2017 Air Quality Annual Status Report (ASR)

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

June 2017

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Executive Summary: Air Quality in Our Area

Air Quality in the Borough of Surrey Heath

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[1,2].

The annual health cost to society of the impacts of particulate matter alone in the UK is estimated to be around £16 billion[3].

The Borough of Surrey Heath is located in the South East of England to the southwest of London. The main air quality issues are associated with the emission of pollutants from road traffic, in particular the M3 motorway, the A30, A325, A322 and the A331. The main pollutant of concern is nitrogen dioxide (NO_2), for which Air Quality Objective values are listed in Appendix E (Ref. 1, Ref. 2, Ref. 3). The levels of NO_2 measured along the M3 corridor, between the Frimley flyover and just north of the Ravenswood Roundabout (A325), led to Surrey Heath Borough Council (SHBC) concluding that exceedances of the annual mean objective for NO_2 were likely in this area and in 2002 an Air Quality Management Area (AQMA) was declared (Ref. 4). The following year a more detailed assessment concluded that the AQMA should be extended in both directions along the M3 (Ref. 5). Since then SHBC has determined to continue monitoring within the Borough and to retain the AQMA. Details of the current AQMA can be found in Section 2.1 and at https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=267.

With the exception of road traffic, there are no significant sources of local emissions in the Borough. Under the previous air quality Review and Assessment regime road traffic has consistently been cited as the principal cause of poor air quality in the Borough (Ref. 6).

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

SHBC monitors NO_2 and PM_{10} concentrations at various locations throughout the Borough. At present, no monitoring of $PM_{2.5}$ is carried out, as no areas of concern with respect to $PM_{2.5}$ concentrations have been identified. Monitoring of NO_2 and PM_{10} is carried out at one mobile continuous monitoring station situated in Castle Road, Camberley, approximately 20 metres north of the M3. In addition, the Council monitors NO_2 concentrations using diffusion tubes across a network of 36 sites, including one triplicate site co-located with the continuous monitoring station.

The data capture for the automatic monitoring station in 2016 was 92.4% for NO_2 concentrations and 79.8% for PM_{10} concentrations.

The 2016 annual mean NO_2 concentration for the continuous monitoring location was 36.3 μg/m^3, which is below the annual mean NO_2 objective of 40 μg/m^3. The 2016 result is the lowest concentration recorded at this site since 2012 (see Table A.3).

In 2016 the annual mean NO_2 objective was exceeded at 1 of the 36 diffusion tube monitoring locations that make up the SHBC network – SH7. This is down from 5 locations in 2015. The SH7 monitoring site is located close to the M3 and is outside of the existing AQMA boundary; however, the monitoring site is not representative of public exposure. After distance correction, the 2016 annual mean NO_2 concentration at the closest representative receptor location to SH7 was estimated to be well below the annual mean NO_2 objective. The monitoring results for PM_{10} obtained at the continuous monitoring station in 2016 indicate that monitored concentrations remain well within the relevant air quality objectives. The 2016 results are consistent with those of the last 5 years indicating that exceedances of the PM_{10} air quality objectives are very unlikely. In turn it is inferred that $PM_{2.5}$ concentrations in the Borough are likely to be well below the EU Limit Value of 25 μg/m^3.

The 2016 NO_2 monitoring results indicate, on average, a decrease in annual mean NO_2 concentrations across the Borough in comparison to the previous year. On the basis of the latest monitoring results it is considered appropriate to retain the existing AQMA, and to continue the current level of monitoring. At the present time it is not deemed necessary to amend the AQMA boundaries, despite the monitored exceedance at diffusion tube site SH7. The reason for this is that, after distance correction to the nearest location of relevant exposure NO_2 concentrations are very unlikely to exceed the air quality objectives. The monitoring results for site SH7 and other sites that have recorded NO_2 concentrations close to or in excess of the annual mean objective in recent years will be closely examined during 2017 and the status of the existing AQMA will be reviewed in the 2018 ASR.

Actions to Improve Air Quality

Following the declaration of the AQMA in 2002, SHBC were required to prepare an Air Quality Action Plan (AQAP). The AQAP was adopted in 2005 and set out the measures SHBC intended to implement to address air quality issues in the Borough and to meet the UK air quality objectives. Also included in the AQAP were considerations and options for Highways England (formerly the Highways Agency) to consider. In the 2007 Action Plan Progress Report (Ref. 7), SHBC highlighted that 46 of the 51 proposed actions had been completed, including 25 that were completed on time. However, four of the twelve options for Highways England were rejected and not pursued. Additionally, Highways England stated that they were unlikely to fund any major projects to address air quality.

Since then, in subsequent progress reports (Ref. 8, Ref. 9, Ref. 10), the Council have been unable to secure any specific remedial measures within the AQMA by Highways England, who in 2008 confirmed to the Council that they did not consider the AQMA a high priority within the national programme.

During 2016 there has been no further progress on the Action Plan. The Council remains committed to continuing to implement the outstanding actions in line with the relevant stakeholders, in pursuit of further improving air quality within the Borough. However, the primary source of emissions, the M3 Motorway, is out of the control of the Council and SHBC do not foresee any local measures that can be carried out to reduce traffic emission levels on the M3 other than to support a speed restriction proposal (Ref. 11).

Local Priorities and Challenges

The main priority for 2017 will be to assess the effect of the completed M3 Smart Motorway Scheme (expected 2018) on local air quality. The Council are in contact with Highways England and seeking predicted concentrations. Current modelling suggests there will be no exceedances of the air quality objectives.

While concentrations in 2016 are mostly below the objective, the emissions from the M3 continue to be the greatest challenge, and this is outside the control of the

Council. Once the Smart Motorway work is completed the Council will be looking at monitoring along the M3 to ascertain whether the air quality objectives are achieved such that the AQMA can be revoked. If following the completion of the Smart Motorway works pollutant concentrations continue to exceed the air quality objectives SHBC may pursue a speed limit restriction on the M3 in order to further reduce concentrations.

How to Get Involved

The general public can take simple measures to help improve air quality, the main ones being, where possible, making short trips and journeys on foot or by bike instead of by car, or using public transport. Car sharing with colleagues, or with other parents on the school run, are some other examples of ways to reduce traffic congestion, for example. Other measures are listed below:

- Purchasing low-emission electric and/or hybrid vehicles, with government funding and grants available.
- Upgrading boilers to newest and most efficient gas condensing boilers with lowest NO_x (and carbon) emissions.
- Renewable energy generation via solar photovoltaics or wind turbine installation (although individual effect on air quality is minor and non-local).

Further information can be found at: http://www.surreyheath.gov.uk/residents/environmental-services/noise-nuisance-pollution/air-quality and http://www.ukairquality.net/

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1 Local Air Quality Management

This report provides an overview of air quality in Surrey Heath 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 the Borough of Surrey Heath 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 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.

A summary of AQMAs declared by Surrey Heath Borough Council (SHBC) can be found in Table 2.1 and a map of the boundary can be found in Figure D.2. Further information related to declared or revoked AQMAs, including maps of AQMA boundaries are available online at https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=267.

At the current time the Council proposes to retain the existing Surrey Heath AQMA and continue the current monitoring regime (see monitoring, Section 3 below) until the Smart Motorway work on the M3 is completed by Highways England (expected 2018). At present, no amendments are considered necessary to the AQMA extents. Exceedances of the annual mean NO_2 objective have been measured at locations outside of the AQMA; however, after distance correction of monitored concentrations to locations of relevant exposure, no locations are predicted to have the potential to exceed the annual mean NO_2 air quality objective.

Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Date of Declaration	Pollutants and Air Quality Objectives	City / Town	One Line Description	Is air quality in the AQMA influenced by roads controlled by Highways England?	Level of Exceedance (maximum monitored/modelled concentration at a location of relevant exposure)		Action Plan (inc. date of publication)
						At Declaration	Now	
Surrey Heath AQMA	01/04/2002	NO_2 Annual Mean	Surrey Heath	The strip of land from Frimley Road Camberley to Ravenswood Roundabout Camberley which embraces the M3 Motorway and the houses on both side of the motorway which border the highway	YES			Surrey Heath Borough Council, Air Quality Action Plan, Progress Report 2007
Surrey Heath AQMA	01/04/2002	PM_{10} 24 Hour Mean	Surrey Heath	The strip of land from Frimley Road Camberley to Ravenswood Roundabout Camberley which embraces the M3 Motorway and the houses on both side of the motorway which border the highway	YES			Surrey Heath Borough Council, Air Quality Action Plan, Progress Report 2007

☒ **SHBC confirm the information on UK-Air regarding their AQMA(s) is up to date**

2.2 Progress and Impact of Measures to address Air Quality in Surrey Heath Borough Council

SHBC have attempted to take forward a number of measures since the publication of the previous ASR in pursuit of improving local air quality. However, in 2016 the Council has been unable to make significant progress towards any of the outstanding actions from the original AQAP document. More detail on these measures can be found in the 2007 Action Plan Progress Report (Ref. 7).

Work towards many of the actions proposed in the AQAP has been completed. Work towards completing the remaining actions is ongoing and the Council is committed to completing the outstanding actions over the course of the next reporting year. The outstanding actions are listed in Table 2.2. Progress towards completing these actions has been slower than expected because SHBC has been unable to secure any specific remedial measures within the AQMA as the main source of emissions (the M3 motorway) is under the control of Highways England (Ref. 8). The situation will be reviewed once the Smart Motorways work is completed (expected 2018), and the Council will then make a decision about whether to push for a lowered speed limit through the AQMA.

SHBC anticipates that the measures stated above and in Table 2.2 will ensure continued compliance at locations of relevant exposure within Surrey Heath AQMA. However, SHBC plans to retain the AQMA until after the completion of the Smart Motorways work on the M3.

