and borough wide initiatives, which will benefit the air quality in the region.

- Implement the new air quality action plan with a range of measures including the promotion and uptake of alternative technologies, modal shift, low emission transport, low emission plant, traffic management, transport planning and infrastructure.
- Ensure the Black Country Air Quality SPD is fully implemented, with appropriate air quality mitigation conditions attached to all relevant planning permissions to ensure all new development is deemed sustainable in terms of air quality.
- Work effectively with the West Midlands Combined Authority and the strategic transport authority to deliver measures to improve Air Quality.
- Identify key areas of exceedance within Sandwell and undertake initial scoping exercise to determine the most appropriate course of action to improve air quality. The model used at Bearwood Road, will be considered as a template for existing exceedance areas. Where appropriate, a detailed source apportionment study (ANPR) and subsequent low emission strategy feasibility study will be undertaken.

Some measures described in the 2009 Action Plan have not been completed and are no longer under consideration. These include Measure 10 and 12 Metro extension routes. New SMBC vehicles are purchased to Euro 5 and 6 standards rather than Euro 4 described in Measure 23 in the 2009 Action Plan. Promotion of eco-driving described in Measure 24 is ongoing through provision of advice on the Sandwell Council website. Measure 25 which is develop a strategy to encourage drivers not to allow their engines to idle when parked will also be developed as an ongoing process.

The West Midlands Freight Strategy WMCA December 2016 describes support for a West Midlands Strategic Freight Corridor from Stourbridge through to Lichfield via Walsall in relation to Measure 41. This could result in a reduction in NO_2 and PM_{10} $PM_{2.5}$ concentrations however, it is not known if it is going to proceed or when a likely completion date could be. (West Midlands Freight Strategy)

The principal challenges and barriers to implementation that Sandwell anticipates facing are a lack of evidence for the air quality benefits to support implementation, reduction in resources and meeting costs or lack of public/council support.

The implementation of the measures set out in the draft revised Action Plan are dependent on securing a sufficient and consistent level of funding both to support any additional staff that may be required, and to deliver the programme.

Progress on the following measures has been slower than expected due to:

Carrying out a full review of the council vehicle fleet and taxi vehicle fleet licenced by Sandwell (Measures 5 and 7 of the revised draft air quality action plan) requires additional analysis before actions to improve air quality may be proposed.

The Midland Metro Extension (Wednesbury to Brierley Hill) (Measure 14 of the draft revised air quality action plan) was a long time in the planning stages to secure funding. Large scale measures such as this require high level funding which may be beyond control of the local authority. An announcement was made by the Government in November 2017 that £250 million will be made available to the West Midlands Combined Authority to implement this measure.

Table 2.4 – Draft Air Quality Action Plan Measures

Measure No.	Measure	EU Category	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments	Cost
1	Develop Air Pollution model of Sandwell to identify hot spots	Other	Sandwell MBC (Environmental Health	2018	2018	Completion of model	Not applicable	Not applicable	2018		Low
2	Hot spot locations Review transport planning and traffic infrastructure at each location and identify and implement programme of work where practicable	Other	Environmental Health	2018	2018	Reducing emissions	Medium at hot spot locations (long term)	Not applicable	2023		To be determined
3	New SMBC vehicles purchased are to Euro 5 and 6 standard Monthly fuel reports are produced and regular user group meetings held to try and improve efficiency	Vehicle Fleet Efficiency	Sandwell MBC Environmental Health and	Completed	On-going	Improved Vehicle Fleet Makeup	Level of reduction	On-going - Monthly fuel reports and progress/ improvement meetings	On-going	Overall reduction in vehicle emissions	To be determined
4	Decrease use of the employee vehicles in Sandwell through the offer of car club/hire vehicles and the use of sustainable modes of travel	Vehicle Fleet Efficiency	Transport for West Midlands /Sandwell MBC	Being developed	Being developed	Reduced mileage claims by local authority staff	Where other systems have been established the bill for mileage claims has been reduced by 30% and cleaner vehicles are used more.	A report on the feasibility of introducing such a system has been presented to the WMCA's Strategic Transport Officer Group	On going		To be determined

Measure No.	Measure	EU Category	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments	Cost
5	**Council Vehicle Fleet** Carry out full review of council vehicle fleet including vehicle types, age and emission profiles	Vehicle Fleet Efficiency and promoting low emission transport	Sandwell MBC Transportation	2018	2018	Report findings	Not applicable	Not applicable	2018		Low
6	**Council Vehicle Fleet** Review findings of action 5 to formulate service specific strategies for improving their vehicle fleet and setting emission based targets	Vehicle Fleet Efficiency and promoting low emission transport	Sandwell MBC Transportation	2019	2019	Improvement plans developed and implemented	To be determined	Not applicable	2023		To be determined
7	**Council Vehicle Fleet** Review and implementation of electric charging and other low emission refuelling options	Vehicle Fleet Efficiency and promoting low emission transport	Sandwell MBC	2018	2019	Number of electric charging points installed?	Low	Not applicable	2023		To be determined
8	**Taxi Vehicles** Review taxi fleet licences by Sandwell (including fleet make-up, age and emission profiles	Promoting Lowe Emission Transport	Sandwell MBC Taxi Licensing	2018	2018	Report findings	To be determined	Not applicable	2018		To be determined
9	**Taxi Vehicles** Determine the best and most effective ways to influence and improve low and ultra-low emission vehicle use in taxi fleet.	Promoting Low Emission Transport	Sandwell MBC Taxi Licensing	2018	2018	Number of vehicles that comply with new standard.	To be determined	Not applicable	On going		To be determined

Measure No.	Measure	EU Category	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments	Cost
10	To engage with Sandwell MBC employees to promote low and ultra-low emission vehicle technologies	Promoting low emission transport	SMBC	2018	2018	Number of employees switching to Low emission vehicles	To be determined	Not applicable	On-going		Very low
11	Improvements of branding to increase attractiveness of public transport	Promoting Travel Alternatives	National Express Midlands / Transport for West Midlands	On-going	On-going	Increased Public Transport patronage	Not known	On-going programme of brand improvement and public awareness, including Safer Network, Improved connections Signage and ease of access.	On-going		Unknown
12	Improving access to information regarding transport options	Promoting Travel Alternatives	Sandwell MBC Transportation /Transport for West Midlands	On-going	On-going	Increased Public Transport patronage	Not known	On-going promotion of branding and services available.	On-going programme of brand improvement and public awareness, including Safer Network, Improved connections Signage and ease of access.	On-going	Very low
13	Major Highway Improvement at Birchley Island (Juction2 M5)	Traffic Management	Sandwell MBC and West Midlands Combined Authority	Planned	2022		To be determined		To be determined		Very High

Measure No.	Measure	EU Category	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments	Cost
14	Midland Metro extension (Wednesbury to Brierley Hill)	Alternatives to private vehicle use	WMCA Black Country Executive Joint Committee	2016	2022/23 Monitor development schedule	Increased Public Transport patronage	Level of reduction	Still in the planning stages to secure funding.	2023/24		Very High
15	Increased bus lane enforcement (increase number of cameras on buses and static cameras for bus lane enforcement)	Traffic Management	National Express Midlands/SMBC/Transport for West Midlands	Complete	On-going	Increased Enforcement Actions	Minor	Limited Progress within Sandwell, however there are only a small number of bus lanes	On-going	Marginal improvement in emissions due to improved bus journeys.	Not known
16	Improvement of Urban Traffic Control Systems designed to reduce congestion	Traffic Management	West Midlands Combined Authority (WMCA),	On-going	On-going	Reduced Congestion	Low	On-going, use of the Urban Traffic Control. Potential opportunity for further expansion	On-going	Potential reduction at locations where traffic control systems are in place.	
17	Ensure AQ considerations are included in the new Local Development Framework Ensure policies seek to reduce the need to travel and promote the use of modes other than the car	Policy Guidance and Development Control	SMBC / Low Emission Towns and Cities Programme, West Midlands Authorities	Complete	From September 2014 On going	Improve vehicle fleet emission	Medium to high long term	Publication of Procurement and Planning Guidance and implementation intended across the West Midlands Metropolitan Authorities in September 2014	On going	Procurement policies to influence a reduction in road transport emissions Guidance published;	

Measure No.	Measure	EU Category	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments	Cost
18	Black Country Low Emission Strategy and Implementation Plan Promotion of Ultra low emission vehicles Create implementation plan to support delivery	Policy Guidance and Development Control	SMBC and Black Country Authorities	Emerging	Emerging	To be established	To be determined	Document being developed	Unknown		To be determined
19	Section 106 – Investigate the practicability of S106 agreements being used to secure monitoring funding and balancing measures in applications where AQ is an issue	Policy Guidance and Development Control	SMBC Planning & Environmental Protection	Complete	On-going	Implementation of guidance and appropriate air quality conditions attached to planning permissions.	Medium to High long-term	LETCP Planning Guidance / Black Country SPD state all new development will be required to contribute to offsetting emission creep, plus larger contributions if significant new sources are introduced.	Adoption of the document October 2016, On-going implementation	To protect and enhance air quality through development	Not applicable
20	AQ guidance Provide guidance in relation to air quality for developers to follow when submitting planning applications	Policy Guidance and Development Control	SMBC / Low Emission Towns and Cities Programme, West Midlands Authorities	Complete	On going	Improve vehicle fleet emission	Medium to High long-term	Publication of Procurement and Planning Guidance and implementation intended across the West Midlands Metropolitan Authorities in September 2014	On-going	Procurement policies to influence a reduction in road transport emissions Guidance published;	Not applicable

Measure No.	Measure	EU Category	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments	Cost
21	Development Management – continue to consider air quality issues for new planning applications in line with the agreed planning protocol	Policy Guidance and Development Control	SMBC	Complete	On-going	Number of planning application with appropriate air quality conditions	Medium to High long-term	On-going		All planning applications assessed against SPD and Planning Guidance	
22	Promotion of Walking	Promoting Travel Alternatives	SMBC	Complete	On-going	Increased uptake of walking for key journeys. Sandwell Travel surveys	Not known	Sandwell MBC Walking Strategy published in 2015. Sandwell Travelwise webpage updated to promote alternative travel	Completed documents, with on-going promotion of walking	Sandwell Travelwise webpage updated to promote alternative travel Travelwise Sandwell	
23	Promotion of Cycling	Promoting Travel Alternatives	SMBC	Complete	On-going promotion of cycling	Increased uptake of cycling for key journeys. Sandwell Travel surveys	Not known		On-going	Sandwell's Cycling strategy is a several years old and would benefit from updating. On-going promotion of cycling on Travelwise	

Measure No.	Measure	EU Category	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments	Cost
24	Encourage travel plans for employers, schools & hospitals	Promoting Travel Alternatives	SMBC / National Express West Midlands / Transport for West Midlands	Complete	On-going implementation	Number of travel plans adopted by relevant organisations – including attached to planning applications.	Low to medium long-term	Travel Plan SPD requires certain developments to implement a Travel Plan. This work is on-going, with the number of travel plans implemented increasing annually. Started using online Modeshift STARS and STARS for tools.	On-going	Travel Plan SPD adopted by Sandwell Council. Considered for all relevant planning applications	
25	Air Quality information on website	Public Information	Information via the Internet & Twitter	Sandwell MBC	On-going	On-going	Not applicable	On going	On-going		Very Low
26	Promote car sharing among residents and businesses in the area	Alternatives to private vehicle use	Sandwell MBC	Complete	On-going	Increased in total participants using the scheme. .	Not known	On-going implementation and promotion of the scheme.	On-going	Further publishing of the car share programme, with an increase in the total number of registered users. Sandwell Carshare	

Measure No.	Measure	EU Category	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments	Cost
27	Provide air quality information and promote sustainable transport in schools	Promoting Travel Alternatives	Sandwell MBC	On-going	On-going	Increase in sustainable travel modes in schools	Reduction in NO_2 and PM_{10} $PM_{2.5}$ Concentrations	Limited Progress To Date. School Travel Plans are a key element of the planning process, but limited funding available to promote sustainable transport at schools. Started using online Modeshift STARS tool.	On-going	An annually updated Sustainable Modes of Travel Strategy (SMOTS) for schools is required by the Education and Inspections Act (2006) to be produced by all local authorities. SMOTS	

2.3 $PM_{2.5}$ – Local Authority Approach to Reducing Emissions and or Concentrations

As detailed in Policy Guidance LAQM.PG16 (Chapter 7), local authorities are expected to work towards reducing emissions and/or concentrations of $PM_{2.5}$ (particulate matter with an aerodynamic diameter of 2.5µm or less). There is clear evidence that $PM_{2.5}$ has a significant impact on human health, including premature mortality, allergic reactions, and cardiovascular diseases.

Based on national estimates[5] (2010) the fraction of mortality attributable to anthropogenic (man-made) $PM_{2.5}$ in Sandwell is 6.9% of all deaths (equal to 198 deaths per annum), which is more than the premature deaths associated with obesity and road accidents combined. Nationally the average across England is 5.1%, thus the current levels of particulate air pollution have a considerable impact on the health of Sandwell residents.

Sandwell Air Quality officers and Public Health specialists are working together to determine the most appropriate way to address the links between Public Health and Air Quality. The importance of $PM_{2.5}$ is reflected by the inclusion of a key indicator of mortality in the Public Health Outcomes Framework.

The primary source of emissions in Sandwell is from road traffic and in particular diesel vehicles. Whilst the majority of measures detailed within this report focus on the reduction of NO_2 concentrations and achieving compliance with the objectives, it is accepted that there is no safe level for particulate matter, including $PM_{2.5}$, therefore all pollutant concentrations must be reduced to meet the health based national air quality objectives and improve health.

Policy Guidance LAQM.PG(16) acknowledges that many local authorities will consider how to address $PM_{2.5}$ alongside other pollutants when developing a range of measures to improve air quality and that few standalone $PM_{2.5}$ measures will be chosen (unless to address a very specific local problem).

[5] Public Health England, 2014, '*Estimating Local Mortality Burdens Associated with Particulate Air Pollution*'

Sandwell MBC is taking the following measures to address $PM_{2.5}$:

- Sandwell currently undertakes $PM_{2.5}$ monitoring at Haden Hill in Cradley Heath. The site is located at an appropriate background location, which allows the comparison with the annual mean $PM_{2.5}$ objective of 25µg/m^3. In 2016, the annual mean was 5µg/m^3 although this figure should be treated with caution as data capture achieved was only 3.4% due to technical issues. We expect a much higher level of data capture in the following year which should be above 75%.
- Sandwell is working on rectifying technical issues with the monitoring stations and will review its requirements for measuring $PM_{2.5}$ and where appropriate may extend its $PM_{2.5}$ monitoring network in order to improve its understanding of $PM_{2.5}$ across the borough. Key locations for consideration will include roads with significant traffic flows and where relevant receptors are present.
- Sandwell is currently in the process of updating its air quality action plan and reference is made to measures that will limit and reduce $PM_{2.5}$ emissions in future years. This will include close partnership working with key stakeholders such as Public Health, Planning and Transportation.
- The LETCP Planning Guidance and the Black Country Air Quality SPD now ensure all new development is sustainable in terms of air quality (Measures 20 and 21) and secure appropriate mitigation measures ranging from Electric Vehicle charging points at minor developments to a full Low Emission Strategy (in scale and kind) at Major developments. Both documents make reference to $PM_{2.5}$ and with the adoption of low emission mitigation measures, will reduce the impact of $PM_{2.5}$ emissions in future years.
- Encouraging modal shift (Measures 4, 7, 10, 11, 12, 14, 22, 23, 24 and 27) such as walking, cycling, public transport and low emission vehicles, will reduce emissions of $PM_{2.5}$ by easing congestion and improving vehicle emissions.
- Reducing traffic congestion through the careful management of road infrastructure, improved traffic and pedestrian signals, speed restrictions and parking enforcement to reduce obstructions on congested roads (Measures 2, 13, 14, 15 and 16). By incorporating all of these measures traffic congestion will be reduced and air quality improved by reducing emissions of $PM_{2.5}$.