Table 2.2 – Progress on Measures to Improve Air Quality

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
2	Identify vehicles doing short motorway journeys	Promoting Travel Alternatives Alternatives to private vehicle use	Encourage / Facilitate home-working Workplace Travel Planning Other	SHBC HE SCC		2011			Compliant 2016	2018	NO_2 levels continue to be below AQ objectives at relevant receptors
6	Liaison with HE	Traffic Management Transport Planning and Infrastructure	Strategic highway improvements, Re-prioritising road space away from cars, inc Access management, Selective vehicle priority, bus priority, high vehicle occupancy lane Bus route improvements	SHBC HE SCC			40ug/m^3 at continuous monitoring station	-15% on 2010 figures	Compliant 2016 but work on-going	On-going, expected completion 2018	On-going SMART M3 work due for completion 2018. Dialogue opened 2017 with HE regarding their AQ plans for the SMART M3
7	AQMA extension and liaison with HE	Traffic Management	Strategic highway improvements, Re-prioritising road space away from cars, inc Access management, Selective vehicle priority, bus priority, high vehicle occupancy	SHBC HE SCC						On-going, M3 work completion expected 2018	SMART M3 work due for completion 2018. Retain AQMA to determine the effect on pollution.

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
			lane								
8	Support for national schemes	Promoting Travel Alternatives Traffic Management	Promote use of rail and inland waterways Workplace Travel Planning Reduction of speed limits						On going	On-going, M3 work completion expected 2018	Considering effect of SMART M3 work and possible variable speed controls
9	Contractor vehicle controls	Promoting Low Emission Transport	Public Vehicle Procurement - Prioritising uptake of low emission vehicles					Little or no effect		Complete 2017	
11	Support for SCC schemes	Transport Planning and Infrastructure	Bus route improvements Cycle network	SCC HE				Little or no effect		On-going	A331 Cycle route under development
14	AQ Strategy	Policy Guidance and Development Control	Other policy					Little or no effect		On-going 2017	Low priority
46	Grant application for energy saving project	Promoting Low Emission Transport	Other measure for low emission fuels for stationary and mobile sources Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging					Little or no effect		Completed 2014	Update 2017; Grant applied by SCC to install EV charging in selected places.

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 2.5 µm 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.

To evaluate the local concentrations of $PM_{2.5}$ within the Borough, SHBC makes use of Defra background mapping and modelling. The background annual average $PM_{2.5}$ concentrations in Surrey Heath for 2016 range from 9.9 µg/m^3 to 12.7 µg/m^3. These concentrations are well below the EU Limit Value (25 µg/m^3). In addition, as the monitored PM_{10} concentrations within the Borough are well below the relevant UK Air Quality Objectives (Table A.5 and Table A.6), it would be expected that $PM_{2.5}$ concentrations are also low.

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

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

SHBC undertook automatic (continuous) monitoring at one site located in Castle Road, Camberley during 2016. This site is approximately 17m north of the M3 motorway and is equipped to monitor nitrogen dioxide (NO_2) and particulate matter (PM_{10}) concentrations. The monitoring station is located within the Surrey Heath AQMA.

Table A.1 in Appendix A shows the details of the site. The data from the station are available at http://www.ukairquality.net/. A map showing the location of the monitoring site is provided in Appendix D. Further details on how the monitors are calibrated and how the data have been adjusted are included in Appendix C.

The annual mean PM_{10} concentration for 2016 was 17.1 μg/m^{3,} which is well below the annual mean PM_{10} objective (40 μg/m^3). The daily mean PM_{10} standard of 50 μg/m^3 was exceeded once during the year. Since the data capture for PM_{10} in 2016 (79.8%) was less than 85%, the 90.4th percentile of daily mean PM_{10} concentrations has been calculated. The 90.4th percentile of daily mean PM_{10} concentrations in 2016 was 27 μg/m^3, which is below the objective of 50 μg/m^3 and so it can be concluded that exceedance of the daily mean PM_{10} objective is unlikely. These results are consistent with the results seen at the continuous monitoring location since 2011, with no exceedances of the annual mean or daily mean PM_{10} objectives.

3.1.2 Non-Automatic Monitoring Sites

SHBC undertook non-automatic (passive) monitoring of NO_2 at 36 locations (38 diffusion tubes) during 2016. Table A.2 in Appendix A shows the details of the sites. Maps showing the location of the monitoring sites are provided in Appendix D. Further details on Quality Assurance/Quality Control (QA/QC), "annualisation", distance correction and bias adjustment 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)

Table A.3 (Appendix A) compares the ratified monitored NO_2 annual mean concentrations for the past 5 years with the annual mean NO_2 objective of 40 µg/m^3. Table A.4 (Appendix A) compares the ratified continuous monitored NO_2 hourly mean concentrations for the past 5 years with the hourly mean NO_2 objective of 200 µg/m^3, not to be exceeded more than 18 times per year.

The annual mean NO_2 concentration in 2016 at the Castle Street, Camberley monitoring station was 36.3 µg/m^3, which is lower than the annual mean objective, and lower than the annual mean NO_2 concentration recorded in 2015 (40.4 µg/m^3) and 2014 (50.0 µg/m^3). There were no exceedances of the hourly mean NO_2 standard of 200 µg/m^3, which is fewer than the 18 hours permitted per year to achieve the hourly objective. The monitoring station is located within the existing AQMA. The latest monitoring results indicate that the annual mean NO_2 objective was not exceeded at this location and that the hourly mean NO_2 objective was achieved.

In comparison with the results of previous years, the 2016 result brings an end to the trend of increasing annual mean concentrations that had been apparent since 2011. In addition, the result for 2016 represents a significant decrease in annual mean NO_2 concentration compared with the 2015 period (40.4 µg/m^3). No exceedances of the hourly mean objective value (200 µg/m^3) were recorded during 2016. This is consistent with the results seen over the previous 4 years and is well within the 18 exceedances of the hourly standard allowed per annum.

The full 2016 diffusion tube dataset of raw monthly mean values is provided in Table B.1 (Appendix B).

Annual mean NO_2 concentrations at one NO_2 diffusion monitoring location (SH7) exceeded the annual mean NO_2 objective during 2016 (40.1 µg/m^3). Since 2014, monitored NO_2 concentrations at SH7 have been the highest of all the monitoring sites in SHBC.

SH7 is located close to the M3 outside of the existing AQMA (see Appendix D) but is not at a location of relevant public exposure ("receptor"). After distance correction, the annual mean NO_2 concentration in 2016 at the nearest location of relevant exposure was predicted to be 28.6 µg/m^3 (Figure C.3), which is well below the annual mean NO_2 objective.

As none of the diffusion tube sites recorded annual mean NO_2 concentrations greater than 60 µg/m^3 it is unlikely that there were exceedances of the 1-hour mean objective at any location in 2016.

3.2.2 Particulate Matter (PM_{10})

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

Table A.6 (Appendix A) compares the ratified continuous monitored PM_{10} daily mean concentrations for the past 5 years with the air quality objective of 50 µg/m^3, not to be exceeded more than 35 times per year.

During 2016, the data capture recorded at the Castle Street, Camberley monitoring station was 79.8%. The annual mean PM_{10} concentration in 2016 was 17.1 µg/m^3, which is well below the air quality objective and slightly lower than the concentrations recorded over the preceding 4 years of monitoring. On the basis of the recent years' monitoring results it can be concluded that the annual mean PM_{10} concentrations in the Borough are not currently of concern and future years would not be expected to deviate greatly from the trend of recent years.

There was 1 exceedance of the daily mean PM_{10} standard of 50 µg/m^3 during 2016, which is well within the 35 permitted days for compliance with the daily mean objective. Where PM_{10} data capture is less than 85% the 90.4th percentile of daily mean PM_{10} concentrations is a more appropriate measure for assessing compliance with the daily mean PM_{10} objective. The 90.4th percentile of daily PM_{10} concentrations in 2016 was 27 µg/m^3, which is well below the 50 µg/m^3 threshold that would indicate a potential exceedance of the daily objective. The latest results indicate a reduction in exceedances of the daily PM_{10} standard in comparison to previous years.

In conclusion, recent years' PM_{10} monitoring results indicate that the annual mean and daily mean PM_{10} objectives are unlikely to be exceeded anywhere within the

Borough. SHBC will continue to monitor PM_{10} at Castle Street, Camberley, but no further actions are needed at this time.

Appendix A: Monitoring Results

Table A.1 – Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Inlet Height (m)
CM1	Castle Road, Camberley	Roadside	488647	159807	NO_2; PM_{10}	YES	Chemiluminescent; BAM	20	17	1.5

Notes:

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

(2) N/A if not applicable.

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

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) [(1)]	Distance to kerb of nearest road (m) [(2)]	Tube collocated with a Continuous Analyser?	Height (m)
SH1	A30 Bagshot	Roadside	491010	163344	NO_2	NO	15	2.2	NO	1.75
SH2	Windle Valley Daycare Centre	Roadside	491065	163337	NO_2	NO	30	2.5	NO	1.75
SH3	Snows Ride School Windlesham	Urban Background	492810	164408	NO_2	NO	10	N/A	NO	1.75
SH4	Shaftesbury Road Bisley	Urban Background	494764	159623	NO_2	NO	50	N/A	NO	1.75
SH5	Chestnut Avenue	Roadside	489460	160586	NO_2	NO	37	17	NO	1.75
SH6	Church Lane Bisley	Roadside	494974	159611	NO_2	NO	35	2.3	NO	1.75
SH7	M3 Brickhill roadside	Roadside	496220	164432	NO_2	NO	140	10	NO	1.75
SH8	M3 Brickhill 60m back	Roadside	496168	164467	NO_2	NO	48	62	NO	1.75
SH9	A30 Jolly Farmer	Roadside	489617	161874	NO_2	NO	18	4.8	NO	1.75
SH10	A30 Homebase	Roadside	485861	160112	NO_2	NO	100	3	NO	1.75
SH11	Watchetts School Camberley	Roadside	486933	159006	NO_2	NO	50	6	NO	1.75
SH12	High Street Camberley	Roadside	487490	160788	NO_2	NO	0	2	NO	1.75
SH13	Le Marchant Road	Kerbside	488740	159579	NO_2	NO	25	1	NO	1.75
SH14	Badgers Copse	Kerbside	488603	159675	NO_2	YES	1	1	NO	1.75
SH15	Castle Road, Camberley	Roadside	488647	159807	NO_2	YES	17	17	YES	1.75
SH16	Wood Road	Roadside	486834	158336	NO_2	NO	4	35	NO	1.75
SH17	Guildford Road, Bisley	Roadside	495487	158960	NO_2	NO	15	2	NO	1.75
SH20	Deepcut Bridge Road	Roadside	490354	157214	NO_2	NO	20	2	NO	1.75
SH21	Benner Lane	Urban Background	495137	161092	NO_2	NO	20	N/A	NO	1.75

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
SH22	Castle Road, Camberley	Roadside	488647	159807	NO_2	YES	17	17	YES	1.75
SH23	Red Road/Maultway	Kerbside	490782	160270	NO_2	NO	35	1	NO	1.75
SH24	High Street, Chobham	Roadside	497341	161734	NO_2	NO	3	2	NO	1.75
SH25	Castle Road, Camberley	Roadside	488647	159807	NO_2	YES	17	17	YES	1.75
SH26	College Ride	Urban Background	487762	161393	NO_2	NO	15	N/A	NO	1.75
SH27	361 Guildford Road, Bisley	Roadside	495553	158854	NO_2	NO	0	3	NO	1.75
SH28	Queens Road, Bisley	Roadside	495321	159050	NO_2	NO	50	5	NO	1.75
SH29	Heath Park, Windlesham	Roadside	494223	163481	NO_2	NO	50	0	NO	1.75
SH30	Focus, Frimley Road	Roadside	487184	158428	NO_2	NO	100	20	NO	1.75
SH31	Old Pond Close	Roadside	487022	158419	NO_2	NO	10	20	NO	1.75
SH32	Two Hoots, Old Pond Close	Roadside	486979	158393	NO_2	NO	0	20	NO	1.75
SH33	Wood Road Garages	Roadside	486843	158319	NO_2	NO	20	20	NO	1.75
SH34	Brackendale Road	Roadside	487932	159146	NO_2	YES	0	50	NO	1.75
SH35	Prior End	Roadside	489189	160209	NO_2	YES	20	5	NO	1.75
SH36	Youlden Drive	Roadside	489350	160389	NO_2	YES	30	15	NO	1.75
SH37	Crawley Drive	Roadside	489082	160265	NO_2	YES	20	5	NO	1.75
SH38	Swift Lane	Urban Centre	491704	163144	NO_2	NO	20	15	NO	1.75

Notes:

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

(2) N/A if not applicable.

Table A.3 – Annual Mean NO_2 Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [(1)]	Valid Data Capture 2016 (%) [(2)]	NO_2 Annual Mean Concentration ($\mu g/m^3$) [(3)]				
					2012	2013	2014	2015	2016
CM1	Roadside	Automatic	92	92	34.4	**43.3**	**50.0**	**40.4**	36.3
SH1	Roadside	Diffusion Tube	100	100	23.4	31.1	33.0	27.9	24.7
SH2	Roadside	Diffusion Tube	100	100	22.5	30.5	30.8	28.4	26.3
SH3	Urban Background	Diffusion Tube	100	100	17.6	23.9	24.0	24.4	22.6
SH4	Urban Background	Diffusion Tube	100	100	15.3	19.4	23.3	18.5	18.7
SH5	Roadside	Diffusion Tube	100	100	28.1	37.8	**45.2**	32.2	30.9
SH6	Roadside	Diffusion Tube	100	100	23.5	37.5	34.0	27.5	25.3
SH7	Roadside	Diffusion Tube	100	100	**59.7**	**41.1**	**71.6**	**50.4**	**40.1**
SH8	Roadside	Diffusion Tube	83	83	28.0	31.7	39.1	28.9	26.6
SH9	Roadside	Diffusion Tube	100	100	35.5	**47.3**	**42.2**	31.2	30.1
SH10	Roadside	Diffusion Tube	100	100	32.2	**46.1**	**46.5**	35.0	33.4
SH11	Roadside	Diffusion Tube	92	92	28.9	35.5	38.8	34.6	27.6
SH12	Roadside	Diffusion Tube	83	83	25.5	34.0	35.9	34.9	31.5
SH13	Kerbside	Diffusion Tube	92	92	26.2	32.7	33.6	30.8	30.0
SH14	Kerbside	Diffusion Tube	100	100	29.9	39.5	**40.7**	38.9	33.3
SH15	Roadside	Diffusion Tube	100	100	36.6	**42.0**	**49.0**	**40.1**	33.8
SH16	Roadside	Diffusion Tube	100	100	32.2	**40.8**	**48.0**	**41.6**	34.5
SH17	Roadside	Diffusion Tube	100	100	20.1	26.4	27.3	24.1	23.9
SH20	Roadside	Diffusion Tube	100	100	23.1	29.8	31.7	29.2	26.6
SH21	Urban Background	Diffusion Tube	100	100	18.2	26.8	24.2	22.6	21.4
SH22	Roadside	Diffusion Tube	100	100	33.5	**40.9**	**47.6**	**41.2**	35.6
SH23	Kerbside	Diffusion Tube	100	100	34.0	**44.0**	38.1	29.0	27.6

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2016 (%) (2)	NO_2 Annual Mean Concentration (µg/m^3) (3)				
					2012	2013	2014	2015	2016
SH24	Roadside	Diffusion Tube	100	100	24.2	34.2	43.1	36.4	34.9
SH25	Roadside	Diffusion Tube	100	100	34.7	**42.6**	**48.9**	**40.4**	34.8
SH26	Urban Background	Diffusion Tube	100	100	26.2	29.8	39.0	30.6	28.8
SH27	Roadside	Diffusion Tube	92	92	20.5	28.4	29.6	29.8	29.0
SH28	Roadside	Diffusion Tube	83	83	27.6	31.9	33.5	32.1	30.7
SH29	Roadside	Diffusion Tube	100	100	16.8	22.3	21.6	30.6	31.6
SH30	Roadside	Diffusion Tube	100	100	38.7	**44.0**	**43.5**	**41.1**	37.1
SH31	Roadside	Diffusion Tube	100	100	27.4	37.6	**44.2**	35.0	30.6
SH32	Roadside	Diffusion Tube	100	100	29.7	34.7	39.3	34.4	30.7
SH33	Roadside	Diffusion Tube	100	100	31.6	**47.3**	**50.3**	**43.8**	38.7
SH34	Roadside	Diffusion Tube	83	83	26.4	**46.4**	33.9	35.8	30.1
SH35	Roadside	Diffusion Tube	100	100	26.2	32.9	33.8	32.5	30.3
SH36	Roadside	Diffusion Tube	100	100	26.8	33.7	35.2	33.3	29.0
SH37	Roadside	Diffusion Tube	100	100	31.4	34.5	42.9	38.6	34.0
SH38	Urban Centre	Diffusion Tube	92	92	26.8	36.4	39.9	35.4	35.5

☒ **Diffusion tube data has been bias corrected**

☒ **Annualisation has been conducted where data capture is <75%**

☐ **If applicable, all data has been distance corrected for relevant exposure**

Notes:

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

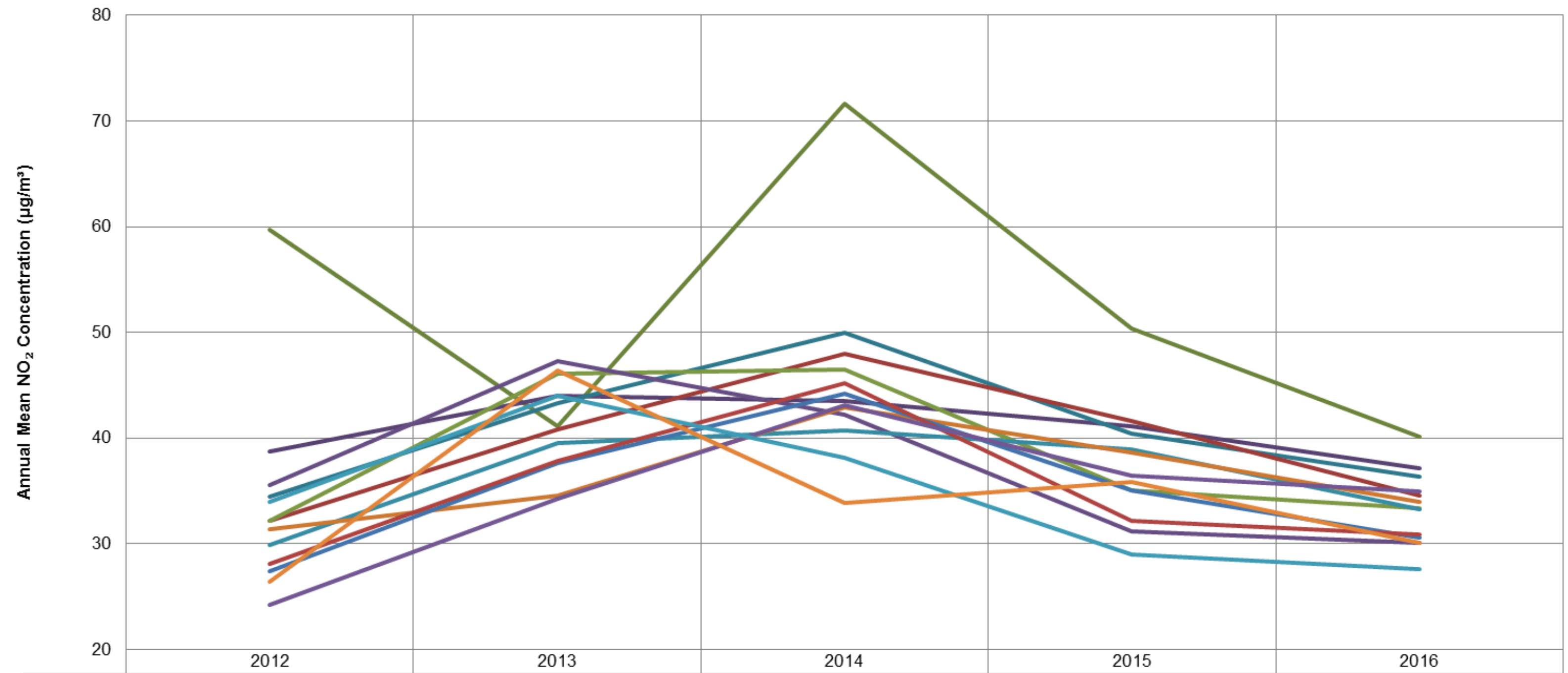
NO_2 annual means exceeding 60µg/m^3, indicating a potential exceedance of the NO_2 1-hour mean objective are shown in **bold and underlined.**