- Improving public awareness of poor air quality and alternative transport options through travel planning, social marketing, council webpages and improved public transport branding will reduce $PM_{2.5}$ emissions (Measures 11, 12, 17, 18, 22, 23, 24, 25, 26 and 27).
- Current environmental legislation regulates the control of emissions of Particulate Matter (including $PM_{2.5}$) from industrial processes. Sandwell and the Environment Agency continue to ensure all sites requiring an Environmental Permit operate within the required limits to reduce emissions of particulate matter. However, it is acknowledged the increased use of biomass technologies may give rise to increased $PM_{2.5}$ emissions if inappropriate technologies are used or combustion plants are poorly managed.

3 Air Quality Monitoring Data and Comparison with Air Quality Objectives and National Compliance

3.1 Summary of Monitoring Undertaken

This section sets out what monitoring has taken place and how it compares with objectives.

3.1.1 Automatic Monitoring Sites

Sandwell Metropolitan Borough Council currently maintains a network of six automatic monitoring sites where data is collected continuously. Data from automatic monitoring sites allow the assessment and comparison with both short-term objectives such as the 1-hourly mean for nitrogen dioxide (NO_2) and annual average concentrations.

Details of the six monitoring sites which were in operations in 2016 and the range of pollutants measured including nitrogen dioxide (NO_2), Particulate Matter (PM_{10} and $PM_{2.5}$), Sulphur Dioxide (SO_2) and Ozone (O_3) are presented in Appendix 1 – Table A.1.

NB. Local authorities do not have to report annually on the following pollutants: 1,3 butadiene, benzene, carbon monoxide and lead, unless local circumstances indicate there is a problem. Sandwell Council does not currently monitor for these pollutants.

Further details of National monitoring results are available online at DEFRA Monitoring Results

A map detailing the approximate location of automatic monitoring sites is provided in Appendix D - Figure D.1.

All monitoring equipment and results are subject to full Quality Assurance and Quality Control (QA/QC) procedures. Further details relating to the QA/QC procedures are detailed in Appendix C.

3.1.2 Non-Automatic Monitoring Sites

Sandwell undertook non-automatic (passive) Diffusion Tube monitoring of NO_2 at 97 sites during the 2016 calendar year.

Table A.2 in Appendix A shows the details of the sites. The table also includes the details of decommissioned diffusion tube monitoring sites, to provide a broader picture of annual mean nitrogen dioxide concentrations.

An overview map showing the general location of the monitoring sites is provided in Figure D.2, Appendix D.

Further details on Quality Assurance/Quality Control (QA/QC) and bias adjustment for the diffusion tubes are included in Appendix C.

3.2 Individual Pollutants

The air quality monitoring results presented in this section are, where relevant, adjusted for "annualisation" and bias. Further details on adjustments are provided in Appendix C.

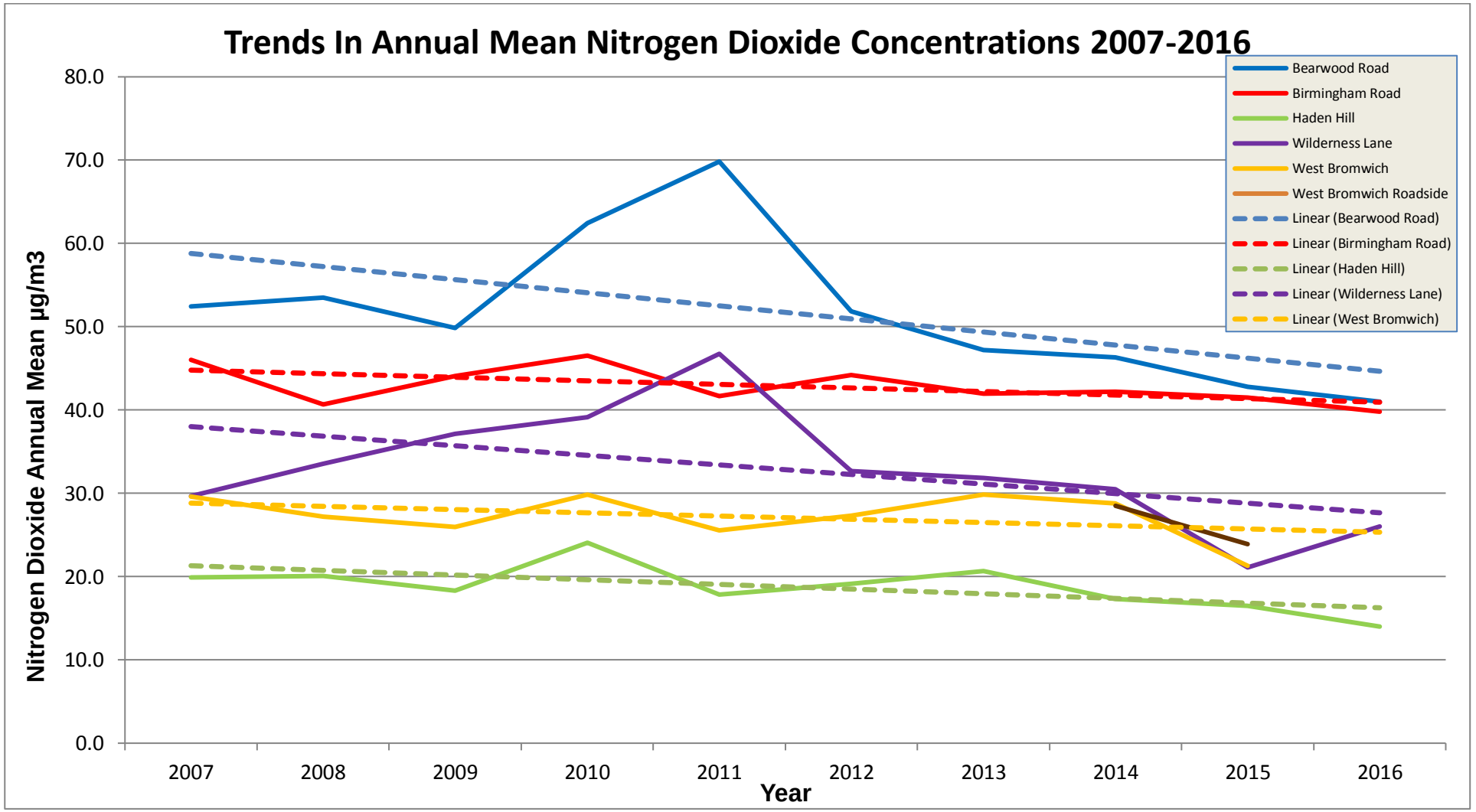
3.2.1 Nitrogen Dioxide (NO_2)

Automatic monitoring for NO_2 was undertaken at six automatic monitoring stations (West Bromwich, Birmingham Road, Bearwood Road OPSIS, Wilderness Lane Great Barr, Haden Hill and West Bromwich Roadside). Table A.3 in Appendix A compares the ratified and adjusted monitored NO_2 annual mean concentrations for the past 7 years with the air quality objective of 40µg/m^3.

All locations are representative of public exposure and the results have been ratified using protocols detailed in LAQM.TG (16). Table A.4 in Appendix A compares the ratified continuous monitored NO_2 hourly mean concentrations for the past 7 years with the air quality objective of 200µg/m^3, not to be exceeded more than 18 times per year.

Table A.5 in Appendix A compares the ratified and adjusted NO_2 diffusion tube results and compares concentrations for the past 6 years with the air quality objective of 40µg/m^3

Figure 3.1 - Trends in Annual Mean Nitrogen Dioxide Concentrations at Automatic Monitoring Sites



Interpretation of Nitrogen Dioxide Results

- Data capture is > 75% for two of the six automatic stations for 2016 and was extremely low at West Bromwich due to technical issues. The data has been annualised, to ensure they are representative of a full calendar year although where data captures are very low the figures should be treated with caution; further details are presented in Appendix C.
- A monitoring station was established at Cronehills Linkway, West Bromwich in 2014 and is known as 'West Bromwich Roadside'. The site was installed due to the redevelopment of the town centre and construction of a large retail development. Results are only available for the period 2014-2016; Data capture was very low for 2016 however, the annual mean NO_2 concentration for these three years is significantly below the objective and demonstrates compliance.
- The Bearwood Road site continues to record exceedances of the 40µg/m^3 NO_2 annual mean objective and the Birmingham Road site was found to be slightly below the objective. Both sites demonstrate a marginal downward trend in NO_2 concentrations.
- No data for NO_2 was available for the background location of West Bromwich Highfields. The background location of Haden Hill recorded a reduction in overall NO_2 concentrations when compared to 2015 results although when annualised a slight increase was observed. Data capture was low due to technical issues so results should be treated with caution for this year.
- 2016 results support previous indications that NO_2 concentrations are not reducing consistently over time. Year on year variation have resulted in increases and decreases in concentrations across a range of locations and demonstrates the impact variability in traffic and climatic conditions have on pollutant concentrations.
- Long term trends (over 5 years or more) in diffusion tube monitoring demonstrate gradual improvements in annual mean NO_2 concentrations at the majority of sites and the widespread compliance with the annual mean objective. However, at a small number of locations, concentrations consistently exceed the objective, with concentrations remaining static or increasing in 2016.

- A total of 19 diffusion tube sites (19.6%) exceeded the NO_2 annual mean objective in 2016. There has been year on year fluctuations in the total number of locations which exceed the objective, although overall there appears to be a downward trend in the total number of exceedances.

Table 3.1 Total number and Percentage of Diffusion Tube Monitoring Sites Which Exceed the NO_2 Annual Mean Objective

Year	2009	2010	2011	2012	2013	2014	2015	2016
Number of Site that Exceed	48	88	25	43	32	29	18	19
Percentage of total sites that exceed NO_2 objective	44.9%	66.2%	17.1%	29.5%	28.6%	20.3%	19%	19.6%

- Four key areas, Birmingham Road Oldbury (BE, BF, BDQ, BD and BR), Bearwood Road/Hagley Road Smethwick (C9D, C10A and C10D), Blackheath (C12A, C12D and C15A) and Newton Road Great Barr (ZQ and ZR), continue to demonstrate significant exceedances of the annual mean NO_2 objective.
- Mallin Street, Smethwick and Burnt Tree Junction/Birmingham New Road, Oldbury have shown an exceedance (Tube MA - 45.31µg/m^3 and TC - 47.86µg/m^3 respectively) of the objective in 2016 at isolated locations. Further monitoring is required. The results for 2016 will be scrutinised and where exceedances persist the site will be included in the map of exceedance areas. There are not currently any receptors near to tube TC however, land nearby is a permissioned site on the planning Brownfield Register and as such is considered to be 'ready for development'.
- Table A.4, Appendix A demonstrates there was only one exceedance of the hourly NO_2 objective at the 6 automatic monitoring stations although data capture was very low. The 99.8th percentiles for each monitoring station are significantly below the hourly objective of 200µg/m^3.
- Trend analysis demonstrates NO_2 concentrations have remained relatively static between 2009 and 2016 at West Bromwich, Haden Hill, Wilderness Lane and Birmingham Road. Bearwood Road has shown an overall downward trend

throughout the same period, but it should be noted in 2010/2011 there were significant increases in annual mean NO_2 at this location.

- At the current time Sandwell will retain its borough wide Air Quality Management Area for exceedances of the annual mean NO_2 Objective.

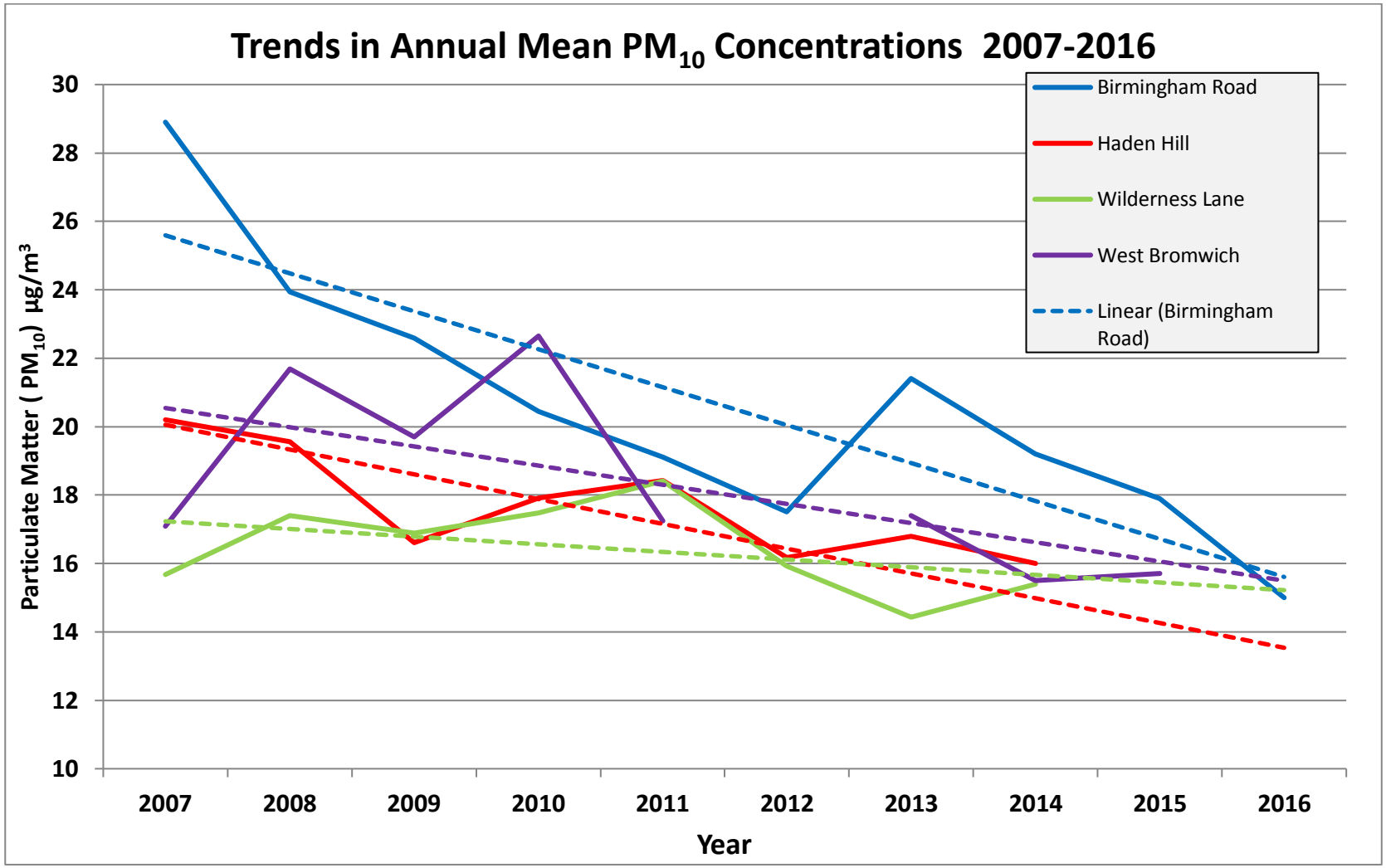
3.2.2 Particulate Matter (PM_{10})

Table A.6 in Appendix A compares the ratified and adjusted monitored PM_{10} annual mean concentrations for the past 5 years with the air quality objective of 40µg/m^3.

Table A.7 in Appendix A compares the ratified continuous monitored PM_{10} daily mean concentrations for the past 6 years with the air quality objective of 50µg/m^3, not to be exceeded more than 35 times per year.

- PM_{10} annual mean concentrations are significantly below the national air quality objective of 40µg/m^3 in 2016 where data was obtained although data capture was very low.
- Data collection at Birmingham Road, Oldbury and Haden Hill, Cradley Heath was below 75%; therefore the results have been annualised in accordance with LAQM TG(16). Further details are provided in Appendix C.
- Due to unforeseen technical issues, no data was collected at Wilderness Lane Great Barr and West Bromwich in 2016.
- Birmingham Road and Haden Hill demonstrated an overall downward trend in PM_{10} concentrations between 2007-2016.
- Only one 24 hour exceedance was recorded at the 4 monitoring sites compared with the maximum 35 exceedances per year although data capture was very low for 2016.
- The total number of 24 hour exceedances and 90th percentiles have remained relatively static over the 6 year period 2010-2016.