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

(3) Means for diffusion tubes have been corrected for bias. All means have been "annualised" as per Boxes 7.9 and 7.10 in LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

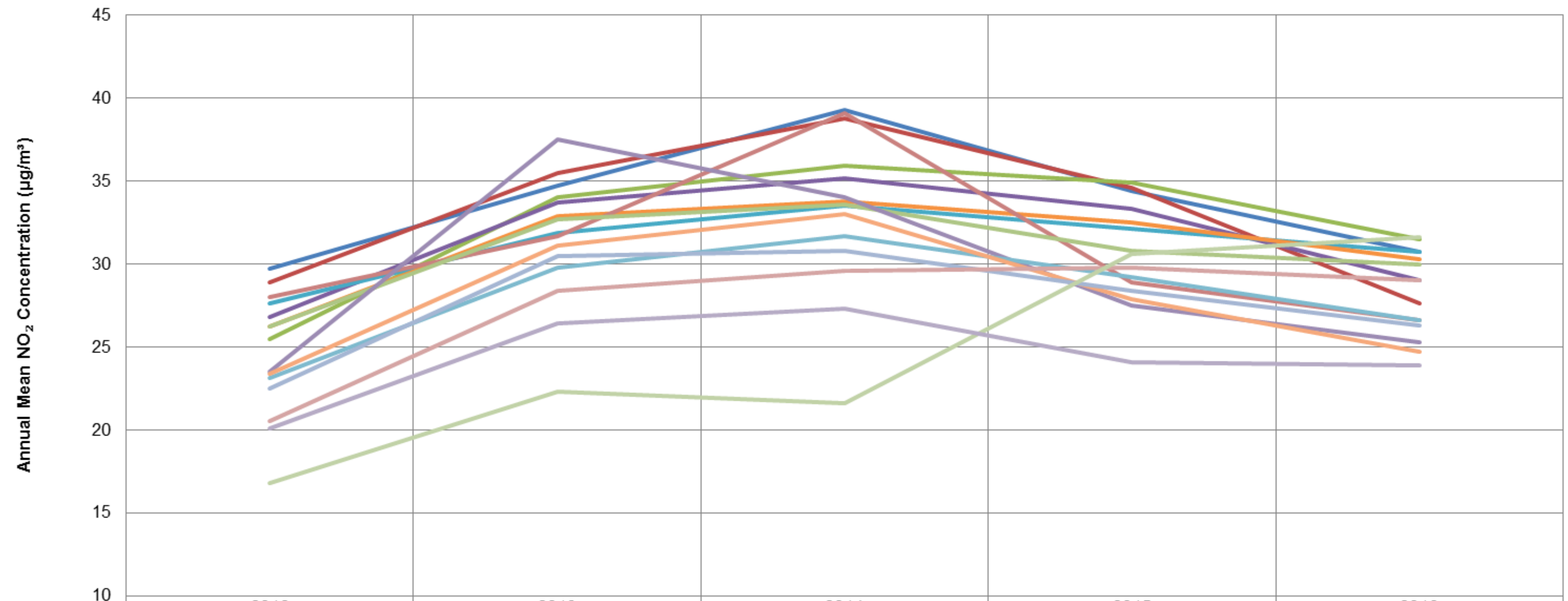
Figure A.1 – Trends in Annual Mean NO_2 Concentrations – Kerbside and Roadside Locations



	2012	2013	2014	2015	2016
SH7	59.7	41.1	71.6	50.4	40.1
SH30	38.7	44.0	43.5	41.1	37.1
CM1	34.4	43.3	50.0	40.4	36.3
SH16	32.2	40.8	48.0	41.6	34.5
SH10	32.2	46.1	46.5	35.0	33.4
SH9	35.5	47.3	42.2	31.2	30.1
SH14	29.9	39.5	40.7	38.9	33.3
SH37	31.4	34.5	42.9	38.6	34.0
SH31	27.4	37.6	44.2	35.0	30.6
SH5	28.1	37.8	45.2	32.2	30.9
SH24	24.2	34.2	43.1	36.4	34.9
SH23	34.0	44.0	38.1	29.0	27.6
SH34	26.4	46.4	33.9	35.8	30.1

Note: Monitoring locations shown in Figure A.1 are Kerbside and Roadside locations which have recorded at least one exceedance of the annual mean NO_2 objective (40 µg/m^3) between 2012 and 2016, inclusive.

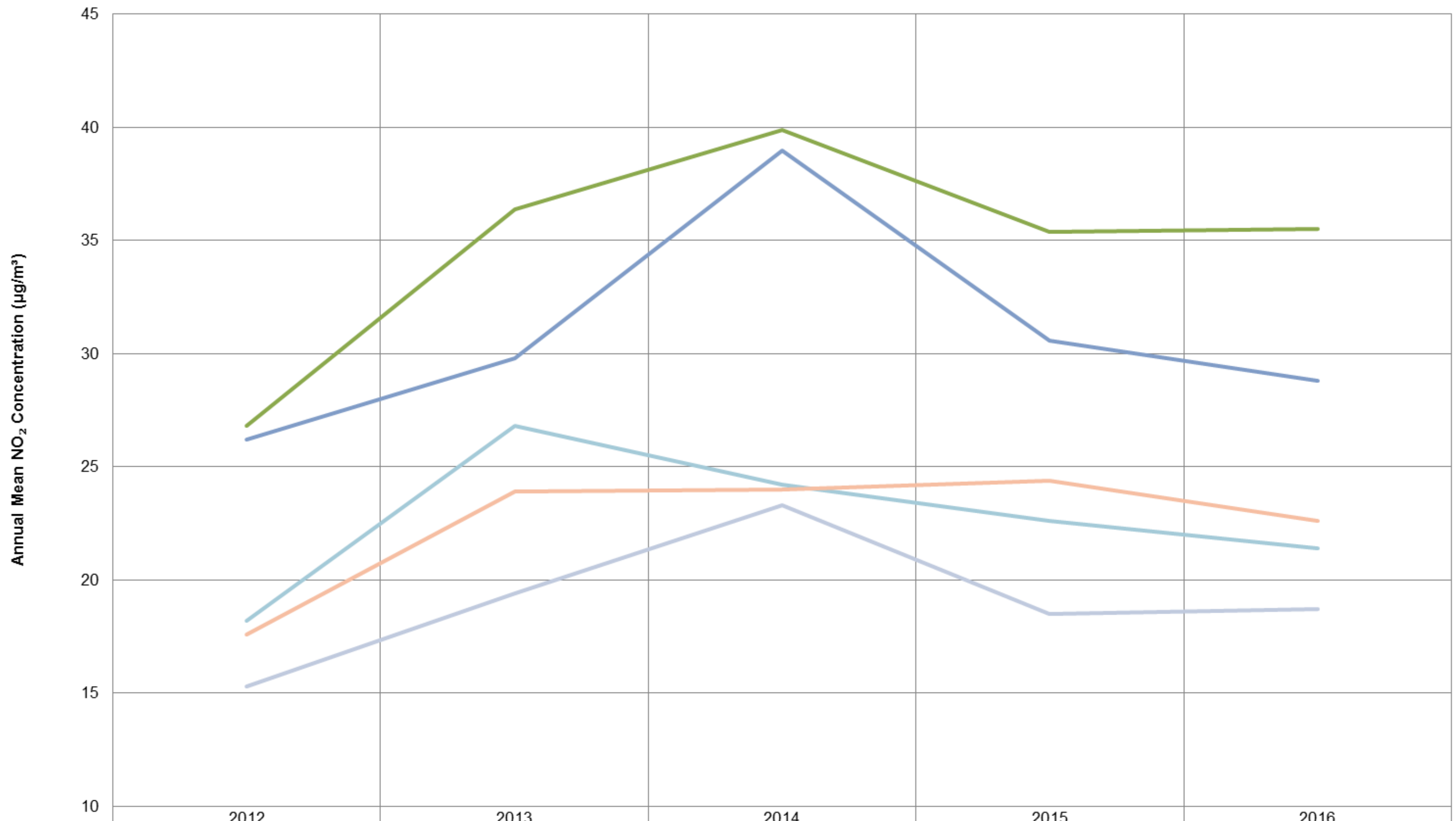
Figure A.2 – Trends in Annual Mean NO_2 Concentrations – Kerbside and Roadside Locations



	2012	2013	2014	2015	2016
SH32	29.7	34.7	39.3	34.4	30.7
SH11	28.9	35.5	38.8	34.6	27.6
SH12	25.5	34.0	35.9	34.9	31.5
SH36	26.8	33.7	35.2	33.3	29.0
SH28	27.6	31.9	33.5	32.1	30.7
SH35	26.2	32.9	33.8	32.5	30.3
SH8	28.0	31.7	39.1	28.9	26.6
SH13	26.2	32.7	33.6	30.8	30.0
SH6	23.5	37.5	34.0	27.5	25.3
SH20	23.1	29.8	31.7	29.2	26.6
SH1	23.4	31.1	33.0	27.9	24.7
SH2	22.5	30.5	30.8	28.4	26.3
SH27	20.5	28.4	29.6	29.8	29.0
SH29	16.8	22.3	21.6	30.6	31.6
SH17	20.1	26.4	27.3	24.1	23.9

Note: Monitoring locations shown in Figure A.2 are Kerbside and Roadside locations which have not recorded any exceedances of the annual mean NO_2 objective (40 µg/m^3) between 2012 and 2016, inclusive.

Figure A.3 – Trends in Annual Mean NO_2 Concentrations – Urban Background Locations



	2012	2013	2014	2015	2016
SH38	26.8	36.4	39.9	35.4	35.5
SH26	26.2	29.8	39.0	30.6	28.8
SH21	18.2	26.8	24.2	22.6	21.4
SH3	17.6	23.9	24.0	24.4	22.6
SH4	15.3	19.4	23.3	18.5	18.7

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

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2016 (%) (2)	NO_2 1-Hour Means > 200µg/m^3 (3)				
					2012	2013	2014	2015	2016
CM1	Roadside	Automatic	94	94	0 (106)	0	2	2 (113)	0

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.**

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

(3) If the period of valid data is less than 85%, the 99.8th percentile of 1-hour means is provided in brackets.

Table A.5 – Annual Mean PM_{10} Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2016 (%) (2)	PM_{10} Annual Mean Concentration (µg/m³) (3)				
				2012	2013	2014	2015	2016
CM1	Roadside	80	80	20.2	22.7	23.7	19.5	17.0

☒ **Annualisation has been conducted where data capture is <75%**

Notes:

Exceedances of the PM_{10} annual mean objective of 40µg/m³ are shown in **bold.**

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

(3) All means have been "annualised" as per Boxes 7.9 and 7.10 in LAQM.TG16, valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Figure A.4 – Trends in Annual Mean PM_{10} Concentrations (CM1)

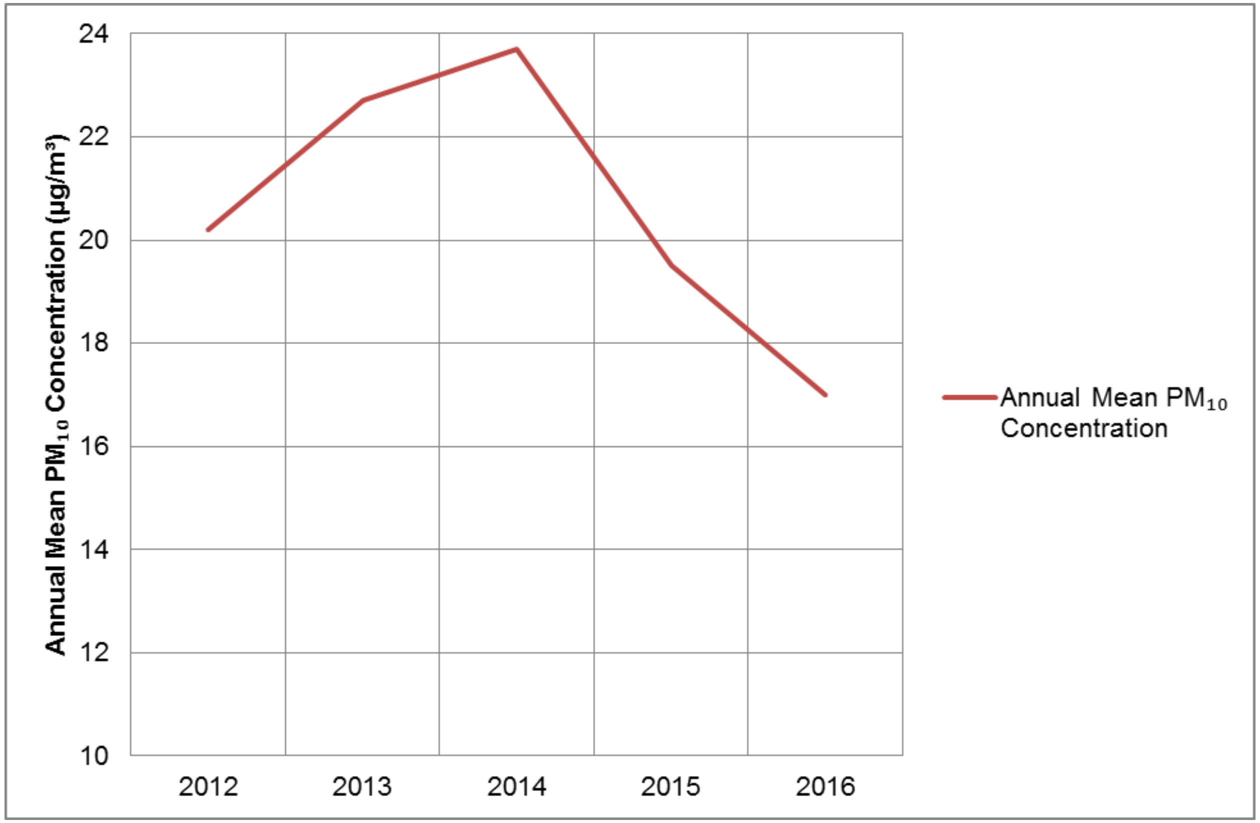


Table A.6 – 24-Hour Mean PM_{10} Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2016 (%) (2)	PM_{10} 24-Hour Means > 50µg/m^3 (3)				
				2012	2013	2014	2015	2016
CM1	Roadside	80	80	2 (27)	2 (30)	2 (32)	8 (33)	1 (27)

Notes:

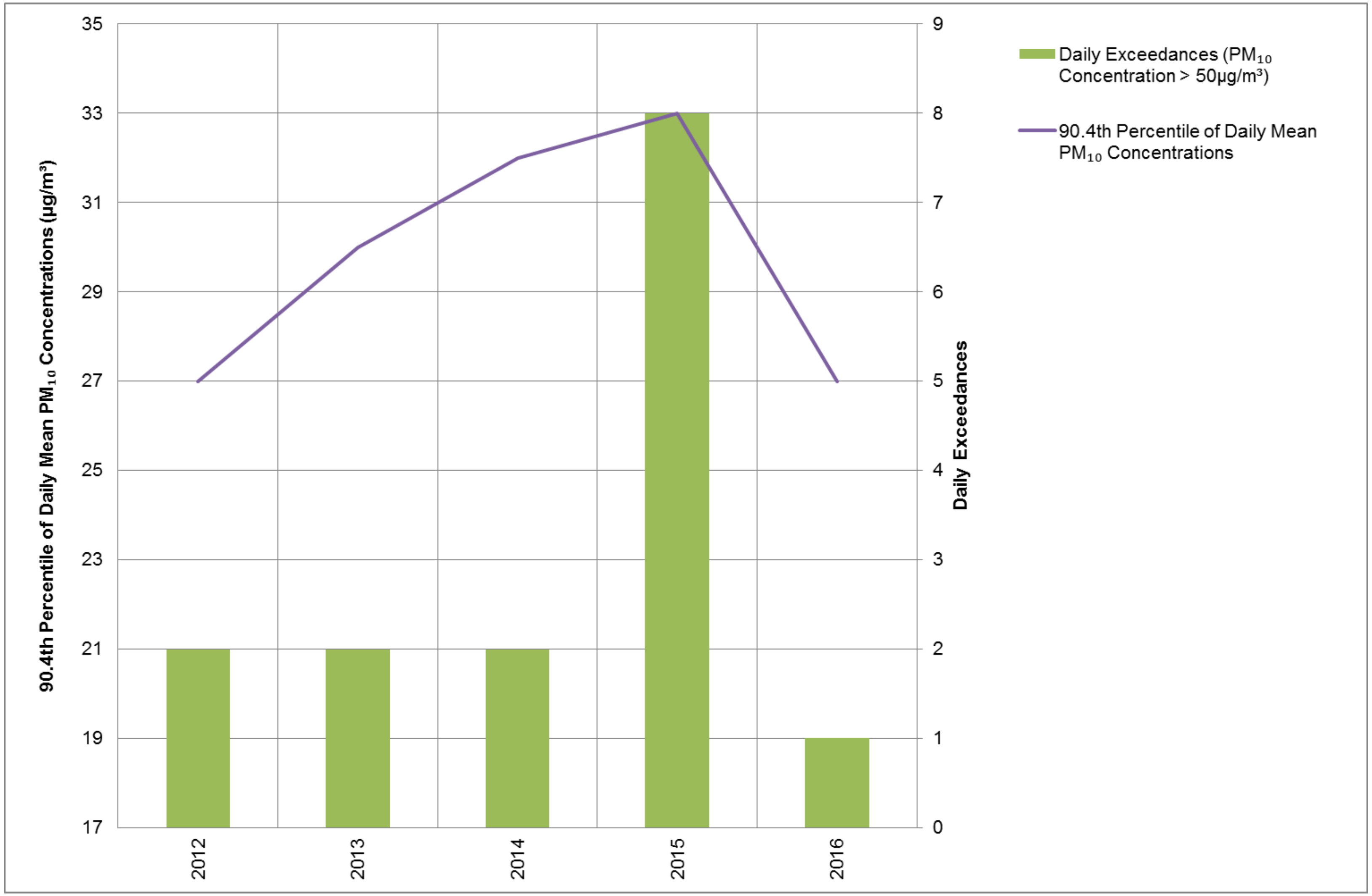
Exceedances of the PM_{10} 24-hour mean objective (50µg/m^3 not to be exceeded more than 35 times/year) are shown in **bold.**

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

(3) If the period of valid data is less than 85%, the 90.4th percentile of 24-hour means is provided in brackets.