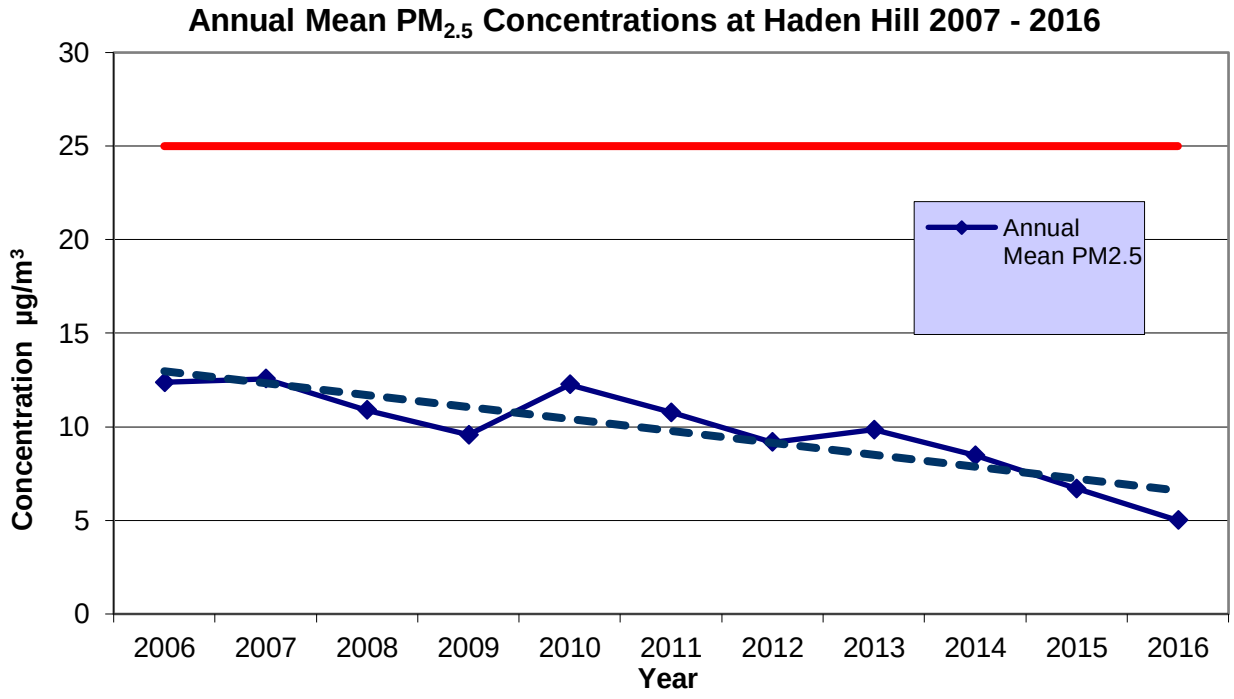
Figure 3.2 - Trends in Annual Mean PM_{10} Concentrations at Automatic Monitoring Sites



3.2.3 Particulate Matter ($PM_{2.5}$)

Table A.8 in Appendix A presents the ratified and adjusted monitored $PM_{2.5}$ annual mean concentrations for the past 5 years.

Figure 3.3 Trends in Annual Mean $PM_{2.5}$ concentrations at Haden Hill Automatic Station 2007-2016



Trend analysis confirms there has been a gradual reduction in the annual mean $PM_{2.5}$ concentration between 2007 and 2016; however year on year concentrations are variable, with 2010, 2011 and 2013 demonstrating an increase compared to the previous years.

All authority areas are required to achieve a 15% reduction in annual mean $PM_{2.5}$ concentration between 2010 and 2020. To date there has been an approximate 59% reduction at Haden Hill background location between 2010 and 2016 (inclusive); however, this figure is likely to represent a best case scenario. The annual mean concentration in 2010 was significantly higher than in previous and subsequent years, which resulted in a larger reduction during the following 5 year period and in reality the percentage reduction is likely to be smaller.

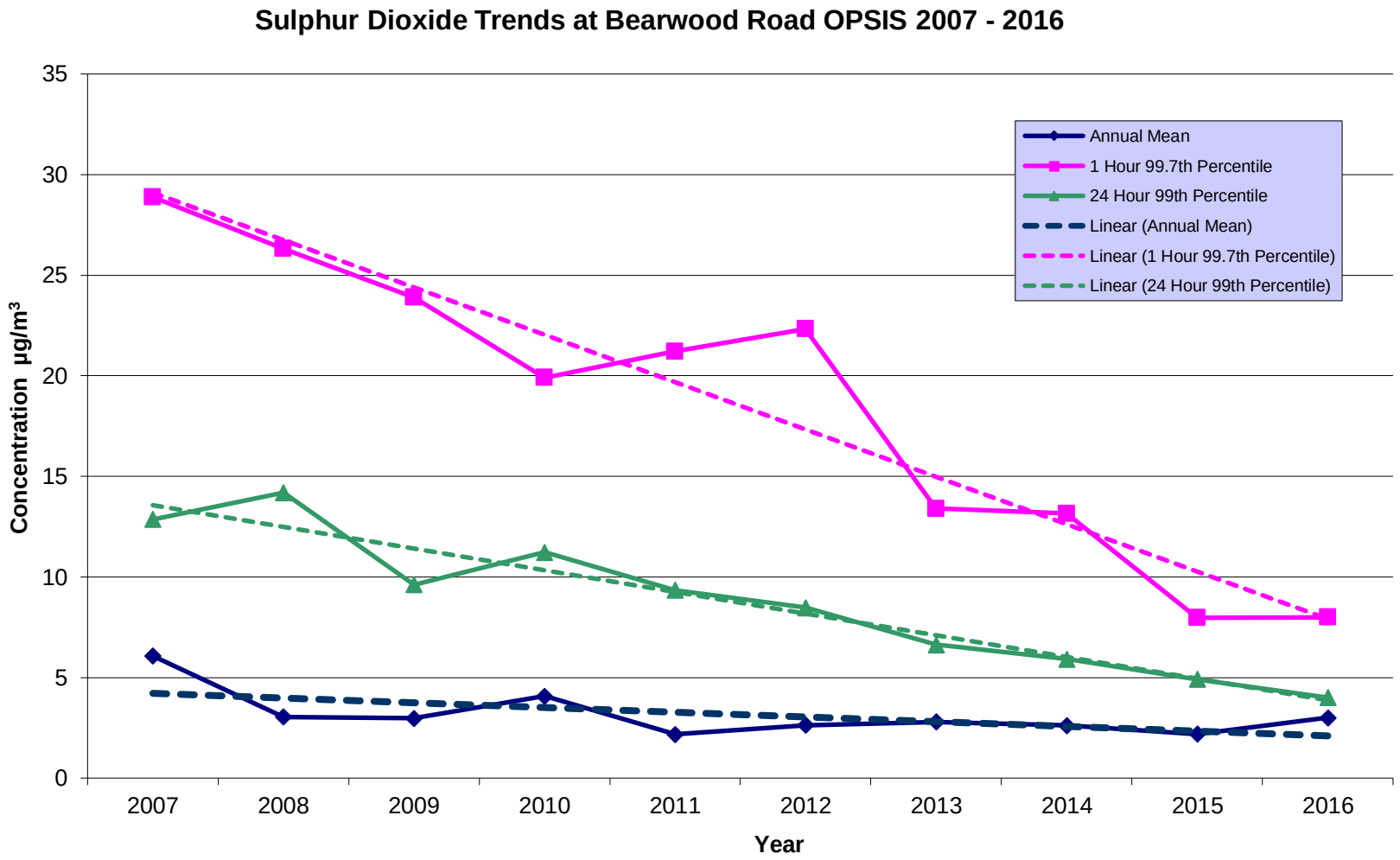
3.2.4 Sulphur Dioxide (SO_2)

Sulphur dioxide (SO_2) monitoring is currently undertaken at Bearwood Road OPSIS. The OPSIS is located at a roadside location and is an indicative monitoring method providing hourly data, therefore the 15 minute mean is unavailable. Bearwood Road monitoring station is located in areas of relevant public exposure, where people are likely to spend an average of 15 minutes or more.

Table A.9 in Appendix A compares the ratified continuous monitored SO_2 concentrations for year 2016 with the air quality objectives for SO_2.

Figure 3.4 depicts the trends in SO_2 concentrations during the period 2007-2016. Overall there has been a slight downward trend in annual mean and 99.7th / 99th percentiles throughout the period.

Figure 3.4 Trends in SO_2 Concentration at Bearwood Road



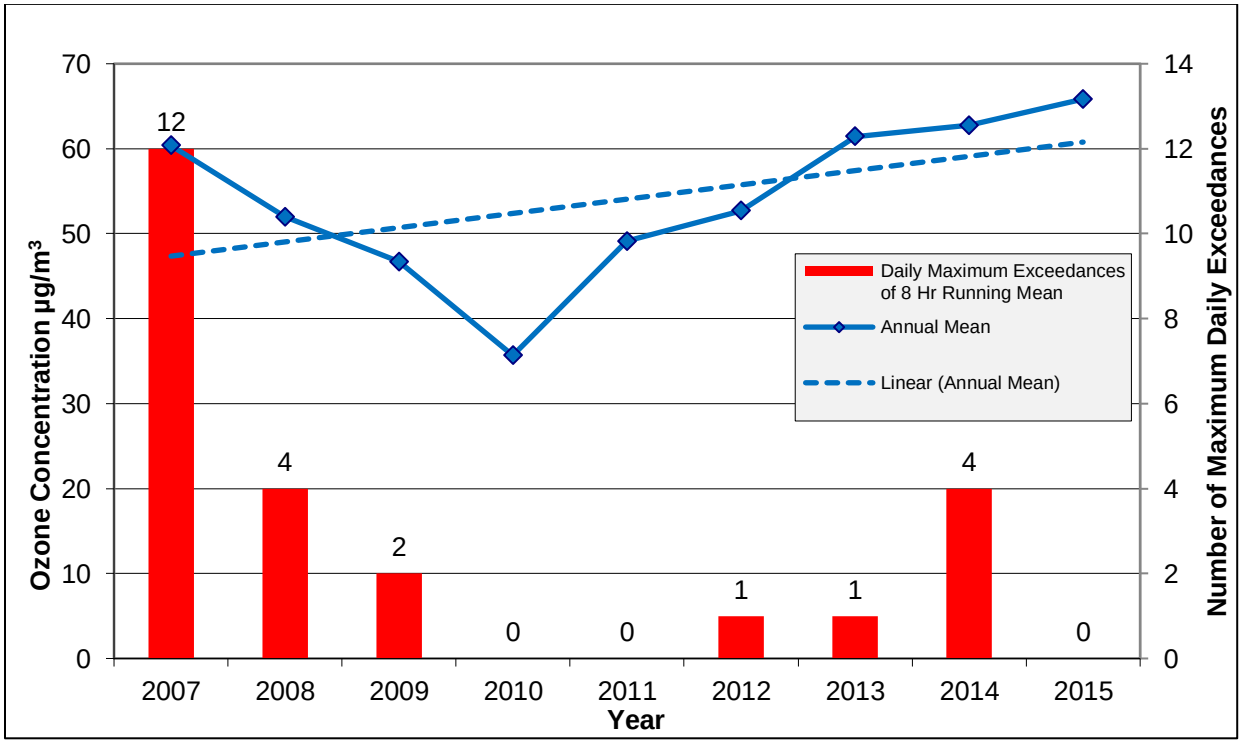
3.2.5 Ozone (O_3)

Local Authorities do not have a responsibility to meet the objectives for ozone as it is identified as a 'trans boundary' pollutant which can drift across countries. It is therefore not included within the National Air Quality Objectives. The World Health Organisation has set an Air Quality Objective for ozone at 100µg/m^3, where the daily maximum of the 8-hour running mean should not be exceeded more than 10 times per annum.

Ozone is monitored at two locations within Sandwell; West Bromwich and Bearwood Road OPSIS. Bearwood Rd OPSIS is an indicative, non-standardised monitoring method; therefore results should be viewed with caution. It was found that ozone measurements from the Bearwood OPSIS for 2016 do not resemble AURN measurements so this has not been reported due to technical concerns. Sandwell will undertake a further review of use of this instrument for measurement of ozone in subsequent monitoring.

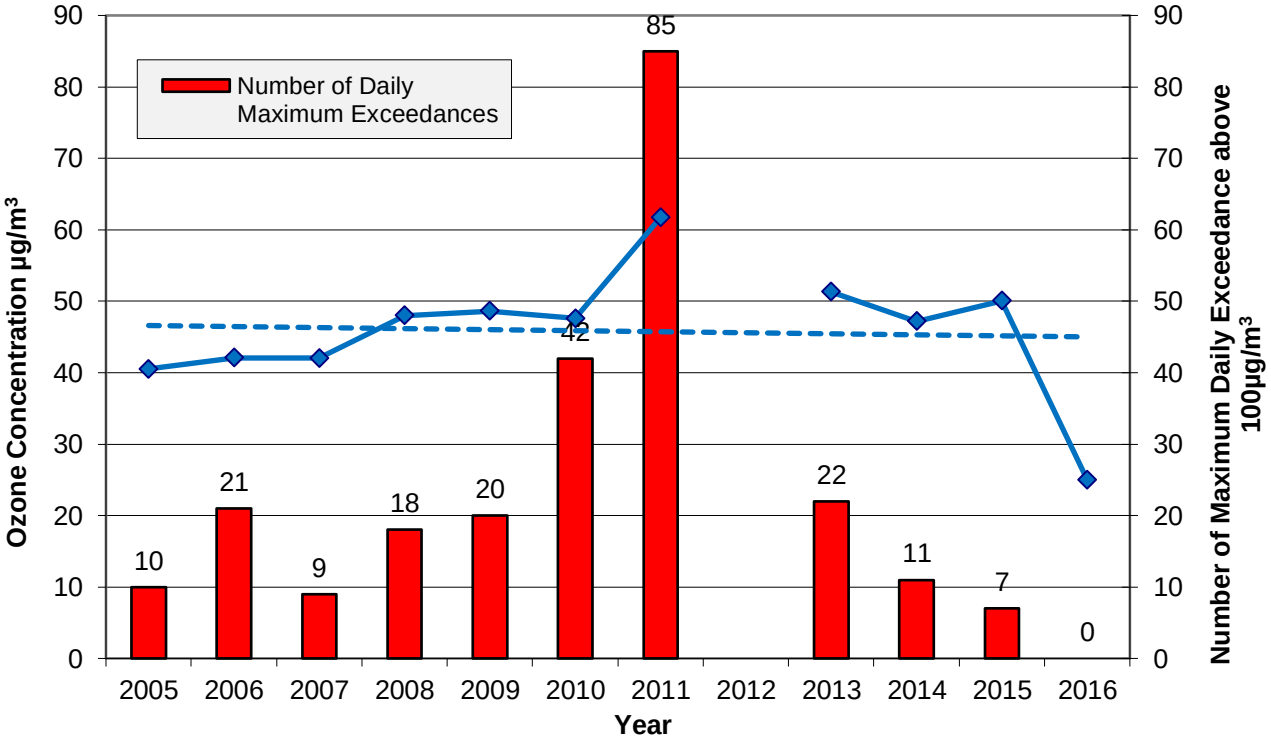
Data capture was very low in 2016 due to technical issues. The trends in annual mean concentrations and number of maximum daily exceedances are presented in Figures 3.5 and 3.6 for Bearwood Road and West Bromwich stations respectively.

Figure 3.5 Trends in Annual Mean Ozone concentrations and Number of Daily Maximum Exceedances at Bearwood Rd 2007-2015.



Ozone concentrations at Bearwood Road have been variable throughout the period 2007-2015; however, the overall trend in annual mean concentration has shown a gradual increase. The number of maximum daily exceedances has reduced steadily throughout the same period.

Figure 3.6 Trends in Annual Mean Ozone concentrations and Number of Daily Maximum Exceedances at West Bromwich 2007-2016.