Figure A.5 – Trends in Number of 24-Hour Mean PM_{10} Results >50µg/m³ (CM1)



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/m³)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
													Raw Data	Bias Adjusted (1.22) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
SH1	17	21	16	18	21	-	20	21	17	21	23	28	20.3	24.7	
SH2	23	24	19	21	17	18	15	16	17	27	28	34	21.6	26.3	
SH3	18	23	17	16	14	14	17	11	12	22	21	26	18.5	22.6	
SH4	15	18	10	12	12	20	17	10	11	21	18	20	15.3	18.7	
SH5	28	26	24	23	23	19	20	24	25	31	63	58	25.3	30.9	
SH6	25	24	22	20	11	18	15	15	15	28	27	29	20.8	25.3	
SH7	30	31	36	31	29	37	31	32	31	33	33	40	32.8	**40.1**	28.6
SH8	21	24	20	20	19	18	17	20	19	28	25	31	21.8	26.6	
SH9	22	25	20	24	-	16	-	22	24	23	32	39	24.7	30.1	
SH10	31	23	31	27	21	25	21	23	24	34	31	38	27.4	33.4	
SH11	29	21	25	22	15	15	17	18	19	23	33	34	22.6	27.6	
SH12	-	40	20	21	15	25	20	23	22	33	26	39	25.8	31.5	
SH13	-	36	24	-	22	18	19	21	17	25	29	35	24.6	30.0	
SH14	-	49	26	25	26	17	21	21	21	30	31	33	27.3	33.3	
SH15	34	18	30	19	23	24	24	28	28	29	34	41	27.7	33.8	
SH16	35	20	32	28	19	26	22	24	27	26	41	39	28.3	34.5	

Site ID	NO_2 Mean Concentrations (µg/m³)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
													Raw Data	Bias Adjusted (1.22) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
SH17	24	20	20	18	15	16	17	16	16	24	23	26	19.6	23.9	
SH20	24	25	25	23	18	18	17	16	18	25	25	28	21.8	26.6	
SH21	22	24	20	19	12	14	9	11	11	22	19	27	17.5	21.4	
SH22	32	27	30	32	22	24	24	30	28	29	35	37	29.2	35.6	
SH23	23	26	20	27	17	18	13	15	17	30	32	33	22.6	27.6	
SH24	27	27	33	35	23	27	20	24	23	38	32	34	28.6	34.9	
SH25	31	29	30	27	22	23	23	27	31	28	34	37	28.5	34.8	
SH26	28	29	24	19	20	18	15	20	21	27	29	33	23.6	28.8	
SH27	27	24	25	24	14	26	17	20	21	26	30	31	23.8	29.0	
SH28	21	34	25	25	27	-	18	18	19	29	32	29	25.2	30.7	
SH29	24	23	19	-	-	18	15	20	22	27	57	34	25.9	31.6	
SH30	36	32	31	24	25	27	19	34	27	35	38	37	30.4	37.1	
SH31	33	24	23	28	19	19	17	26	23	30	26	33	25.1	30.6	
SH32	28	25	30	24	20	25	15	22	25	28	28	32	25.2	30.7	
SH33	36	27	28	25	21	32	24	33	30	30	50	45	31.8	38.7	
SH34	28	25	23	25	20	19	16	22	22	28	30	38	24.7	30.1	
SH35	-	38	-	20	20	17	18	24	18	29	31	33	24.8	30.3	
SH36	25	23	28	26	20	17	20	22	18	27	29	30	23.8	29.0	
SH37	25	29	29	27	29	20	20	23	24	35	37	36	27.8	34.0	
SH38	25	27	27	28	34	29	17	34	31	27	34	36	29.1	35.5	

☒ **Local bias adjustment factor used**

☐ **National bias adjustment factor used**

☒ **Annualisation has been conducted where data capture is <75%**

Notes:

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

NO_2 annual means exceeding 60µg/m^3, indicating a potential exceedance of the NO_2 1-hour mean objective are shown in **<u>bold and underlined.</u>**

(1) See Appendix C for details on bias adjustment and annualisation.

(2) Distance corrected to nearest relevant public exposure.

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

Diffusion Tube Bias Adjustment

Bias adjustment is a calculated factor which shows whether diffusion tubes are over or under reading ambient concentrations relative to a particular reference point, allowing for an appropriate correction to be made.

National Bias Adjustment Factors

In previous years (2010 – 2012) SHBC has used the national bias adjustment factors database provided by the Defra on the LAQM website (Ref. 14). Diffusion tubes for SHBC are supplied and analysed by Lambeth Scientific Services. The preparation method used is 50% triethanolamine (TEA) / acetone.

A list of the national bias adjustment factors for 2010 to 2016 are summarised in Table C.1 below, and the calculation for 2016 using the LAQM national bias adjustment spreadsheet is shown in Figure C.1.

Table C.1 – National Diffusion Tube Bias Adjustment Factors

Year	Preparation Method	Number of Studies	National Bias Factor
2010	50% TEA / Acetone	4	1.06
2011	50% TEA / Acetone	6	1.06
2012	50% TEA / Acetone	2	0.91
2013	50% TEA / Acetone	1	0.83
2014	50% TEA / Acetone	1	0.80
2015	50% TEA / Acetone	2	1.07
2016	50% TEA / Acetone	1	0.94

Figure C.1 National Diffusion Tube Bias Adjustment Factor Spreadsheet

National Diffusion Tube Bias Adjustment Factor Spreadsheet — Spreadsheet Version Number: 03/17 V2

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

This spreadsheet will be updated at the end of June 2017
LAQM Helpdesk Website

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

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

Step 1: Select the Laboratory that Analyses Your Tubes from the Drop-Down List
If a laboratory is not shown, we have no data for this laboratory.

Step 2: Select a Preparation Method from the Drop-Down List
If a preparation method is not shown, we have no data for this method at this laboratory.

Step 3: Select a Year from the Drop-Down List
If a year is not shown, we have no data[2]

Step 4: Where there is only one study for a chosen combination, you should use the adjustment factor shown with caution. Where there is more than one study, use the overall factor[3] shown in blue at the foot of the final column.
If you have your own co-location study then see footnote[4]. If uncertain what to do then contact the Local Air Quality Management Helpdesk at LAQMHelpdesk@uk.bureauveritas.com or 0800 0327953

Analysed By[1]	Method (To undo your selection, choose (All) from the pop-up list)	Year[5] (To undo your selection, choose (All))	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) ($\mu g/m^3$)	Automatic Monitor Mean Conc. (Cm) ($\mu g/m^3$)	Bias (B)	Tube Precision[6]	Bias Adjustment Factor (A) (Cm/Dm)
Lambeth Scientific Services	50% TEA in acetone	2016	KS	Marylebone Road Intercomparison	12	84	79	6.1%	G	**0.94**
Lambeth Scientific Services	50% TEA in acetone	2016		**Overall Factor[3] (1 study)**				Use		**0.94**

Local Bias Adjustment Factor from Co-location Study

As a triplicate diffusion tube array is co-located alongside the continuous NO_2 monitoring site in Castle Road, Camberley, a local bias adjustment factor has been calculated (Ref. 15). A local bias adjustment factor is generally preferred over a national bias adjustment factor, as local influences that may affect diffusion tube results, such as meteorological conditions, are usually better captured by a local factor.

NO_2 concentration data from the continuous monitoring station for 2016 was collated to cover the period of diffusion tube monitoring. Period mean NO_2 concentrations and data capture statistics for the Castle Street, Camberley station were calculated for each diffusion tube exposure period.

It is possible to use either a local bias adjustment factor calculated using all periods, whether or not data capture or precision is adequate (shown in orange box in Figure C.2), or a local factor derived only from periods with adequate data capture and precision (blue box in Figure C.2). In this report, the local factor of 1.22 determined using only the periods with adequate data capture and precision.

Figure C.2 Local Bias Adjustment Factor Spreadsheet

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements										Automatic Method		Data Quality Check	
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 μgm⁻³	Tube 2 μgm⁻³	Tube 3 μgm⁻³	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean	Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
1	06/01/2016	11/02/2016	34	32	31	32	1.5	5	3.8	40.3	72	Good	or Data Capture
2	11/02/2016	15/03/2016	18	27	29	25	5.9	24	14.6	43.2	100	Poor Precision	Good
3	15/03/2016	07/04/2016	30	30	30	30	0.0	0	0.0	39.6	100	Good	Good
4	07/04/2016	04/05/2016	19	32	27	26	6.6	25	16.3	35.1	100	Poor Precision	Good
5	04/05/2016	07/06/2016	23	22	22	22	0.6	3	1.4	33.4	97	Good	Good
6	07/06/2016	30/06/2016	24	24	23	24	0.6	2	1.4	29.3	100	Good	Good
7	30/06/2016	10/08/2016	24	24	23	24	0.6	2	1.4	26.2	59	Good	or Data Capture
8	10/08/2016	08/09/2016	28	30	27	28	1.5	5	3.8	31.4	100	Good	Good
9	08/09/2016	05/10/2016	28	28	31	29	1.7	6	4.3	34.1	100	Good	Good
10	05/10/2016	03/11/2016	29	29	28	29	0.6	2	1.4	34.7	100	Good	Good
11	03/11/2016	07/12/2016	34	35	34	34	0.6	2	1.4	43.0	99	Good	Good
12	07/12/2016	04/01/2017	41	37	37	38	2.3	6	5.7	40.9	100	Good	Good
13													