Ozone levels at West Bromwich have demonstrated a gradual increase in the annual mean concentrations and a gradual increase in the number of maximum daily exceedances up to and including 2011, however there has been a reduction in the number of maximum daily exceedances between 2013 and 2016.

Appendix A: Monitoring Results

Table A.1 – Details of Automatic Monitoring Sites

Site Name	Site Type	OS Grid Reference		Pollutants Monitored	In AQMA ?	Monitoring Technique	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m)	Inlet Height (m)	Worst case Exposure Represented
		X	Y							
West Bromwich	Urban Background	400187	291601	NO_2	Yes	Chemiluminescence	35	21m	2.5m	No
West Bromwich	Urban Background	400187	291601	SO_2	Yes	Chemiluminescence	35	21m	2.5m	No
West Bromwich	Urban Background	400187	291601	PM_{10}	Yes	TEOM FDMS	35	21m	2.5m	No
West Bromwich	Urban Background	400187	291601	O_3	Yes	Chemiluminescence	35	21m	2.5m	No
Birmingham Rd (Oldbury)	Roadside	399857	289392	NO_2	Yes	Chemiluminescence	8	5m	2.5m	Yes
Birmingham Rd (Oldbury)	Roadside	399857	289392	PM_{10}	Yes	TEOM FDMS	8	5m	2.5m	Yes
Wilderness Lane (Great Barr)	Roadside	403956	294855	NO_2	Yes	Chemiluminescence	147	11m	2.8m	No
Wilderness Lane (Great Barr)	Roadside	403956	294855	PM_{10}	Yes	TEOM FDMS	147	11m	2.8m	No
Haden Hill	Urban Background	395755	285493	NO_2	Yes	Chemiluminescence	105	119m	2.5m	No

Site Name	Site Type	OS Grid Reference		Pollutants Monitored	In AQMA ?	Monitoring Technique	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m)	Inlet Height (m)	Worst case Exposure Represented
		X	Y							
Haden Hill	Urban Background	395755	285493	PM_{10}	Yes	TEOM	105	119m	2.5m	No
Haden Hill	Urban Background	395755	285493	$PM_{2.5}$	Yes	TEOM	105	119m	2.5m	No
Bearwood Road OPSIS	Kerbside *(Transept crosses road approx. 5m from road each end)*	402181 286360 *(Northern Point of OPSIS – Source)*	402223 286097 *(Southern Point of OPSIS – Receiver)*	NO_2, SO_2, O_3	Yes	Differential Optical Absorption Spectroscopy	5	8m or less (Varies across transept)	5.5m	Yes
West Bromwich Roadside	Roadside	400521	291541	NO_2	Yes	Chemiluminescence	11	7m	1.6m	Yes

(1) 0m if the monitoring site is at a location of exposure (e.g. installed on the façade of a residential property).

Table A.2 – Details of Non-Automatic Monitoring Sites

Diffusion tube monitoring sites which were decommissioned prior to May 2014 are presented in Blue.

Area	Site ID	Site Type	OS Grid Reference		Pollutants Monitored	In AQMA?	Is Monitoring Co-located with a Continuous Analyser	Relevant Exposure?	Distance to Kerb of Nearest Road (m)	Does this Location Represent Worst-Case Exposure?
			X	Y						
Great Barr	KA	Urban Background	403387	294587	NO_2	Yes	No	Y (0m)	15m	Y
	KB	Urban Background	403492	294678	NO_2	Yes	No	Y (0m)	15m	Y
	KD	Urban Background	403794	294698	NO_2	Yes	No	Y (0.3m)	12.92m	Y
	KE	Roadside	403932	294951	NO_2	Yes	No	Y (0m)	1.2m	Y
	QE	Roadside	403934	294934	NO_2	Yes	No	N	1.8m	Y
	SA	Urban Background	403951	294852	NO_2	Yes	Yes	N	5.1m	N
	SB	Urban Background	403953	294855	NO_2	Yes	Yes	N	5.1m	N
	XE	Urban Background	404439	294846	NO_2	Yes	No	Y (4.3m)	16.3m	Y
	YC	Urban Background	404104	294950	NO_2	Yes	No	Y (0m)	10.3m	N
	ZA	Roadside	404617	294931	NO_2	Yes	No	N	0.3m	Y
	ZC	Roadside	404505	294821	NO_2	Yes	No	Y (3m)	1.9m	Y
	ZK	Roadside	404622	294291	NO_2	Yes	No	Y (0m)	17.2m	Y
	ZN	Roadside	404474	294659	NO_2	Yes	No	Y (0m)	16.8m	Y
	ZO	Roadside	404555	294219	NO_2	Yes	No	N	2.9m	Y
	ZP	Roadside	404292	294180	NO_2	Yes	No	Y (0m)	3.2m	Y
	ZQ	Roadside	404547	294188	NO_2	Yes	No	Y (0m)	8.5m	Y
	ZR	Roadside	404475	294181	NO_2	Yes	No	Y (0m)	5.9m	Y
Yew Tree	WA	Roadside	401917	295329	NO_2	Yes	No	Y (8m)	0.2m	Y
	WB	Urban Background	402152	295064	NO_2	Yes	No	N	1.6m	N
	WF	Urban Background	402119	295273	NO_2	Yes	No	Y (8m)	0.2m	Y

Area	Site ID	Site Type	OS Grid Reference		Pollutants Monitored	In AQMA?	Is Monitoring Co-located with a Continuous Analyser	Relevant Exposure?	Distance to Kerb of Nearest Road (m)	Does this Location Represent Worst-Case Exposure?
			X	Y						
Oldbury	BA	Roadside	399686	289431	NO_2	Yes	No	Y (7.7m)	7.8m	Y
	BB	Roadside	399751	289398	NO_2	Yes	No	Y (25.6m)	0.5m	Y
	BC	Roadside	399949	289367	NO_2	Yes	No	Y (0m)	5.9m	Y
	BD	Roadside	399914	289374	NO_2	Yes	No	Y (0m)	5.8m	Y
	BDQ	Roadside	399999	289360	NO_2	Yes	No	Y (0m)	8.6m	Y
	BE	Roadside	399920	289352	NO_2	Yes	No	Y (2.5m)	0.8m	Y
	BF	Roadside	399809	289406	NO_2	Yes	No	Y (0m)	5.8m	Y
	BG	Roadside	399718	289427	NO_2	Yes	No	Y(0m)	5.6m	Y
	BO	Roadside	400079	289389	NO_2	Yes	No	Y (0m)	6.2m	Y
	BP	Roadside	399820	289400	NO_2	Yes	No	Y (0m)	6.8m	Y
	BR	Roadside	400171	289436	NO_2	Yes	No	Y (0m)	5.9m	Y
	BS	Urban Background	399863	289396	NO_2	Yes	No	Y (8.6m)	16.3m	Y
	GA	Roadside	399858	289391	NO_2	Yes	Yes	Y (8.2m)	5.4m	Y
	GB	Roadside	399858	289391	NO_2	Yes	Yes	Y (8.2m)	5.4m	Y
	GC	Roadside	399858	289391	NO_2	Yes	Yes	Y (8.2m)	5.4m	Y
	GD	Roadside	399858	289391	NO_2	Yes	Yes	Y (8.2m)	5.4m	Y
	S3N	Urban Background	399296	289503	NO_2	Yes	No	Y (0m)	13.4m	N
	S5N	Urban Background	399462	289478	NO_2	Yes	No	Y (0m)	2.9m	Y
	TA	Roadside	395958	290645	NO_2	Yes	No	Y (0m)	5.4m	Y
	TC	Roadside	395854	290643	NO_2	Yes	No	N	3.9m	Y
	C5A	Roadside	399297	290133	NO_2	Yes	No	Y (0m)	2.1m	Y
	C5D	Roadside	399199	290021	NO_2	Yes	No	Y (8.3m)	0.7m	Y

Area	Site ID	Site Type	OS Grid Reference		Pollutants Monitored	In AQMA?	Is Monitoring Co-located with a Continuous Analyser	Relevant Exposure?	Distance to Kerb of Nearest Road (m)	Does this Location Represent Worst-Case Exposure?
			X	Y						
	C5E	Roadside	399139	289947	NO_2	Yes	No	Y (2.9m)	1.9m	Y
	C6A	Roadside	398941	289326	NO_2	Yes	No	Y (0m)	17.2m	Y
	C6D	Roadside	399004	289326	NO_2	Yes	No	Y (9.9)	15.3m	Y
	C6E	Kerbside	399229	289315	NO_2	Yes	No	Y (13.8m)	0.48m	Y
	C7A	Roadside	398137	290229	NO_2	Yes	No	Y (1.5m)	0.6m	Y
	C7D	Kerbside	398279	290115	NO_2	Yes	No	Y (11.3m)	1.6m	Y
	C7E	Roadside	398042	290285	NO_2	Yes	No	Y (0m)	9.5m	Y
	C7F	Kerbside	397493	290628	NO_2	Yes	No	Y (4.7m)	0.3m	Y
	C7H	Roadside	398311	290135	NO_2	Yes	No	Y (0m)	4.4m	Y
	C7I	Roadside	398359	290049	NO_2	Yes	No	Y (0m)	4.6m	Y
	C13D	Roadside	396399	291457	NO_2	Yes	No	Y (4.1m)	2.4m	Y
	C13E	Roadside	396346	291476	NO_2	Yes	No	Y (0.9m)	7.3m	Y
	VT	Roadside	397155	290867	NO_2	Yes	No	Y (10.3m)	2.73	Y
Smethwick	OA	Roadside	402232	286142	NO_2	Yes	No	Y (0m)	2.9m	Y
	OB	Roadside	402210	286162	NO_2	Yes	No	Y (0m)	5.5m	Y
	OC	Roadside	402220	286180	NO_2	Yes	No	Y (0m)	3.2m	Y
	OD	Roadside	402193	286235	NO_2	Yes	No	Y (0m)	5.2m	Y
	OE	Roadside	402207	286252	NO_2	Yes	No	Y (0m)	4.0m	Y
	OF	Roadside	402176	286294	NO_2	Yes	No	N	0.1m	Y
	OG	Roadside	402178	286347	NO_2	Yes	No	N	1.6m	Y
	OH	Roadside	402212	286173	NO_2	Yes	No	N	0.1m	Y
	OI	Roadside	402200	286264	NO_2	Yes	No	N	0.1m	Y

Area	Site ID	Site Type	OS Grid Reference		Pollutants Monitored	In AQMA?	Is Monitoring Co-located with a Continuous Analyser	Relevant Exposure?	Distance to Kerb of Nearest Road (m)	Does this Location Represent Worst-Case Exposure?
			X	Y						
	OJ	Roadside	402194	286246	NO_2	Yes	No	N	0.1m	Y
	OP4	Roadside	402222	286098	NO_2	Yes	No	N	5.5m	Y
	C9A	Roadside	402135	286654	NO_2	Yes	No	Y (0m)	2.6m	Y
	C9D	Kerbside	402160	286554	NO_2	Yes	No	N	0.6m	Y
	C10A	Roadside	402258	286053	NO_2	Yes	No	Y (0m)	4.0m	Y
	C10D	Kerbside	402258	286049	NO_2	Yes	No	N	1.0m	Y
	N2A	Roadside	402279	286049	NO_2	Yes	No	N	0.8m	Y
	N2B	Kerbside	403224	288467	NO_2	Yes	No	N	0.2m	Y
	JA	Roadside	403198	287675	NO_2	Yes	No	Y (4.3m)	0.8m	Y
	JB	Roadside	403322	287728	NO_2	Yes	No	Y (8.9m)	2.7m	Y
	MA	Roadside	400712	289296	NO_2	Yes	No	Y (1.8m)	2.0m	Y
	MB	Roadside	400711	289302	NO_2	Yes	No	Y (0m)	4.0m	Y
	MC	Roadside	400748	289150	NO_2	Yes	No	Y (1.6m)	0.7m	Y
	MD	Roadside	400773	289131	NO_2	Yes	No	Y (0m)	12.0m	Y
Blackheath	C11A	Roadside	397457	286434	NO_2	Yes	No	Y (0m)	4.9m	Y
	C11D	Kerbside	397421	286381	NO_2	Yes	No	Y (1.3m)	0.5m	Y
	C11E	Kerbside	397398	286366	NO_2	Yes	No	Y (4.5m)	0.1m	Y
	C12A	Roadside	396899	286438	NO_2	Yes	No	Y (0m)	2.5m	Y
	C12D	Kerbside	396872	286454	NO_2	Yes	No	N	0.1m	Y
	C12E	Roadside	396780	286465	NO_2	Yes	No	Y (0m)	3.5m	Y
	UA	Roadside	398146	287639	NO_2	Yes	No	N	2.0m	Y
	UB	Roadside	398208	287749	NO_2	Yes	No	Y (7.4m)	1.2m	Y
	UC	Roadside	398170	287746	NO_2	Yes	No	Y (7.7m)	0.2m	Y

Area	Site ID	Site Type	OS Grid Reference		Pollutants Monitored	In AQMA?	Is Monitoring Co-located with a Continuous Analyser	Relevant Exposure?	Distance to Kerb of Nearest Road (m)	Does this Location Represent Worst-Case Exposure?
			X	Y						
	C15A	Roadside	396867	285536	NO_2	Yes	No	Y	2.0m	Y
M5 J1 – J2	RA	Roadside	401558	290077	NO_2	Yes	No	N	1.1m	Y
	S7N	Urban Background	397996	287880	NO_2	Yes	No	N	36.1m	N
West Bromwich	HA	Roadside	400383	291307	NO_2	Yes	No	N	0.3m	Y
	LA	Urban Background	400187	291601	NO_2	Yes	Yes	N	26.1m	N
	LB	Urban Background	400187	291601	NO_2	Yes	Yes	N	26.1m	N
	LC	Urban Background	400187	291601	NO_2	Yes	Yes	N	26.1m	N
	LD	Urban Background	400394	291415	NO_2	Yes	Yes	N	26.1m	N
	SU	Roadside	400476	291481	NO_2	Yes	No	Y (0m)	7.8m	Y
	C1A	Roadside	400668	291726	NO_2	Yes	No	N	0.3m	Y
	C1D	Roadside	400664	292020	NO_2	Yes	No	N	2.0m	Y
	C2A	Roadside	401050	292898	NO_2	Yes	No	Y (0m)	9.8m	Y
	C2E	Roadside	401059	292966	NO_2	Yes	No	Y (0m)	4.9m	Y
	C4A	Roadside	400619	290153	NO_2	Yes	No	Y (0m)	9m	Y
	C4D	Roadside	400657	290090	NO_2	Yes	No	N	0.3m	Y
	C4E	Roadside	400738	290113	NO_2	Yes	No	N	1.8m	Y
	PS1A	Roadside	400504	291239	NO_2	Yes	No	Y (0m)	6.2m	Y
	PS1B	Roadside	400504	291239	NO_2	Yes	No	Y (0m)	6.2m	Y
	PS2A	Roadside	400525	291251	NO_2	Yes	No	Y (0m)	9.6m	Y
	PS2B	Roadside	400525	291251	NO_2	Yes	No	Y (0m)	9.6m	Y
	N1A	Roadside	399647	290355	NO_2	Yes	No	N	2.1m	Y
	N1B	Kerbside	399615	290358	NO_2	Yes	No	N	0.9m	Y