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

Overall survey --> Good precision | Good Overall DC

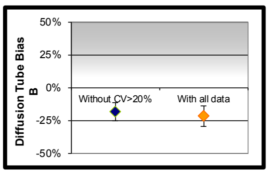
Site Name/ ID: Camberley

Precision 10 out of 12 periods have a CV smaller than 20%

(Check average CV & DC from Accuracy calculations)

Accuracy (with 95% confidence interval)	
without periods with CV larger than 20%	
Bias calculated using 8 periods of data	
Bias factor A	1.22 (1.13 - 1.33)
Bias B	-18% (-25% - -11%)
Diffusion Tubes Mean:	29 μgm⁻³
Mean CV (Precision):	3
Automatic Mean:	36 μgm⁻³
Data Capture for periods used:	99%
Adjusted Tubes Mean:	36 (33 - 39) μgm⁻³

Accuracy (with 95% confidence interval)	
WITH ALL DATA	
Bias calculated using 10 periods of data	
Bias factor A	1.28 (1.16 - 1.42)
Bias B	-22% (-29% - -14%)
Diffusion Tubes Mean:	29 μgm⁻³
Mean CV (Precision):	8
Automatic Mean:	36 μgm⁻³
Data Capture for periods used:	100%
Adjusted Tubes Mean:	37 (33 - 41) μgm⁻³



Jaume Targa, for AEA
Version 04 - February 2011

If you have any enquiries about this spreadsheet please contact the LAQM Helpdesk at: LAQMHelpdesk@uk.bureauveritas.com

Decision of Adjustment Factor

In this report, the local bias adjustment factor has been used, for the following reasons. Firstly, the local bias factor is likely to be more representative of the local area. Secondly, the nationally-derived bias adjustment factor is based on only one study located in one of the most polluted locations in the UK where the potential for diffusion tubes to overestimate NO_2 concentrations is considered greatest. Thirdly, the local bias adjustment factor, while outside the normal range expected, allows for worst-case NO_2 concentrations to be assessed.

Continuous Monitoring Short-term to Long-term Adjustment ('Annualisation')

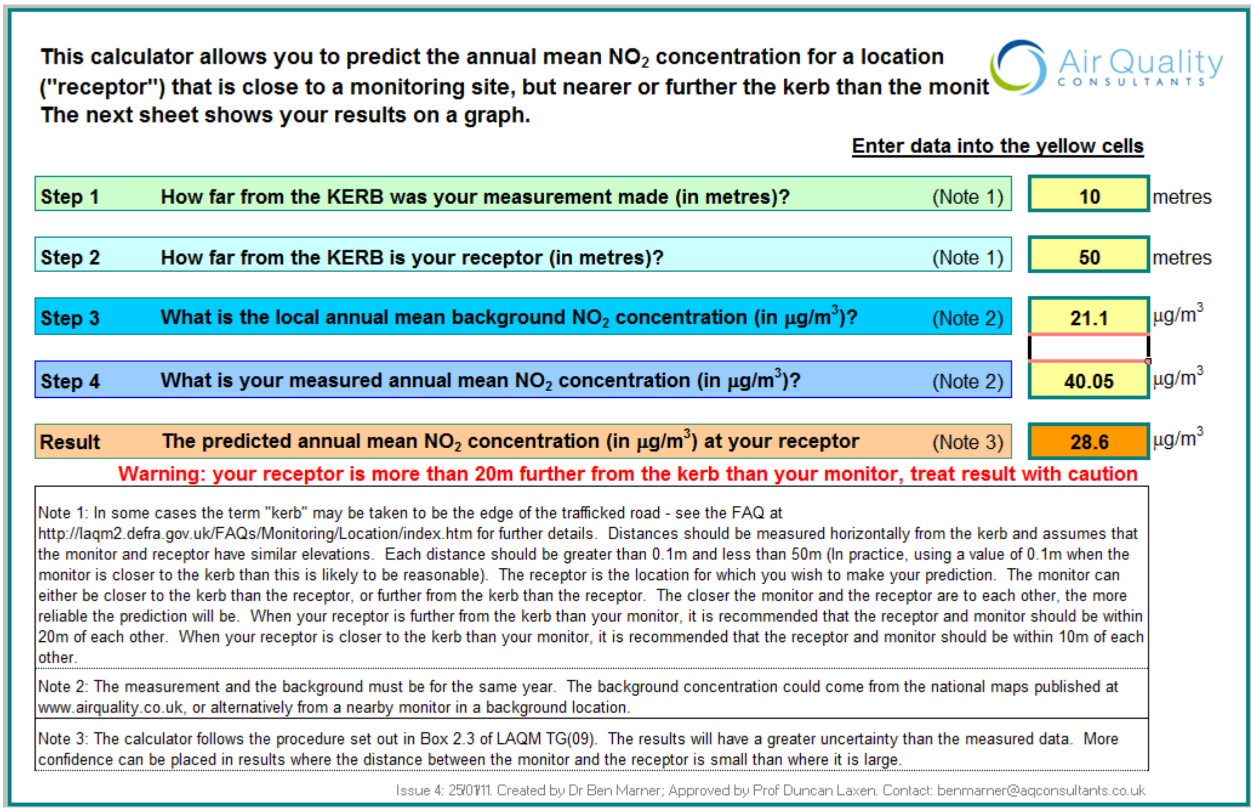
In 2016 there was not need to calculate "annualisation" adjustment factors as all sites achieved greater than 75% data capture.

Annual Mean NO_2 Correction for Façade Distance Calculations

If an exceedance is measured at a monitoring site which is not representative of public exposure, Technical Guidance LAQM.TG16 suggests that a distance correction calculation should be carried out to estimate the annual mean NO_2 concentration at the nearest location of relevant exposure ("receptor") using the measurements made at the monitoring site (Ref. 18).

For the 2016 NO_2 Diffusion Tube results, this tool has been used at all monitoring sites that exceeded the annual mean NO_2 objective value, to predict whether the annual mean objective is likely to also be exceeded at the nearest location of relevant exposure.

Figure C.3 Façade distance correction calculation for Site SH7



This calculator allows you to predict the annual mean NO_2 concentration for a location ("receptor") that is close to a monitoring site, but nearer or further the kerb than the monit
The next sheet shows your results on a graph.

Air Quality CONSULTANTS

Enter data into the yellow cells

Step 1	How far from the KERB was your measurement made (in metres)?	(Note 1)	10	metres
Step 2	How far from the KERB is your receptor (in metres)?	(Note 1)	50	metres
Step 3	What is the local annual mean background NO_2 concentration (in µg/m^3)?	(Note 2)	21.1	µg/m^3
Step 4	What is your measured annual mean NO_2 concentration (in µg/m^3)?	(Note 2)	40.05	µg/m^3
Result	The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor	(Note 3)	28.6	µg/m^3

Warning: your receptor is more than 20m further from the kerb than your monitor, treat result with caution

Note 1: In some cases the term "kerb" may be taken to be the edge of the trafficked road - see the FAQ at http://laqm2.defra.gov.uk/FAQs/Monitoring/Location/index.htm for further details. Distances should be measured horizontally from the kerb and assumes that the monitor and receptor have similar elevations. Each distance should be greater than 0.1m and less than 50m (In practice, using a value of 0.1m when the monitor is closer to the kerb than this is likely to be reasonable). The receptor is the location for which you wish to make your prediction. The monitor can either be closer to the kerb than the receptor, or further from the kerb than the receptor. The closer the monitor and the receptor are to each other, the more reliable the prediction will be. When your receptor is further from the kerb than your monitor, it is recommended that the receptor and monitor should be within 20m of each other. When your receptor is closer to the kerb than your monitor, it is recommended that the receptor and monitor should be within 10m of each other.

Note 2: The measurement and the background must be for the same year. The background concentration could come from the national maps published at www.airquality.co.uk, or alternatively from a nearby monitor in a background location.

Note 3: The calculator follows the procedure set out in Box 2.3 of LAQM TG(09). The results will have a greater uncertainty than the measured data. More confidence can be placed in results where the distance between the monitor and the receptor is small than where it is large.

Issue 4: 25/01/11. Created by Dr Ben Marner; Approved by Prof Duncan Laxen. Contact: benmarner@aqconsultants.co.uk

The 2016 monitored annual mean NO_2 concentration at site SH7 was 40.1 µg/m^3. After distance correction, the annual mean NO_2 concentration at the nearest location of relevant exposure to site SH7 was estimated to be well below the annual mean NO_2 objective.