Area	Site ID	Site Type	OS Grid Reference		Pollutants Monitored	In AQMA?	Is Monitoring Co-located with a Continuous Analyser	Relevant Exposure?	Distance to Kerb of Nearest Road (m)	Does this Location Represent Worst-Case Exposure?
			X	Y						
	EA	Roadside	400869	291102	NO_2	Yes	No	Y(4.8m)	0.8m	Y
	EB	Roadside	400920	290998	NO_2	Yes	No	Y(6.9m)	2.3m	Y
	EC	Roadside	400889	291048	NO_2	Yes	No	Y(7.3m)	10.5m	Y
	ED	Roadside	400368	291123	NO_2	Yes	No	Y(4.0m)	4.5m	Y
	EE	Roadside	400555	291257	NO_2	Yes	No	Y(0m)	3.5m	Y
	EF	Roadside	399800	290557	NO_2	Yes	No	Y(5.2m)	5.5m	Y
	EG	Roadside	399800	290558	NO_2	Yes	No	Y(0m)	4.4m	Y
	EH	Roadside	400666	290458	NO_2	Yes	No	Y(0m)	7.9m	Y
	EI	Roadside	400632	290227	NO_2	Yes	No	Y(0m)	9.1m	Y
Wednesbury	AC	Roadside	399723	296148	NO_2	Yes	No	Y (6.1m)	2.1m	Y
	AD	Roadside	399639	296095	NO_2	Yes	No	Y (10.0m)	1.5m	Y
	AE	Roadside	399702	296115	NO_2	Yes	No	Y (11.2m)	1.8m	Y
	AF	Roadside	399647	296015	NO_2	Yes	No	Y (1.1m)	1.7m	Y
	WW/WW 2	Urban Background	400550	296043	NO_2	Yes	No	Y (0m)	6.5m	Y
	WW3	Roadside	400600	296041	NO_2	Yes	No	Y (0m)	9.1m	Y
	WW4	Roadside	400519	296095	NO_2	Yes	No	Y (4.8m)	1.6m	Y
Tipton	C14A	Roadside	397355	293929	NO_2	Yes	No	N	0.6m	Y
	C14D	Roadside	397353	293930	NO_2	Yes	No	Y (26.0m)	2.4m	Y
	OS2	Roadside	395728	292514	NO_2	Yes	No	Y (0m)	13.7m	Y
	DP1	Roadside	397324	292256	NO_2	Yes	No	Y (1.3m)	3.2m	Y

Area	Site ID	Site Type	OS Grid Reference		Pollutants Monitored	In AQMA?	Is Monitoring Co-located with a Continuous Analyser	Relevant Exposure?	Distance to Kerb of Nearest Road (m)	Does this Location Represent Worst-Case Exposure?
			X	Y						
	DP3	Roadside	397350	292199	NO_2	Yes	No	Y (5.8m)	0.8m	Y
	DP4	Roadside	397344	292214	NO_2	Yes	No	Y (7.1m)	1.5m	Y
	DP5	Roadside	396959	291993	NO_2	Yes	No	Y (2.5m)	0.1m	Y
	TE	Roadside	395057	293073	NO_2	Yes	No	Y (8.0m)	2.75m	Y
	TF	Roadside	395021	395021	NO_2	Yes	No	Y(6.4m)	0.6m	Y
	TG	Roadside	394967	292595	NO_2	Yes	No	Y (5.7m)	2.2m	Y
	TH	Roadside	394880	292576	NO_2	Yes	No	Y (5.3m)	1.7m	Y
	TI	Roadside	394849	292425	NO_2	Yes	No	Y (6.9m	2.2m	Y
	VA	Roadside	397639	292465	NO_2	Yes	No	Y (0m)	3.1m	Y
	VB	Roadside	397686	292483	NO_2	Yes	No	Y (2.9m)	0.3m	Y
	VC	Roadside	397706	292520	NO_2	Yes	No	Y (0m)	2.4m	Y
	VD	Roadside	397,625	292,564	NO_2	Yes	No	Y (5.3m)	2.0m	Y
Cradley Heath	CH2	Roadside	394310	285895	NO_2	Yes	No	N	3.0m	Y
	CH3	Roadside	394537	286032	NO_2	Yes	No	Y (0m)	2.3m	Y
	CH4	Kerbside	394696	286148	NO_2	Yes	No	N	0.9m	Y
	HH1	Urban Background	395754	285492	NO_2	Yes	Yes	N	87m	N
	HH2	Urban Background	395755	285493	NO_2	Yes	Yes	N	87m	N

(1) 0m if the monitoring site is at a location of exposure (e.g. installed on/adjacent to the façade of a residential property).

All diffusion tubes deployed in 2016 were prepared in 50% Triethanolamine in Acetone.

Table A.3 – Annual Mean NO_2 Monitoring Results

Notes: Exceedances of the NO_2 annual mean objective of 40µg/m^3 are shown in **bold**.

Site ID	Location	Site Type	Located within an AQMA	Valid Data Capture 2016 (%)	Annual Mean NO_2 Concentration µg/m^3						
					2010	2011	2012	2013	2014	2015	2016
West Bromwich	Highfields, West Bromwich	Urban Background	Y	0%	29.8	25.6	26.6[3]	29.8	28.8	21.3 (23.2)[5]	N/A
Birmingham Road	Birmingham Rd, Oldbury	Roadside	Y	84.8%	**46.5**	**41.7**	**44.2**	**42.0**	**42.2**	**41.5**	39.8
Wilderness Lane	Great Barr	Roadside	Y	46.1%	39.2	**46.8**	32.6	31.8	30.5	21.1 (28.4)[5]	26.0 (31.5)[6]
Haden Hill	Haden Hill Park, Cradley Heath	Urban Background	Y	46.5%	24.1	17.8	19.1	20.7	17.3	16.5	14.0 (17.0)[6]
Bearwood Road OPSIS[1]	Bearwood Rd, Smethwick	Roadside	Y	87.8%	**62.4**[2]	**69.8**[2]	**51.9**	**47.2**	**46.3**	**42.8**	**41.0**
West Bromwich Roadside	Cronehills Linkway, West Bromwich	Roadside	Y	5.4%	-	-	-	-	28.5 (*30.6*)[4]	23.9	34.0 (*25.5*)[4]

[1] OPSIS is an indicative monitoring method only.
[2] see 2016 ASR, [3] See 2016 ASR
[4] West Bromwich Roadside Commenced Monitoring 25 August 2014. Result Annualised from 4 months data as described in Box 3.2 in LAQM TG.09 using data from AURN Background sites Birmingham Tyburn Road and Acocks Green (Short Term mean is presented in brackets)
[5] Data capture <75%, bias adjusted annual mean concentration has been annualised following the procedure described in Technical Guidance LAQM.TG16 Box 7.9 using ratified data from AURN background sites Birmingham Tyburn Road and Acocks Green, Coventry Allesley and Leamington Spa. Short term mean is presented in brackets.
[6] Data capture <75%, bias adjusted annual mean concentration has been annualised following the procedure described in Technical Guidance LAQM.TG16 Box 7.9 using ratified data from AURN background sites Birmingham Tyburn, Birmingham Acocks and Walsall Woodlands. Short term mean is presented in brackets.

Table A.4 – 1-Hour Mean NO_2 Monitoring Results

Notes: Exceedances of the NO_2 1-hour mean objective (200µg/m^3 not to be exceeded more than 18 times/year) are shown in **bold.**

Site ID	Location	Site Type	Located within an AQMA	Valid Data Capture 2016 %	Number of Exceedances of Hourly Mean (200 µg/m^3)						
					2010	2011	2012	2013	2014	2015	2016
West Bromwich	Highfields, West Bromwich	Urban Background	Y	0%	2	0	0 (110.97)[2]	0 (104.3)[2]	0 (115.5)[2]	0 (90.6)[2]	-
Birmingham Road	Oldbury	Roadside	Y	84.8%	1	3	0	0	1 (131.1)[2]	0	0 (131.9)[2]
Wilderness Lane	Great Barr	Roadside	Y	46.1%	0	0	0	0	0	0 (82.7)[2]	0 (90.0)[2]
Haden Hill	Haden Hill Park, Cradley Heath	Urban Background	Y	46.5%	0	0	0	0	0	0	0 (71.0)[2]
Bearwood Road OPSIS	Bearwood Rd, Smethwick	Roadside	Y	87.8%	**28**[1]	1	4	1	4	0	1
West Bromwich Roadside	Cronehills Linkway, West Bromwich	Roadside	Y	5.4%	-	-	-	-	0 (111.6)[2]	0	0 (134.0)[2]

[1] 25 exceedances recorded 6th – 7th December during temperature inversion. The UK was subject to a Cold Weather Cycle
[2] Data Capture less than 90%, 99.8th percentile of the hourly means in presented in brackets

Table A.5 – Annual Mean NO_2 Diffusion Tube Monitoring Results

Notes: Exceedances of the NO_2 annual mean objective of 40µg/m^3 are shown in **bold**.

Location	Site ID	Site Type	Annual Mean Concentration (µg/m^3) - Adjusted for Bias [1]					
			2011 (Bias Adjustment Factor =0.93)	2012 (Bias Adjustment Factor = 1.02)	2013 (Bias Adjustment Factor = Weighted average of 1.01 and 0.81)	2014 (Bias Adjustment Factor = 0.81)	2015 (Bias Adjustment Factor = Weighted average of 0.79 and 0.96)	2016 (Bias Adjustment Factor = 1.01)
Great Barr	KA	UB	27.3	30.4	33.2	27.9	-	-
	KB	UB	27.5	31.0	31.2	29.9	-	-
	KD	UB	30.3	36.7[1]	34.7	31.6	28.7	30.3
	KE	R	29.0	**41.0**[1]	32.1	29.8	27.8	26.2
	QE	R	27.4	30.5	26.0	31.2	36.1	-
	SA	UB	32.4	33.9	29.8	28.6	30.8	31.3
	SB	UB	37.4	33.9	32.6	38.0	-	
	XE	UB	26.9	33.6[1]	32.9[1]	32.9	27.3	30.9
	YC	UB	27.6	29.8[1]	25.0	27.5	-	-
	ZA	R	32.7	36.8[1]	36.1[1]	35.7	29.7	29.3
	ZC	R	34.4	37.7[1]	32.2[1]	25.7	26.8	30.7
	ZK	R	31.6	38.3[1]	32.4[1]	29.4	28.5	30.5
	ZN	R	28.4	32.2[1]	30.3[1]	32.1	-	-
	ZO	R	36.5	36.3	35.4[1]	32.6	31.9	33.2
	ZP	R	33.6	35.8	33.6[1]	34.6	33.8	34.2
	ZQ	R	**41.9**	**47.1**	**46.6**	**49.5**	**44.3**	**50.3**
	ZR	R	**45.5**	**47.8**	**44.2**	**45.8**	**44.3**	**43.5**

Location	Site ID	Site Type	Annual Mean Concentration (µg/m^3) - Adjusted for Bias [1]					
			2011 (Bias Adjustment Factor =0.93)	2012 (Bias Adjustment Factor = 1.02)	2013 (Bias Adjustment Factor = Weighted average of 1.01 and 0.81)	2014 (Bias Adjustment Factor = 0.81)	2015 (Bias Adjustment Factor = Weighted average of 0.79 and 0.96)	2016 (Bias Adjustment Factor = 1.01)
Yew Tree	WA	R	38.0	38.3	34.0	31.2	35.5	32.6
	WB	UB	34.0	30.9[1]	31.5	33.9	30.1	26.8
	WF	UB	33.2	32.7	33.1	30.8	32.5	30.0
Oldbury	BA	R	36.5	**41.1**	38.6	38.6	37.1	34.3
	BB	R	32.2	37.2	36.6	33.3	-	-
	BC	R	38.1	**43.4**	38.9	37.1	-	-
	BD	R	33.4	37.6	36.3	38.1	38.8	**41.6**
	BDQ	R	33.0	38.9	36.8	39.1	36.1	**45.1**
	BE	R	**45.5**	**52.3**	**49.2**	**51.2**	**46.0**	**46.7**
	BF	R	39.6	**46.7**	**40.2**	**42.2**	**41.2**	**40.0**
	BG	R	36.5	**40.6**	**40.0**	**42.0**	**42.4**	38.7
	BO	R	34.7	**40.2**	37.8	37.8	38.1	36.6
	BP	R	37.3	**41.6**	37.6	39.9	39.0	37.6
	BR	R	38.6	**44.0**	38.9	38.6	37.1	**40.6**
	BS	UB	38.9	**47.1**	**40.8**	**44.4**	**40.7**	35.2
	GA	R	38.6	**45.9**	**42.4**	**44.8**	**42.4**	38.8
	GB	R	38.5	**46.0**	**45.4**	**43.3**	**40.3**	37.1
	GC	R	39.5	**46.0**	**41.6**	**45.0**	**41.7**	39.0
	GD	R	**40.0**	**44.2**	**45.1**	**47.1**	**-**	**-**
	S3N	UB	23.0	28.0[1]	29.3	35.2	-	-
	S5N	UB	28.1	33.1[1]	35.4[1]	37.1	-	-
	TA	R	24.5	33.7	31.2	30.2	31.7	29.8
	C5A	R	38.5	39.9	**40.0**[1]	**40.4**	33.1	29.6
	C5D	R	36.2	**42.3**	**40.1**	35.5	34.9	37.7

Location	Site ID	Site Type	Annual Mean Concentration (µg/m^3) - Adjusted for Bias [1]					
			2011 (Bias Adjustment Factor =0.93)	2012 (Bias Adjustment Factor = 1.02)	2013 (Bias Adjustment Factor = Weighted average of 1.01 and 0.81)	2014 (Bias Adjustment Factor = 0.81)	2015 (Bias Adjustment Factor = Weighted average of 0.79 and 0.96)	2016 (Bias Adjustment Factor = 1.01)
	C5E	R	39.6	**45.9**[1]	28.4[1]	30.7	37.2	38.1
	C6A	R	30.8	**43.1**	36.4	32.9	34.5	31.5
	C6D	R	33.1	34.2	30.8	35.7	-	-
	C6E	K	30.3	36.7	35.5	35.5	32.3	31.6
	C7A	R	**45.8**	39.1[1]	29.3	35.6	32.9	25.8
	C7D	K	35.5	39.4	35.7	32.2	36.0	**47.4**
	C7E	R	31.5	**43.8**	38.6	**40.5**	38.2	32.5
	C7F	K	**41.4**	39.3[1]	38.4[1]	35.6	34.1	35.9
	C7H	R	34.4	37.5	25.8	34.3	21.6	27.5
	C7I	R	28.9	33.6	26.8	25.7	-	-
	C13D	R	34.9	**44.8**[1]	30.0	30.0	33.8	30.3
	C13E	R	29.9	33.2	31.0[1]	37.7	-	-
	VT	R	-	-	-	-	-	28.2
Bearwood	OA	R	33.8	39.4	**40.9**	37.3	29.4	36.5
	OB	R	38.3	**46.9**	**47.4**	**43.4**	38.5	38.3
	OC	R	34.7	37.9	**40.6**	**40.4**	31.9	33.4
	OD	R	39.1	**43.1**	**44.5**[1]	**41.8**	**40.4**	36.7
	OE	R	30.5	35.8	35.5	34.9	34.0	34.2
	OF	R	30.7	38.3	37.4	37.0	-	-
	OG	R	35.1	38.7[1]	**40.0**	33.7	31.1	37.3
	OH	R	37.3	**44.5**	**41.3**	**40.0**	34.8	38.3
	OI	R	32.9	35.1	37.5	39.2	33.4	35.7
	OJ	R	**42.1**	36.1[1]	**41.1**	**44.0**	**43.8**	38.9
	OP4	R	34.1	39.6	35.9	37.6	36.8	35.3

Location	Site ID	Site Type	Annual Mean Concentration (µg/m^3) - Adjusted for Bias [1]					
			2011 (Bias Adjustment Factor =0.93)	2012 (Bias Adjustment Factor = 1.02)	2013 (Bias Adjustment Factor = Weighted average of 1.01 and 0.81)	2014 (Bias Adjustment Factor = 0.81)	2015 (Bias Adjustment Factor = Weighted average of 0.79 and 0.96)	2016 (Bias Adjustment Factor = 1.01)
	C9A	R	**41.2**	**42.2**	37.2	36.3	36.0	32.1
	C9D	K	32.4	35.1	**41.4**	39.0	35.1	**40.1**
	C10A	R	**42.9**	**47.5**	**46.8**	**45.6**	**42.1**	**41.0**
	C10D	K	**49.8**	**59.7**	**60.8**	**49.0**	**48.0**	**46.7**
	N2A	R	**43.0**	24.3	27.7	30.5	25.9	26.9
	N2B	K	27.8	31.7	33.4	30.7	-	-
	JA	R	30.6	38.5	31.8[1]	29.4	-	-
	JB	R	31.5	33.8[1]	32.8	31.0	-	-
	MA	R	34.0	39.1	39.4	**40.7**	**45.5**	**45.3**
	MB	R	33.9	36.4	35.0	38.0	-	-
	MC	R	**43.2**	**43.5**[1]	**44.2**	**40.1**	37.3	37.0
	MD	R	22.3	26.3	25.3	28.6	-	-
Blackheath	C11A	R	33.7	39.3	34.7[1]	37.3	31.9	33.6
	C11D	K	**40.9**	**40.5**	32.5[1]	35.8	39.3	38.6
	C11E	K	36.4	**43.1**	35.0[1]	34.2	34.2	36.0
	C12A	R	**51.2**	**52.8**[1]	**49.3**	**50.3**	**49.7**	**45.6**
	C12D	K	**47.1**	**53.4**[1]	**44.2**	**42.7**	39.7	**41.4**
	C12E	R	**41.3**	**40.9**[1]	39.2	35.2	37.3	38.9
	UA	R	**41.8**	**43.2**[1]	**41.3**[1]	32.6	32.7	34.3
	UB	R	35.5	39.9[1]	**40.0**[1]	33.3	34.0	35.8
	UC	R	34.2	**40.5**[1]	**42.3**	37.6	34.4	36.9
	C15A	R	**46.9**	38.7[1]	**49.2**[1]	**41.4**	**43.0**	**41.1**
M5 J1 - J2	RA	R	**40.2**	**40.77**	38.8	38.5	36.1	36.6
	S7N	UB	24.5	23.88	24.2	29.7	-	-

Location	Site ID	Site Type	Annual Mean Concentration (µg/m^3) - Adjusted for Bias [1]					
			2011 (Bias Adjustment Factor =0.93)	2012 (Bias Adjustment Factor = 1.02)	2013 (Bias Adjustment Factor = Weighted average of 1.01 and 0.81)	2014 (Bias Adjustment Factor = 0.81)	2015 (Bias Adjustment Factor = Weighted average of 0.79 and 0.96)	2016 (Bias Adjustment Factor = 1.01)
West Bromwich	HA	R	30.0	34.25	33.6	33.1	30.2	31.2
	LA	UB	21.7	24.65	27.4	26.1	26.0	23.1
	LB	UB	23.3	24.93	26.7	25.9	22.4	23.1
	LC	UB	22.1	25.73	28.1	26.3	26.5	22.5
	LD	UB	27.3	24.82	27.1	27.0	-	
	SU	R	22.8	27.2	27.4	28.6	27.9	23.0
	C1A	R	34.0	35.1	30.9	31.3	**40.5**	31.4
	C1D	R	**40.1**	**48.5**[1]	**45.5**	**42.9**	39.3	**43.0**
	C2A	R	31.8	34.04[1]	32.1	29.3	34.6	33.7
	C2E	R	30.8	35.3	33.4	35.4	33.7	22.1
	C4A	R	**40.7**	38.3	37.8	39.2	36.0	34.8
	C4D	R	**40.5**	**48.3**	**42.8**	**40.4**	39.1	**43.0**
	C4E	R	37.0	39.0[1]	39.5	**40.6**	38.0	38.4
	PS1A	R	34.1	37.8	35.1	33.9	34.6	32.1
	PS1B	R	35.1	39.3	33.9	33.7	-	-
	PS2A	R	34.3	37.3	32.7	36.4	-	-
	PS2B	R	35.0	38.8	31.2[1]	36.7	-	-
	N1A	R	35.2	39.9	35.5[1]	35.8	39.7	**40.4**
	N1B	K	38.2	38.7	34.6[1]	39.0	34.1	33.2
	EA	R	31.2	39.9[1]	29.2	29.7	32.7	23.9
	EB	R	31.4	36.2	32.5	29.4	23.7	17.0
	EC	R	28.1	33.3	31.1	33.5	-	-
	ED	R	38.0	**40.8**	36.8	32.8	31.6	32.1
	EE	R	30.5	37.2	**40.3**	**41.8**	35.6	32.9

Location	Site ID	Site Type	Annual Mean Concentration (µg/m^3) - Adjusted for Bias [1]					
			2011 (Bias Adjustment Factor =0.93)	2012 (Bias Adjustment Factor = 1.02)	2013 (Bias Adjustment Factor = Weighted average of 1.01 and 0.81)	2014 (Bias Adjustment Factor = 0.81)	2015 (Bias Adjustment Factor = Weighted average of 0.79 and 0.96)	2016 (Bias Adjustment Factor = 1.01)
	EF	R	32.5	37.8	36.2[1]	34.4	**41.3**	30.5
	EG	R	30.0	36.5	33.2	29.9	-	-
	EH	R	25.7	27.0	29.5[1]	26.5	-	-
	EI	R	29.0	33.3	32.5	30.6	-	-
Wednesbury	AC	R	24.8	28.7	28.5[1]	**40.9**	25.7	-
	AD	R	**50.7**	**44.3**	39.8[1]	34.3	30.6	26.5
	AE	R	**44.0**	**44.4**	36.4[1]	33.0	37.3	37.6
	AF	R	**42.6**	**40.0**	**40.7**[1]	32.2	-	38.3
	WW/WW2	UB	24.5	28.6	27.8	28.5	-	-
	WW3	R	23.9	20.7[1]	27.1	27.9	-	-
	WW4	R	22.1	25.6	27.2	29.5	-	-
	C14A	R	30.3	35.5[1]	37.1	31.8	32.6	30.4
	C14D	R	33.6	36.3	34.6	34.3	-	-
Tipton	OS2	R	16.0	19.9	20.2	19.0	-	-
	DP1	R	36.8	**40.5**	38.9[1]	33.7	33.3	33.3
	DP3	R	26.9	27.6[1]	27.1	23.6	-	-
	DP4	R	35.2	35.4[1]	35.2[1]	33.5	30.6	26.3
	DP5	R	32.7	36.8[1]	35.2	32.9	-	-
	TE	R	28.5	33.7	33.5	25.6	-	-
	TF	R	18.9	27.94	29.9	31.4	-	-
	TG	R	21.4	34.4[1]	20.1[1]	24.6	-	-
	TI	R	28.6	39.2[1]	24.9[1]	26.0	-	-
	VA	R	25.7	29.0	28.8	39.4	-	-
	VB	R	27.4	29.8	30.5	30.9	-	-

Location	Site ID	Site Type	Annual Mean Concentration (µg/m^3) - Adjusted for Bias [1]					
			2011 (Bias Adjustment Factor =0.93)	2012 (Bias Adjustment Factor = 1.02)	2013 (Bias Adjustment Factor = Weighted average of 1.01 and 0.81)	2014 (Bias Adjustment Factor = 0.81)	2015 (Bias Adjustment Factor = Weighted average of 0.79 and 0.96)	2016 (Bias Adjustment Factor = 1.01)
	VC	R	29.9	33.1	34.3	33.5	-	-
	VD	R	39.8	**42.7**	**42.1**[1]	35.0	32.4	25.0
	TC	R	-	**-**	**-**	-	-	**47.9**
Cradley Heath	CH2	R	27.5	30.2	28.2	30.0	-	-
	CH3	R	27.8	32.4	29.1	32.7	-	-
	CH4	K	24.3	24.8	24.4	27.4	-	-
	HH1	UB	17.3	18.2	17.5	17.7	15.1	18.3
	HH2	UB	18.2	19.8[1]	18.0	17.6	-	-

Table A.6 – Annual Mean PM_{10} Monitoring Results

Notes: Exceedances of the PM_{10} annual mean objective of 40µg/m^3 are shown in **bold.**

Site ID	Location	Site Type	Within AQMA?	Valid Data Capture 2016%	Confirm Gravimetric Equivalent (Y or N/A)	Annual Mean Concentration (µg/m^3)					
						2011	2012	2013	2014	2015	2016
West Bromwich	Highfields, West Bromwich	Urban Background	No	0%	Y	17.2	9.0[1]	17.4 (17.5)[3,6]	15.5	15.7 (19.7)[4,5]	N/A
Birmingham Road	Oldbury	Roadside	No	29.8%	Y	19.1	17.5	21.4	19.2	17.9	15.0 (15.46)[4,10]
Wilderness Lane	Great Barr	Roadside	No	0%	Y	18.4	15.9	14.4	15.4 (15.7)[3,8]	N/A	N/A
Haden Hill	Haden Hill Park, Cradley Heath	Urban Background	No	20.9%	N	18.4[2]	16.0[2]	16.8 (19.1)[2,3,7]	16.0 (15.7)[2,3,9]	N/A	12.0 (14.28)[2,3,11]

[1]. Exceptionally low data capture for 2012 due to station relocation. Result not acceptable for comparison with annual mean objective or with previous years monitoring.
[2]. Results corrected using King's College London Volatile Correction Model as described in Box 3.4 in LAQM TG.09 and geographically specific spreadsheet downloaded from www.volatile-correction-model.info/default.aspx
[3]. Data Capture <75% of full calendar year. Short term mean has been annualised " as in Box 7.9 of TG(16) (https://laqm.defra.gov.uk/documents/LAQM-TG16-April-16-v1.pdf), Two monitoring sites Birmingham Tyburn Road and Nottingham Centre which both form part of the AURN have been used for annualisation.(Short term mean is presented in bracket)
[4]. Data capture <75%, bias adjusted annual mean concentration has been annualised following the procedure described in Technical Guidance LAQM.TG16 Box 7.9 using ratified data from AURN background sites Birmingham Tyburn/Tyburn Road and Leamington Spa. Short term mean is presented in brackets.
[5,6,7,8,9] – see previous Annual Status Reports for short term adjustment factors
[10]. 2016 Short Term Adjustment Factor for Birmingham Road, Oldbury - Ra: 1.03
[11]. 2016 Short Term Adjustment Factor for Haden Hill, Cradley Heath - Ra: 1.19

Table A.7 – 24-Hour Mean PM_{10} Monitoring Results

Notes: Exceedances of the PM_{10} 24-hour mean objective (50µg/m^3 not to be exceeded more than 35 times/year) are shown in **bold.**

Site ID	Location	Site Type	Within AQMA	Valid Data Capture 2016 %	Confirm Gravimetric Equivalent (Y or N/A)	Number of Daily Means > 50µg/m^3					
						2011	2012	2013	2014	2015	2016
West Bromwich	Highfields, West Bromwich	Urban Background	No	0%	Yes	10	N/A[3]	8 (32.9)[1]	5 (26.4)[1]	10 (29.6)[1]	N/A
Birmingham Road	Oldbury	Roadside	No	29.8%	Yes	13	8	9 (35.8)[1]	7 (34.6)[1]	4 (36.2)[1]	1 (32.0)[1]
Wilderness Lane	Great Barr	Roadside	No	0%	Yes	9	6 (30.2)[1]	5 (25.9)[1]	6 (30.4)[1]	No Data	N/A
Haden Hill	Haden Hill Park, Cradley Heath	Urban Background	No	20.9%	No	7[2]	4[2]	4 (29)[1,2]	2 (27.4)[1,2]	No Data	0 (19.0)[1]

[1]. Data capture for full calendar year is less than 90%, 90.4th percentile of 24-hour mean is provided in brackets.

[2]. Results corrected using King's College London Volatile Correction Model, a geographically specific spreadsheet downloaded from www.volatile-correction-model.info/default.aspx

[3]. Low data capture – No reliable monitoring results for comparison with the 24 Hour Mean Objective

Table A.8 – $PM_{2.5}$ Monitoring Results

Site ID	Location	Data Capture 2016 %	Annual Mean µg/m^3						
			2010	2011	2012	2013	2014	2015	2016
Haden Hill	Haden Hill Park Cradley Heath	3.4%	12.2	10.8	9.2	9.8	8.5	6.7	5.0[1]

1. Annual mean of a very low data capture.

Measurements of PM2.5 were taken using a R & P TEOM-1400AB. A volatile correction model is not currently available for $PM_{2.5}$ and therefore the values presented in Table A.8 are uncorrected.

Table A.9 – SO_2 Monitoring Results

Notes: Exceedances of the SO_2 objectives are shown in **bold** (15-min mean = 35 allowed a year, 1-hour mean = 24 allowed a year, 24-hour mean = 3 allowed a year)

Site ID	Location	Site Type	Within AQMA	Data Capture 2016 %	Number of SO_2 Exceedances (percentile in bracket μg/m³)		
					15-minute Objective (266 μg/m³)	1-hour Objective (350 μg/m³)	24-hour Objective (125 μg/m³)
West Bromwich	Highfields West Bromwich	Urban Background	No	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Bearwood OPSIS[2]	Bearwood Road	Roadside	No	87.8%	77.0	40.0	8.0

1. No data capture, analyser offline
2. OPSIS is an indicative monitoring technique providing hourly concentrations only.

Table A.10 – Ozone (O_3) Monitoring Results

Site ID	Location	Data Capture 2016%	Annual mean O_3 concentrations ($\mu g/m^3$)					
			2011	2012	2013	2014	2015	2016
West Bromwich	Highfields West Bromwich	9.1%	61.7	N/A[2]	51.3	47.2	50.0	25.0[3]
Bearwood Road OPSIS[1]	Bearwood Rd	0%	49.1	82.7	61.4	62.8	65.8	N/A[2]

1. Bearwood Road OPSIS is an indicative analyser and the results should be viewed with caution.
2. No data capture due to technical issues.
3. Very low Data Capture - Annual mean result presented, however this has not been annualised.

Table A.11 – Ozone (O_3) Exceedances of the Maximum Daily 8 Hour Running Mean

Site ID	Location	Data Capture 2016%	Number of Daily Maximum O_3 Exceedances based on 8-Hour Running Mean					
			2011	2012	2013	2014	2015	2016
West Bromwich	Highfields, West Bromwich	9.1%	85	N/A[2]	22	11	0	0
Bearwood Rd OPSIS[1]	Bearwood Road	0%	0	1	1	0	0	N/A[2]

1. Bearwood Road OPSIS is an indicative analyser and the results should be viewed with caution.
2. No data capture due to technical issues.