Appendix D: Maps of Monitoring Locations and AQMAs

Figure D.1 Map of Monitoring Locations in West of the Borough of Surrey Heath

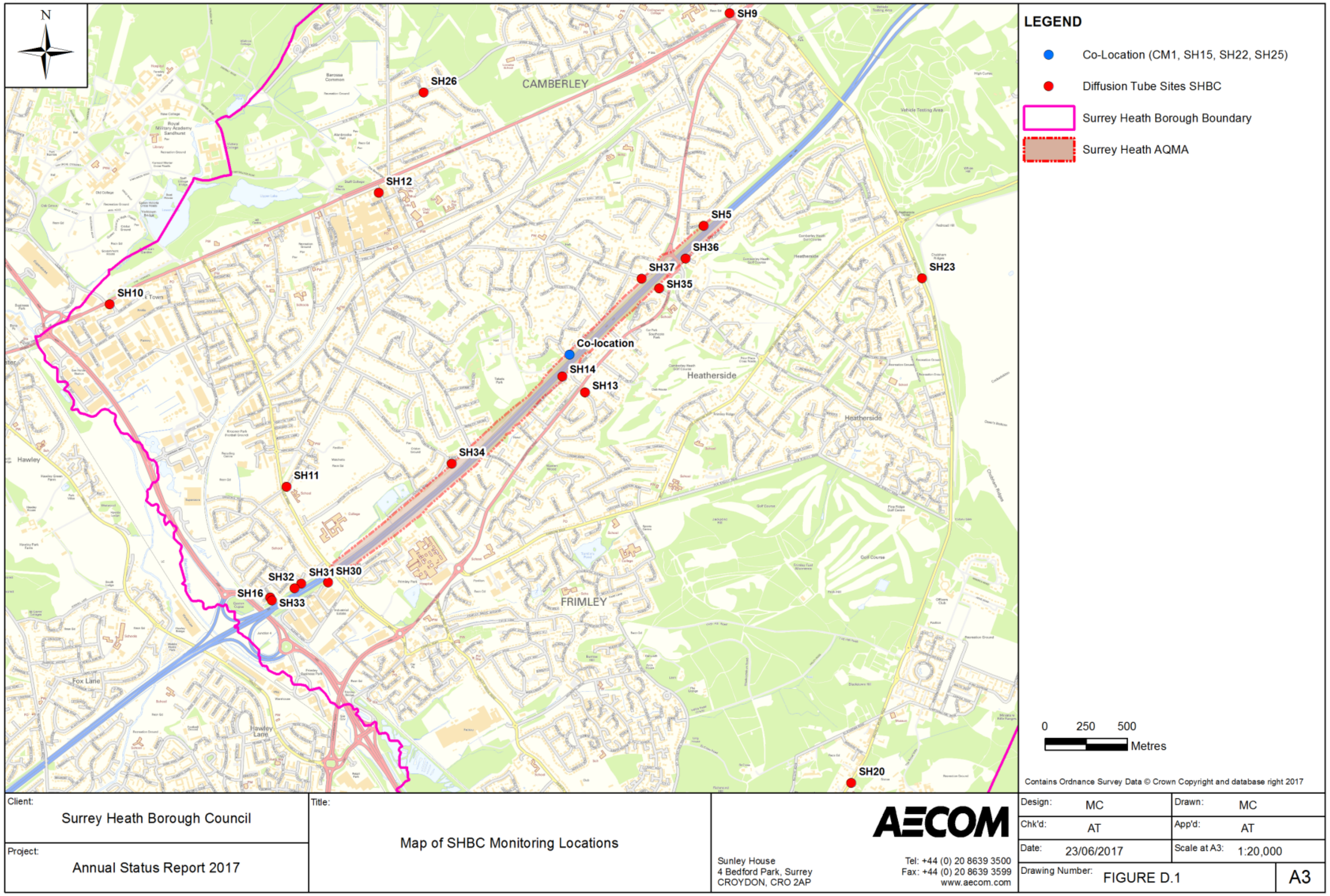
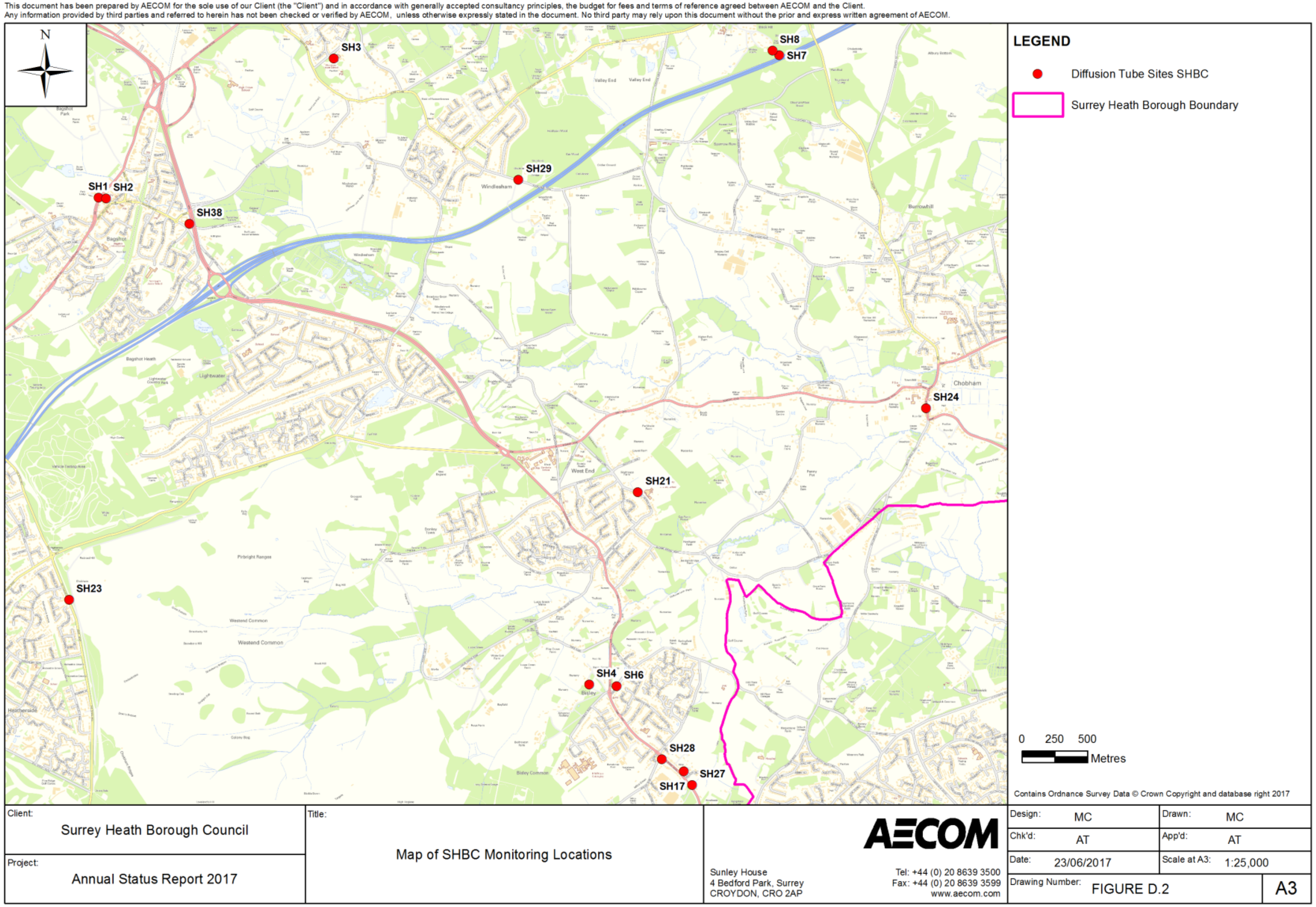


Figure D.2 Map of Monitoring Locations in East of the Borough of Surrey Heath



Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective[4]	
	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

[4] 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
AQS	Air Quality Strategy
ASR	Air quality Annual Status Report
AURN	Automatic Urban and Rural Network
BAM	Beta Attenuation Monitor
Defra	Department for Environment, Food and Rural Affairs
EU	European Union
EV	Electric Vehicle
FDMS	Filter Dynamics Measurement System
HE	Highways England
LAQM	Local Air Quality Management
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
PHOF	Public Health Outcomes Framework
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
SCC	Surrey County Council
SHBC	Surrey Heath Borough Council

Abbreviation	Description
SO_2	Sulphur Dioxide
TEOM	Tapered Element Oscillating Microbalance
USA	Updating and Screening Assessment

References

Ref. 1 Defra, (2007), The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Volume 1).

Ref. 2 Air Quality (England) Regulations 2000 (SI 928)

Ref. 3 The Air Quality (England) (Amendment) Regulations 2002 (SI 3043)

Ref. 4 Surrey Heath Borough Council, Round One Review and Assessment Stage III, 2002.

Ref. 5 Surrey Heath Borough Council, Round One Review and Assessment Stage IV, 2004.

Ref. 6 Surrey Heath Borough Council, Air Quality Updating and Screening Assessment, August 2015.

Ref. 7 Surrey Heath Borough Council, Action Plan Progress Report, 2007.

Ref. 8 Surrey Heath Borough Council, Action Plan Progress Report, 2008.

Ref. 9 Surrey Heath Borough Council, Action Plan Progress Report, 2009.

Ref. 10 Surrey Heath Borough Council, Action Plan Progress Report, 2010.

Ref. 11 Surrey Heath Borough Council, Air Quality Progress Report, 2014.

Ref. 12 Directive 2008/50/EC of the European Parliament and the Council on Ambient Air Quality and Cleaner Air for Europe, 2008.

Ref. 13 Public Health England, Public Health Outcomes Framework, Indicator number 3.01 - Fraction of all-cause adult mortality attributable to anthropogenic particulate air pollution (measured as fine particulate matter, PM2.5),http://www.phoutcomes.info/public-health-outcomes-framework#page/6/gid/1000043/pat/6/par/E12000008/ati/102/are/E06000036/iid/30101/age/230/sex/4, accessed 22/06/2016.

Ref. 14 Defra, LAQM, National Diffusion Tube Bias Adjustment factors, Spreadsheet Version 03/16, http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html, accessed on: 21/06/2016.

Ref. 15 Defra, LAQM, Local bias adjustment factor spreadsheet: http://laqm.defra.gov.uk/bias-adjustment-factors/local-bias.html, accessed on: 21/06/2016.

Ref. 16 Defra, LAQM, 2015 Diffusion Tube monitoring calendar, http://laqm.defra.gov.uk/documents/Timetable-2015.pdf, accessed on: 21/06/2016.

Ref. 17 Defra, LAQM, Nitrogen Dioxide fall off with distance calculator, http://laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html, accessed on: 21/06/2016.

Ref. 18 Defra, Local Air Quality Management, Technical Guidance: LAQM.TG16, 2016