Appendix B: Full Monthly Diffusion Tube Results for 2016

Table B.1 – NO_2 Monthly Diffusion Tube Results - 2016

Site ID	NO_2 Mean Concentrations (µg/m^3)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
													Raw Data	Bias Adjusted (1)	Distance Corrected to Relevant Receptor
AD	36.00	24.10	24.00	21.71	22.41	27.00	17.83	20.53	-	31.37	-	37.68	26.3	26.53	25.4[3,4]
AE	44.49	27.78	32.71	30.35	34.89	35.81	-	25.79	40.90	39.58	46.66	50.07	37.2	37.56	34.0[3]
AF	46.65	34.05	35.61	34.69	36.20	40.80	31.44	36.38	32.15	41.84	-	47.30	37.9	38.30	32.7[3]
BA	44.29	38.47	29.55	30.92	30.86	28.96	25.94	30.53	35.55	34.80	46.64	30.53	33.9	34.26	34.8[3]
BD	38.40	40.53	37.24	40.79	43.77	43.03	29.99	33.63	40.54	43.33	56.30	46.48	41.2	**41.58**	-
BDQ	45.60	44.00	38.83	42.16	39.98	44.88	36.74	40.51	46.90	44.27	59.21	53.04	44.7	**45.12**	-
BE	52.58	47.26	38.73	44.87	44.96	51.33	34.68	38.58	43.12	48.81	55.56	53.80	46.2	**46.65**	**44.2**[3]
BF	44.35	38.36	34.67	35.70	41.97	41.19	30.61	35.53	39.66	40.12	52.00	41.16	39.6	**40.01**	-
BG	43.15	38.21	34.05	42.89	37.82	39.96	26.23	33.42	34.16	37.48	53.27	39.17	38.3	38.70	-
BO	24.29	33.03	36.23	38.55	37.69	40.48	27.98	32.32	36.65	40.52	46.25	40.26	36.2	36.55	-
BP	38.82	42.86	33.30	38.25	32.61	31.06	28.47	34.44	35.33	40.95	49.16	41.03	37.2	37.56	-
BR	41.41	40.96	34.38	37.80	38.48	39.21	34.20	37.56	41.66	38.50	54.18	44.08	40.2	**40.60**	-
BS	49.08	36.91	30.76	31.86	28.89	29.71	26.80	28.71	34.39	35.04	40.90	44.77	34.8	35.17	-

Site ID	NO_2 Mean Concentrations (µg/m^3)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
													Raw Data	Bias Adjusted (1)	Distance Corrected to Relevant Receptor
C10A	40.53	35.20	40.15	46.11	42.43	45.67	33.09	36.06	40.73	35.80	36.64	54.06	40.5	**40.95**	-
C10D	52.86	49.35	55.72	56.35	48.88	56.74	41.74	27.23	39.89	31.72	38.37	56.02	46.2	**46.70**	**45.0**[3]
C11A	38.61	32.83	30.06	30.62	28.18	32.12	26.20	31.16	35.12	-	39.86	40.79	33.2	33.56	-
C11D	42.61	36.73	-	33.95	32.89	35.01	32.30	31.65	38.65	39.02	46.38	50.81	38.2	38.56	36.9[3]
C11E	39.17	31.17	29.69	30.57	31.69	33.29	29.49	42.41	37.38	35.39	43.71	43.91	35.7	36.01	34.6[3]
C12A	54.79	44.56	37.92	39.40	41.25	43.21	40.37	36.66	49.80	42.32	52.58	58.54	45.1	**45.57**	-
C12D	44.47	38.44	-	40.88	36.80	37.99	35.56	35.11	41.92	41.17	51.54	47.16	41.0	**41.41**	30.7[3]
C12E	36.86	33.36	37.81	43.91	38.90	37.46	29.20	27.98	36.99	41.72	51.98	45.78	38.5	38.88	-
C13D	40.51	-	8.80	24.17	32.28	30.37	26.29	24.82	34.10	31.97	46.67	-	30.0	30.30	
C14A	43.71	27.35	27.16	23.08	23.31	23.15	22.45	37.09	33.08	31.12	39.29	-	30.1	30.37	28.5[3]
C15A	50.38	49.66	36.19	38.54	38.16	12.66	38.33	26.11	47.09	40.84	54.89	55.73	40.7	**41.12**	**-**
C1A	49.00	30.94	26.17	24.07	22.63	22.38	25.44	30.27	31.97	28.71	35.70	45.84	31.1	31.40	28.6[3]
C1D	57.30	49.55	38.96	44.70	38.15	-	15.88	-	40.70	40.52	47.49	52.58	42.6	**43.01**	32.6[3]
C2A	37.91	26.97	30.52	29.47	25.89	36.80	25.75	27.24	37.34	39.63	40.61	42.66	33.4	33.73	-
C2E	48.47	34.70	30.87	-	15.78	15.55	16.23	12.41	11.32	8.68	9.54	36.76	21.8	22.07	-
C4A	45.47	31.68	30.31	30.72	26.21	29.47	31.24	28.96	36.72	31.91	43.38	47.12	34.4	34.78	-

Site ID	NO_2 Mean Concentrations (µg/m^3)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
													Raw Data	Bias Adjusted (1)	Distance Corrected to Relevant Receptor
C4D	60.46	40.50	32.71	37.51	32.69	35.88	36.73	36.02	43.95	38.96	54.59	60.79	42.6	**42.99**	35.1[3]
C4E	47.95	36.57	35.43	34.13	34.71	36.67	27.97	31.39	38.30	42.23	45.16	45.74	38.0	38.40	34.2[3]
C5A	32.80	-	34.01	22.12	24.21	28.20	22.44	22.20	29.12	31.55	38.23	37.46	29.3	29.60	-
C5D	43.47	28.36	44.59	26.26	29.07	39.09	29.08	32.90	39.80	39.30	45.89	49.82	37.3	37.68	31.7[3]
C5E	44.08	28.80	40.21	28.88	37.25	36.58	32.27	30.70	39.20	40.19	45.46	49.13	37.7	38.11	37.6[3]
C6A	16.18	28.00	35.55	25.23	28.97	30.38	31.79	30.81	36.56	29.72	37.68	42.76	31.1	31.45	-
C6E	38.78	24.90	35.68	23.27	26.49	27.27	26.61	25.37	32.06	34.73	39.12	41.17	31.3	31.60	31.1[3]
C7A	-	29.45	31.23	32.39	29.41	29.39	14.11	15.72	22.14	25.09	26.73	-	25.6	25.82	-
C7D	51.59	49.60	55.23	41.15	39.88	41.66	39.23	45.67	45.39	42.63	55.41	55.61	46.9	**47.39**	-
C7E	41.29	27.41	31.52	29.66	33.30	31.77	22.28	27.63	31.15	35.33	34.19	40.47	32.2	32.49	-
C7F	47.66	32.15	30.97	32.72	31.53	31.84	30.46	32.26	35.22	35.20	42.72	43.73	35.5	35.89	29.8[3]
C7H	33.69	20.14	20.84	19.06	16.72	17.52	28.57	27.04	34.73	30.95	37.37	40.12	27.2	27.50	-
C9A	37.21	27.78	31.98	24.74	25.27	28.71	23.93	-	36.99	33.44	38.32	41.48	31.8	32.12	-
C9D	40.74	42.07	40.44	43.85	36.30	42.76	-	34.35	37.38	33.48	39.48	46.06	39.7	**40.12**	33.7[3]
DP1	39.20	28.83	30.69	28.81	30.96	32.35	25.62	28.63	30.07	34.63	40.16	45.47	33.0	33.28	29.9[3]
DP4	36.52	23.36	28.04	32.90	21.30	21.27	15.71	17.21	22.86	25.40	33.17	34.24	26.0	26.26	25.6[3]

Site ID	NO_2 Mean Concentrations (µg/m^3)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
													Raw Data	Bias Adjusted (1)	Distance Corrected to Relevant Receptor
EA	39.97	25.87	28.88	25.35	26.70	28.15	23.44	-	10.64	8.94	9.62	32.67	23.7	23.89	23.7[3,4]
EB	8.57	8.06	10.09	12.70	15.32	13.34	15.84	17.89	23.71	25.23	34.41	-	16.8	17.00	-
ED	37.64	27.74	30.83	24.26	30.61	35.57	22.87	27.51	31.54	36.95	35.12	40.29	31.7	32.06	30.0[3]
EE	43.21	35.48	25.64	26.50	33.46	29.55	30.60	28.15	31.30	34.06	39.18	34.25	32.6	32.94	-
EF	36.97	31.22	28.83	26.74	23.08	31.44	20.80	22.78	32.94	32.51	36.72	38.64	30.2	30.52	-
GA	46.35	41.40	42.78	34.08	31.66	32.76	30.90	32.85	39.26	27.48	55.48	46.24	38.4	38.82	-
GB	47.86	43.84	4.97	32.97	31.91	30.85	31.36	30.74	40.07	41.47	54.84	50.21	36.8	37.12	-
GC	47.33	42.00	31.82	33.68	34.57	35.87	31.47	33.13	39.90	35.54	52.90	45.51	38.6	39.03	-
HA	38.22	26.59	30.93	26.70	29.98	32.36	21.04	24.30	30.74	32.63	38.10	38.65	30.9	31.16	28.2[3]
HH1	19.79	17.28	13.70	11.55	12.66	44.29	6.85	9.57	16.21	19.78	22.50	23.70	18.2	18.34	-
KD	31.88	22.38	34.46	31.25	32.22	34.03	18.98	22.54	23.98	38.46	35.60	33.62	29.9	30.25	-
KE	35.53	24.57	23.15	18.91	19.38	20.58	21.25	21.63	29.03	32.37	26.29	38.19	25.9	26.17	-
LA	31.12	22.32	22.59	19.12	17.16	17.85	13.46	16.90	21.69	24.04	29.75	38.16	22.8	23.07	-
LB	33.38	19.88	23.94	18.04	18.72	17.79	15.70	16.03	23.25	23.33	27.51	37.03	22.9	23.11	-
LC	33.26	20.50	20.19	17.50	17.30	16.54	15.22	16.08	21.66	24.55	28.13	35.94	22.2	22.46	-
MA	54.46	41.83	-	41.88	40.89	43.86	42.20	39.85	39.09	39.47	54.49	55.41	44.9	**45.31**	**-**

Site ID	NO_2 Mean Concentrations (µg/m^3)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
													Raw Data	Bias Adjusted (1)	Distance Corrected to Relevant Receptor
MC	54.46	41.83	-	41.88	40.89	43.86	42.20	39.85	39.09	39.47	54.49	55.41	44.9	37.02	-
N1A	42.35	36.17	-	32.24	28.05	36.72	32.26	32.30	37.97	36.84	44.04	44.21	36.6	40.37	37.3[3]
N1B	53.91	-	33.39	29.10	33.41	38.48	32.37	35.95	42.52	38.67	47.94	53.93	40.0	**33**.19	30.4[3]
N2A	45.34	31.70	28.96	26.55	26.96	29.44	28.26	32.07	37.15	33.57	-	41.48	32.9	26.89	-
OA	30.10	23.39	29.31	20.30	25.63	27.94	17.16	22.38	22.97	33.26	41.22	25.83	26.6	36.50	-
OB	42.08	-	33.14	31.71	-	33.90	34.28	33.12	34.99	38.29	38.81	41.09	36.1	38.26	-
OC	46.92	37.50	32.74	30.73	36.26	38.05	37.31	33.59	45.25	32.01	-	46.29	37.9	33.42	-
OD	36.51	29.54	32.98	31.99	32.04	33.78	26.70	29.57	33.44	39.55	37.86	-	33.1	36.73	-
OE	42.06	36.76	37.06	36.95	30.22	33.36	32.25	32.59	40.13	36.34	42.32	-	36.4	34.15	-
OG	30.56	23.53	-	34.45	30.76	38.08	-	33.59	31.95	40.11	35.16	39.90	33.8	37.29	30.9[3]
OH	45.35	29.21	-	33.51	31.27	32.99	36.83	33.97	36.97	40.86	42.64	42.52	36.9	38.27	34.6[3]
OI	38.14	35.27	35.87	35.97	33.64	30.56	34.68	36.79	43.25	37.95	41.96	50.66	37.9	35.71	33.5[3]
OJ	38.66	-	-	32.48	33.64	40.34	19.82	28.33	33.63	45.63	39.58	41.42	35.4	38.92	36.0[3]
OP4	42.22	41.80	35.53	30.76	34.02	31.15	33.02	35.83	45.06	37.42	45.81	49.77	38.5	35.28	-
PS1A	40.77	34.63	31.38	33.57	32.62	36.05	38.44	31.80	35.81	31.91	39.69	32.47	34.9	32.13	-
RA	39.34	36.69	29.11	16.86	26.17	28.61	30.39	29.87	32.57	29.74	37.54	44.78	31.8	36.60	-

Site ID	NO_2 Mean Concentrations (µg/m^3)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
													Raw Data	Bias Adjusted (1)	Distance Corrected to Relevant Receptor
SA	45.09	30.40	25.69	24.86	25.04	24.77	31.43	26.05	32.12	38.45	24.92	43.07	31.0	31.30	-
SU	-	9.24	21.26	28.88	17.32	17.98	14.81	16.74	24.05	29.49	33.64	36.98	22.8	22.99	-
TA	38.50	36.05	27.67	27.68	26.36	<0.56	27.86	28.35	-	31.95	38.20	41.54	29.5	29.81	-
TC	-	-	-	-	-	36.96	44.46	54.26	47.37	35.90	53.97	58.75	47.4	**47.86 (50.9)**[2]	-
UA	39.42	31.30	29.90	31.96	29.62	32.73	25.20	28.13	37.56	36.51	41.47	43.12	33.9	34.25	32.1[3]
UB	43.00	32.78	30.15	32.13	30.85	30.08	29.42	31.12	38.98	35.92	45.12	46.18	35.5	35.83	33.2[3]
UC	45.59	35.50	36.20	31.17	25.89	38.42	26.57	27.41	38.54	40.72	47.17	45.12	36.5	36.89	31.0[3]
VD	23.83	22.84	25.12	22.24	22.67	24.33	16.67	22.07	22.99	26.90	32.61	35.04	24.8	25.02	25.0[3]
VT	-	-	-	-	-	19.91	22.94	23.55	27.76	28.18	32.81	40.29	27.9	28.20 (29.99)[2]	-
WA	45.21	35.74	28.59	29.76	27.22	24.24	28.09	27.19	33.81	25.96	37.14	43.77	32.2	32.55	-
WB	43.09	32.27	22.67	24.43	26.14	<0.59	23.80	24.18	28.88	22.67	31.59	38.40	26.6	26.83	-
WF	43.18	31.91	27.97	26.74	22.19	22.15	24.70	23.33	32.77	24.48	37.42	39.20	29.7	29.97	-
XE	38.58	27.50	33.37	-	-	3.41	20.87	31.25	38.81	34.10	30.75	46.83	30.5	30.85	-
ZA	34.07	25.72	33.47	-	-	4.40	26.66	30.79	31.67	27.36	33.87	42.34	29.0	29.33	-
ZC	39.76	26.39	32.84	-	-	4.00	29.73	31.38	33.79	29.48	36.72	39.40	30.3	30.65	-
ZK	45.24	24.96	29.54	-	-	4.04	29.55	33.62	38.00	27.07	26.57	43.03	30.2	30.46	-

Site ID	NO_2 Mean Concentrations (µg/m^3)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
													Raw Data	Bias Adjusted (1)	Distance Corrected to Relevant Receptor
ZO	**43.52**	27.71	32.22	28.72	27.27	29.59	25.88	30.60	36.63	31.31	35.81	**45.68**	32.9	33.24	-
ZP	**43.09**	26.50	33.13	29.44	35.84	25.60	28.31	30.53	**40.24**	35.24	33.63	**45.05**	33.9	34.22	-
ZQ	54.50	39.52	57.60	43.03	44.26	49.82	45.50	54.18	56.85	48.48	46.04	58.38	**49.8**	**50.34**	-
ZR	45.98	37.13	39.26	38.45		40.27	42.77	47.78	54.05	35.65		49.39	**43.1**	**43.50**	-

1 See Appendix C for details on bias adjustment

2 Data capture is less than 75% therefore an Annualised mean has been calculated from the short term monitoring data (Calculated using methodology described in Box 7.9 Technical Guidance LAQM TG(16)) using background diffusion tube sites HH1, LA, KD and WF. The bias adjusted short term monitoring result is recorded in brackets.

3 Monitoring location is not representative of public exposure. NO_2 concentration has been estimated at the closer receptor using the NO_2 fall-off with distance" calculator (http://laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html), which follows the procedure explained in Box 5.2 of Technical Guidance LAQM.TG(16)

4 Distance correction calculation was undertaken using an adjacent published background concentration, because the measured concentration was lower than the published background concentration for the given diffusion tube location. Recommendation by LAQM Helpdesk 26/4/2012.

Appendix C: Supporting Technical Information / Air Quality Monitoring Data QA/QC

C1: Significant changes to sources / changes to proposed monitoring in 2016

No significant changes to report.

C2: Monitoring / modelling of emissions

New monitoring data from 2016 has found exceedances of the annual mean NO_2 objective at the following previously identified locations within the existing borough wide AQMA:

Sandwell MBC Nitrogen Dioxide Annual Mean Exceedance Areas	
Area	**Description Of Area**
1	Area between M5, Birmingham Road and Blakeley Hall Road - Oldbury
8	Dudley Road East / Roway Lane (A457), Oldbury
10	Newton Road / Birmingham Road (A34), Great Barr
11	Bearwood Road, Smethwick
13	High Street / Powke Lane, Blackheath
14	Bromford Road (including the Kelvin Way / Brandon Way Junction), West Bromwich
15	Trinity Way / Kenrick Way, West Bromwich
16	All Saints Way / Expressway, West Bromwich
22	Gorsty Hill, Blackheath

Sandwell Council will continue to monitor air quality at key locations to confirm the trends in pollutant concentrations, in order to determine whether compliance with the objectives is achieved in future years. Where locations are currently compliant with the objectives, further monitoring will be undertaken to confirm ongoing compliance, with a view to removing identified locations from the list of key exceedance areas within the borough wide AQMA.

At the current time Sandwell will retain its borough wide AQMA, as this is deemed the most effective method for reducing concentrations of NO_2 and other key pollutants such as particulate matter.

C3: QA/QC on monitoring data

Air quality data should meet Quality Control and Quality Assurance (QA/QC) criteria. The purpose of this is to ensure that the concentrations of pollutants measured represent the actual concentrations of pollutants in the atmosphere. In addition, the data must be consistent over time and sufficiently accurate and precise to enable a comparison with the National Air Quality Objectives. Sandwell follows QA/QC procedures laid down in Technical Guidance provided by DEFRA in LAQM.TG(16).

C3.1 Automatic Monitoring

All analysers are calibrated at fortnightly intervals by an experienced Local Authority Officer and the results are scaled and validated every two months. The validation process takes account of: calibration factors, negative or out of range data, rapid 'spikes' in data and comparisons with results from other monitoring stations. This is in accordance with the procedure described in the AURN Operator's Manual.

All monitoring data is collected, scaled and ratified in accordance with Technical Guidance LAQM TG (16). The operation of all monitoring equipment was carried out in accordance with the AEA Site Operator's Manual.

The following automatic analysers are used within Sandwell's monitoring stations:

West Bromwich AURN

APNA370 Ambient NOx
APOA370 Ambient O_3

Tapered Element Oscillating Microbalance (TEOM) with Filter Dynamics Measurement System (FDMS) measuring PM_{10} (Particulate Matter < 10 microns)

West Bromwich Roadside

Teledyne API T200 Ambient NOx

Birmingham Road

APNA370 Ambient NOx

Tapered Element Oscillating Microbalance (TEOM) with Filter Dynamics Measurement System (FDMS) measuring PM_{10} (Particulate Matter < 10 microns)

Wilderness Lane – Great Barr

APNA370 Ambient NOx

Tapered Element Oscillating Microbalance (TEOM) with Filter Dynamics Measurement System (FDMS measuring PM_{10} (Particulate Matter < 10 microns)

Haden Hill

APNA370 Ambient NOx

Tapered Element Oscillating Microbalance (TEOM) 1400AB Measuring PM_{10} (Particulate Matter <10 microns)

Tapered Element Oscillating Microbalance (TEOM) 1400AB Measuring $PM_{2.5}$ (Particulate Matter < 2.5 microns)

Short-term to Long-term Data adjustment

Data with <75% data capture rate were adjusted in accordance with Box 7.9 of LAQM. TG (16), which states that it is permissible to annualise the data using background, roadside or kerbside sites. The data collated from the following sites has been annualised:

Nitrogen Dioxide: Haden Hill, Cradley Heath and Wilderness Lane Great Barr

PM_{10}: Birmingham Road, Oldbury and Haden Hill, Cradley Heath

Data was used from the background AURN sites at Birmingham Tyburn, Birmingham, Acocks Green and Walsall Woodlands for NO_2 and Tyburn Road Birmingham and Leamington Spa for PM_{10}.

Table C.1 Site: Nitrogen Dioxide Wilderness Lane, Great Barr - Annualisation

	Wilderness Lane NO_2 µg/m3	Birmingham Acocks Green NO2 µg/m3	Birmingham Tyburn NO2 µg/m3	Walsall Woodlands NO2 µg/m3		
Annual Mean (AM)	26.00	21.31	28.96	18.40		
Period Mean (PM)		17.88	24.75	14.48		
Ratio (AM/PM)		1.19	1.17	1.27		
					1.21	Average Ratio (Ra)
					31.46	**Annualised Mean**

Table C.2 Site: Nitrogen Dioxide: Haden Hill, Cradley Heath Annualisation

	Haden Hill NO_2 µg/m3	Birmingham Acocks Green NO2 µg/m3	Birmingham Tyburn NO2 µg/m3	Walsall Woodlands NO2 µg/m3		
Annual Meal (AM)	14.00	21.31	28.96	18.40		
Period Mean (PM)		17.88	24.75	14.48		
Ratio (AM/PM)		1.19	1.17	1.27		
					1.21	Average Ratio (Ra)
					16.95	**Annualised Mean**

Table C.3 Site: Nitrogen Dioxide: West Bromwich Roadside Annualisation

	West Bromwich Roadside	Birmingham Tyburn PM_{10} µg/m3	Birmingham Acocks Green NO2 µg/m3	
Annual Mean (AM)	34.00	28.96	21.31	
Period Mean (PM)		39.57	27.74	
Ratio (AM/PM)		0.73	0.77	
			075	Average Ratio (Ra)
			25.50	**Annualised Mean**

Table C.4 Site: PM_{10}: Birmingham Road, Oldbury Annualisation

	Birmingham Road PM_{10} µg/m3	Birmingham Tyburn PM_{10} µg/m3	Leamington Spa PM_{10} µg/m3	
Annual Mean (AM)	15.00	16.19	17.39	
Period Mean (PM)		16.56	14.20	
Ratio (AM/PM)		0.98	1.08	
			1.03	Average Ratio (Ra)
			15.46	**Annualised Mean**

Table C.5 Site: PM_{10}: Haden Hill, Cradley Heath Annualisation

	Haden Hill PM_{10} µg/m3	Birmingham Tyburn PM_{10} µg/m3	Nottingham Centre PM_{10} µg/m3	
Annual Meal (AM)	12.00	16.19	17.42	
Period Mean (PM)		14.27	14.08	
Ratio (AM/PM)		1.13	1.24	
			1.19	Average Ratio (Ra)
			14.28	**Annualised Mean**

PM Monitoring Adjustment

Tapered Element Oscillating Microbalance (TEOM) data is collected and ratified. Filter Dynamics Measurement System (FDMS) TEOM's are considered to be gravimetrically equivalent and therefore require no further adjustment. For non TEOM only instruments measuring PM_{10}, the King's College Volatile Correction Model has been applied to the data.

No such correction has been developed for $PM_{2.5}$ at the current time.

The instruments are manually checked on a fortnightly basis. Instrument filters are changed when the filter loading reaches 80% or is likely to reach 80% before the unit can be visited again. All work is carried out in accordance with the procedures described in the AURN Operator's Manual.

C5.2 Diffusion Tube Monitoring

In 2016 Sandwell used the following diffusion tube supplier: Diffusion tubes were exposed for monthly periods as prescribed in the Diffusion Tube Monitoring Calendar published by DEFRA[6].

[6] http://laqm.defra.gov.uk/diffusion-tubes/data-entry.html

Diffusion Tube Details	
Supplier	Gradko International
Period	2016
Type Of Tube	Nitrogen Dioxide NO_2
Type of Absorbent	Triethanolamine
Method of Tube Preparation	50% TEA in Acetone
Exposure Dates	LAQM Exposure Calendar 2016
Exposure Duration	One Month
Bias Adjustment Factor	1.01

Gradko International follow the procedures set out in the Air Proficiency Testing Scheme (AIR-PT) an independent analytical proficiency testing scheme operated by LGC Standards. AIR offers a number of test samples designed to test the proficiency of laboratories undertaking analysis of chemical pollutants in ambient air.

The results of proficiency testing demonstrated that Gradko had 'Good' precision in 17 out of 18 rounds of testing in 2016. [7]

As a result of difficulties with data capture, Sandwell was unable to submit results to the National co-location study**.**

The 2016 diffusion tube data has been bias adjusted in accordance with technical guidance LAQM TG(16) using a National Bias Correction Factor.

Discussion of Choice of Factor to Use

The National Bias Adjustment Factors were selected because Sandwell's was unable to undertake a co-location study due to difficulties with data capture. Sandwell Council's monitoring sites also cover a large range of site types including urban background, kerbside and roadside and facades of buildings which will result in variations in recorded concentrations. The National Factors are calculated from a range of diffusion tube settings and are deemed representative of all monitoring sites within Sandwell.

[7] Diffusion Tube Precision 2014-2016 https://laqm.defra.gov.uk/assets/tubeprecision2016version0617finalreduced.pdf

Where data capture is below the required 75% (9 months) of the full calendar year, the Annualised Mean has been estimated using the procedure set out in Box 7.9 of LAQM.TG(16) for short term monitoring data and is presented as the annual mean in Table A.2. Where the result has been annualised, the bias adjusted short term annual mean monitoring result is recorded in brackets.

A total of 34 diffusion tubes are sited at locations with no relevant receptor. Tube TC has not been distance corrected because current receptors are too far from the location. The tube is situated in anticipation of nearby future development. Results have been distance corrected using DEFRA's NO_2 Fall-Off with Distance Calculator[8] to the closest receptor. Distance corrected results are presented in Table B.1. Diffusion tubes MC and EB have not been distance corrected because they may be subject to the influence of more than one road.

[8] http://laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html

Appendix D: Map(s) of Monitoring Locations

Figure D.1 Map of Automatic Monitoring Sites

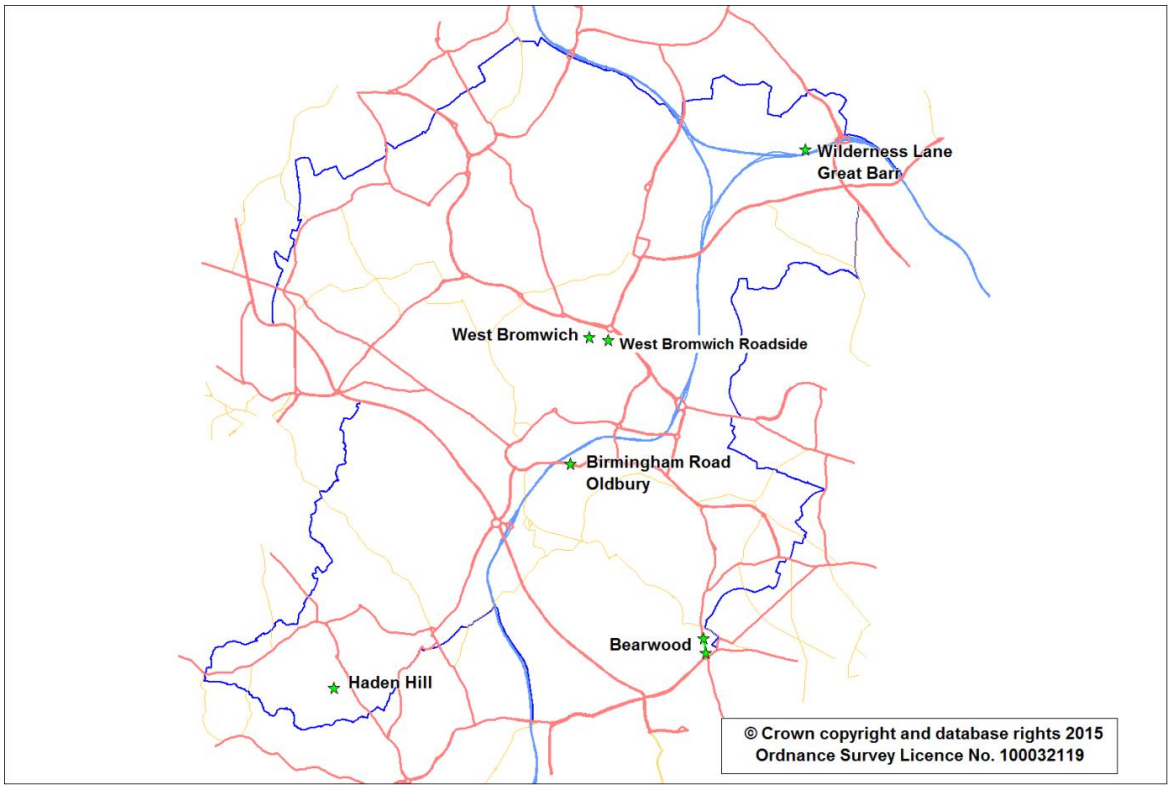
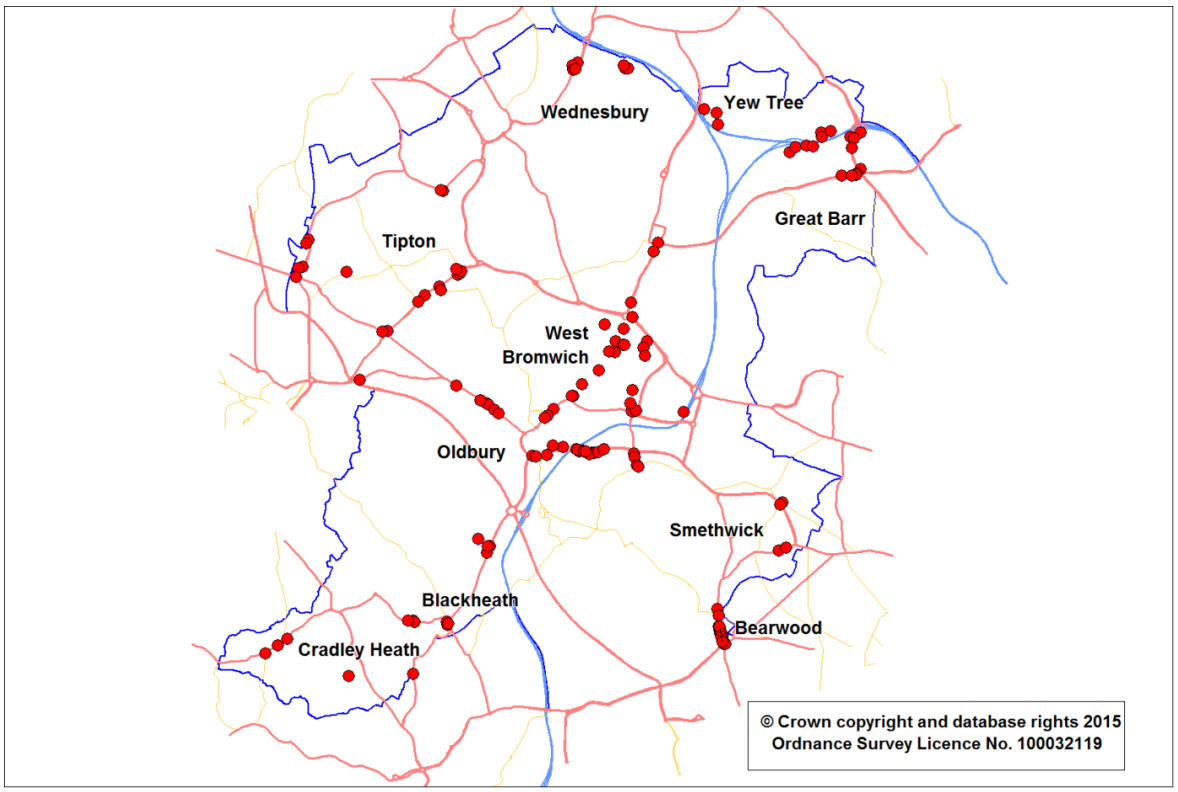


Figure D.2 Map of Non-Automatic Monitoring Sites



Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective[9]	
	Concentration	Measured as
Nitrogen Dioxide (NO_2)	200 µg/m^3 not to be exceeded more than 18 times a year	1-hour mean
	40 µg/m^3	Annual mean
Particulate Matter (PM_{10})	50 µg/m^3, not to be exceeded more than 35 times a year	24-hour mean
	40 µg/m^3	Annual mean
Sulphur Dioxide (SO_2)	350 µg/m^3, not to be exceeded more than 24 times a year	1-hour mean
	125 µg/m^3, not to be exceeded more than 3 times a year	24-hour mean
	266 µg/m^3, not to be exceeded more than 35 times a year	15-minute mean

[9] The units are in microgrammes of pollutant per cubic metre of air (µg/m^3).

Glossary of Terms

Abbreviation	Description
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the local authority intends to achieve air quality limit values'
AQMA	Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives
ASR	Air quality Annual Status Report
DEFRA	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England
EU	European Union
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
LETCP	Low Emission Towns and Cities Programme
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
O_3	Ozone
OPSIS	The OPSIS System measures multiple gases over an Open Path using the DOAS (Differential Optical Absorption Spectroscopy) technique.
PM_{10}	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less
$PM_{2.5}$	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SMBC	Sandwell Metropolitan Borough Council
SO_2	Sulphur Dioxide
TEOM	Tapered Element Oscillating Microbalance
$\mu g/m^3$	Microgrammes per Cubic Metre

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